SUMY

FIDAR INDUSTRIAL GROUP

TECHNICAL REFERENCE COLLECTION

DUPLOMATIC

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Current PARTcommunity Collection - 2026 Snapshot

178 catalogue documents | 1482 original technical pages

Compiled into a single indexed engineering reference.

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ABOUT THIS EDITION

A reconstructed master catalogue for practical use

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The original technical sheets are preserved as published. SUMY branding, navigation pages, bookmarks and compilation page numbers are added only to improve browsing and internal technical use.

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Two legacy catalogue sheets (65200 and 65360) were recovered from distributor archives because a directly retrievable current-host file could not be obtained. They are identified in the manifest.

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CATALOGUES COLLECTED	ORIGINAL TECHNICAL PAGES	PRODUCT GROUPS

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01

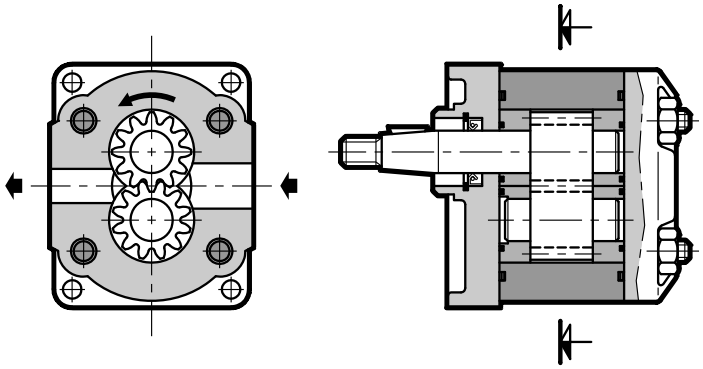
PUMPS

11 catalogue documents | 160 original technical pages



GP
EXTERNAL GEAR PUMPS
SERIES 20

OPERATING PRINCIPLE



— The GP pumps are fixed displacement external gear pumps with axial clearance compensation.

— They give high volumetric efficiency even with high operating pressures, a low noise level, and they have a high endurance thanks to the balancing system of the loads on the guide bushings.

— They are divided into three size groups, with displacements of up to 9.1 - 27.9 and 87.6 cm^3/rev respectively, and with operating pressures of up to 250 bar (standard) and up to 310 bar (H version for high pressure).

— They are available with clockwise, anticlockwise and reversible rotation, with tapered shaft (standard). Other kind of shaft are available upon request.

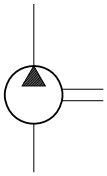
— They are available in multiple versions, and can be combined in multi-flow groups, with a splined connection motion system that guarantees high power performances.

TECHNICAL SPECIFICATIONS

GP PUMP SIZE		GP1	GP2	GP3
Displacement range	cm^3/rev	1.3 ÷ 9.1	7 ÷ 27.9	20.7 ÷ 87.6
Flow rate and operating pressures		see table 3 - Performances		
Rotation speed		see table 3 - Performances		
Rotation direction		clockwise, anticlockwise or reversible (seen from the shaft side)		
Loads on the shaft		radial and axial load are not allowed		
Max torque applicable to the shaft		see paragraph 14.1		
Hydraulic connection		flanged fittings (see paragraph 16)		
Type of mounting		4-holes flange - rectangular type		
Mass: standard version H version	kg	1.2 ÷ 1.6 1.9 ÷ 2.3	2.6 ÷ 3.5 3.8 ÷ 4.7	6 ÷ 8.5 8.7 ÷ 11.2

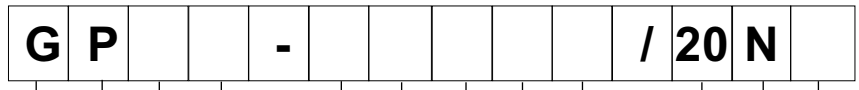
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-15 / +80
Fluid viscosity range	see paragraph 2.2	
Fluid contamination degree	see paragraph 2.3	
Recommended viscosity	cSt	25 ÷ 100

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

1.1 - Identification code for single and front pumps



External gear pump

Pump size:
1 = from 1.3 to 9.1 cm³/rev
2 = from 7.0 to 27.9 cm³/rev
3 = from 20.7 to 87.6 cm³/rev

Omit for single pumps (**standard**)
F = only for front pump to be coupled

Nominal size
(see table 3 - Performances)

Direction of rotation (seen from the shaft side)
R = clockwise (**standard**)
L = anticlockwise
D = reversible (option available for single pumps only)

Mounting flange
9 = 4-holes - rectangular type (**standard**)
0 = SAE J744 - 2 holes

H = version for high pressure.
Omit for standard pressure.

NBR seals for mineral oils

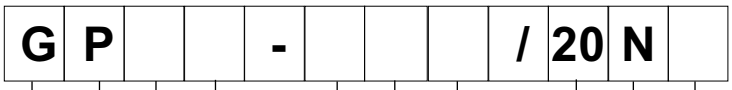
Series No.
(from 20 to 29 sizes and mounting dimensions remain unchanged)

Hydraulic connection
F = flanged ports (**standard**)
B = BSP threaded ports
U = UNF threaded ports

Shaft end type - see **NOTE 1**
7 = tapered keyed with thread (**standard**)
5 = cylindrical keyed
(available for single pumps only)
0 = cylindrical keyed SAE-J744
1 = splined SAE-J744

NOTE 1: See at table 1.4 compatibility among mounting flange, type of shaft and type of hydraulic connection.

1.2 - Identification code for intermediate and rear pumps



External gear pump

Pump size:
1 = from 1.3 to 9.1 cm³/rev
2 = from 7.0 to 27.9 cm³/rev
3 = from 20.7 to 87.6 cm³/rev

Pump position:
M = intermediate
R = rear

Nominal size
(see table 3 - Performances)

Direction of rotation (seen from the shaft side)
R = clockwise (**standard**)
L = anticlockwise

H = version for high pressure.
Omit for standard pressure.

NBR seals for mineral oils

Series No.
(from 20 to 29 sizes and mounting dimensions remain unchanged)

Hydraulic connection
F = flanged ports (**standard**)
B = BSP threaded ports
U = UNF threaded ports

NOTE 2: Front, intermediate and rear pumps for multiple groups are supplied without mating joint, which must be ordered separately (see paragraph 1.5). To order a group of one or more pumps completely assembled see paragraph 1.3.

1.3 - Identification code for multiple pumps

identification code front pump **+** identification code intermediate pump (omit for double pumps) **+** identification code rear pump

1.4 - Compatibility among mounting flange, type of shaft and type of hydraulic connection

FLANGE CODE	SHAFT CODE				HYDRAULIC CONNECTION CODE		
	7	**5**	**0**	**1**	**F**	**B**	**U**
9	yes	yes	no	no	yes	yes	no
0	no	no	yes	yes	yes	no	yes

1.5 - Identification code for mating joints

FIRST PUMP	SECOND PUMP		
	GP1	**GP2**	**GP3**
GP1	3101100003	-	-
GP2	3101100004	3101100005	-
GP3	3101100006	3101100007	3101100008

1.6 - Examples

a) single pump size 1 - 1.3 cm^3/rev - anticlockwise rotation - standard flange and shaft
GP1-0013L97F/20N

b) single pump size 2 - 14 cm^3/rev - clockwise rotation - standard flange and shaft
GP2-0140R97F/20N

c) single pump size 3 - 22.5 cm^3/rev - clockwise rotation - SAE flange and shaft
GP3-0225R01F/20N

d) double pump made of:
- pump size 2 - 7 cm^3/rev -clockwise rotation
- pump size 1 - 2 cm^3/rev - high pressure

GP2F-0070R97F/20N + GP1R-0020RF/20NH

e) triple pump made of:
- pump size 3 - 22.5 cm^3/rev
- pump size 2 - 14 cm^3/rev
- pump size 1 - 2 cm^3/rev

GP3F-0225R97F/20N + GP2M-0140RF/20N + GP1R-0020RF/20N

2 - HYDRAULIC FLUID

2.1 Type of fluid

Use mineral oil based hydraulic fluids with anti-foam and antioxidant additives, in conformity with the requisites of the following standards:
- FZG test - 11th stage
- DIN 51525
- VDMA 24317

For use with other types of fluid (water glycol, phosphate esters and others), consult our technical dept. Operation with fluid at a temperature greater than 80°C causes a premature deterioration of the fluid quality and of the seals. The physical and chemical properties of the fluid must be maintained.

2.2 - Fluid viscosity

The operating fluid viscosity must be within the following range:

minimum viscosity	12 cSt	referred to the maximum fluid temperature of 80 °C
optimum viscosity	25 ÷ 100 cSt	referred to the operating temperature of the fluid in the tank
maximum viscosity	1600 cSt	limited to only the start-up phase of the pump

2.3 - Degree of fluid contamination

The maximum degree of fluid contamination must be according to ISO 4406:1999 class 20/18/15; therefore, use of a filter with $\beta_{20} \geq 75$ is recommended. A degree of maximum fluid contamination according to ISO 4406:1999 class 18/16/13 is recommended for optimum endurance of the pump. Hence, use of a filter with $\beta_{10} \geq 100$ is recommended.

If there is a filter installed on the suction line, be sure that the pressure at the pump inlet is not lower than the values specified in paragraph 13.

The suction filter must be equipped with a by-pass valve and, if possible, with a clogging indicator.

3 - PERFORMANCE RATINGS

(values obtained with mineral oil with viscosity of 36 cSt at 50°C)

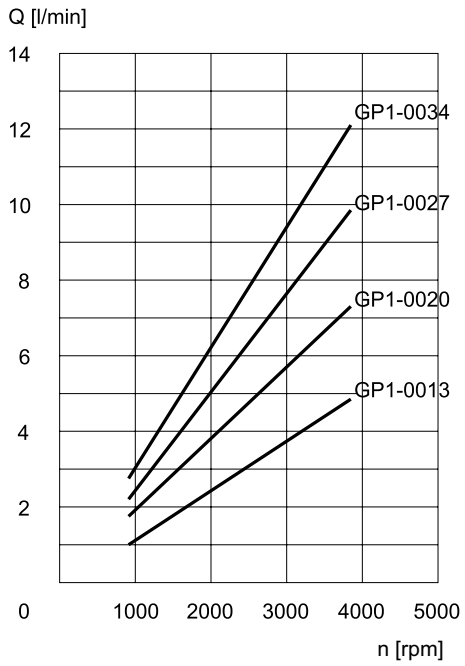
Values in brackets refer to the version **H,** for high pressure. The max pressure values for reversible high pressure pumps (rotation type **D**) must be reduced by 15%.

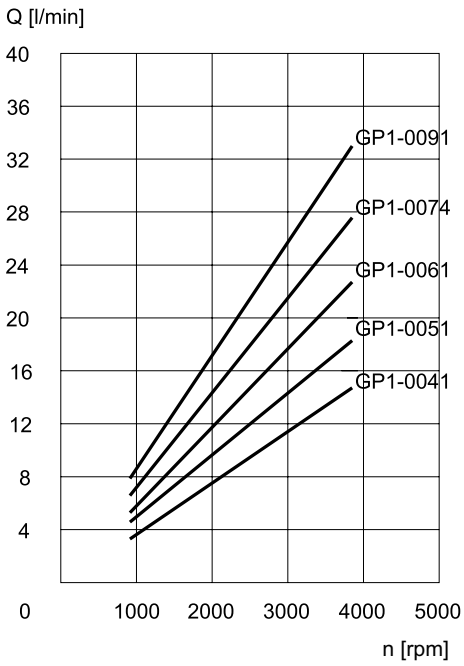
PUMP SIZE	**NOMINAL SIZE**	**DISPLACEMENT** [cm^3/rev]	**MAX FLOW RATE** at 1500 rpm [l/min]	**MAX PRESSURE** at 1500 rpm [bar]		**SPEED** [rpm]		
				continuous operating	**peak**	**max** flange = **9**	**max** flange = **0**	**min**
GP1	**0013**	1.3	2.0	250 (270)	290 (310)	6000	6000	800
	0020	2.0	3.0					
	0027	2.7	4.0			5000	5000	
	0034	3.4	5.1					
	0041	4.1	6.1			4000	4000	
	0051	5.1	7.6	230 (260)	260 (290)	4000	3500	
	0061	6.1	9.1			3800	3000	
	0074	7.4	11.1	200 (230)	230 (290)	3200	3500	600
	0091	9.1	13.6	180 (210)	210 (240)	2600	3000	
GP2	**0070**	7.0	10.5	250 (280)	290 (310)	4000	4000	600
	0095	9.5	14.2			3000		
	0113	11.3	16.9	230 (280)	270 (310)	4000	4000	
	0140	14.0	21.0	230 (260)	270 (300)		3200	
	0158	15.8	23.7	210 (260)	240 (290)		3800	500
	0178	17.8	26.7			3600	2500	
	0208	20.8	31.2	180 (230)	210 (260)	3200	2200	
	0234	23.4	35.1			3000	2000	
	0279	27.9	41.8	170 (200)	200 (230)	2500	1800	
GP3	**0207**	20.7	31.0	230 (280)	270 (310)	3500	3500	500
	0225	22.5	33.7					
	0264	26.4	39.6			3000	3300	
	0337	33.7	50.5	230 (270)	270 (300)			
	0394	39.4	59.1	220 (260)	260 (290)		3000	
	0427	42.7	64.0	210 (250)	250 (280)	2800	2800	400
	0514	51.4	77.1	200 (230)	240 (260)	2400	2500	
	0600	60.0	90.0	190 (210)	220 (240)	2800	2800	
	0696	69.6	104.4	170 (200)	200 (230)	2500	2500	
	0776	77.6	116.4	160 (180)	190 (210)	2300	2300	
	0876	87.6	131.4	140 (160)	170 (190)	2000	2000	

4 - CURVES AND CHARACTERISTIC DATA OF GROUP GP1 PUMPS

(values obtained with mineral oil with viscosity of 36 cSt at 50°C)

4.1 - Flow rate curves Q = f (n) obtained with operating pressure 0 bar





4.2 - Efficiencies

PUMP NOMINAL SIZE	VOLUMETRIC EFFICIENCY [%]	TOTAL EFFICIENCY [%]
0013	0.90	0.82
0020	0.90	0.85
0027	0.95	0.90
0034	0.91	0.87
0041	0.94	0.90
0051	0.96	0.92
0061	0.96	0.92
0074	0.96	0.90
0091	0.96	0.88

The volumetric and total efficiencies for the various nominal dimensions of the Group GP1 pumps, measured at 1500 rpm and with 150 bar operating pressure, are shown in the table.

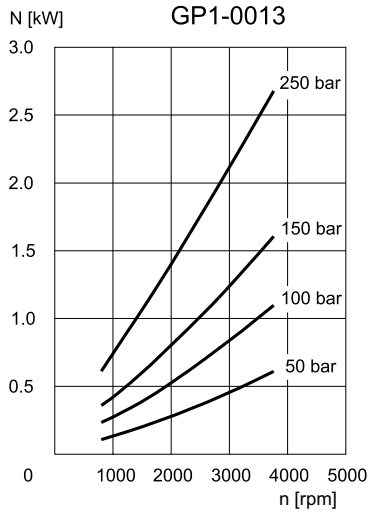
The total efficiency considers the volumetric efficiency and the mechanical efficiency of the pump in the specified operating conditions.

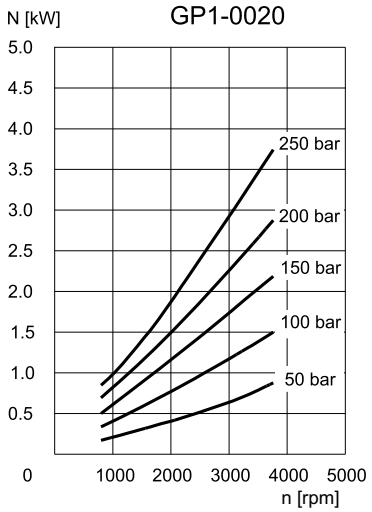
4.3 - Noise level

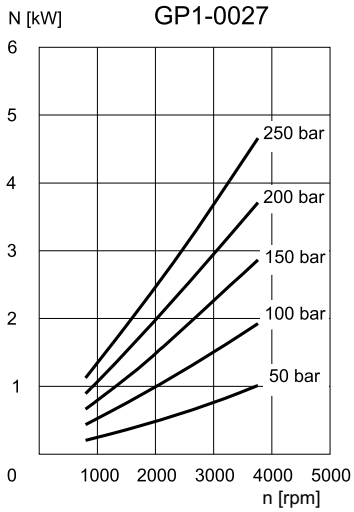
PUMP NOMINAL SIZE	NOISE LEVEL [dB (A)]
0013	65
0020	66
0027	68
0034	68
0041	70
0051	73
0061	73
0074	73
0091	77

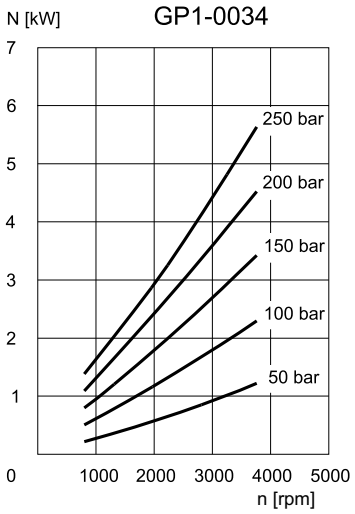
The noise levels for the various nominal dimensions of the Group GP1 pumps, measured at 1500 rpm, with 150 bar operating pressure and measured at a distance of 1 metre from the pump, are shown in the table.

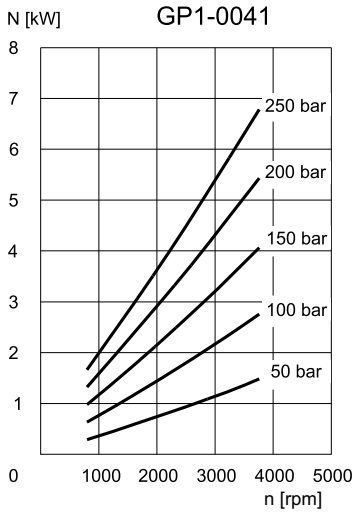
4.4 - Absorbed power curves N = f(n), obtained with operating pressures from 50 to 250 bar

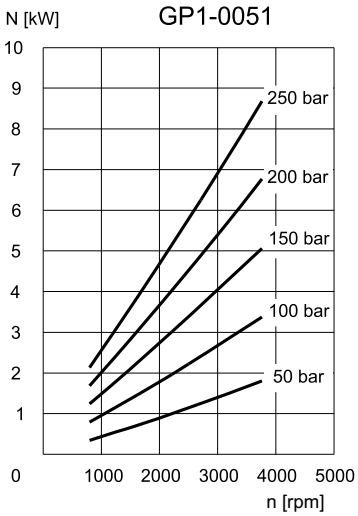


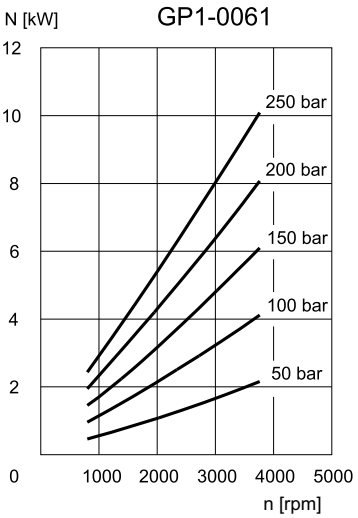


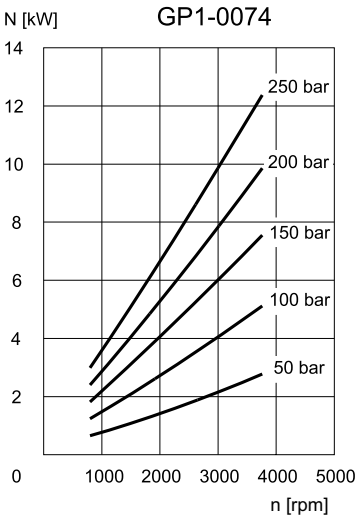


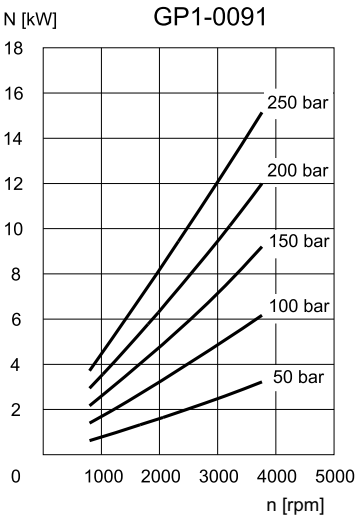








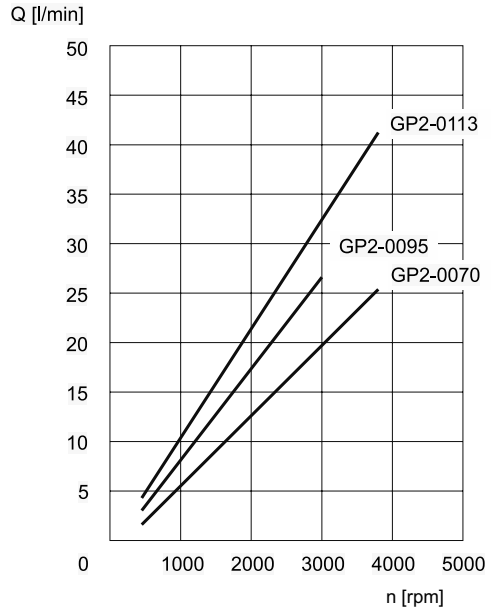


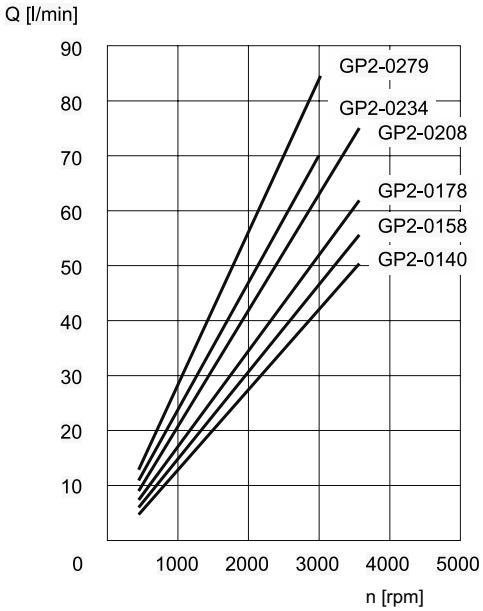


5 - CURVES AND CHARACTERISTIC DATA OF GROUP GP2 PUMPS

(values obtained with mineral oil with viscosity of 36 cSt at 50°C)

5.1 - Flow rate curves Q = f(n) obtained with operating pressure 0 bar





5.2 - Efficiencies

PUMP NOMINAL SIZE	VOLUMETRIC EFFICIENCY [%]	TOTAL EFFICIENCY [%]
0070	0.92	0.87
0095	0.95	0.88
0113	0.95	0.87
0140	0.93	0.87
0158	0.95	0.86
0178	0.93	0.85
0208	0.93	0.88
0234	0.97	0.89
0279	0.94	0.85

The volumetric and total efficiencies for the various nominal dimensions of the Group GP2 pumps, measured at 1500 rpm and with 150 bar operating pressure, are shown in the table.

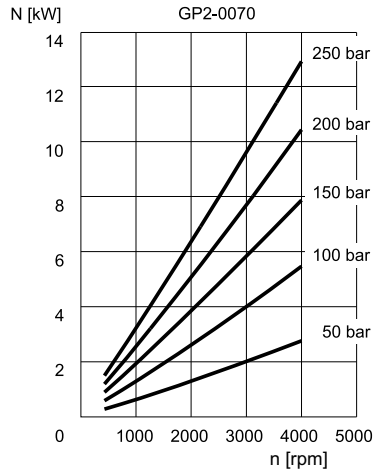
The total efficiency considers the volumetric efficiency and the mechanical efficiency of the pump in the specified operating conditions.

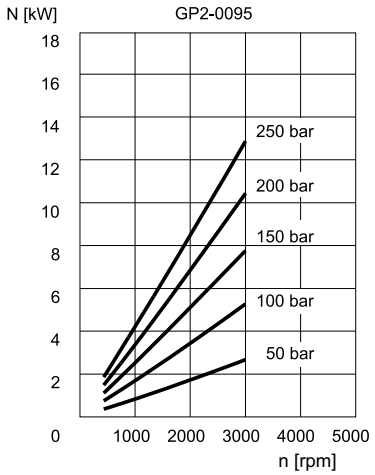
5.3 - Noise level

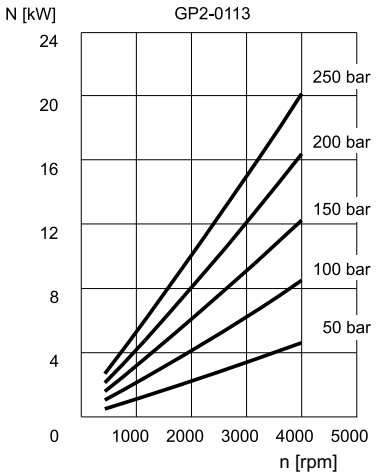
PUMP NOMINAL SIZE	NOISE LEVEL [dB (A)]
0070	75
0095	77
0113	77
0140	72
0158	72
0178	73
0208	74
0234	76
0279	76

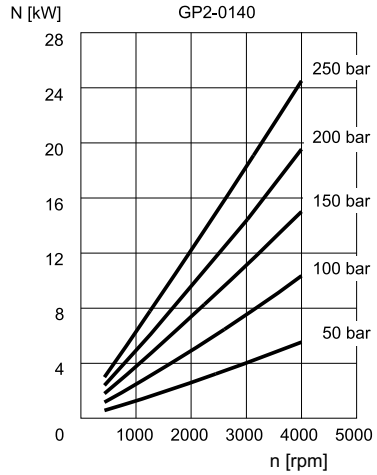
The noise levels for the various nominal dimensions of the Group GP2 pumps, measured at 1500 rpm, with 150 bar operating pressure and measured at a distance of 1 metre from the pump, are shown in the table.

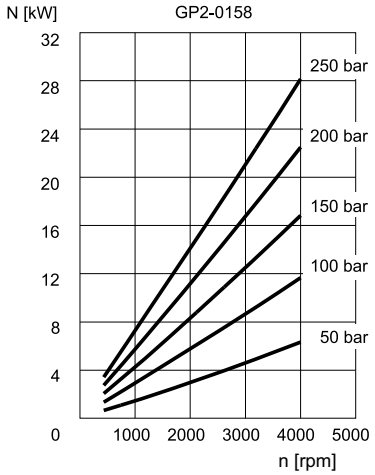
5.4 - Absorbed power curves N = f(n), measured with operating pressures from 50 to 250 bar



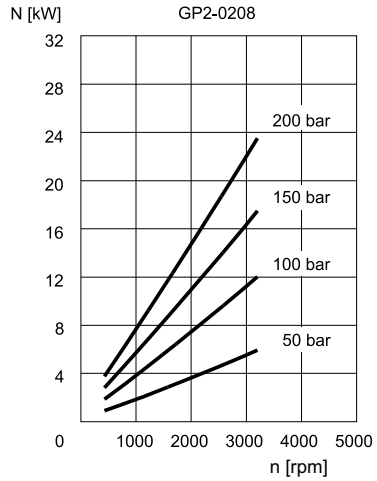


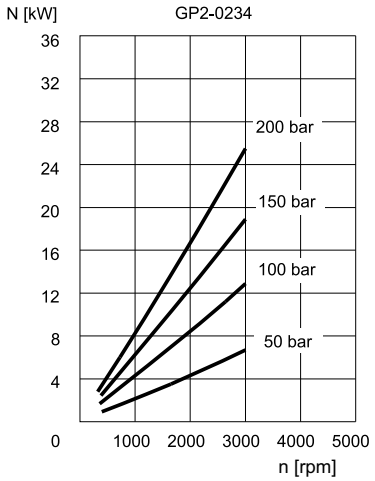


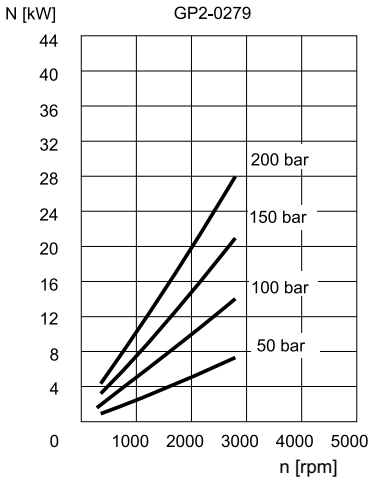








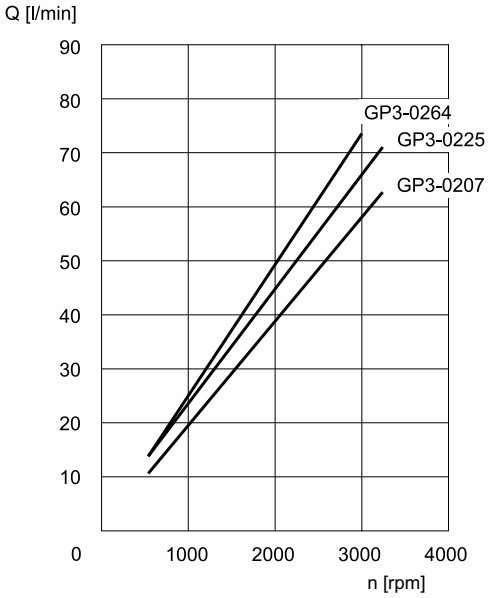


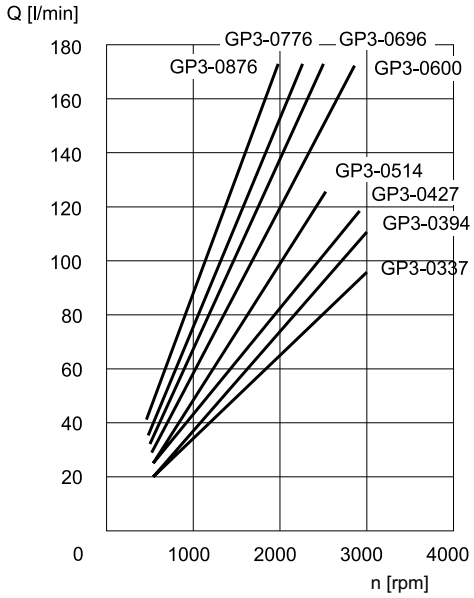


6 - CURVES AND CHARACTERISTIC DATA OF GROUP GP3 PUMPS

(values obtained with mineral oil with viscosity of 36 cSt at 50°C)

6.1 - Flow rate curves Q = f(n) obtained with operating pressure 0 bar





6.2 - Efficiencies

PUMP NOMINAL SIZE	VOLUMETRIC EFFICIENCY [%]	TOTAL EFFICIENCY [%]
0207	0.88	0.83
0225	0.97	0.92
0264	0.90	0.84
0337	0.92	0.87
0394	0.91	0.86
0427	0.92	0.82
0514	0.93	0.83
0600	0.85	0.82
0696	0.95	0.90
0776	0.93	0.87
0876	0.89	0.84

The volumetric and total efficiencies for the various nominal dimensions of the Group GP3 pumps, measured at 1500 rpm and with 150 bar operating pressure, are shown in the table.

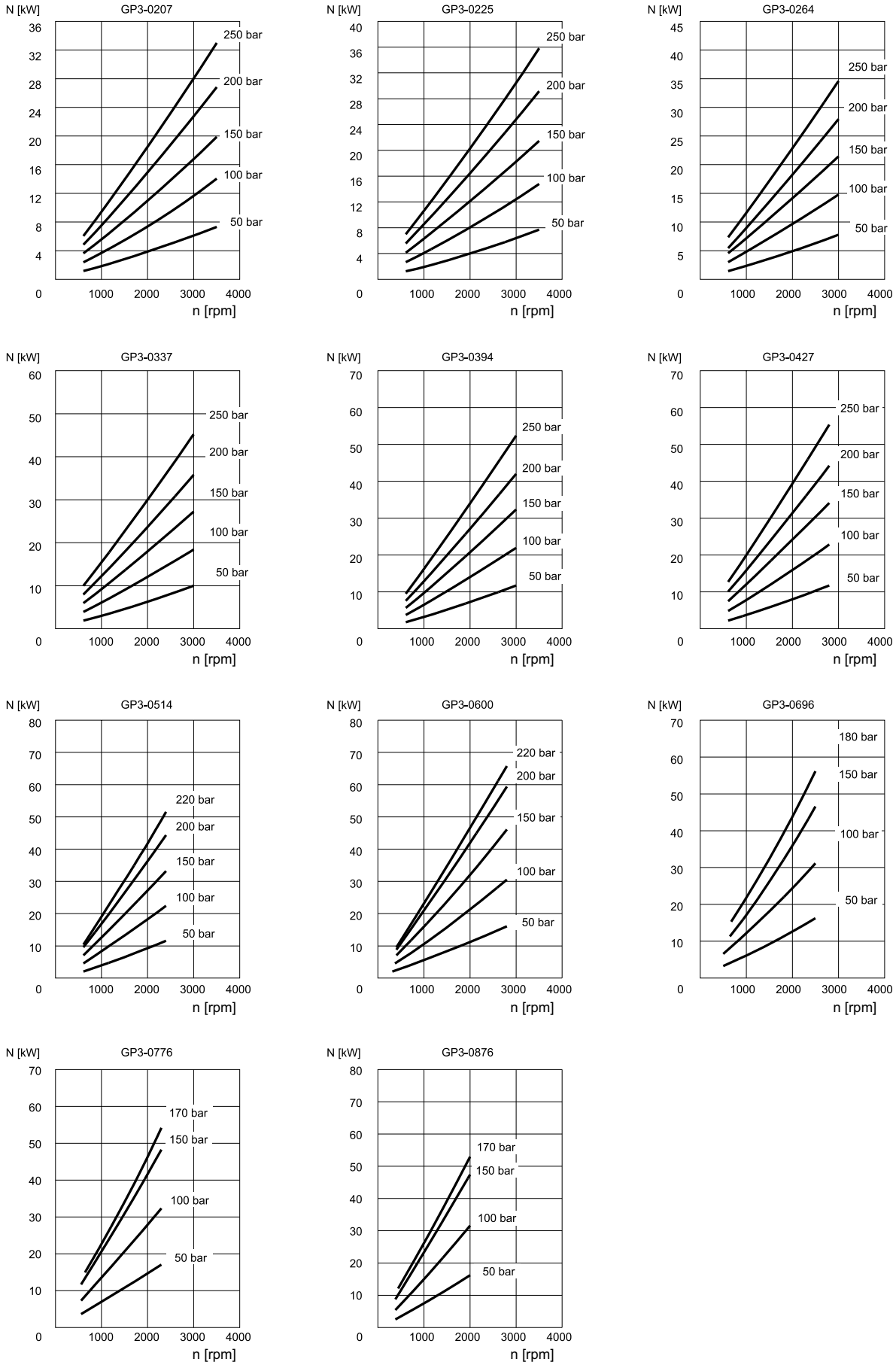
The total efficiency considers the volumetric efficiency and the mechanical efficiency of the pump in the specified operating conditions.

6.3 - Noise level

PUMP NOMINAL SIZE	NOISE LEVEL [dB (A)]
0207	75
0225	75
0264	76
0337	72
0394	72
0427	73
0514	75
0600	77
0696	77
0776	76
0876	78

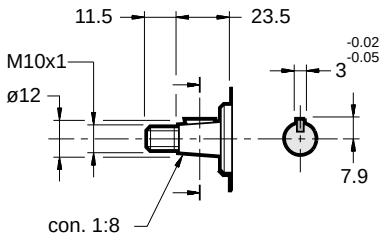
The noise levels for the various nominal dimensions of the Group GP3 pumps, measured at 1500 rpm, with 150 bar operating pressure and measured at a distance of 1 metre from the pump, are shown in the table.

6.4 - Absorbed power curves N = f(n), obtained with operating pressures from 50 to 250 bar

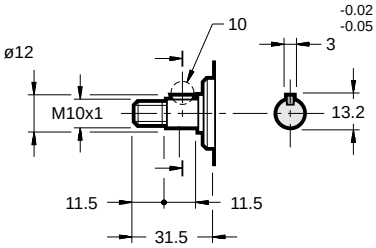


7 - GP1 PUMPS WITH STANDARD FLANGE - OVERALL AND MOUNTING DIMENSIONS

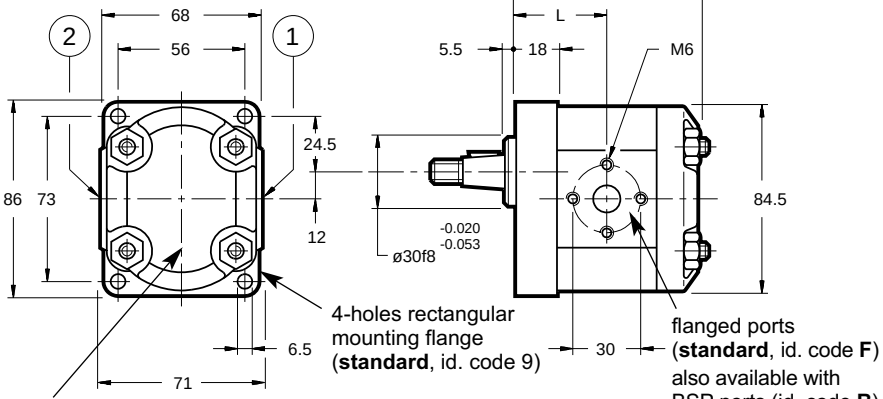
dimensions in mm



tapered shaft end with thread
(**standard**, id. code **7**)



cylindrical keyed shaft end with thread
(id. code **5**)



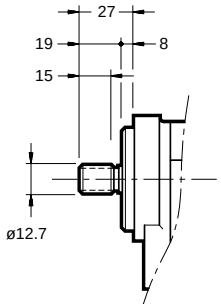
Pump nominal dimension	L	M	**1** suction port (clockwise rotation)		**2** delivery port (clockwise rotation)	
			flange	BSP	flange	BSP
0013	40	80.5	Ø13	1/2"	Ø13	3/8"
0020	41	82.5				
0027	42	84.5				
0034	43	86.5				
0041	44	88.5				1/2"
0051	45.5	91.5				
0061	47	94.5				
0074	49	98.5				
0091	51.5	103.5				

NOTE:
1. Ports (1) and (2) are reversed on pumps with anticlockwise rotation
2. On reversible pumps the delivery port has the same size of the suction

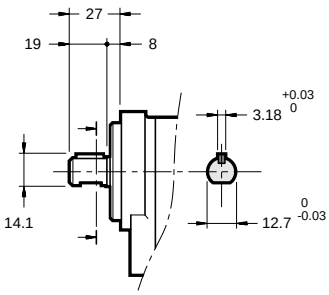
8 - GP1 PUMPS WITH SAE FLANGE - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

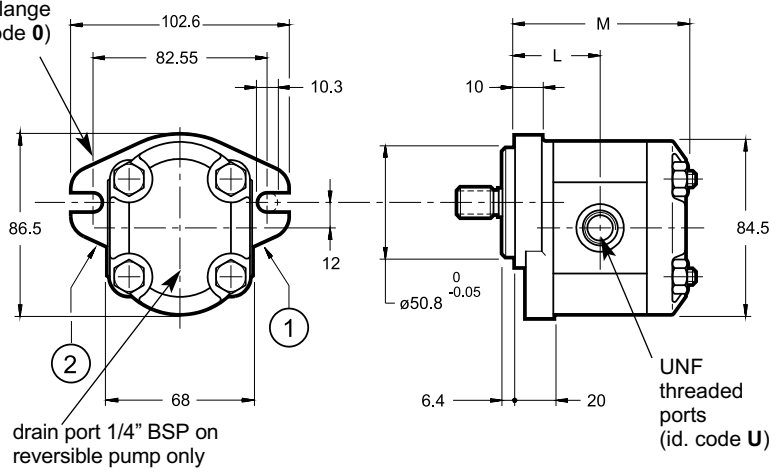
splined SAE A-A
20/40 d.p. - 9T
(**standard**, id. code **1**)



cylindrical keyed SAE A-A
(id. code **0**)



SAE A-A
2-holes flange
(id. code **0**)



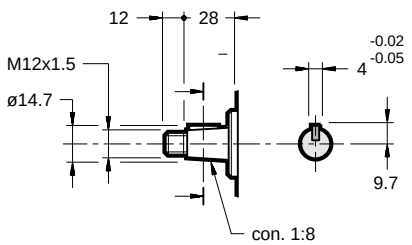
Pump nominal dimension	L	M	**1** suction port (clockwise rotation)		**2** delivery port (clockwise rotation)	
			flange	UNF	flange	UNF
0013	42	82.5	Ø13	3/4-16	Ø13	9/16-18
0020	43	84.5				
0027	44	86.5				
0034	45	88.5				
0041	46	90.5				
0051	47.5	93.5				
0061	49	69.5				
0074	51	100.5		7/8-14		3/4-16
0091	53.5	105.5				

NOTE:
1. Ports (1) and (2) are reversed on pumps with anticlockwise rotation
2. On reversible pumps the delivery port has the same size of the suction

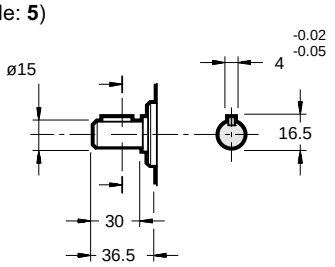
9 - GP2 PUMPS WITH STANDARD FLANGE - OVERALL AND MOUNTING DIMENSIONS

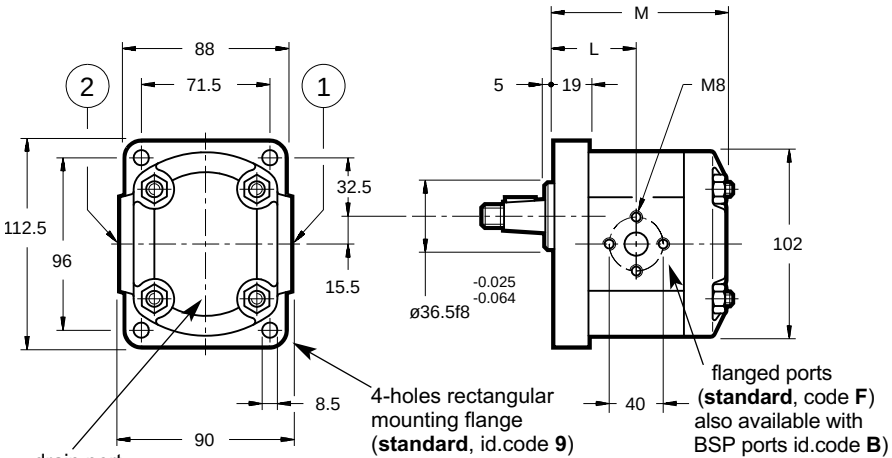
dimensions in mm

tapered shaft end with thread
(**standard**, id. code **7**)



cylindrical keyed shaft end
(id code: **5**)





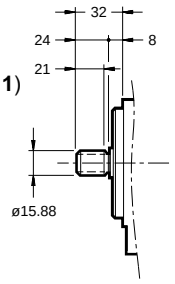
Pump nominal dimension	L	M	1 suction port (clockwise rotation)		**2** delivery port (clockwise rotation)	
			flange	BSP	flange	BSP
0070	47.5	97.5	Ø13	1/2"	Ø13	1/2"
0095	49.5	101.5				
0113	51	104.5	Ø19	3/4"		
0140	53	108.5				
0158	54.5	111.5				
0178	56	114.5				
0218	58.5	119.5			Ø19	
0234	60.5	123.5				
0279	64	130.5				

NOTE:
1. Ports (1) and (2) are reversed on pumps with anticlockwise rotation
2. On reversible pumps the delivery port has the same size of the suction port

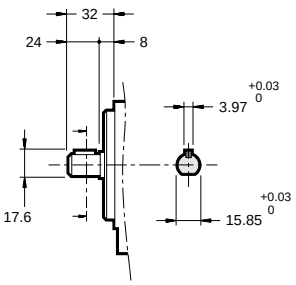
10 - GP2 PUMPS WITH SAE FLANGE - OVERALL AND MOUNTING DIMENSIONS

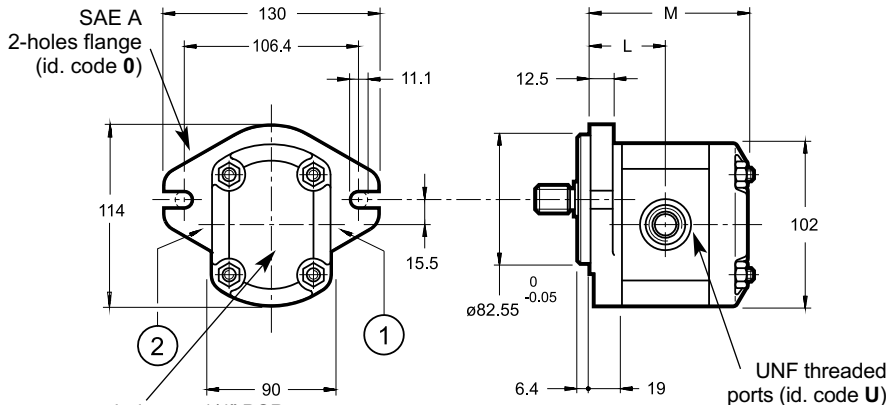
dimensions in mm

splined SAE A
16/32 d.p. - 9T
(**standard**, id. code **1**)



cylindrical keyed
SAE A
(id. code **0**)



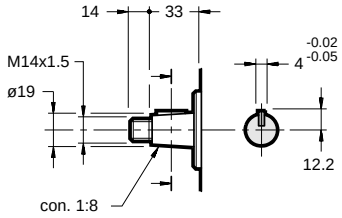


Pump nominal dimension	L	M	1 suction port (clockwise rotation)		**2** delivery port (clockwise rotation)	
			flange	UNF	flange	UNF
0070	47.5	97.5	Ø13	1 1/16-12	Ø13	7/8-14
0095	49.5	101.5				
0113	51	104.5	Ø19			
0140	53	108.5				
0158	54.5	111.5				
0178	56	114.5				
0218	58.5	119.5			Ø19	
0234	60.5	123.5				
0279	64	130.5				

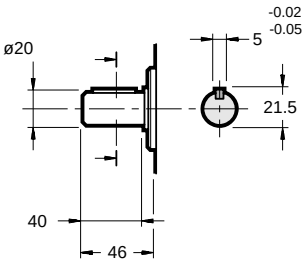
NOTE:
1. Ports (1) and (2) are reversed on pumps with anticlockwise rotation
2. On reversible pumps the delivery port has the same size of the suction port

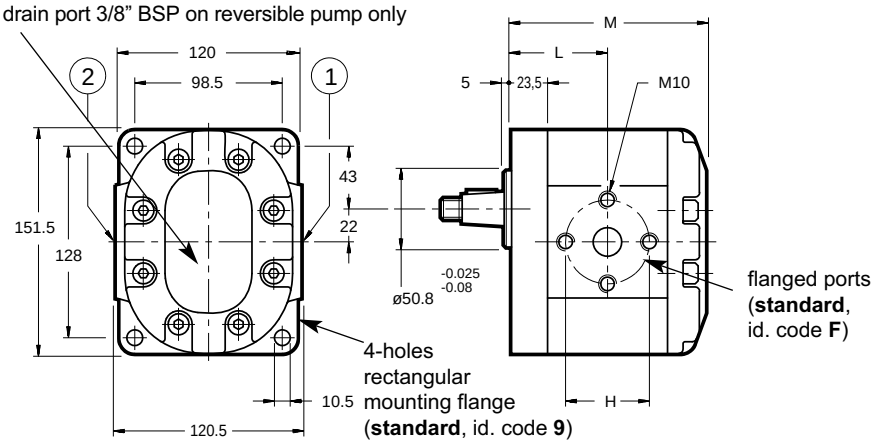
11 - GP3 PUMPS WITH STANDARD FLANGE - OVERALL AND MOUNTING DIMENSIONS

tapered shaft end with thread
(**standard**, id. code **7**)



cylindrical keyed shaft end
(id code: **5**)





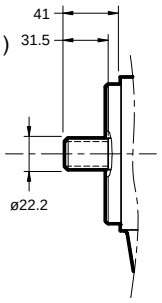
NOTE:
1. Ports (1) and (2) are reversed on pumps with anticlockwise rotation
2. On reversible pumps the delivery port has the same size of the suction port
3. Values marked with * refer to the suction port only, whereas the value for delivery port is 51 mm

dimensions in mm

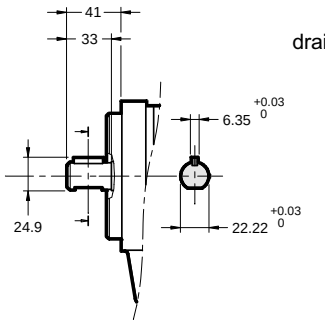
Pump nominal dimension	L	M	H	**1** suction port (clockwise rotation)		**2** delivery port (clockwise rotation)	
				flange	BSP	flange	BSP
0207	64	129.5	56	Ø27	3/4"	Ø19	3/4"
0225	64.5	130.5	56				
0264	66	133.5	56		1"		
0337	68.5	138.5	56				
0394	70.5	142.5	56				
0427	72	145.5	51		1 1/4"	Ø27	1"
0514	75	151.5	62*				
0600	78	157.5	62*	Ø33			
0696	81.5	164.5	62*		1 1/2"		1 1/4"
0776	84	169.5	62*				
0879	87	175.5	62*				

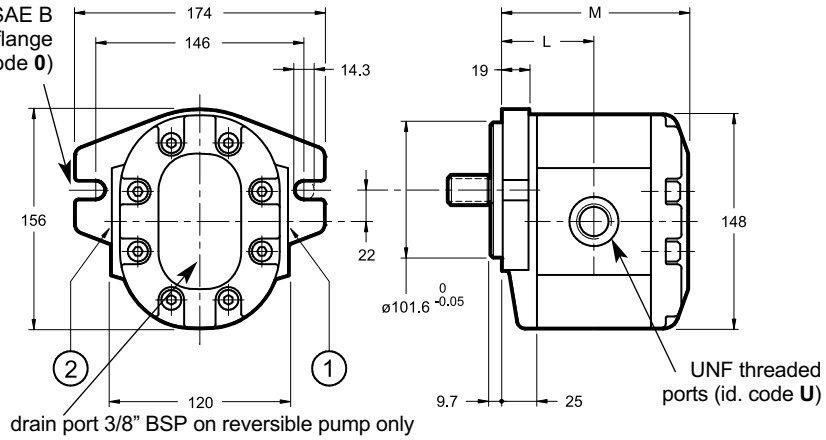
12 - GP3 PUMPS WITH SAE FLANGE - OVERALL AND MOUNTING DIMENSIONS

splined SAE B
16/32 d.p. - 13T
(**standard**, id. code **1**)



cylindrical keyed
SAE B
(id. code **0**)





NOTE:
1. Ports (1) and (2) are reversed on pumps with anticlockwise rotation
2. On reversible pumps the delivery port has the same size of the suction
3. Values marked with * refer to the suction port only, whereas the value for delivery port is 51 mm

dimensions in mm

Pump nominal dimension	L	M	H	**1** suction port (clockwise rotation)		**2** delivery port (clockwise rotation)	
				flange	UNF	flange	UNF
0207	65	130.5	56	Ø27	1 5/16-12	Ø19	1 1/16-12
0225	65.5	131.5	56				
0264	67	134.5	56				
0337	69.5	139.5	56				
0394	71.5	143.5	56		1 5/8-12		
0427	73	146.5	51			Ø27	
0514	76	152.5	62*				
0600	79	158.5	62*	Ø33	1 7/8-12		1 5/16-12
0696	82.5	165.5	62*				
0776	85	170.5	62*				
0879	88	176.5	62*				

13 - INSTALLATION

– The GP gear pumps can be installed with shaft oriented in any position.

– Check that the rotation direction of the motor corresponds to the direction of the arrow marked on the pump before commissioning.

– Before the first start up vent the air from the delivery port.

– The pump start up, especially at a cold temperature, should occur with the pump unloading.

– The suction pipe must be suitably sized to facilitate the passage of the fluid. Bends and restrictions or an excessive length of the pipeline can affect the correct operation of the pump. It is advisable not to exceed the speed of 1 ÷ 2 m/sec in suction hose.

– The minimum permissible suction pressure is -0.3 bar relative. Standard pumps cannot work with pressure at suction port, excerpt reversible pumps, which are able to withstand pressurized inlet

– Gear pumps must not operate with a rotation speed lower than the minimum rotation speed indicated in table 3 - performance. **The pumps must be filled with the same operating fluid as the circuit before being installed.** Filling can be done through the ports connections. Rotate the pump manually if needed.

– The motor-pump connection must be carried out directly with a flexible coupling able to compensate any offsets. Couplings that generate axial or radial loads on the pump shaft are not allowed.

– The drain port of the reversible pumps must always be connected to the tank. Maximum permitted pressure rise is 6 bar

14 - MULTIPLE PUMPS

It's possible to create multi-flow groups with independent hydraulic circuits coupling several pumps together. While sizing multiple pumps the following conditions must be taken into account:

– Assembly can take place between pumps of the same group, or in decreasing order of size.

– The max. rotation speed is determined by the pump with the lowest speed.

– The values of the max. applicable torque can not be exceeded.

14.1 - Maximum applicable torque

The input torque (M) is given for each pump by the following ratio:

$$M = \frac{9550 \cdot N}{n} = [Nm]$$

n = rotation speed [rpm]

where the absorbed power (N) is given by:

$$N = \frac{Q \cdot \Delta p}{600 \cdot \eta\,tot} = [kW]$$

Q = flow rate [l/min]

Δp = differential pressure between the pump suction and delivery [bar]

η_{tot} = total efficiency (see diagrams in par. 4.2 - 5.2 - 6.2).

or it can be obtained from the diagrams ABSORBED POWER (see paragraphs 4.4 - 5.4 - 6.4).

If several pumps are coupled, the torque of each single pump has to be added to the torque of subsequent pumps when they are loaded simultaneously.

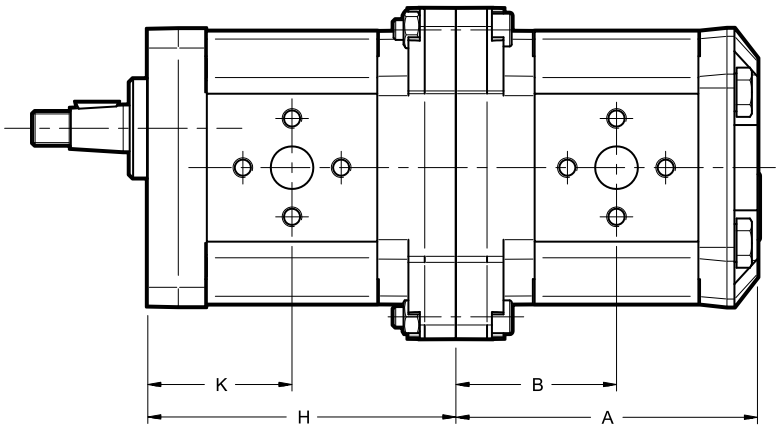
The obtained torque value for each pump has to be lower than the value specified in the table below.

If the obtained torque values are higher than those stated in the table, reduce the working pressure value or replace the overloaded pump with a pump suitable to bear the required torque.

	MAX APPLICABLE TORQUE [Nm]					
	Front pump shaft type			Intermediate / rear pump		
front pump size	tapered, keyed code **7**	SAE J744 splined code **1**	SAE J744 cylindrical keyed code **0**	**GP1**	**GP2**	**GP3**
GP1	90	55	55	50	-	-
GP2	145	110	105		110	-
GP3	280	405	295			230

15 - MULTIPLE PUMPS OVERALL DIMENSIONS

Dimensions below are concerning to standard pumps (clockwise rotation, rectangular flange, tapered keyed with thread shaft end and flanged ports). Please consult our Technical Dept. for different configurations and for overall dimensions of groups composed by three or more pumps.



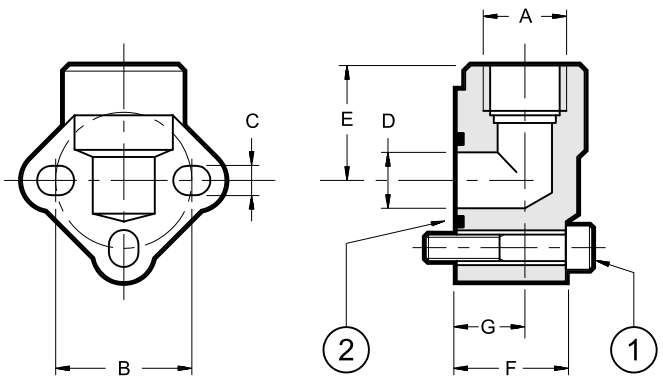
dimensions in mm

PUMP SIZE	NOMINAL SIZE	FRONT PUMP		REAR PUMP	
		H	K	A	B
GP1	**0013**	86	40	86,5	46
	0020	88	41	88,5	47
	0027	90	42	90,5	48
	0034	92	43	92,5	49
	0041	94	44	94,5	50
	0051	97	45,5	97,5	51,5
	0061	100	47	100,5	53
	0074	104	49	104,5	55
	0091	109	51,5	109,5	57,5
GP2	**0070**	101	47,5	103,5	53,5
	0095	105	49,5	107,5	55,5
	0113	108	51	110,5	57
	0140	112	53	114,5	59
	0158	115	54,5	117,5	60,5
	0178	118	56	120,5	62
	0208	123	58,5	125,5	64,5
	0234	127	60,5	129,5	66,5
	0279	134	64	136,5	70
GP3	**0207**	135,5	64	137	71,5
	0225	136,5	64,5	138	72
	0264	139,5	66	141	73,5
	0337	144,5	68,5	146	76
	0394	148,5	70,5	150	78
	0427	151,5	72	153	79,5
	0514	157,5	75	159	82,5
	0600	163,5	78	165	85,5
	0696	170,5	81,5	172	89
	0776	175,5	84	177	91,5
	0876	181,5	87	183	94,5

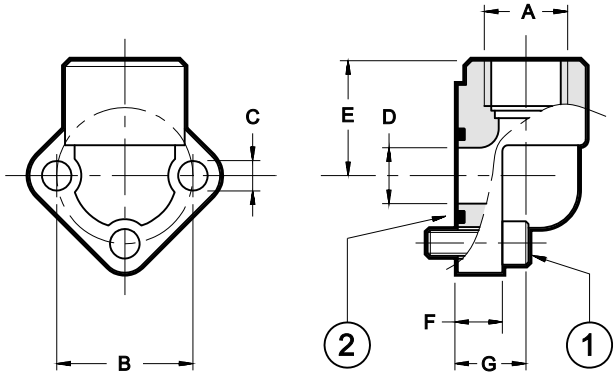
NOTE: Add 11 mm to both A and B quotes on assembled multiple pumps made by GP3+GP1 pumps to calculate the correct overall.

16 - CONNECTION FLANGES

dimensions in mm



ALUMINIUM FLANGES
type **RP**



STEEL FLANGES
type **RPA**

Fastening bolt and O-rings included

ALUMINIUM FLANGES TYPE RP

	Flange code	Flange description	p_{max} [bar]	ØA	B	C	ØD	E	F	G	(1) SHC bolts	(2) seals
GP1	0610506	RP1 - 38	180	3/8" BSP	30	6.5	12.5	30	26	18	n°3 - M6x35	OR 121 (15.88x2.62)
	0610248	RP1 - 12		1/2" BSP	30	6.5	12.5	30	26	18		
GP2	0610508	RP2 - 12		1/2" BSP	40	8.5	18.5	40	31	20	n°3 - M8x45	OR 130 (22.22x2.62)
	0610249	RP2 - 34		3/4" BSP	40	8.5	18.5	40	31	20		
GP3	0610717	RP3 - 34		3/4" BSP	51	10.5	25	46	43	26	n°3 - M10x60	OR 4118 (29.75x3.53)
	0610250	RP3 - 100		1" BSP	56	10.5	25	46	43	26		

STEEL FLANGES TYPE RPA

	Flange code	Flange description	p_{max} [bar]	ØA	B	C	ØD	E	F	G	(1) SHC bolts	(2) seals
GP1	0771048	RPA1 - 38	315	3/8" BSP	30	6.5	12	24	17	9.5	n°3 - M6x20	OR 121 (15.88x2.62)
	0771049	RPA1 - 12		1/2" BSP	30	6.5	12	24	17	9.5		
GP2	0771050	RPA2 - 12		1/2" BSP	40	8.5	20	36	22	11.5	n°3 - M8x25	OR 132 (23.81x2.62)
	0770615	RPA2 - 34		3/4" BSP	40	8.5	20	36	22	11.5		
GP3	0771051	RPA3 - 34A		3/4" BSP	51	10.5	24	46	26	13	n°3 - M10x30	OR 3125 (31.42x2.62)
	0770617	RPA3 - 100A		1" BSP	51	10.5	24	46	26	13		
	0770618	RPA3 - 34B		3/4" BSP	56	10.5	24	46	26	13		
	0770619	RPA3 - 100B		1" BSP	56	10.5	24	46	26	13		
	0771052	RPA35 - 114A		1" ¼ BSP	62	13	31	55	35	17	n°3 - M10x35	

DUPLOMATIC MOTION SOLUTIONS

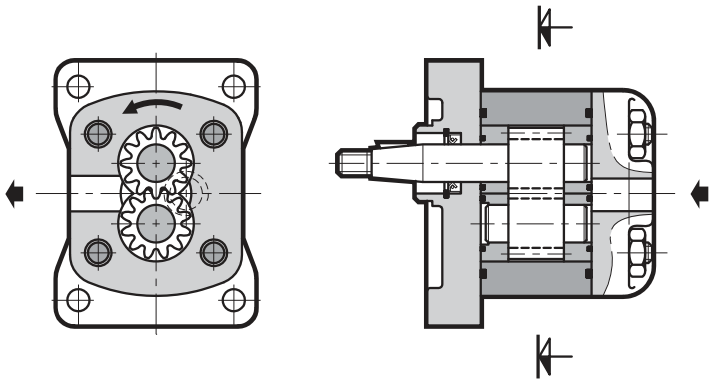
DUPLOMATIC MS S.p.A.
via M. Re Depaolini 24 • 20015 PARABIAGO (MI) • ITALY
tel. +39 0331.895.111 • www.duplomatic.com • e-mail: sales.exp@duplomatic.com

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1P
EXTERNAL GEAR PUMPS
SERIES 11

OPERATING PRINCIPLE



— The 1P pumps are fixed displacement external gear pumps with axial clearance compensation.

— They give high volumetric flows even with high operating pressures, a low noise level, and they have a high endurance thanks to the balancing system of the loads on the guide bushings.

— They are available with displacements going from 1,1 to 8,0 cm^3/rev and with operating pressures of up to 230 bar.

— They are available with clockwise rotation direction and with tapered shaft.

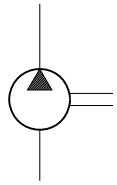
— The hydraulic connection is with BSP threaded ports type.

TECHNICAL SPECIFICATIONS

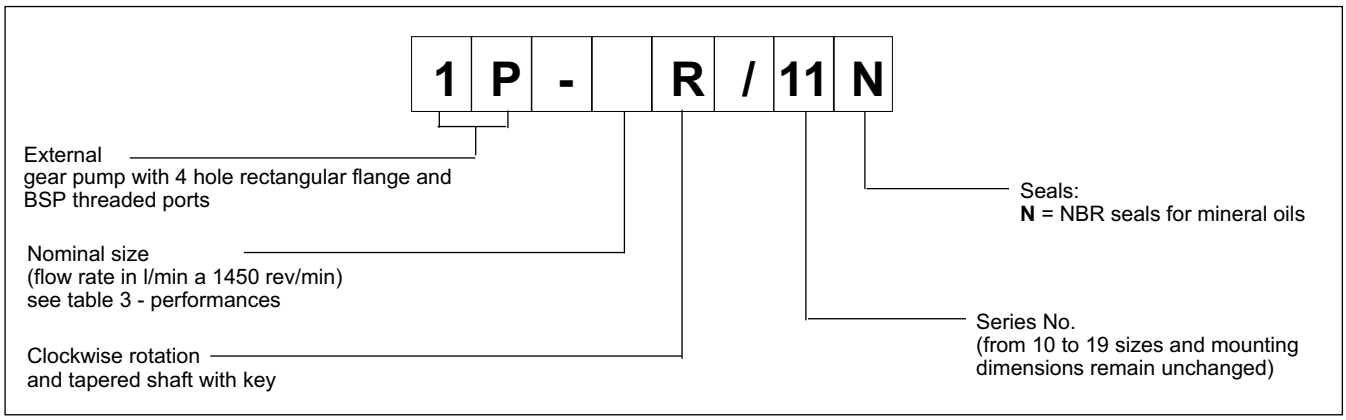
PUMP SIZE		1P
Displacement range	cm^3/rev	1,1 ÷ 8,0
Flow rate and operating pressures		see table 3 - Performances
Rotation speed		see table 3 - Performances
Rotation direction		clockwise (seen from the shaft side)
Loads on the shaft		radial and axial load are not allowed
Hydraulic connection		threaded ports BSP
Type of mounting		4 hole flange - rectangular type
Mass	kg	approx. 1,6

Ambient temperature range	°C	–20 / +50
Fluid temperature range	°C	–15 / +80
Fluid viscosity range	see par. 2.2	
Recommended viscosity	cSt	25 ÷ 100
Degree of fluid contamination	see par. 2.3	

HYDRAULIC SYMBOL



1 - CODIFICATION



2 - HYDRAULIC FLUID

2.1 Type of fluid

Use mineral oil based hydraulic fluids with anti-foam and antioxidant additives, in conformity with the requisites of the following standards:
- FZG test - 11th stage - DIN 51525 - VDMA 24317

For use with other types of fluid (water glycol, phosphate esters and others), consult our technical dept.

Operation with fluid at a temperature greater than 80°C causes a premature deterioration of the fluid quality and of the seals. The physical and chemical properties of the fluid must be maintained.

2.2 - Fluid viscosity

The operating fluid viscosity must be within the following range:

minimum viscosity	12 cSt	referred to the maximum fluid temperature of 80 °C
optimum viscosity	25 ÷ 100 cSt	referred to the operating temperature of the fluid in the tank
maximum viscosity	1600 cSt	limited to only the start-up phase of the pump

2.3 - Degree of fluid contamination

The maximum degree of fluid contamination must be according to ISO 4406:1999 class 20/18/15; therefore, use of a filter with $\beta_{20} \geq 75$ is recommended. A degree of maximum fluid contamination according to ISO 4406:1999 class 18/16/13 is recommended for optimum endurance of the pump. Hence, use of a filter with $\beta_{10} \geq 100$ is recommended.

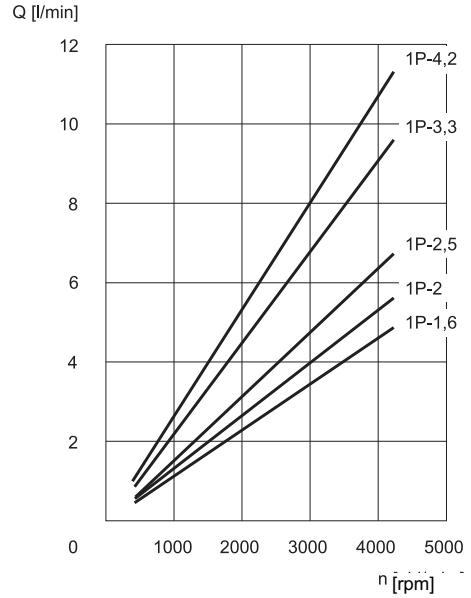
If there is a filter installed on the suction line, be sure that the pressure at the pump inlet is not lower than the values specified in paragraph 6. The suction filter must be equipped with a by-pass valve and, if possible, with a clogging indicator.

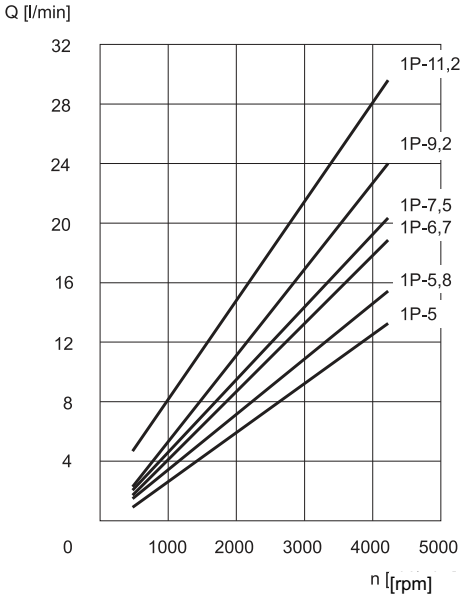
3 - PERFORMANCES (values obtained with mineral oil with viscosity of 36 cSt at 50°C)

PUMP SIZE	NOMINAL SIZE	DISPALCEMENT [cm³/rev]	MAX. FLOW RATE (at 1500 rpm) [l/min.]	MAX. OPERATING PRESSURE (ar 1500 rpm) [bar]	MAX. PEAK PRESSURE (at 1500 rpm.) [bar]	MAX.ROTATION SPEED [rpm]	MIN.ROTATION SPEED [rpm]
1P	**1,6**	1,1	1,6	230	270	6000	1000
	2	1,3	2,0				
	2,5	1,6	2,4				
	3,3	2,1	3,2				
	4,2	2,7	4,0				800
	5	3,2	4,8	210	250	5000	
	5,8	3,7	5,6			4500	
	6,7	4,2	6,4			4000	
	7,5	4,8	7,2	190	230	3500	600
	9,2	5,8	8,7			3000	
	11,5	8,0	11,9	160	200	2100	

4 - CURVES AND CHARACTERISTIC DATA OF GROUP 1P PUMPS (values obtained with mineral oil with viscosity of 36 cSt at 50°C)

4.1 - Flow rate curves Q=f (n) obtained with operating pressure 0 bar





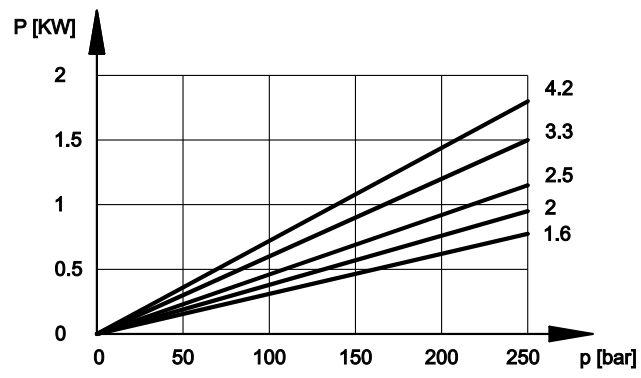
4.2 - Efficiencies

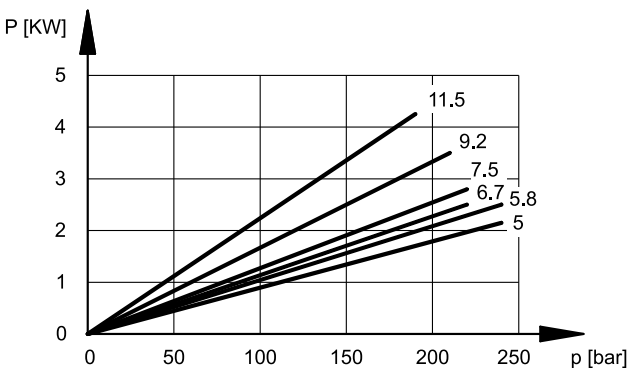
PUMP NOMINAL SIZE	VOLUMETRIC EFFICIENCY [%]	TOTAL EFFICIENCY [%]
1,6	0,96	0,85
2	0,94	0,87
2,5	0,94	0,87
3,3	0,96	0,90
4,2	0,96	0,90
5	0,96	0,90
5,8	0,96	0,89
6,7	0,97	0,92
7,5	0,97	0,93
9,2	0,95	0,89
11,5	0,94	0,89

4.3 - Noise level (at 1500 rpm)

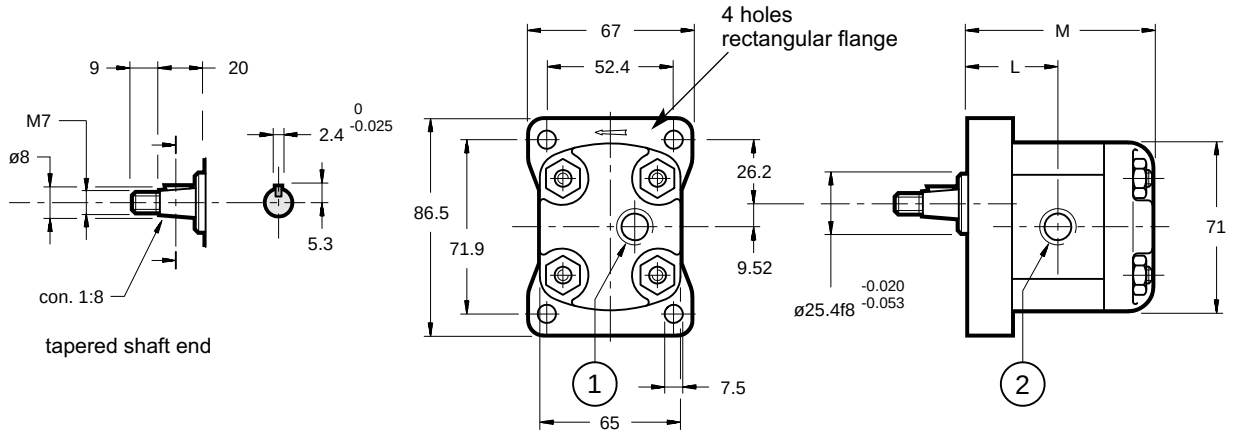
PUMP NOMINAL SIZE	NOISE LEVEL [dB (A)]
1,6	55
2	58
2,5	58
3,3	60
4,2	65
5	66
5,8	66
6,7	68
7,5	72
9,2	72
11,5	74

4.4 - Absorbed power / pressure (at 1500 rpm)





5 - OVERALL AND MOUNTING DIMENSIONS



dimensions in mm

Pump code	Pump nominal dimension	L	M	1	2
0710842	1P-1,6	34	75	suction port: 3/8" BSP clockwise rotation direction	delivery port: 3/8" BSP clockwise rotation direction
0710843	1P-2	34,5	76		
0710844	1P-2,5	35	77		
0710845	1P-3,3	36	79		
0710846	1P-4,2	37	81		
0710847	1P-5	38	83		
0710848	1P-5,8	39	85		
0710849	1P-6,7	40	87		
0710850	1P-7,5	41	89		
0710851	1P-9,2	43	93		
0710852	1P-11,5	47	101		

6 - INSTALLATION

- The 1P gear pumps can be installed with the shaft oriented in any position.
- Be sure the control rotation direction corresponds to the direction of the arrow marked on the pump before putting the pump into operation.
- It is necessary to vent the air from the delivery connection before operating it the first time.
- The pump start up, especially at a cold temperature, should occur with the pump unloading.
- The suction line must be suitably sized to facility the flow of the oil. Bends and restrictions or an excessive line length can impede correct operation of the pump. It is advisable that the speed of 1 ÷ 2 m/sec is not exceeded in the suction line.
- The minimum suction pressure allowed is -0,3 bar relative. The pumps can not function with suction pressure.
- The gear pumps must not operate with a rotation rating of less than the minimum rotation speed (see table 3 - performances). They must be filled with the same plant operation oil before installation. Filling is done through the connection lines. If necessary, rotate the pump manually.
- The motor-pump connection must be carried out directly with a flexible coupling able to compensate any offsets. Couplings that generate axial or radial loads on the pump shaft are not allowed.

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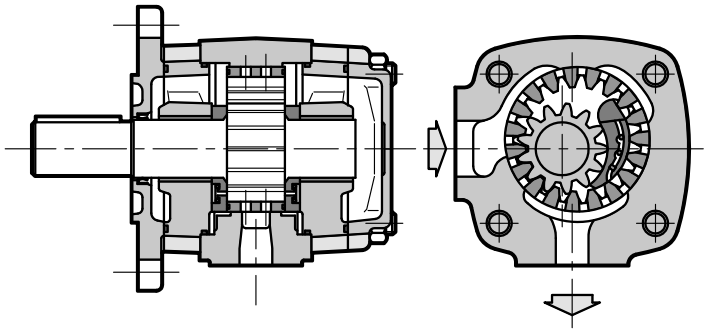
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IGP
INTERNAL GEAR PUMPS
SERIES 11

OPERATING PRINCIPLE



— IGP pumps are volumetric displacement pumps with internal gears, available in five sizes, each divided into a range of different displacement.

— The pumps feature high volumetric performance levels, thanks to both radial and axial compensation in proportion to operating pressure, in addition to low noise levels.

— Optimal load distribution and special friction bearings enable continuous duty at high pressures and ensure extended pump lifetime.

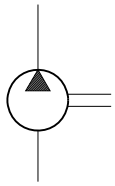
— IGP pumps are also available in multiple versions which can be combined to make multi-flow groups.

TECHNICAL SPECIFICATIONS

PUMP SIZE		3	4	5	6	7
Displacement range	cm³/rev	3,6 ÷ 10,2	13,3 ÷ 32,6	33,1 ÷ 64,9	64,1 ÷ 126,2	125,8 ÷ 251,7
Flow rate range (at 1500 rpm)	l/min	5,4 ÷ 15,3	19,9 ÷ 48,9	49,6 ÷ 97,3	96,1 ÷ 189,3	188,7 ÷ 377,5
Operating pressures	bar	see table 2 - performances				
Rotation speed	rpm	see table 2 - performances				
Rotation direction		clockwise or counterclockwise				
Loads on the shaft		refer to our technical dept. for permitted axial and radial loads				
Hydraulic connections		SAE J518 c fittings, flanged (see point 9)				
Mounting flange type		SAE J744 - ISO 3019-1				
Mass (single pump)	kg	4 ÷ 4,8	8,6 ÷ 11	15,5 ÷ 18,7	29,2 ÷ 35	46,5 ÷ 59

Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Degree of fluid contamination	see point 3.2	
Recommended viscosity	cSt	25 ÷ 100

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

1.1 - Single pump



Internal gear pump

Pump size
3 = from 3,6 to 10,2 cm³/rev
4 = from 13,3 to 32,6 cm³/rev
5 = from 33,1 to 64,9 cm³/rev
6 = from 64,1 to 126,2 cm³/rev
7 = from 125,8 to 251,7 cm³/rev

Nominal delivery
(see performances table, point 2)

Rotation direction (seen from the shaft side)
R = clockwise (**standard**)
L = counterclockwise

Mounting flange
0 = SAE-2 / ISO 3019-1 (for IGP3, IGP4, IGP5 and IGP6)
1 = SAE-4 / ISO 3019-1 (for IGP7 only)
other flanges types are available upon request

Shaft end type:
cylindrical keyed
(other shaft ends are available upon request)

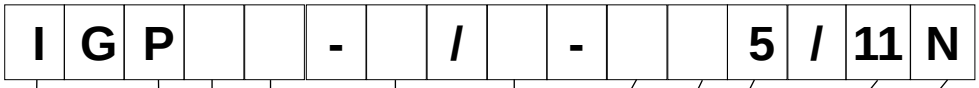
Series No.
(from 10 to 19 sizes and mounting dimensions remain unchanged.)

Seals for mineral oils
(for IGP3, IGP4, IGP5 and IGP6 pumps, the front shaft seal is in Viton)

Option:
F = through drive shaft
Omit if not required

NOTE: No through-drive shaft inside standard single pumps

1.2 - Multiple pump



Internal gear pump

Front pump size
3 = from 3,6 to 10,2 cm³/rev
4 = from 13,3 to 32,6 cm³/rev
5 = from 33,1 to 64,9 cm³/rev
6 = from 64,1 to 126,2 cm³/rev
7 = from 125,8 to 251,7 cm³/rev

Rear pump size
3 = from 3,6 to 10,2 cm³/rev
4 = from 13,3 to 32,6 cm³/rev
5 = from 33,1 to 64,9 cm³/rev
6 = from 64,1 to 126,2 cm³/rev
7 = from 125,8 to 251,7 cm³/rev

Nominal delivery of the front pump
(see performance table, point 2)

Nominal delivery of the secondary/rear pump
(see performance table, point 2)

Rotation direction (seen from the shaft side)
R = clockwise (**standard**)
L = counterclockwise

Mounting flange
0 = SAE-2 / ISO 3019-1 (for IGP3, IGP4, IGP5 and IGP6)
1 = SAE-4 / ISO 3019-1 (for IGP7 only)
other flange types are available upon request

Shaft end type:
cylindrical keyed
(other shaft ends are available upon request)

Series No.
(from 10 to 19 sizes and mounting dimensions remain unchanged.)

NBR seals for mineral oils
(for IGP3, IGP4, IGP5 and IGP6 pumps, the front shaft seal is in Viton)

NOTE: Secondary / rear pumps are available as spare parts. All secondary pumps are provided with through drive shaft. The coupling is not included.
To order, put the code together by adding an **R** at the end of the identification code, after the size, delivery, direction of rotation, series and seals.
Code example: **IGP4- 020-R/11N/R**

2 - PERFORMANCES

(obtained with mineral oil with viscosity within 25 ÷ 100 cSt)

PUMP SIZE	NOMINAL DELIVERY	DISPLACEMENT [cm³/rev] NOTE 2	FLOW RATE at 1500 rpm [l/min]	PRESSURE [bar] NOTE 3 steady	PRESSURE [bar] NOTE 3 peak	ROTATION SPEED [rpm] NOTE 4 max	ROTATION SPEED [rpm] NOTE 4 min
IGP3	003	3,6	5,4	330	345	3600	400
	005	5,2	7,8				
	006	6,4	9,6				
	008	8,2	12,3				
	010	10,2	15,3				
IGP4	013	13,3	19,9	330	345	3600	400
	016	15,8	23,7			3400	
	020	20,7	31,0			3200	
	025	25,4	38,1	300	330	3000	
	032	32,6	48,9	250	280	2800	
IGP5	032	33,1	49,6	315	345	3000	400
	040	41	61,5			2800	
	050	50,3	75,4	280	315	2500	
	064	64,9	97,3	230	250	2200	
IGP6	064	64,1	96,1	300	330	2600	400
	080	80,7	121,0	280	315	2400	
	100	101,3	151,9	250	300	2100	
	125	126,2	189,3	210	250	1800	
IGP7	125	125,8	188,7	300	330	2200	400
	160	160,8	241,2	280	315	2000	
	200	202,7	304,0	250	300	1800	
	250	251,7	377,5	210	250		

NOTE 1: Under continuous operating conditions, the allowed suction pressure range is 0.8 ÷ 3 bar abs. For shorter time, a minimum suction pressure of 0,6 bar abs is allowed.

NOTE 2: Production tolerances can reduce the displacement by 1,5% max. The flow rate at 1500 rpm shown in the table, considers operation with pressure of 10 bar.

NOTE 3: The continuous and peak pressures are valid for rotation speeds between 400 and 1500 rpm. For speeds of more than 1500 rpm the peak pressure must be reduced. The peak pressure is applicable for 15% of the operating time, with a maximum cycle time of 1 minute.

NOTE 4: Variable speeds require pressure limitations if they are out of 400 ÷ 1500 rpm range. Contact our technical department for applications of this kind.

3 - HYDRAULIC FLUID

3.1 - Fluid type

Use mineral oil based hydraulic fluids with anti-foam and antioxidant additives. Limitations apply with other fluid types. See the table below or consult our Technical Department for authorization of use.

FLUID TYPE	NOTES
HFC (water glycol solutions with proportion of water ≤ 40%)	- The pumps are tested with mineral oil. An appropriate cleaning cycle is required. - The values shown in the performance table must be reduced by at least 20% - The maximum speed of the fluid in the suction line must not exceed 1 m/s. - The suction pressure must not be less than 0,8 bar absolute. - The maximum fluid temperature must be at less than 50°C
HFD (phosphate esters)	NOT ALLOWED

3.2 - Fluid viscosity

The operating fluid viscosity must be within the following range:

minimum viscosity	10 cSt	referred to the maximum fluid temperature of 80 °C
optimum viscosity	25 ÷ 100 cSt	referred to the fluid working temperature in the tank
maximum viscosity	2000 cSt	limited to the start-up phase of the pump only

When selecting the fluid type, be sure that the true viscosity is within the range specified above at the operating temperature.

3.3 - Degree of fluid contamination

The maximum degree of fluid contamination must be according to ISO 4406:1999 class 20/18/15; therefore, use of a filter with $\beta_{20} \geq 75$ is recommended.

A degree of maximum fluid contamination according to ISO 4406:1999 class 18/16/13 is recommended for optimum endurance of the pump. Hence, we recommend the use of a filter with $\beta_{10} \geq 100$.

If there is a filter installed on the suction line, be sure that the pressure at the pump inlet is not lower than the values specified in **NOTE 1** of the table in point 2.

The suction filter must be equipped with a by-pass valve and, if possible, with a clogging indicator.

4 - CHARACTERISTIC CURVES

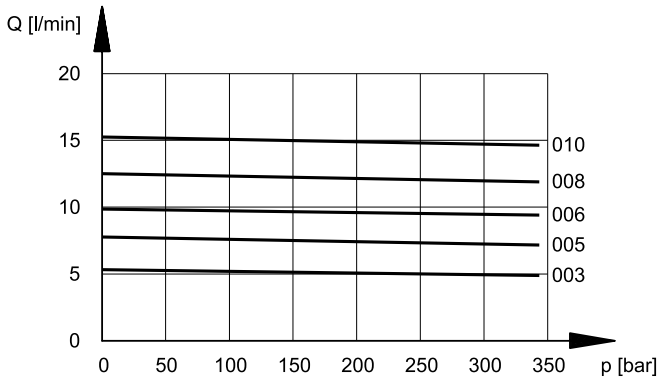
(values obtained with mineral oil with viscosity of 46 cSt at 40°C)

The data shown in the diagrams were noted with pump rotation speed = 1500 rpm.

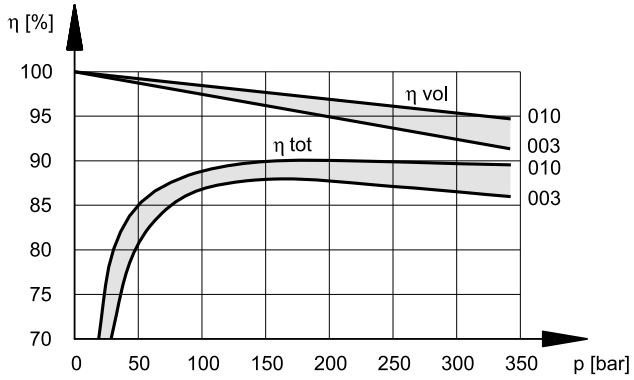
Noise pressure levels were measured in a semi-anechoic room, at an axial distance of 1 m from the pump. The shown values must be reduced by 5 dB(A) if they are to be considered in a completely anechoic room.

4.1 - IGP3

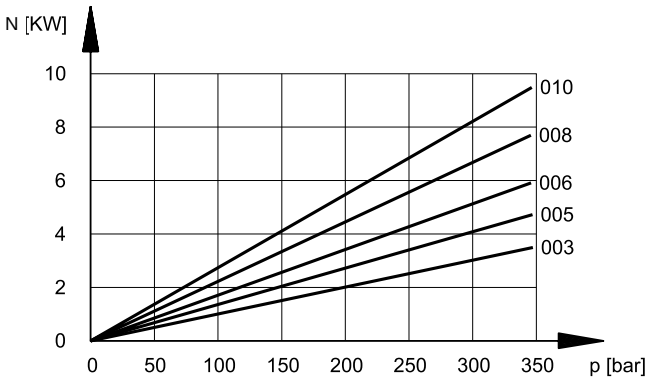
FLOW RATE/PRESSURE CURVES



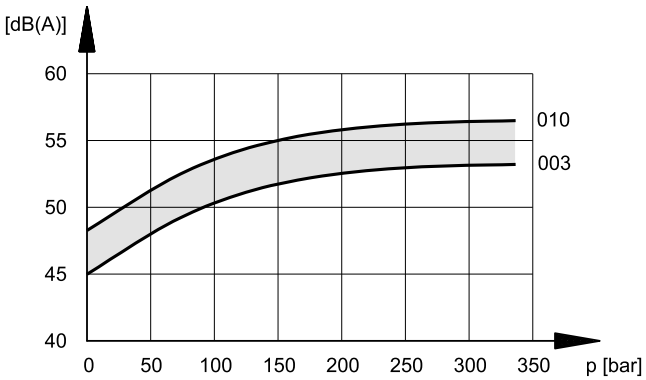
VOLUMETRIC AND TOTAL EFFICIENCY



ABSORBED POWER

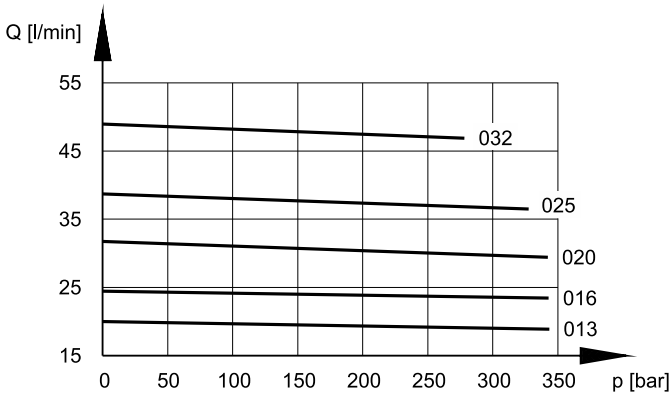


NOISE LEVEL

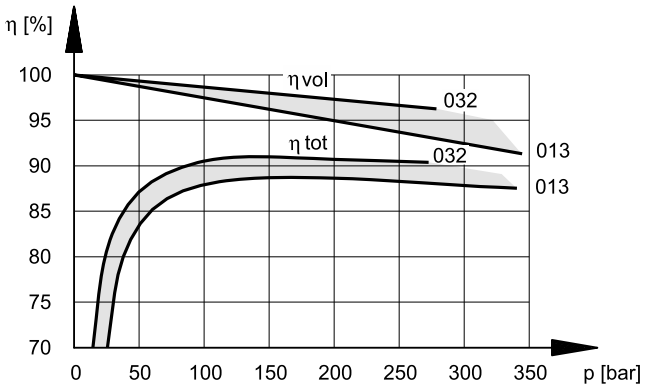


4.2 - IGP4

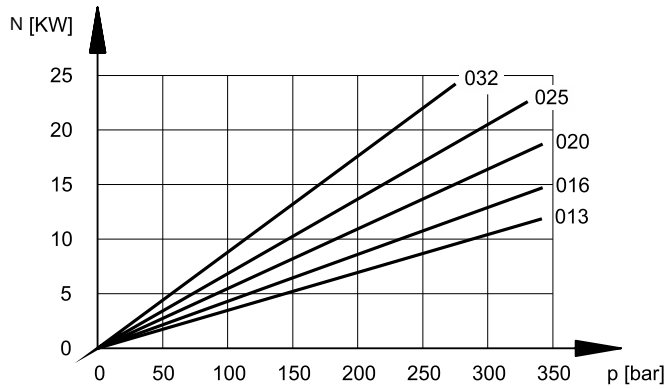
FLOW RATE/PRESSURE CURVES



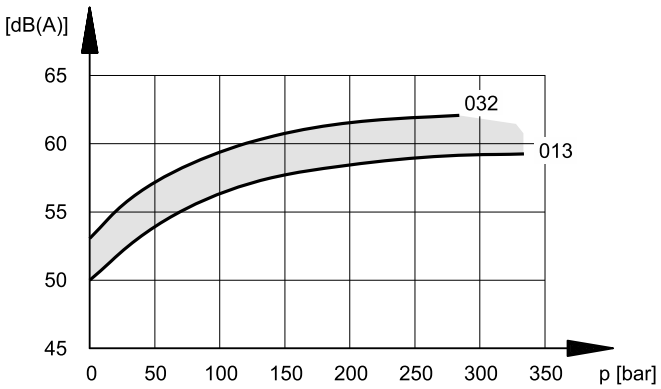
VOLUMETRIC AND TOTAL EFFICIENCIES



ABSORBED POWER

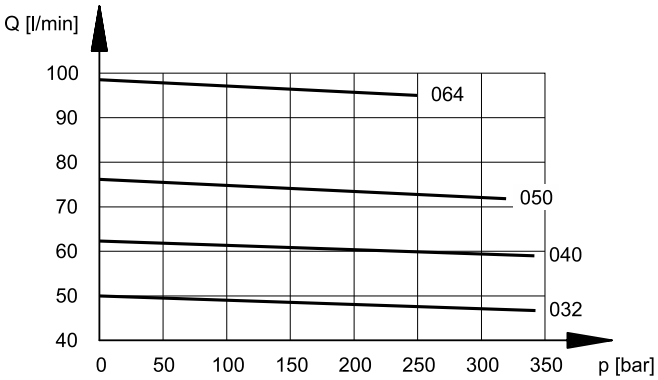


NOISE LEVEL

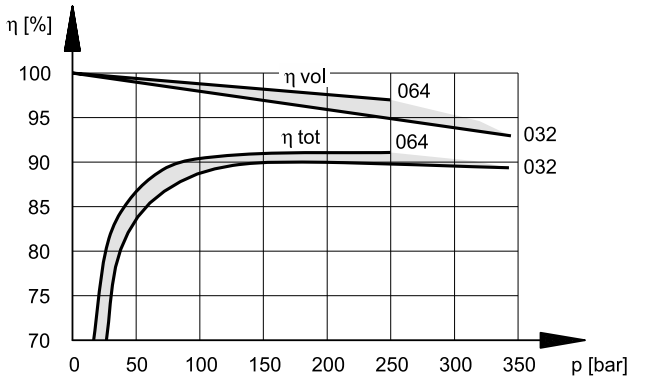


4.3 - IGP5

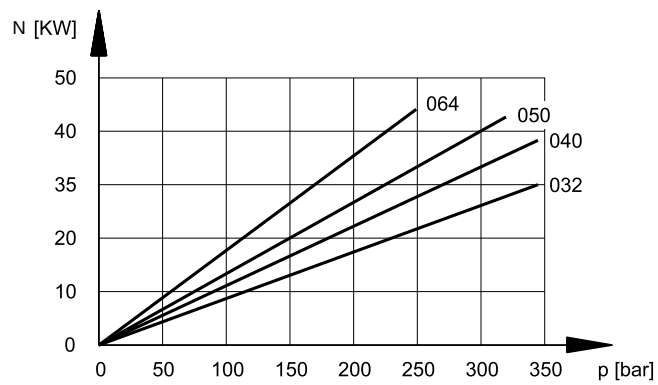
FLOW RATE/PRESSURE CURVES



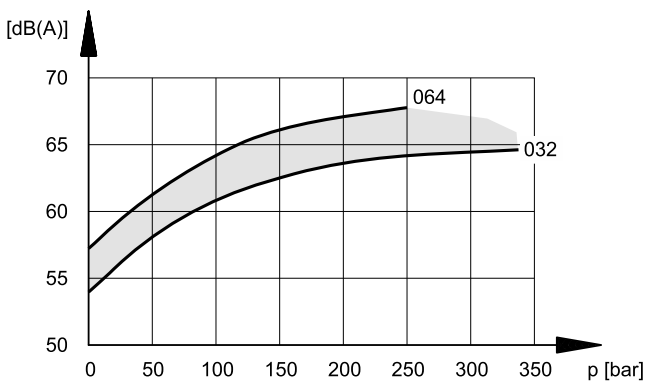
VOLUMETRIC AND TOTAL EFFICIENCIES



ABSORBED POWER

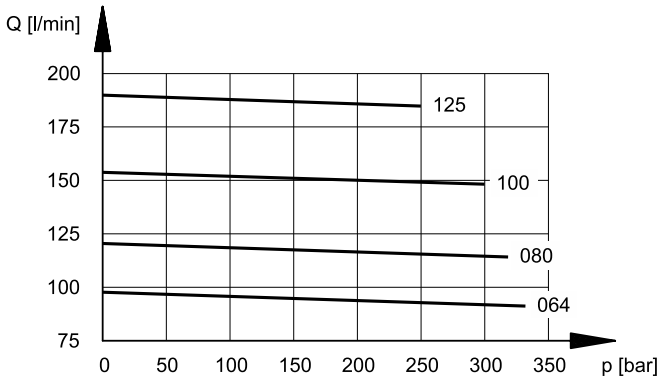


NOISE LEVEL

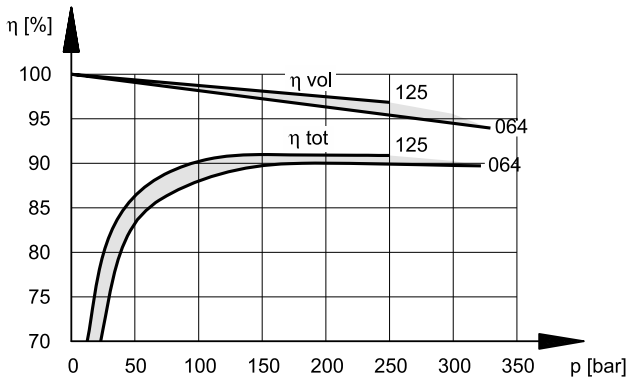


4.4 - IGP6

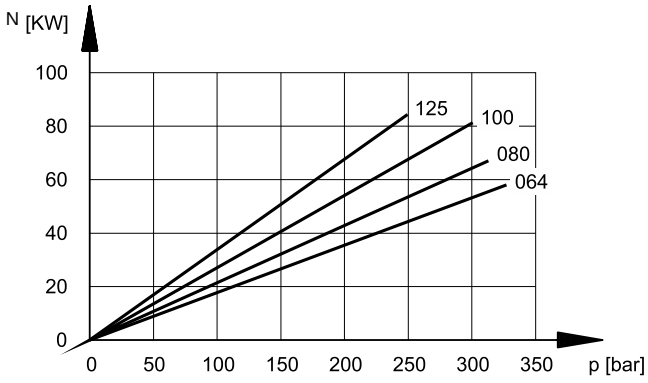
FLOW RATE/PRESSURE CURVES



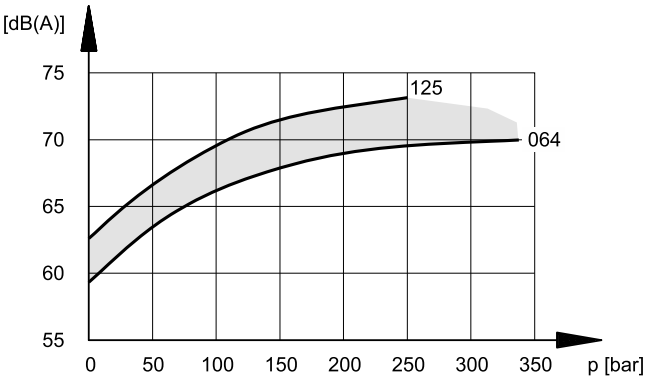
VOLUMETRIC AND TOTAL EFFICIENCIES



ABSORBED POWER

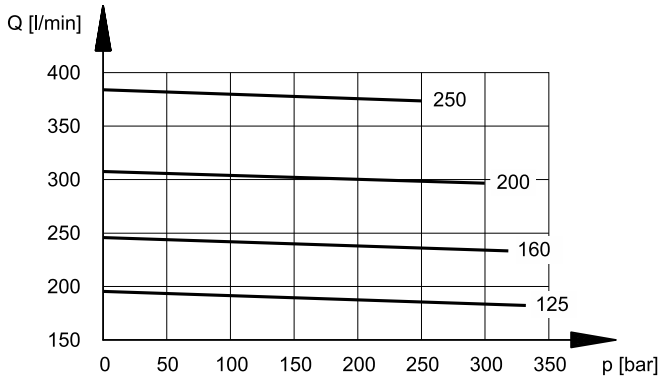


NOISE LEVEL

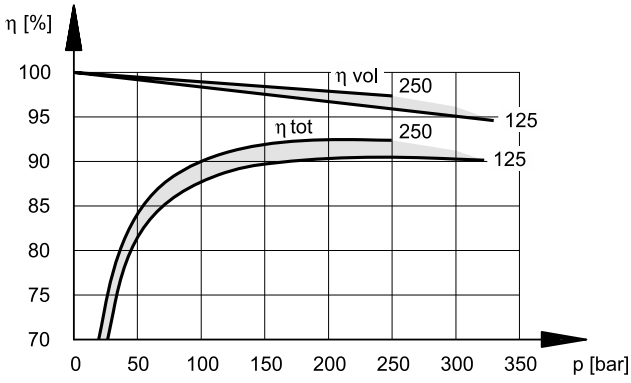


4.5 - IGP7

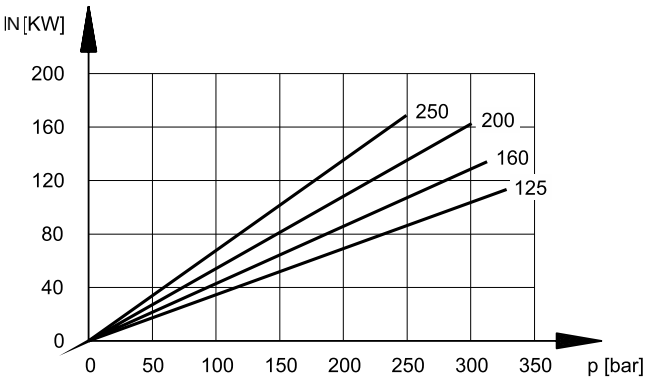
FLOW RATE/PRESSURE CURVES



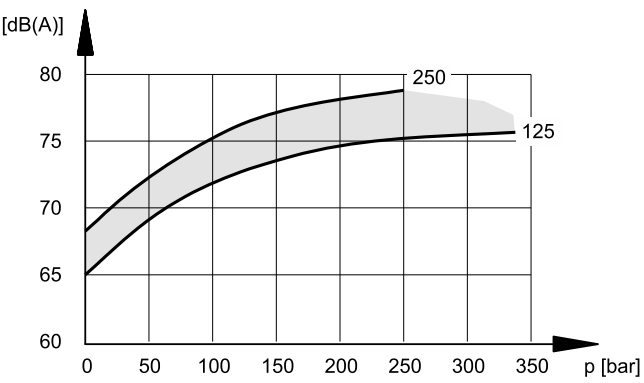
VOLUMETRIC AND TOTAL EFFICIENCIES



ABSORBED POWER



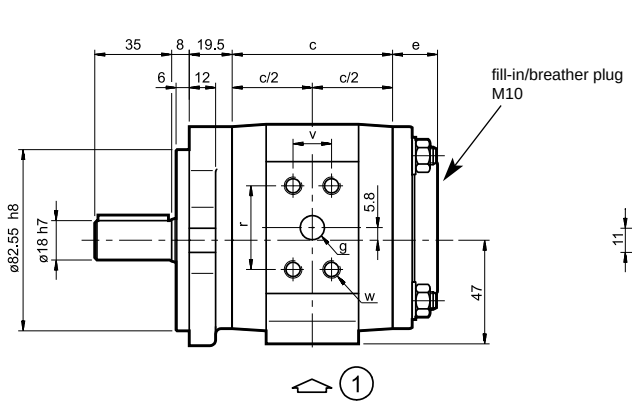
NOISE LEVEL

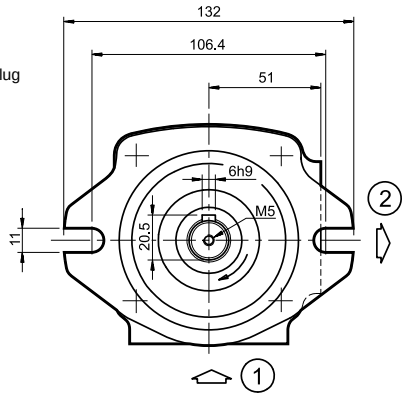


5 - OVERALL MOUNTING AND DIMENSIONS

5.1 - IGP3

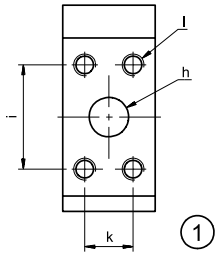
dimensions in mm





1	Suction port
2	Delivery port

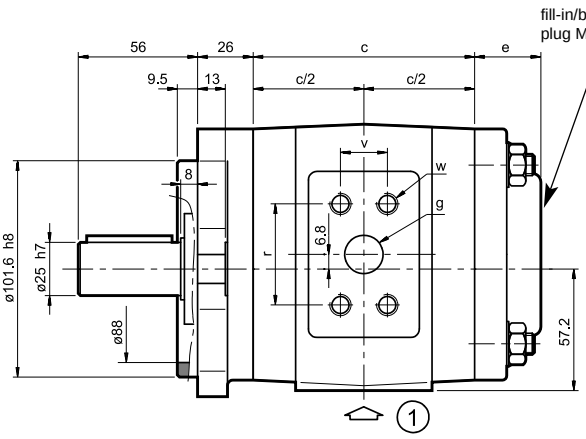
NOTE: the pump is shown in the clockwise rotation configuration
For the counterclockwise configuration, the delivery port (2) is on the opposite side of the pump

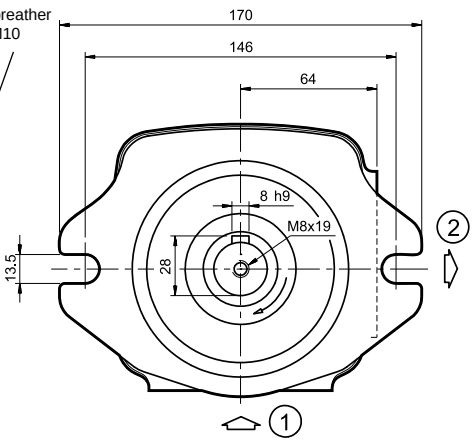


											CONNECTION FLANGES (see point9)	
	c	e	g	h	i	k	l	r	v	w	delivery	suction
IGP3-003	66	20.5	9	14	38.1	17.5	M8x13	38.1	17.5	M8x13	0610718	0610718
IGP3-005	70	20.5	11	14	38.1	17.5	M8x13	38.1	17.5	M8x13		
IGP3-006	73	20.5	11	19	47.6	22.3	M10x15	38.1	17.5	M8x13		0610719
IGP3-008	77.5	20.5	13	19	47.6	22.3	M10x15	38.1	17.5	M8x13		
IGP3-010	82.5	20.5	13	21	52.4	26.2	M10x15	38.1	17.5	M8x13		0610713

5.2 - IGP4

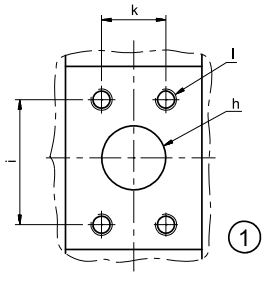
dimensions in mm





1	Suction port
2	Delivery port

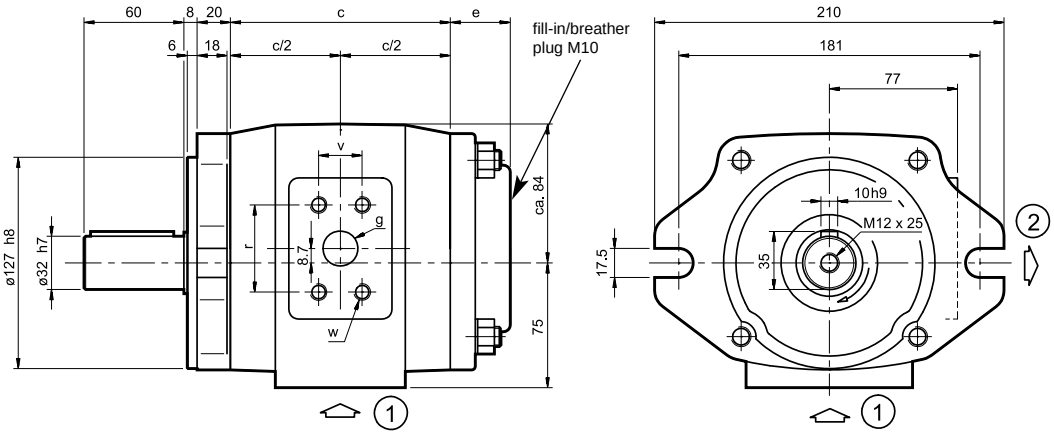
NOTE: the pump is shown in the clockwise rotation configuration
For the counterclockwise configuration, the delivery port (2) is on the opposite side of the pump



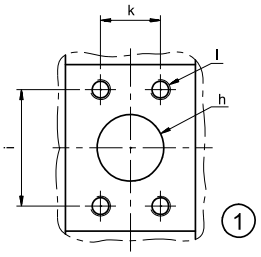
											CONNECTION FLANGES (see point9)	
	c	e	g	h	i	k	l	r	v	w	delivery	suction
IGP4-013	88.5	31	13	23	52.4	26.2	M10x15	38.1	17.5	M8x13	0610718	0610713
IGP4-016	92.5	31	14	25	52.4	26.2	M10x15	38.1	17.5	M8x13		
IGP4-020	98	31	18	27	58.7	30.2	M10x15	47.6	22.3	M10x15	0610719	0610720
IGP4-025	104	31	18	30	58.7	30.2	M10x15	47.6	22.3	M10x15		
IGP4-032	113	31	18	32	58.7	30.2	M10x15	47.6	22.3	M10x15		

5.3 - IGP5

dimensions in mm



1	Suction port
2	Delivery port

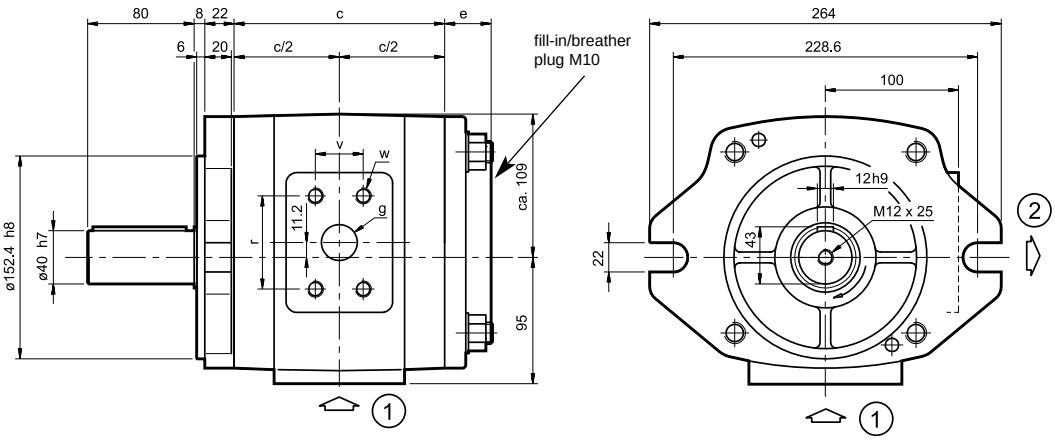


NOTE: the pump is shown in the clockwise rotation configuration
For the counterclockwise configuration, the delivery port (2) is on the opposite side of the pump

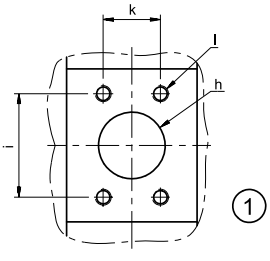
											CONNECTION FLANGES (see point9)	
	c	e	g	h	i	k	l	r	v	w	delivery	suction
IGP5-032	119	36	18	32	58.7	30.2	M10x15	47.6	22.3	M10x15	0610719	0610720
IGP5-040	125	36	19	35	69.9	36	M12x20	52.4	26.2	M10x15	0610713	0610714
IGP5-050	132	36	21	40	69.9	36	M12x20	52.4	26.2	M10x15		
IGP5-064	143	36	23	40	69.9	36	M12x20	52.4	26.2	M10x15		

5.4 - IGP6

dimensions in mm



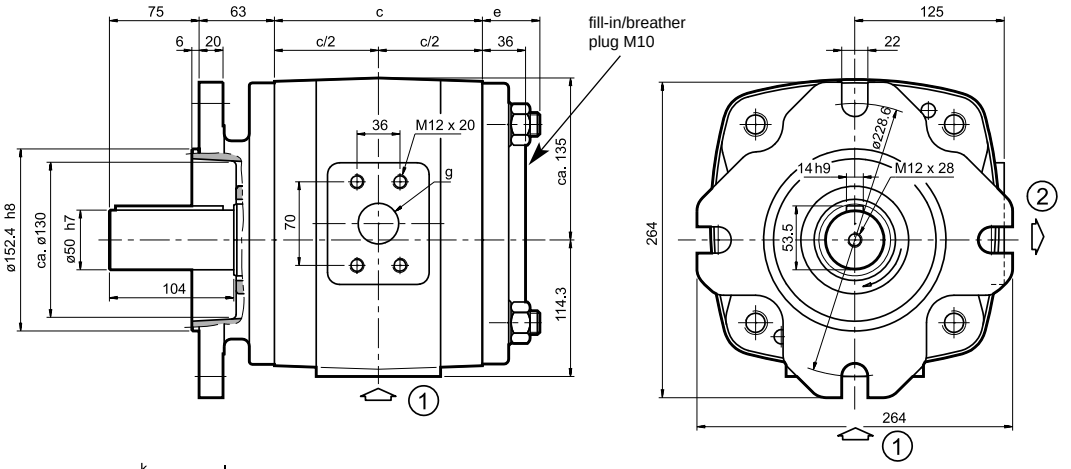
1	Suction port
2	Delivery port



NOTE: the pump is shown in the clockwise rotation configuration
For the counterclockwise configuration, the delivery port (2) is on the opposite side of the pump

											CONNECTION FLANGES (see point9)	
	c	e	g	h	i	k	l	r	v	w	delivery	suction
IGP6-064	140	40	23	40	69.9	35.7	M12x20	52.4	26.2	M10x15	0610713	0610714
IGP6-080	148	35	23	45	77.8	42.9	M12x20	69.9	35.7	M12x20	0610714 **NOTE 5**	0610721
IGP6-100	158	35	27	50	77.8	42.9	M12x20	69.9	35.7	M12x20		
IGP6-125	170	40	30	50	77.8	42.9	M12x20	69.9	35.7	M12x20		

5.5 - IGP7



dimensions in mm

1	Suction port
2	Delivery port

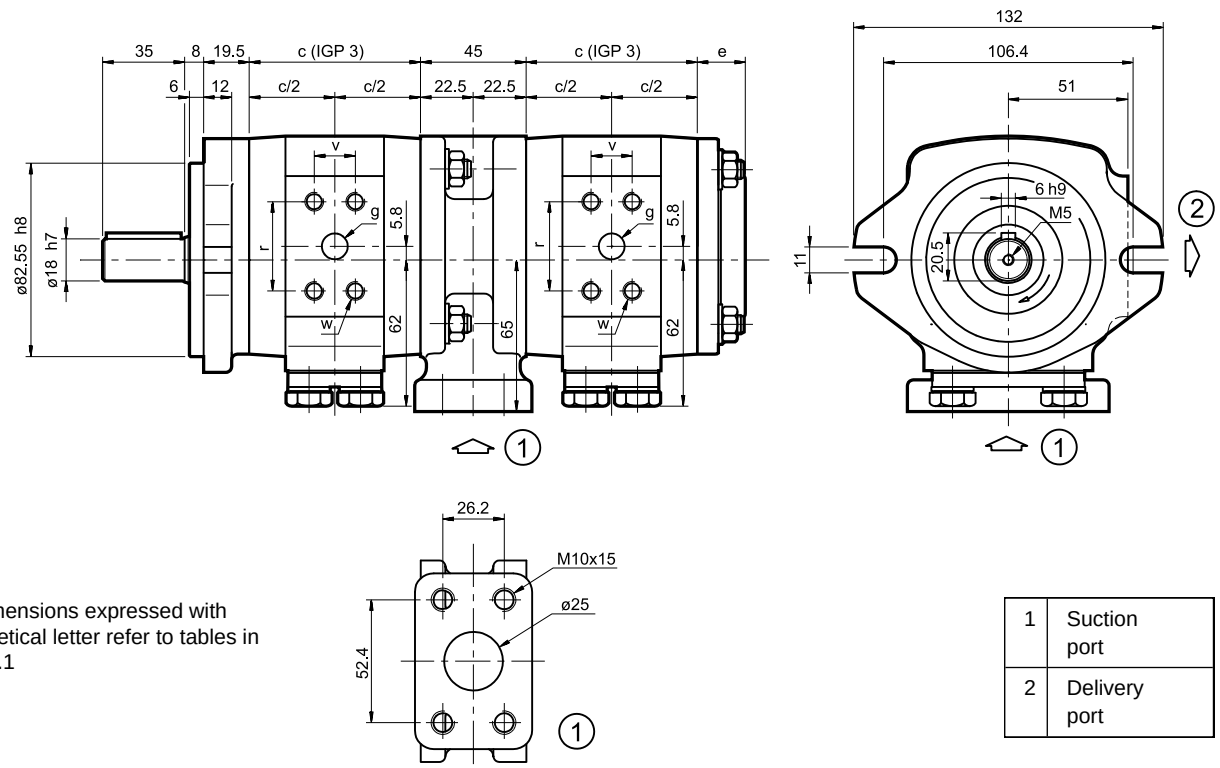
NOTE: the pump is shown in the clockwise rotation configuration
For the counterclockwise configuration, the delivery port (2) is on the opposite side of the pump

											CONNECTION FLANGES (see point9)	
	c	e	g	h	i	k	l	r	v	w	delivery	suction
IGP7-125	152	48	30	50	77.5	42.9	M12x20	69.9	35.7	M12x20	0610714 **NOTE 5**	0610721
IGP5-160	162	48	30	56	88.9	50.8	M12x20	69.9	35.7	M12x20		0610722
IGP5-200	174	46	34	62	88.9	50.8	M12x20	69.9	35.7	M12x20		0610722
IGP5-250	188	42	38	72	106.9	62	M16x25	69.9	35.7	M12x20		0610723

NOTE 5: For applications with delivery pressure > 200 bar, a special connection flange cod. 0610725 is required.

6 - DOUBLE PUMPS OVERALL MOUNTING AND DIMENSIONS

6.1 - IGP33



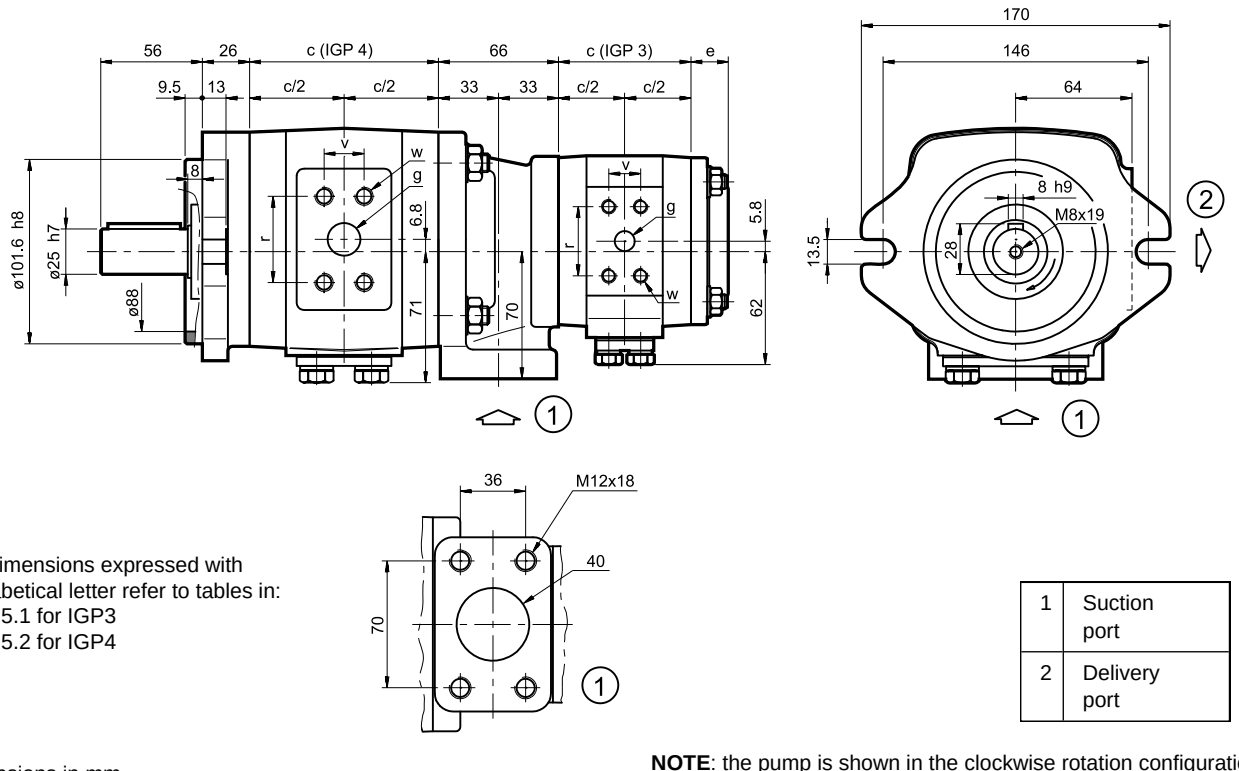
For dimensions expressed with alphabetical letter refer to tables in point 5.1

1	Suction port
2	Delivery port

dimensions in mm

NOTE: the pump is shown in the clockwise rotation configuration
For the counterclockwise configuration, the delivery port (2) is on the opposite side of the pump

6.2 - IGP43



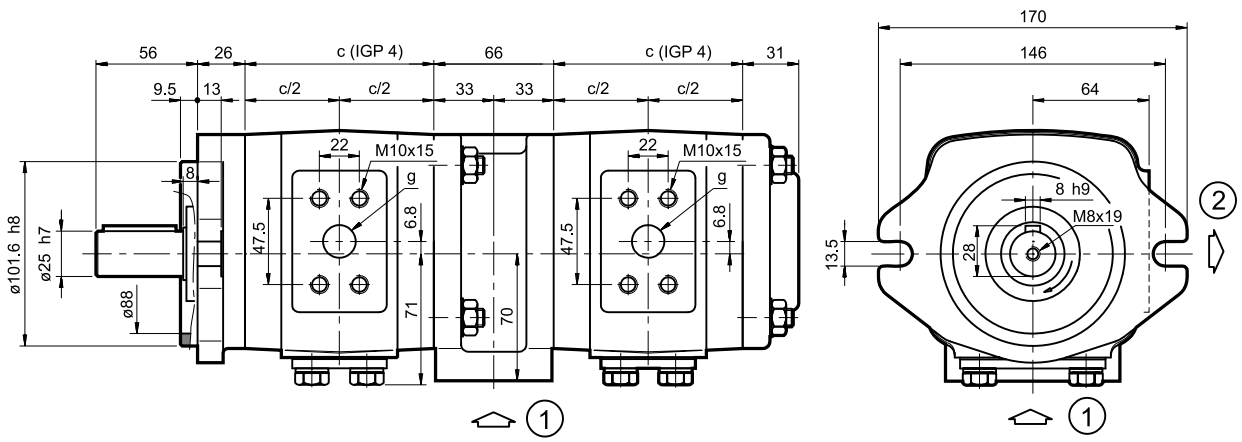
For dimensions expressed with alphabetical letter refer to tables in:
point 5.1 for IGP3
point 5.2 for IGP4

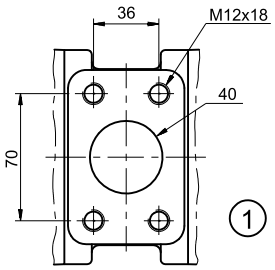
1	Suction port
2	Delivery port

dimensions in mm

NOTE: the pump is shown in the clockwise rotation configuration
For the counterclockwise configuration, the delivery port (2) is on the opposite side of the pump

6.3 - IGP44





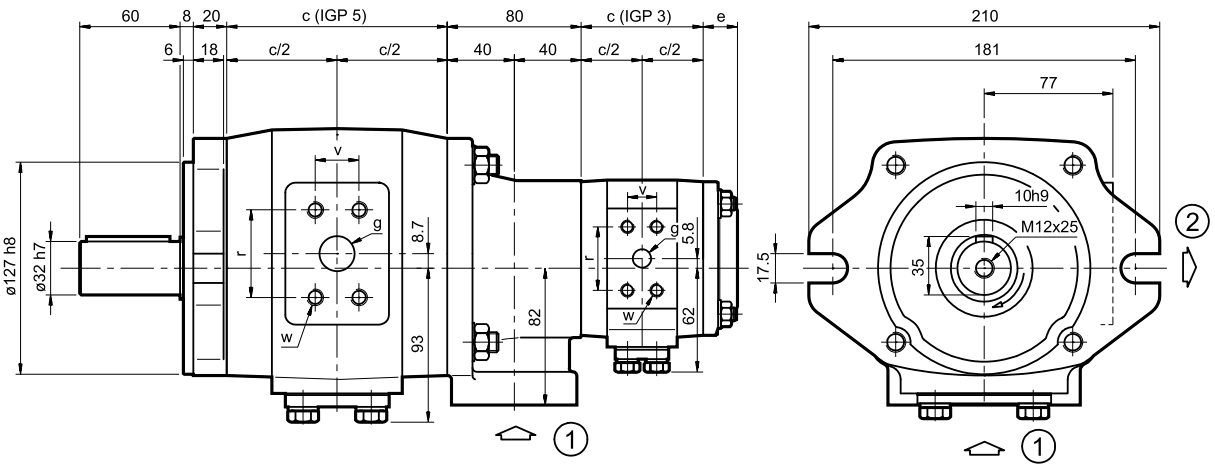
For dimensions expressed with alphabetical letter refer to tables in point 5.2

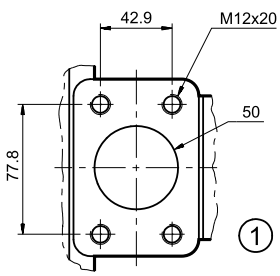
1	Suction port
2	Delivery port

dimensions in mm

NOTE: the pump is shown in the clockwise rotation configuration
For the counterclockwise configuration, the delivery port (2) is on the opposite side of the pump

6.4 - IGP53





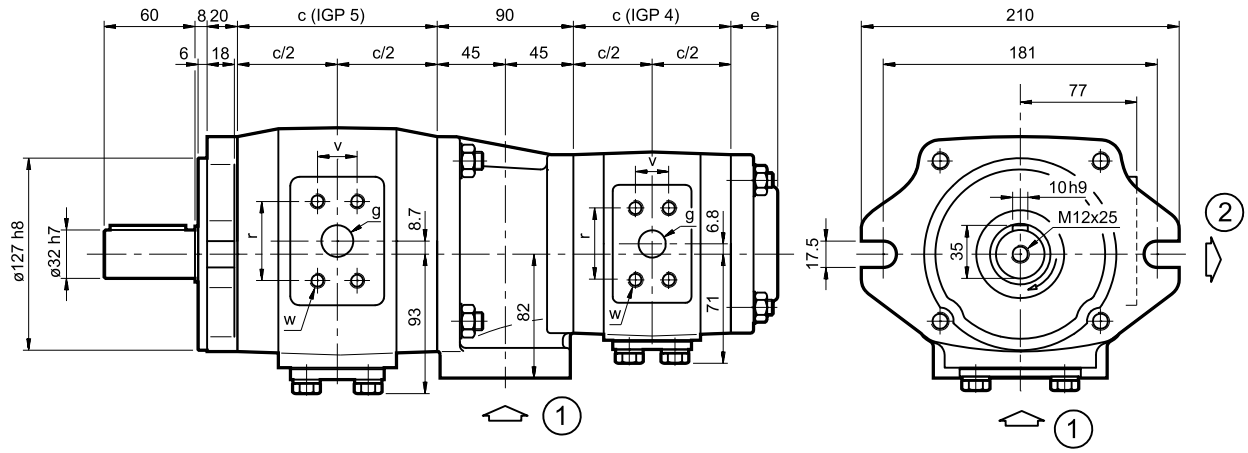
For dimensions expressed with alphabetical letter refer to tables in:
point 5.1 for IGP3
point 5.3 for IGP5

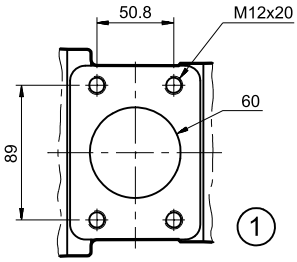
1	Suction port
2	Delivery port

dimensions in mm

NOTE: the pump is shown in the clockwise rotation configuration
For the counterclockwise configuration, the delivery port (2) is on the opposite side of the pump

6.5 - IGP54





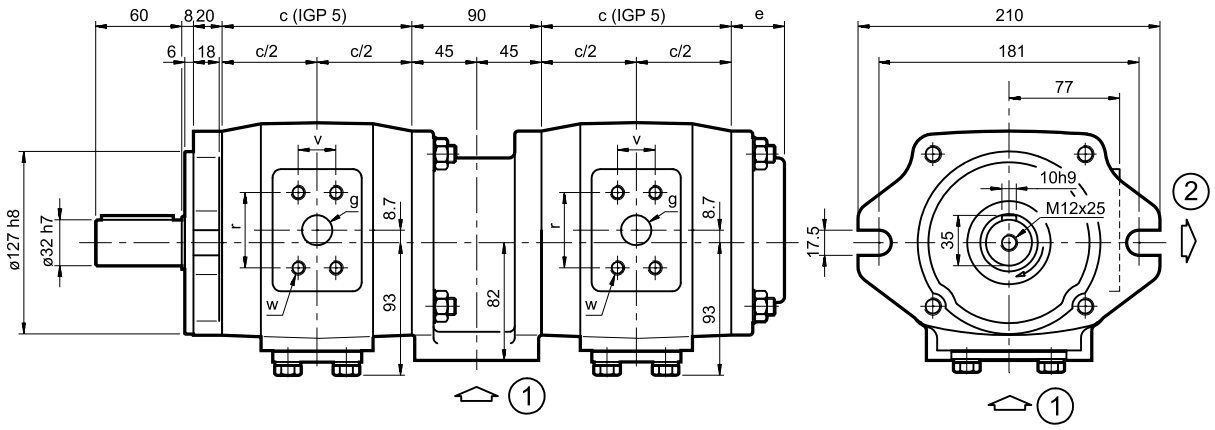
For dimensions expressed with alphabetical letter refer to tables in:
point 5.2 for IGP4
point 5.3 for IGP5

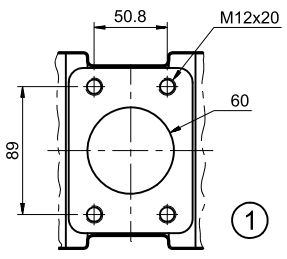
1	Suction port
2	Delivery port

dimensions in mm

NOTE: the pump is shown in the clockwise rotation configuration
For the counterclockwise configuration, the delivery port (2) is on the opposite side of the pump

6.6 - IGP55





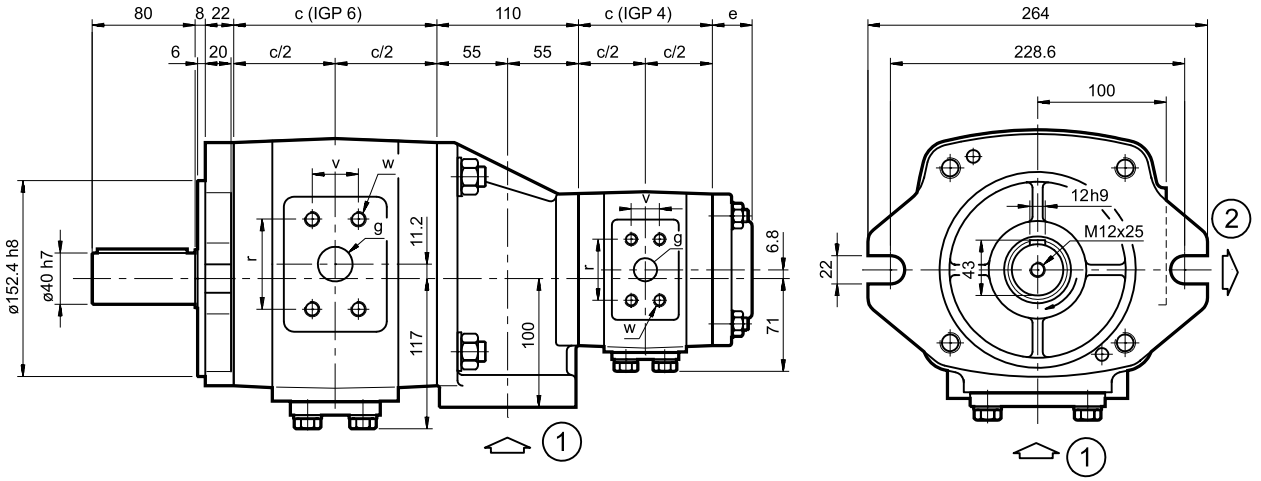
For dimensions expressed with alphabetical letter refer to tables in:
point 9 for IGP3
point 11 for IGP5

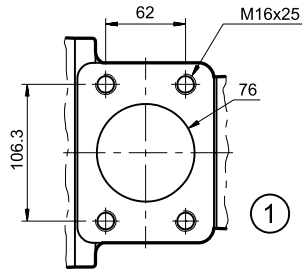
1	Suction port
2	Delivery port

dimensions in mm

NOTE: the pump is shown in the clockwise rotation configuration
For the counterclockwise configuration, the delivery port (2) is on the opposite side of the pump

6.7 - IGP64





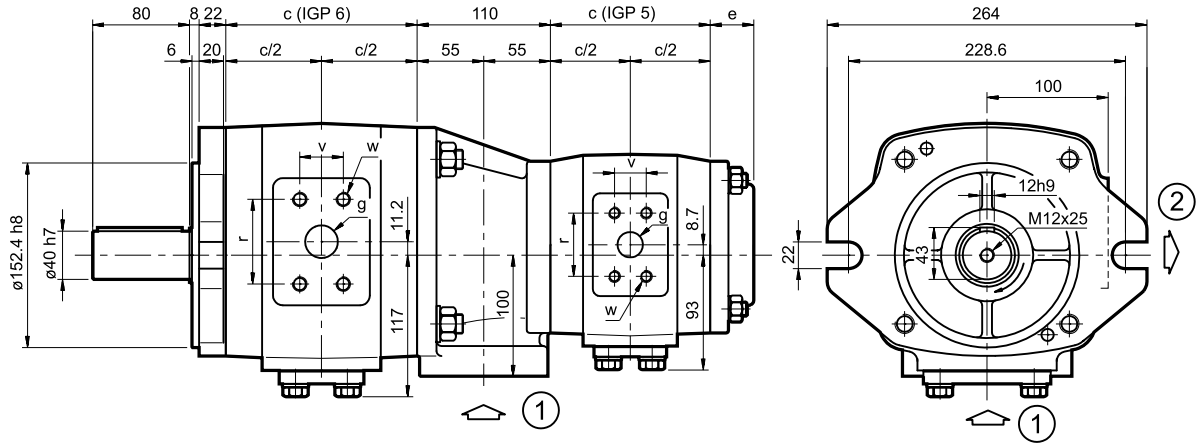
For dimensions expressed with alphabetical letter refer to tables in:
point 5.2 for IGP4
point 5.4 for IGP6

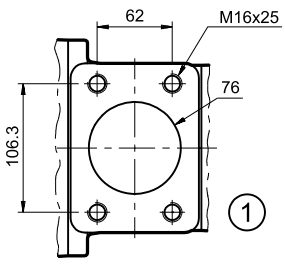
1	Suction port
2	Delivery port

dimensions in mm

NOTE: the pump is shown in the clockwise rotation configuration
For the counterclockwise configuration, the delivery port (2) is on the opposite side of the pump

6.8 - IGP65





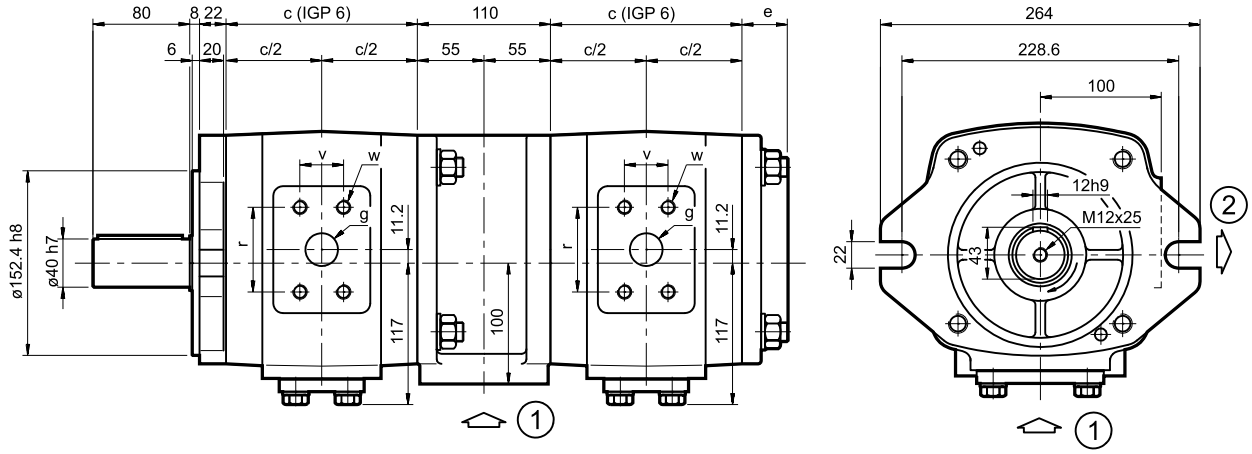
For dimensions expressed with alphabetical letter refer to tables in:
point 5.3 for IGP5
point 5.4 for IGP6

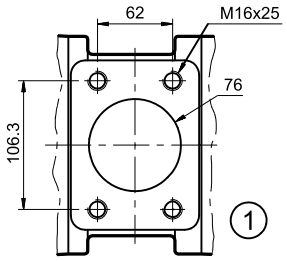
1	Suction port
2	Delivery port

dimensions in mm

NOTE: the pump is shown in the clockwise rotation configuration
For the counterclockwise configuration, the delivery port (2) is on the opposite side of the pump

6.9 - IGP66





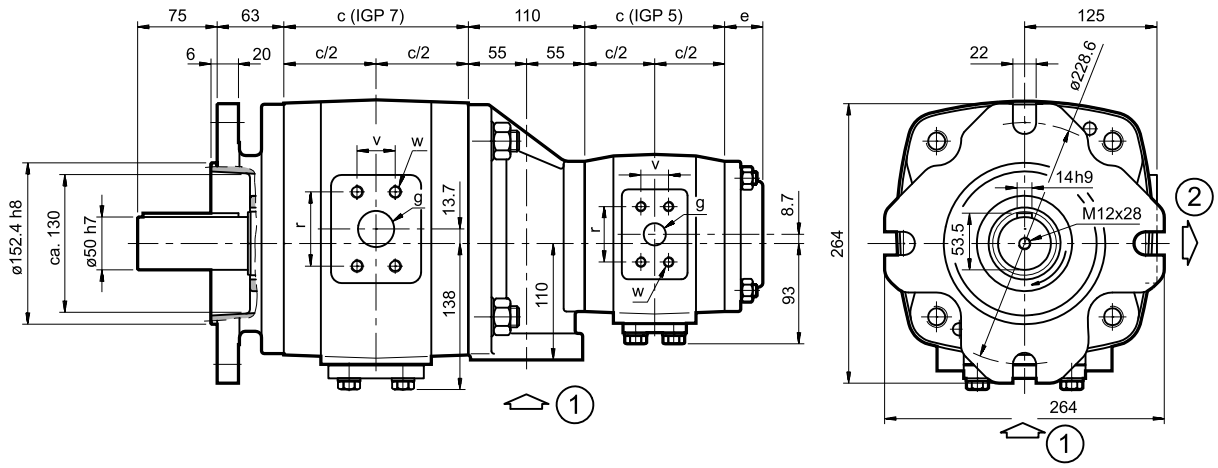
For dimensions expressed with alphabetical letter refer to tables in point 5.4

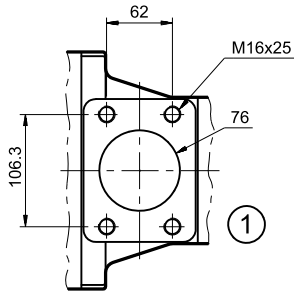
1	Suction port
2	Delivery port

dimensions in mm

NOTE: the pump is shown in the clockwise rotation configuration
For the counterclockwise configuration, the delivery port (2) is on the opposite side of the pump

6.10 - IGP75





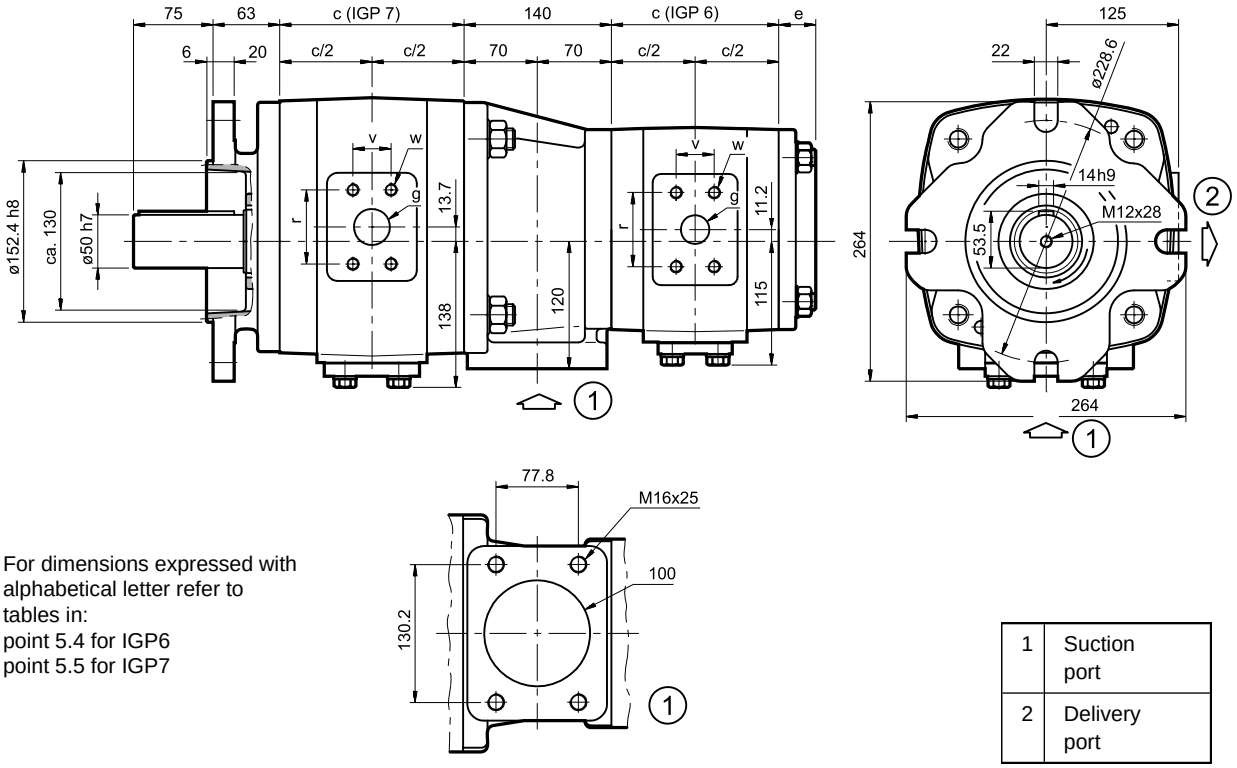
For dimensions expressed with alphabetical letter refer to tables in:
point 5.3 for IGP5
point 5.5 for IGP7

1	Suction port
2	Delivery port

dimensions in mm

NOTE: the pump is shown in the clockwise rotation configuration
For the counterclockwise configuration, the delivery port (2) is on the opposite side of the pump

6.11 - IGP76

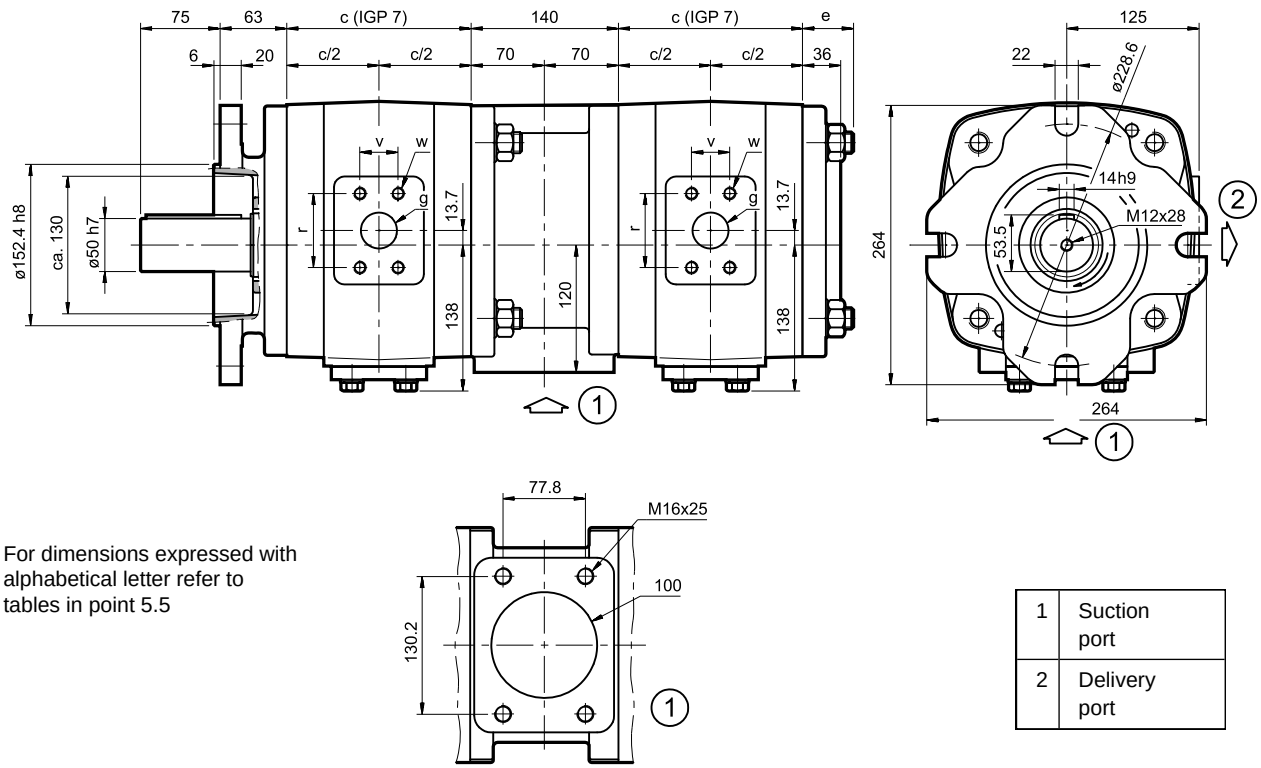


For dimensions expressed with alphabetical letter refer to tables in:
point 5.4 for IGP6
point 5.5 for IGP7

1	Suction port
2	Delivery port

dimensions in mm

6.12 - IGP77



For dimensions expressed with alphabetical letter refer to tables in point 5.5

1	Suction port
2	Delivery port

dimensions in mm

7 - INSTALLATION

— The IGP pumps can be installed in any position.

— Before putting the pump into operation, check that the rotation direction of the motor is according to the direction of the arrow marked on the pump body.

— The suction line must be sized so that the speed of the fluid does not exceed 1 m/s (1,5 m/s with positive pressure at the pump inlet) and must be placed in the tank at least at 50 mm below the minimum oil level.

Any bends and restrictions or an excessive line length can impair correct working of the pump.

The height of suction from the bottom of the tank must not be less than 50 mm.

— The IGP pumps are self-priming in the entire operating speed range specified. At the first start-up of the pump, it is necessary to vent the air from the delivery line. The pump starting operation, especially at low temperatures, must be undertaken at the minimum pressure inside the system.

— There is a plug M10 (SW5) on the pump, for the filling or the breathing of the pump casing, according to the installation position.
Be sure that the plug is closed (couple 10Nm) when the pump is operating. If a check valve with cracking pressure of >1 bar is installed on the delivery line, it is necessary to vent the air from the circuit branch between the check valve and the pump at the time of start-up.

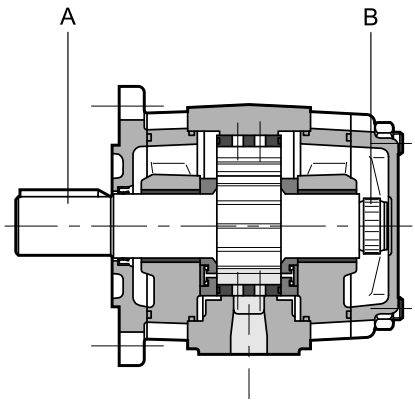
— The motor-pump connection must be carried out directly with a flexible coupling.

Consult our technical dept. for installations that generate axial or radial loads on the pump shaft.

The coupling must be mounted without axially forcing the pump shaft. Be sure that the joint coupling diameter be made with a K7 tolerance.

— Refer to point 3.3 for the characteristics and installation of the filtering elements.

8 - MAXIMUM APPLICABLE TORQUE



PUMP SIZE	MAX. TORQUE APPLIED TO THE SHAFT [Nm]	
	primary shaft **A**	secondary shaft **B**
IGP3	160	80
IGP4	335	190
IGP5	605	400
IGP6	1050	780
IGP7	1960	1200

NOTE: The pumps must be connected in decreasing order of displacement and size.

8.1 - Maximum applicable torque for double pumps

In case of double pumps, even of the same displacement, each pump can operate at the maximum PERFORMANCES specified in point 2.

8.2 - Maximum applicable torque for multiple pumps

The torque (M) at the inlet of each pump is given by the following equation:

$$M = \frac{9549 \cdot N}{n} = [Nm]$$

where the absorbed power (N) is given by:

$$N = \frac{Q \cdot \Delta p}{600 \cdot \eta tot} = [kW]$$

n = rotation speed [rpm]

Q = delivery [l/min]

Δp = differential pressure on the pump [bar]

η tot = total efficiency (noted from the relative diagrams in point 4)

or can be derived from the ABSORBED POWER diagrams (see point 4).

In case of multiple pumps, the torque of the single pump must be added to the torque generated by the downstream pumps.

The torque value thus calculated for each pump must be less than the relative value specified in the above table, taking what follows into account:

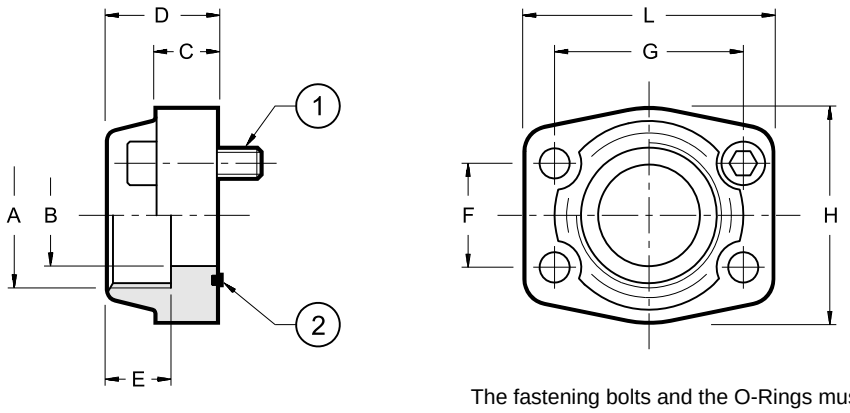
1st pump = refer to the specified values for primary shaft A

2nd, 3rd, 4th pump = refer to the specified values for secondary shaft B

In the event that the calculated torque values are higher than those shown in the table, it is necessary to reduce the operating pressure or to replace the overloaded pump with one that can support the required torque.

9 - CONNECTION FLANGES SAE J518

dimensions in mm



The fastening bolts and the O-Rings must be ordered separately.

	Flange code	Flange description	p_{max} [bar]	ØA	ØB	C	D	E	F	G	H	L	1 bolts ISO 4762	2
SAE 3000	0610718	SAE - 1/2”	345	1/2” BSP	13	16	36	19	17.5	38.1	46	57	n° 4 - M8x30	OR 4075 (18.64x3.53)
	0610719	SAE - 3/4”	345	3/4” BSP	19	18	36	19	22.2	47.6	50	65	n° 4 - M10x35	OR 4100 (24.99x3.53)
	0610713	SAE - 1”	345	1” BSP	25	18	38	22	26.2	52.4	55	70	n° 4 - M10x35	OR 4131 (32.93x3.53)
	0610720	SAE - 1 ¼”	276	1 ¼” BSP	32	21	41	22	30.2	58.7	68	79	n° 4 - M10x35	OR 4150 (37.69x3.53)
	0610714	SAE - 1 ½”	207	1 ½” BSP	38	25	45	24	35.7	69.9	78	93	n° 4 - M12x40	OR 4187 (47.22x3.53)
	0610725	SAE - 1 ½”	345	1 ½” BSP	38	50	50	24	35.7	69.9	82	98	n° 4 - M12x55 class 10.9	OR 4187 (47.22x3.53)
	0610721	SAE - 2”	207	2” BSP	51	25	45	30	43	77.8	90	102	n° 4 - M12x40	OR 4225 (56.74x3.53)
	0610722	SAE - 2 ½”	172	2 ½” BSP	63	25	50	30	50.8	89.0	105	114	n° 4 - M12x45	OR 4275 (69.44x3.53)
	0610723	SAE - 3”	138	3” BSP	73	27	50	34	61.9	106.4	124	134	n° 4 - M16x50	OR 4337 (85.32x3.53)
	0610724	SAE - 4”	34	4” BSP	99	27	48	34	77.8	130.2	146	162	n° 4 - M16x50	OR 4437 (110.70x3.53)

NOTE: Flange code 0610725 is a special flange which differs from SAEJ518 standards.

DUPLOMATIC MOTION SOLUTIONS

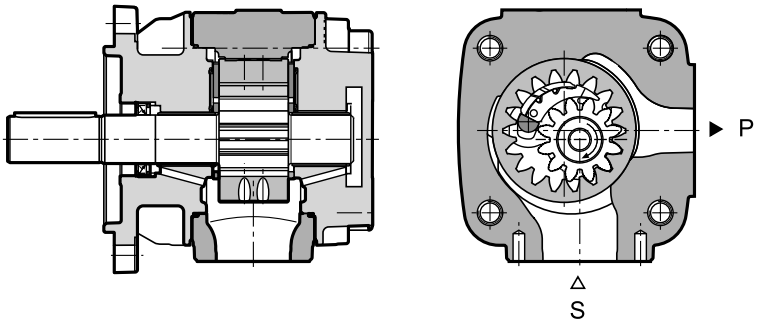
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IGS
INTERNAL GEAR PUMPS
SERIES 10

OPERATING PRINCIPLE



— IGS pumps are volumetric displacement pumps with internal gears, available in three sizes, each divided into a range of different displacement. Double pumps are also available.

— The pumps feature high volumetric performance levels, thanks to both radial and axial compensation in proportion to operating pressure, in addition to low noise levels.

— Optimal load distribution and special friction bearings enable continuous duty at high pressures and ensure extended pump lifetime.

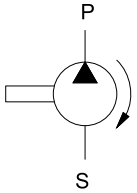
— The toothing with involute flanks features a long meshing length for low flow and pressure pulsation and therefore ensures low noise operation.

TECHNICAL SPECIFICATIONS

PUMP SIZE		2	3	5
Displacement range	cm³/rev	8.2 ÷ 24.0	25.3 ÷ 63.7	81.4 ÷ 162.8
Flow rate range (at 1500 rpm)	l/min	12 ÷ 36	38 ÷ 95	120 ÷ 245
Operating pressures	bar	see table 3 - performances		
Rotation speed	rpm	see table 3 - performances		
Rotation direction		clockwise or counterclockwise		
Loads on the shaft		axial and radial loads not allowed		
Hydraulic connections		SAE J518 c fittings, flanged (see point 10)		
Mounting flange type		SAE 2 - ISO 3019-1		
Mass (single pump)	kg	see table 3 - performances		

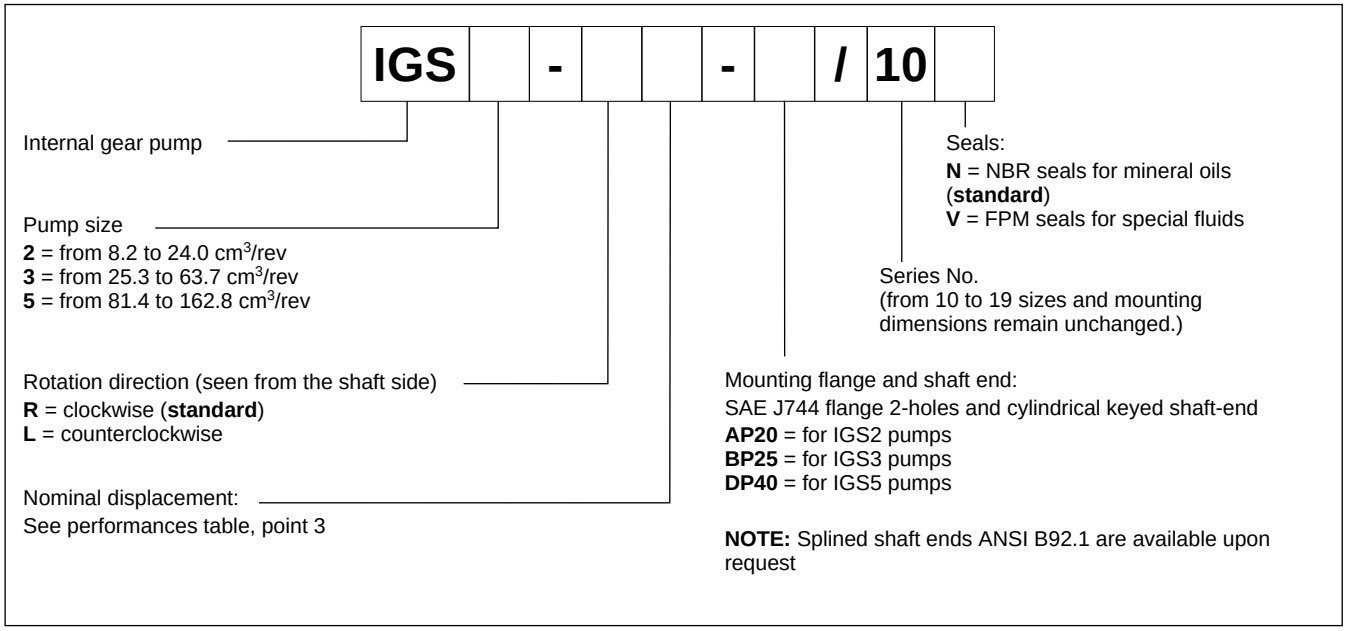
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-10 / +80
Degree of fluid contamination	see point 4.3	
Recommended viscosity	cSt	25 ÷ 100

HYDRAULIC SYMBOL

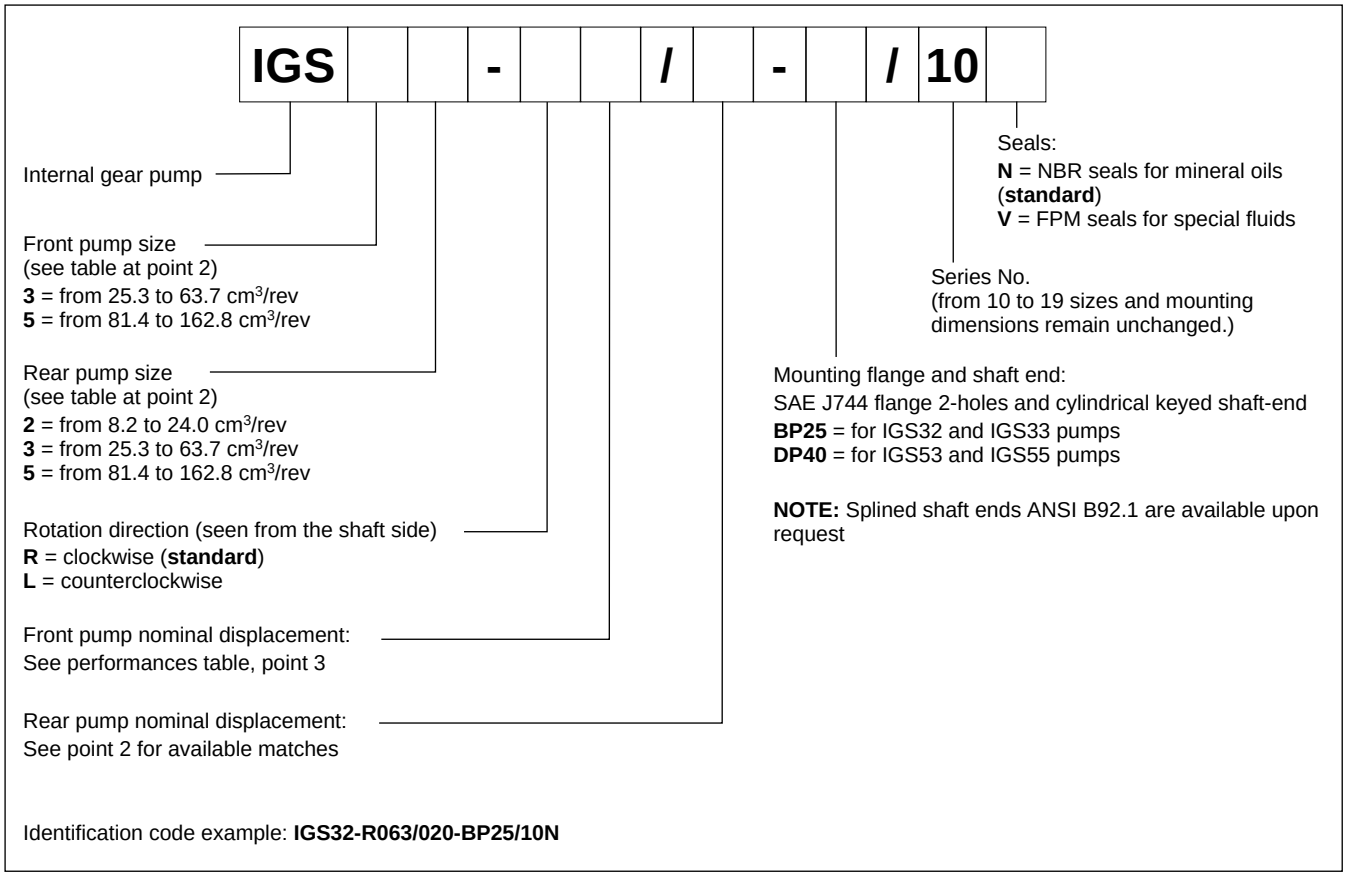


1 - IDENTIFICATION CODE

1.1 - Single pump



1.2 - Double pump



2 - AVAILABLE DOUBLE PUMPS

			REAR PUMP															
			IGS2						IGS3					IGS5				
		NOMINAL DISPLACEMENT	008	010	013	016	020	024	025	032	040	050	063	080	100	125	145	162
FRONT PUMP	IGS3	025	■	■	■	■	■	■	■									
		032	■	■	■	■	■	■	■	■								
		040	■	■	■	■	■	■	■	■	■							
		050	■	■	■	■	■	■	■	■	■	■						
		063	■	■	■	■	■	■	■	■	■	■	■					
	IGS5	080							■	■	■	■	■	■				
		100							■	■	■	■	■	■	■			
		125							■	■	■	■	■	■	■	■		
		145							■	■	■	■	■	■	■	■	■	
		162							■	■	■	■	■	■	■	■	■	■

3 - PERFORMANCES

(obtained with mineral oil with viscosity within 25 ÷ 100 cSt)

PUMP SIZE	NOMINAL DISPLACEMENT	DISPLACEMENT [cm³/rev]	FLOW RATE at 1500 rpm [l/min]	PRESSURE [bar] rated	PRESSURE [bar] max NOTE 1	ROTATION SPEED [rpm] max	ROTATION SPEED [rpm] min NOTE 2	WEIGHT [kg] (single pump)
IGS2	008	8.2	12.3	315	350	3000	400	4.6
	010	10.2	15.3					4.8
	013	13.3	20					4.9
	016	16.0	24					5.2
	020	20.0	30	250	300			5.6
	024	24.0	36					6.0
IGS3	025	25.3	38	315	350		200	14.5
	032	32.7	49.1					15
	040	40.1	60.2					16
	050	50.7	76.1					17
	063	63.7	95.6	250	300			18.5
IGS5	080	81.4	122.1	315	350		200	43.5
	100	100.2	150.3					45.5
	125	125.3	188					48
	145	145.2	217.8	250	280			50
	162	162.8	244.2	210	260			52

NOTE 1: The maximum operation time under maximum pressure is 5 seconds.

NOTE 2: The continuous pressures are valid for minimum rotation speeds. Variable speeds require pressure limitations if they are lower than the minimum rotation speed. The minimum allowable rotation speed can be reduced to 50 rpm for a duration of no more than 30 seconds, limiting the maximum pressure to 175 bar; otherwise the pump will overheat and consequently wear out faster.

4 - HYDRAULIC FLUID

4.1 - Fluid type

Use mineral oil based hydraulic fluids with anti-foam and antioxidant additives. Limitations apply with other fluid types. See the table below or consult our Technical Department for authorization of use.

FLUID TYPE	NOTES
HFC (water glycol solutions with proportion of water ≤ 40%)	- The pumps are tested with mineral oil. An appropriate cleaning cycle is required. - The values shown in the performance table must be reduced by at least 20%. - The maximum speed of the fluid in the suction line must not exceed 1 m/s. - Input speed n maximum 2000 rpm. - The suction pressure must not be less than 0,8 bar absolute. - The maximum fluid temperature must be less than 50°C.

4.2 - Fluid viscosity

The operating fluid viscosity must be within the following range:

minimum viscosity	10 cSt	referred to the maximum fluid temperature of 80 °C
optimum viscosity	25 ÷ 100 cSt	referred to the fluid working temperature in the tank
maximum viscosity	2000 cSt	limited to the start-up phase of the pump only

When selecting the fluid type, be sure that the true viscosity is within the range specified above at the operating temperature.

4.3 - Degree of fluid contamination

The maximum degree of fluid contamination must be according to ISO 4406:1999 class 20/18/15; therefore, use of a filter with $\beta_{20} \geq 75$ is recommended. A degree of maximum fluid contamination according to ISO 4406:1999 class 18/16/13 is recommended for optimum endurance of the pump. Hence, we recommend the use of a filter with $\beta_{10} \geq 100$.

If there is a filter installed on the suction line, be sure that the pressure at the pump inlet is not lower than the values specified in point 8. The suction filter must be equipped with a by-pass valve. A clogging indicator is also recommended.

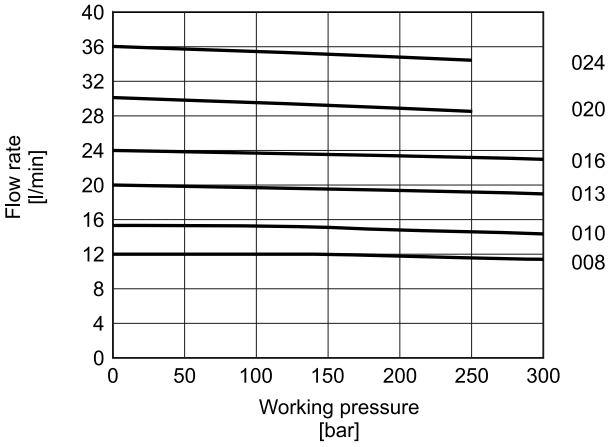
5 - CHARACTERISTIC CURVES

(values obtained with mineral oil with viscosity of 46 cSt at 40 °C)

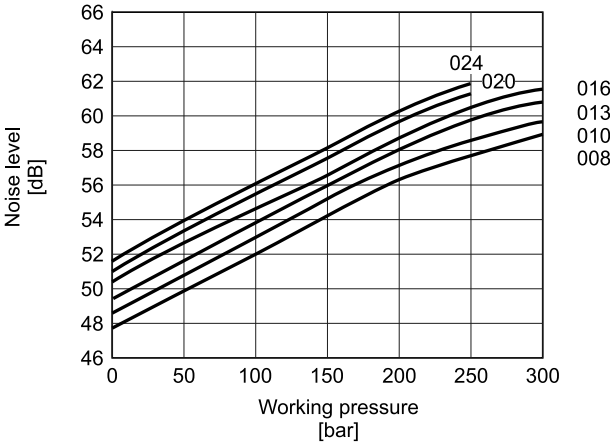
The data in the diagrams were noted with pump rotation speed = 1500 rpm.

5.1 - IGS2

FLOW RATE/PRESSURE CURVES

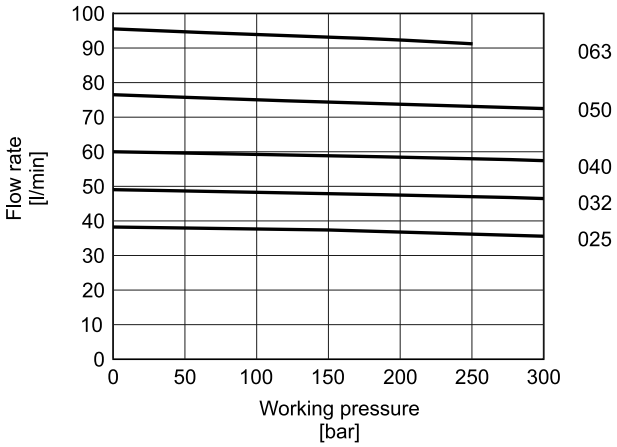


NOISE LEVEL

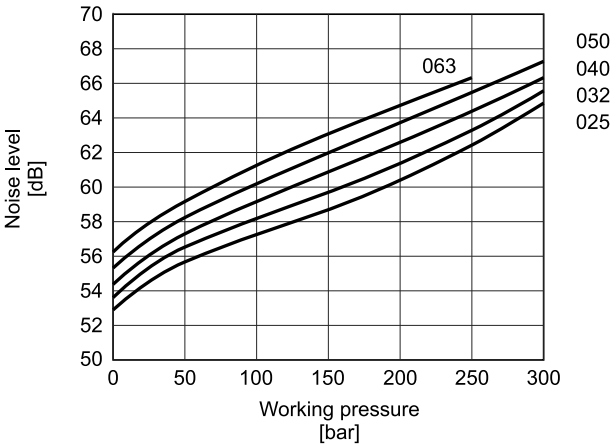


5.2 - IGS3

FLOW RATE/PRESSURE CURVES

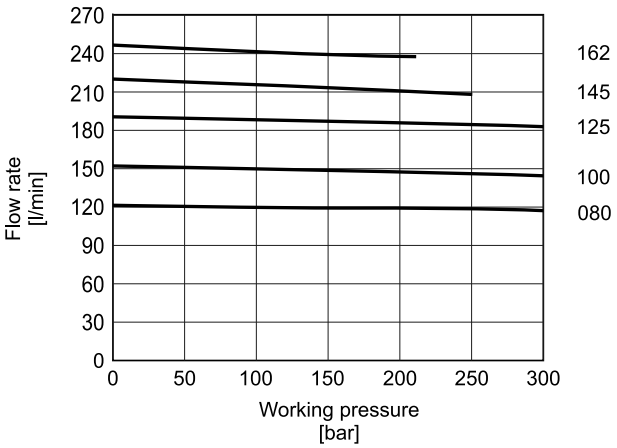


NOISE LEVEL

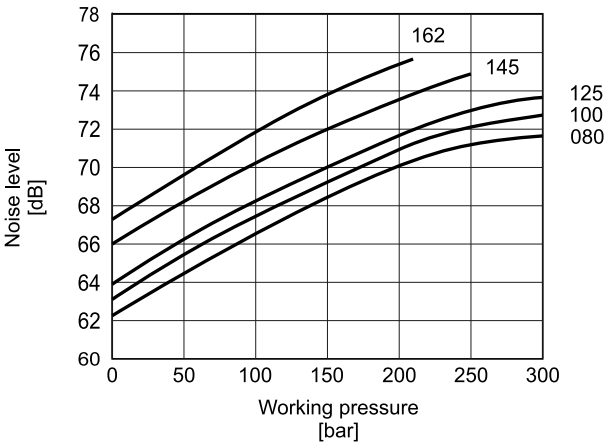


5.3 - IGS5

FLOW RATE/PRESSURE CURVES



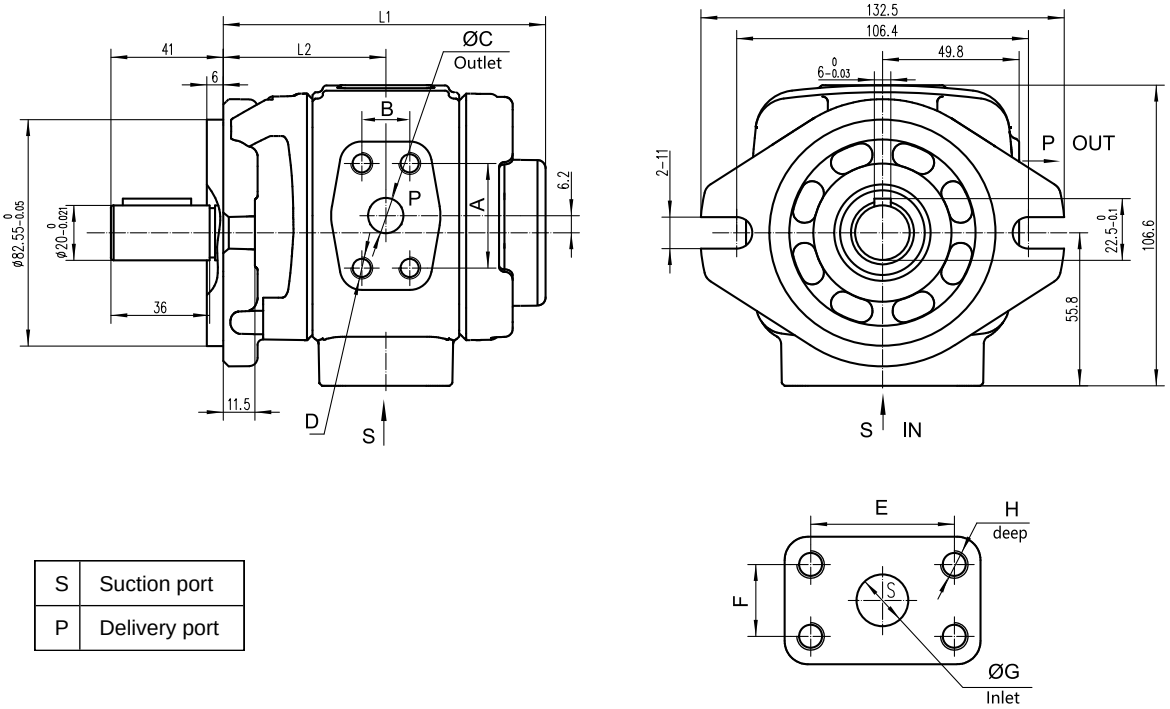
NOISE LEVEL



6 - SINGLE PUMPS - OVERALL MOUNTING AND DIMENSIONS

6.1 - IGS2 (SAE A J744 flange mounting)

dimensions in mm



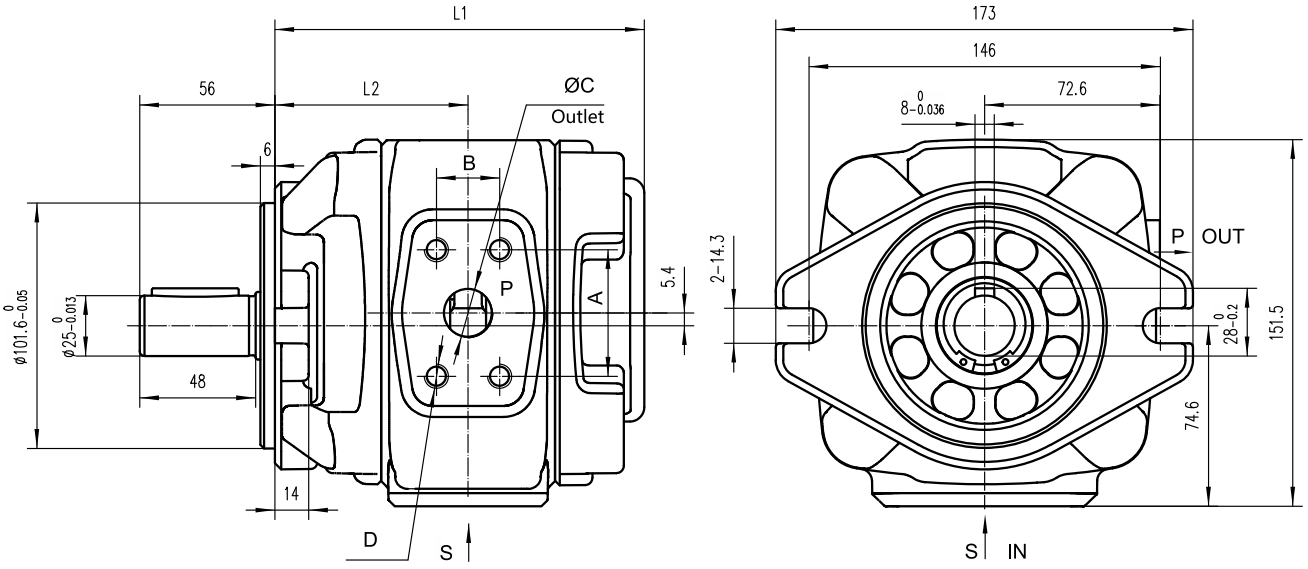
S	Suction port
P	Delivery port

NOTE: Clockwise rotating pump here illustrated.
Delivery port (P) is placed on the opposite side of the pump in counterclockwise models.

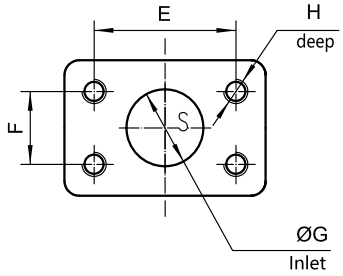
											CONNECTION FLANGES (see point 10)	
	L1	**L2**	**A**	**B**	**ØC**	**D**	**E**	**F**	**ØG**	**H**	delivery	suction
IGS2-008	107	54	38.1	17.5	13	M8 depth 13	47.6	22.2	19	M10 depth 15	0610718	0610719
IGS2-010	111	56					52.4	26.2	19			0610713
IGS2-013	117.5	59.25										
IGS2-016	123	62										
IGS2-020	131	66	47.6	22.2	18	M10 depth 15	58.7	30.2	26	M10 depth 15	0610719	0610720
IGS2-024	139	70			19				28			

6.2 - IGS3 (SAE B J744 flange mounting)

dimensions in mm



S	Suction port
P	Delivery port

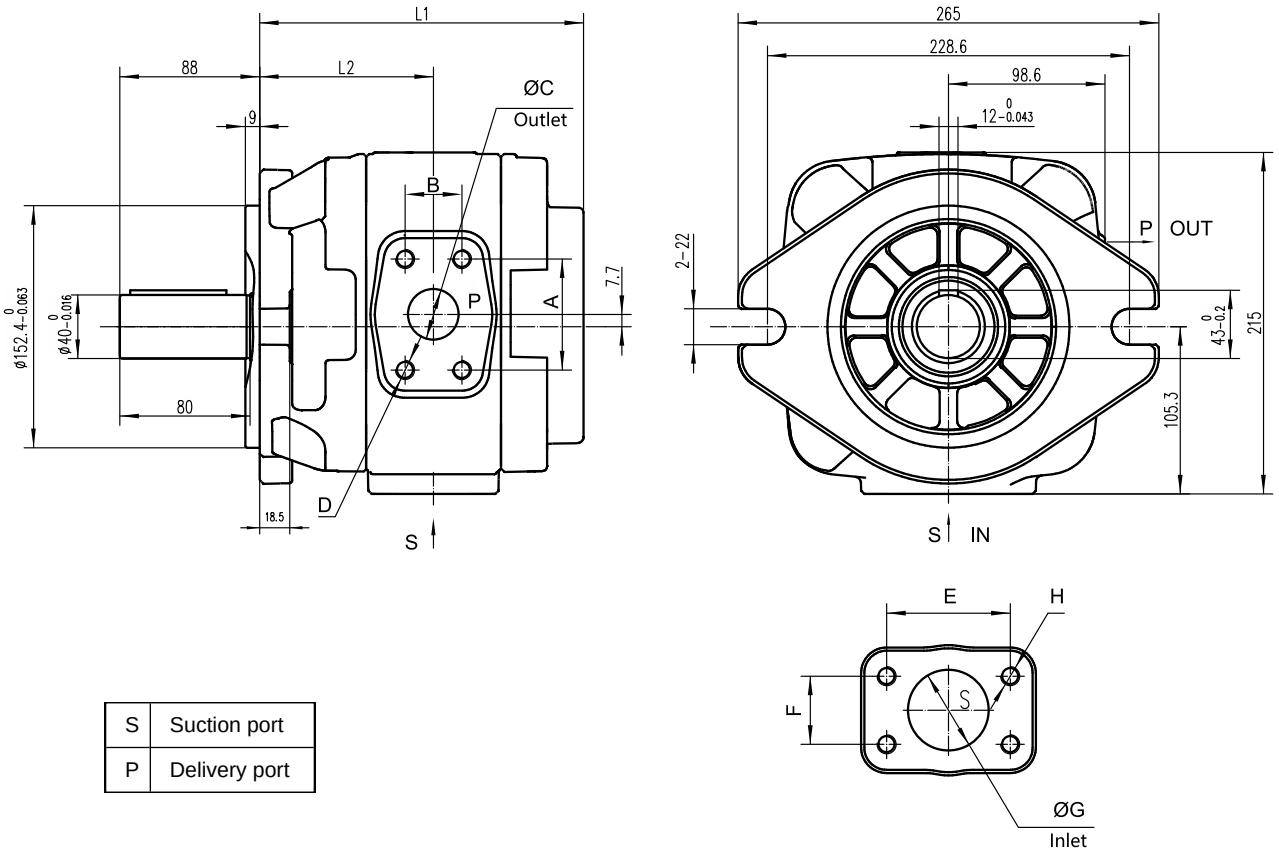


NOTE: Clockwise rotating pump here illustrated.
Delivery port (P) is placed on the opposite side of the pump in counterclockwise models.

											CONNECTION FLANGES (see point 10)	
	L1	**L2**	**A**	**B**	**ØC**	**D**	**E**	**F**	**ØG**	**H**	delivery	suction
IGS3-025	139	73	47.6	22.2	18	M10 depth 17	58.7	30.2	32	M10 depth 17	0610719	0610720
IGS3-032	146	76.5										
IGS3-040	153	80	52.4	26.2	20						0610713	
IGS3-050	163	85										
IGS3-063	177	92										

6.3 - IGS5 (SAE D J744 flange mounting)

dimensions in mm



S	Suction port
P	Delivery port

NOTE: Clockwise rotating pump here illustrated.
Delivery port (P) is placed on the opposite side of the pump in counterclockwise models.

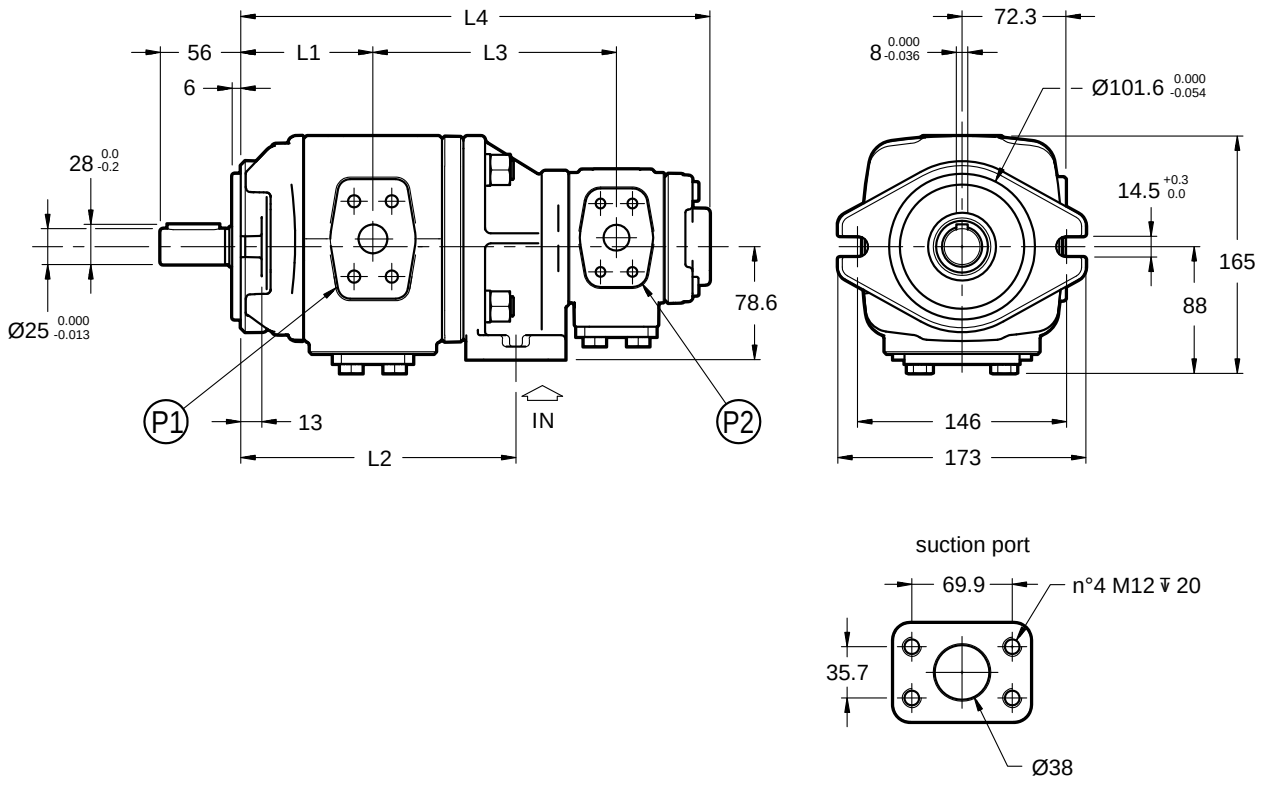
											CONNECTION FLANGES (see point 10)	
	L1	**L2**	**A**	**B**	**ØC**	**D**	**E**	**F**	**ØG**	**H**	delivery	suction
IGS5-080	204	109.5	69.9	35.7	32	M12 depth 20	77.8	42.6	51	M12 depth 20	0610714 (**NOTE**)	0610721
IGS5-100	213	114										
IGS5-125	225	120	79.4	36.5	38	M16 depth 25	88.9	50.8	63.5		0773462	0610722
IGS5-145	235.5	124.75										
IGS5-162	243	129					106.4	61.9	76	M16 depth 25		0610723

NOTE: Applications with delivery pressure > 200 bar require the special flange cod. 0610725.

7 - DOUBLE PUMPS - OVERALL MOUNTING AND DIMENSIONS

7.1 - IGS32 (SAE B J744 flange mounting)

dimensions in mm



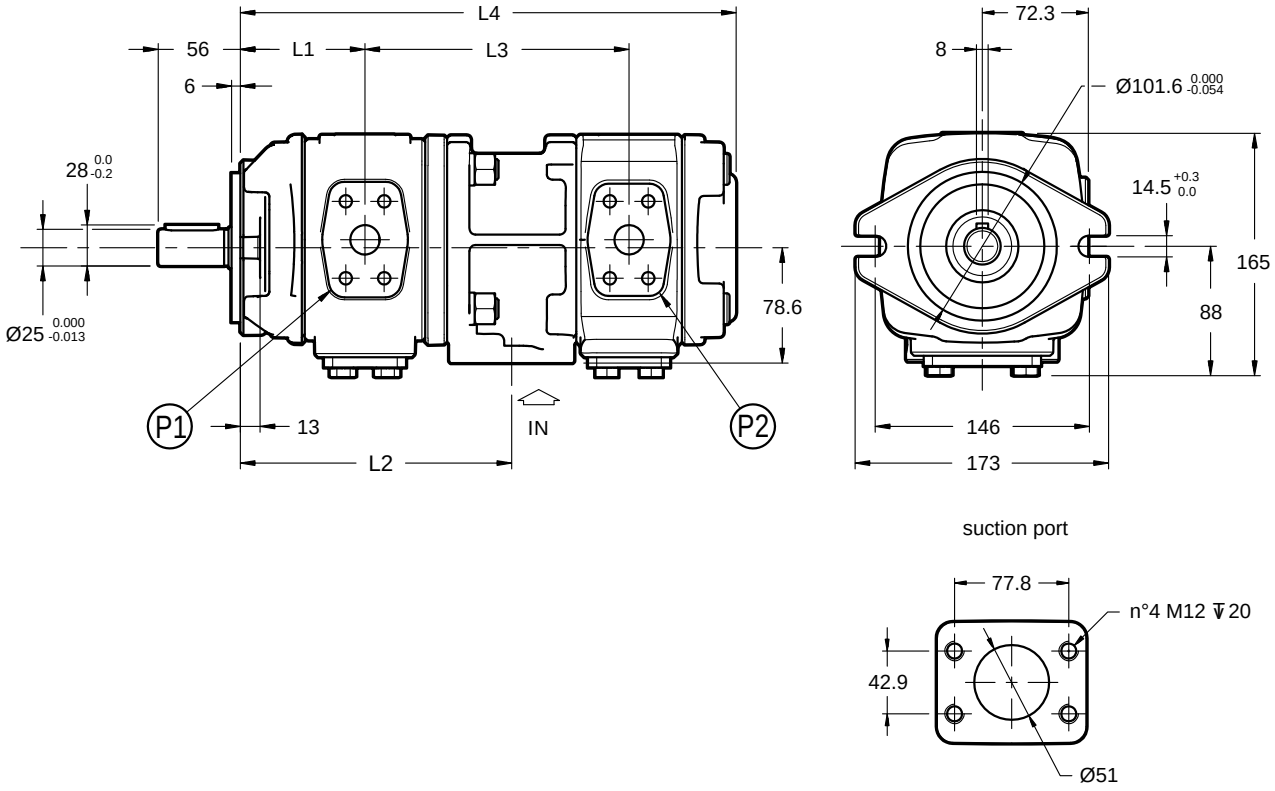
IN	Suction port: SAE 3000 1 1/2”
P1	Delivery port, front see dimensions at p.6.2
P2	Delivery port, rear see dimensions at p.6.1

NOTE: Clockwise rotating pump here illustrated.
Delivery ports (P1 and P2) of counter-clockwise rotating pumps are placed on the opposite side.

Front pump	L1	L2	Rear pump											
			008		010		013		016		020		024	
			L3	L4	L3	L4	L3	L4	L3	L4	L3	L4	L3	L4
025	73	153.5	138.5	264.5	140.5	268.5	143.8	275	146.5	280.5	150.5	288.5	154.5	296.5
032	76.5	160.5	142	271.5	144	275.5	147.3	282	150	287.5	154	295.5	158	303.5
040	80	167.5	145.5	278.5	147.5	282.5	150.8	289	153.5	294.5	157.5	302.5	161.5	310.5
050	85	177.5	150.5	288.5	152.5	292.5	155.8	299	158.5	304.5	162.5	312.5	166.5	320.5
063	92	191.5	157.5	302.5	159.5	306.5	162.8	313	165.5	318.5	169.5	326.5	173.5	334.5

7.2 - IGS33 (SAE B J744 flange mounting)

dimensions in mm



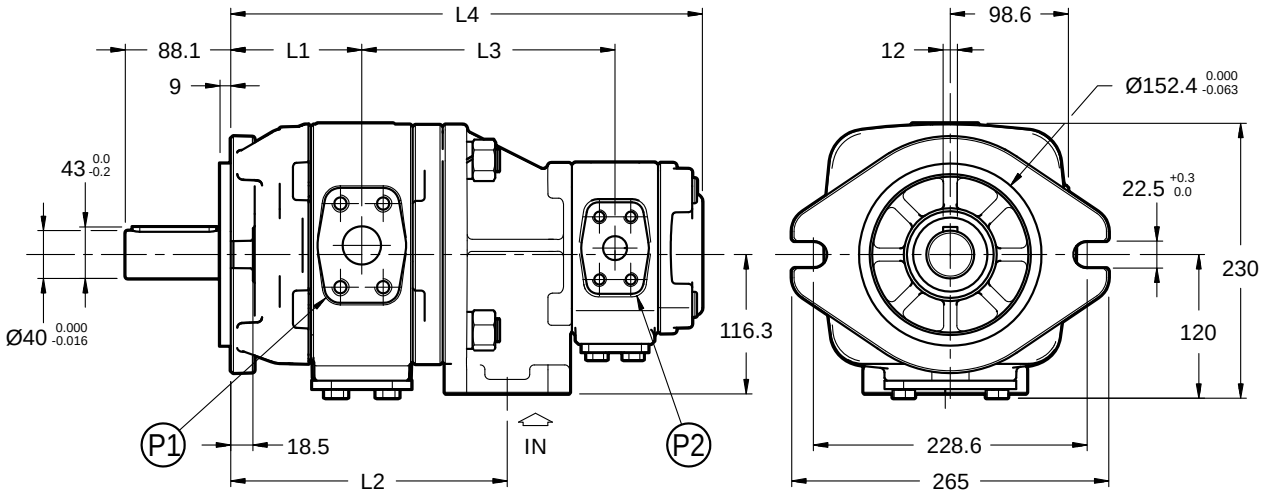
IN	Suction port: SAE 3000 2”
P1	Delivery port, front see dimensions at p.6.2
P2	Delivery port, rear see dimensions at p.6.2

NOTE: Clockwise rotating pump here illustrated.
Delivery ports (P1 and P2) of counter-clockwise rotating pumps are placed on the opposite side.

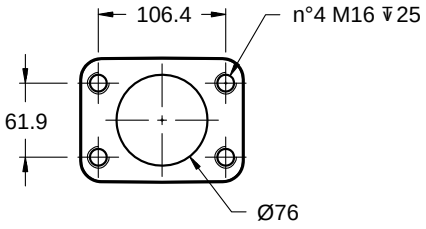
Front pump	L1	L2	Rear pump									
			025		032		040		050		060	
			L3	L4	L3	L4	L3	L4	L3	L4	L3	L4
025	73	161	161	300	-	-	-	-	-	-	-	-
032	76.5	168	164.5	307	168	341	-	-	-	-	-	-
040	80	175	168	314	171.5	321	175	328	-	-	-	-
050	85	185	173	324	176.5	331	180	338	185	348	-	-
063	92	199	180	338	183.5	345	187	352	192	362	199	376

7.3 - IGS53 (SAE D J744 flange mounting)

dimensions in mm



suction port



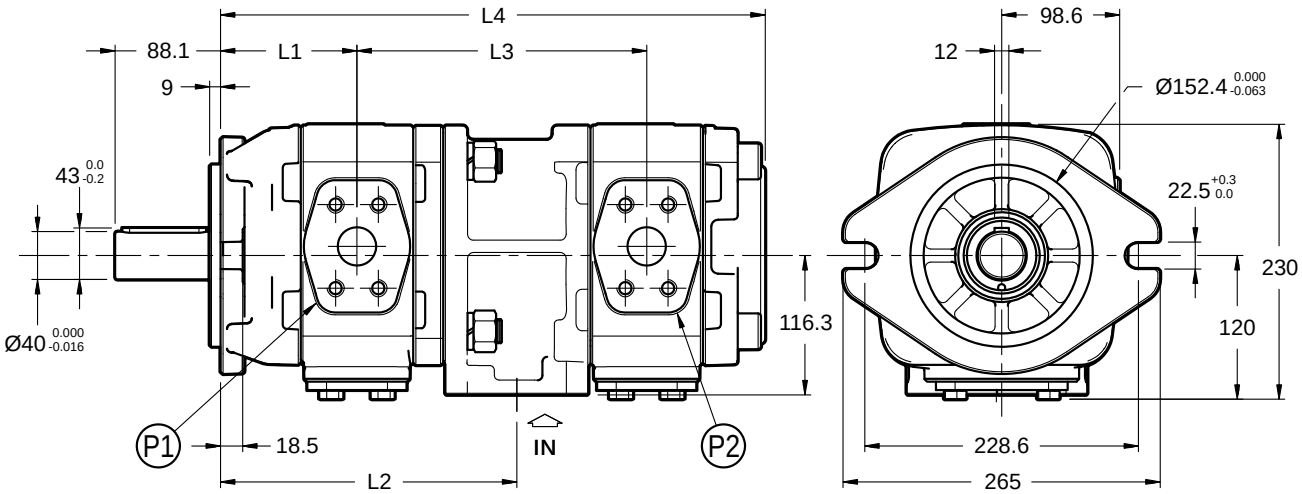
IN	Suction port: SAE 3000 3”
P1	Delivery port, front see dimensions at p.6.3
P2	Delivery port, rear see dimensions at p.6.2

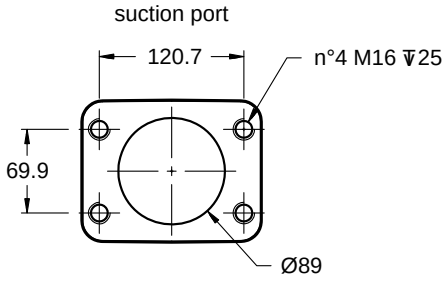
NOTE: Clockwise rotating pump here illustrated.
Delivery ports (P1 and P2) of counter-clockwise rotating pumps are placed on the opposite side.

Front pump	L1	L2	Rear pump									
			025		032		040		050		060	
			L3	L4	L3	L4	L3	L4	L3	L4	L3	L4
080	109.5	231	204.5	380	208	387	211.5	394	216.5	404	223.5	418
100	114	240	209	389	212.5	396	216	403	221	413	228	427
125	120	252	215	401	218.5	408	222	415	227	425	234	439
145	124.8	261.5	219.8	410.5	223.3	417.5	226.8	424.5	231.8	434.5	238.8	448.5
160	129	270	224	419	227.5	426	231	433	236	443	243	457

7.4 - IGS55 (SAE D J744 flange mounting)

dimensions in mm





IN	Suction port: SAE 3000 3 1/2”
P1	Delivery port, front see dimensions at p.6.3
P2	Delivery port, rear see dimensions at p.6.3

NOTE: Clockwise rotating pump here illustrated.
Delivery ports (P1 and P2) of counter-clockwise rotating pumps are placed on the opposite side.

Front pump	L1	L2	Rear pump									
			080		100		125		145		160	
			L3	L4	L3	L4	L3	L4	L3	L4	L3	L4
080	109.5	238.5	233	437	-	-	-	-	-	-	-	-
100	114	247.5	237.5	446	242	455	-	-	-	-	-	-
125	120	259.5	243.5	458	248	467	254	497	-	-	-	-
145	124.8	269	248.3	467.5	252.8	476.5	258.8	488.5	263.5	498	-	-
160	129	277.5	252.5	476	257	485	263	497	267.8	506.5	272	515

8 - INSTALLATION

— When connecting the pump shaft and motor shaft, use a flexible coupling to avoid bending moments or axial thrusts. The maximum allowable coaxiality error between the pump shaft and the motor shaft is 0.15 mm when installing the coupling. It is strictly forbidden to use blows or strong pressure for installation.

— Check that the rotation direction of the motor is according to the direction of the arrow marked on the pump body before putting the pump into operation.

— Select the inner diameter of the suction piping according to the size of the pump suction port (optimal suction flow rate is 0.6~1.2 m/s) and taking into account the allowable suction pressure (the value is between 0.8 bar and 2 bar absolute). Suction line must be immersed in the tank, at least below the minimum oil level and 50 mm from the tank bottom. Any bends and restrictions or an excessive line length may impair correct operation of the pump.

— The IGS pumps are self-priming in the entire operating speed range specified.

— Before start-up, fill the pump body with hydraulic oil through the suction port or through the delivery port; open the relief valve of the system to vent the air from the delivery line. Run the motor intermittently without load, until the pump is fully lubricated, vent the air in the pipeline. (If the circuit branch is not equipped with a relief valve, the method of slightly loosening the pump discharge connection to cause leakage can be adopted. When no more bubbles appear in the leaked oil, tighten the loosened part according to the specified torque.)
NOTE: Apply this method only under low pressure conditions, making sure the pressure cannot rise during the start-up. The pump starting operation, especially at low temperatures, must be undertaken at the minimum pressure in the system.

— Refer to point 4.3 for characteristics and installation of the filtering elements.

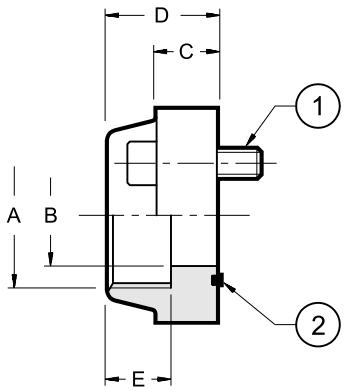
9 - MAXIMUM APPLICABLE TORQUE

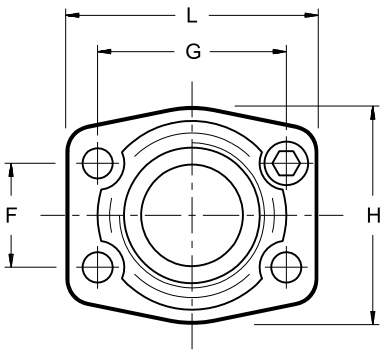
The table shows values for cylindrical keyed shafts-ends. In case of double pumps, even of the same displacement, each pump can operate at the maximum PERFORMANCES specified in point 3.

PUMP SIZE	MAX. TORQUE APPLICABLE TO THE SHAFT [Nm]
IGS2	250
IGS3	450
IGS5	1100

10 - SAE J518 CONNECTION FLANGES

dimensions in mm





The fastening bolts and the O-Rings must be ordered separately.

	Flange code	Flange description	p_{max} [bar]	ØA	ØB	C	D	E	F	G	H	L	1 bolts ISO 4762	2
SAE 3000	0610718	SAE - 1/2"	345	1/2" BSP	13	16	36	19	17.5	38.1	46	57	n° 4 - M8x30	OR 4075 (18.64x3.53)
	0610719	SAE - 3/4"	345	3/4" BSP	19	18	36	19	22.2	47.6	50	65	n° 4 - M10x35	OR 4100 (24.99x3.53)
	0610713	SAE - 1"	345	1" BSP	25	18	38	22	26.2	52.4	55	70	n° 4 - M10x35	OR 4131 (32.93x3.53)
	0610720	SAE - 1 ¼"	276	1 ¼" BSP	32	21	41	22	30.2	58.7	68	79	n° 4 - M10x35	OR 4150 (37.69x3.53)
	0610714	SAE - 1 ½"	207	1 ½" BSP	38	25	45	24	35.7	69.9	78	93	n° 4 - M12x40	OR 4187 (47.22x3.53)
	0610725	SAE - 1 ½"	345	1 ½" BSP	38	50	50	24	35.7	69.9	82	98	n° 4 - M12x55 class 10.9	OR 4187 (47.22x3.53)
	0610721	SAE - 2"	207	2" BSP	51	25	45	30	43	77.8	90	102	n° 4 - M12x40	OR 4225 (56.74x3.53)
	0610722	SAE - 2 ½"	172	2 ½" BSP	63	25	50	30	50.8	89.0	105	114	n° 4 - M12x45	OR 4275 (69.44x3.53)
	0610723	SAE - 3"	138	3" BSP	73	27	50	34	61.9	106.4	124	134	n° 4 - M16x50	OR 4337 (85.32x3.53)
	0610724	SAE - 3 ½"	34	3 ½" BSP	89	27	48	34	69.9	120.7	136	152	n° 4 - M16x50	OR 4387 (98.02x3.53)
SAE 6000	0773462	SAE - 1 ½"	420	1 ½" BSP	38	30	94	26	36.5	79.3	94	112	n° 4 - M16x55	OR 4187 (47.22x3.53)

NOTE: Flange code 0610725 is a special flange which differs from the SAE J518 standard.

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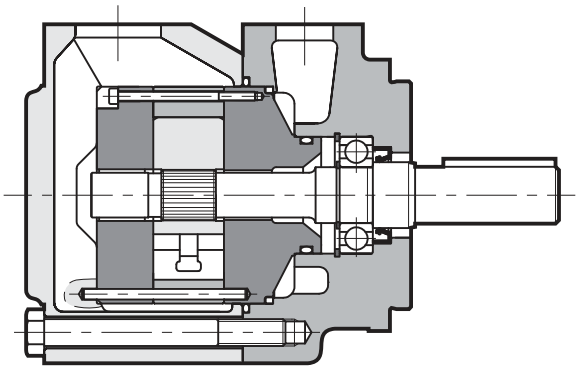


DFP

FIXED DISPLACEMENT VANE PUMPS

SERIES 20

OPERATING PRINCIPLE



— The DFP pumps are fixed displacement vane pumps made in four different sizes, each size having five different nominal displacement. They are available with one pumping element (single pump) or with double pumping element (double pump). See par. 15 ÷ 20 for the combinations of double pumps.

— The pumping group is composed of a cartridge type compact element that contains the rotor, the vanes, the cam ring and the head disks. The cartridge is easily removable without the need to disconnect the pump from the hydraulic circuit, thus simplifying the maintenance operations.

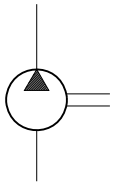
— The special elliptical profile of the cam ring, with double suction and delivery chambers one against the other, eliminates the radial thrusts on the rotor, decisively reducing wear of the pump. In addition, the use of a 12-vane rotor reduces the delivery pressure pulsations, suppressing the vibrations and noise level of the pump.

TECHNICAL SPECIFICATIONS

DFP PUMP SIZE		1	2	3	4
Displacement range	cm^3/rev	18 ÷ 45,9	40,1 ÷ 67,5	69 ÷ 121,6	138,6 ÷ 193,4
Flow rate range (at 1.500 rpm)	l/min.	26,1 ÷ 69,6	58,8 ÷ 99,8	101,4 ÷ 177,3	203,4 ÷ 285
Operating pressures		see table 3 - performances			
Rotation speed		see table 3 - performances			
Rotation direction		clockwise or anticlockwise (seen from the shaft side)			
Loads on the shaft		axial loads are not allowed			
Hydraulic connection		flange fittings SAE J518 (see par. 22)			
Type of fastening		flanged SAE			
Mass (single pump)	kg	12	15	23	34

Ambient temperature range	°C	–20 / +50
Fluid temperature range (see par. 4)	°C	–10 / +70
Fluid viscosity range	see par. 4.2	
Recommended true viscosity	cSt	25 ÷ 50
Degree of fluid contamination	see par. 4.3	

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

D	F				-		/		-					/	20	/	

Fixed displacement vane pump

Pump type
P = single pump
DP = double pump
C = shaft side cartridge or for single pump
CC= cover side cartridge

Pump size:
- single pump
- shaft side pump
(only for double pumps):

1 = from 18 to 45,9 cm³/rev
2 = from 40,1 to 67,5 cm³/rev
3 = from 69 to 121,6 cm³/rev
4 = from 138,6 to 193,4 cm³/rev

Added pump size
(only for double pumps):

1 = from 18 to 45,9 cm³/rev
2 = from 40,1 to 67,5 cm³/rev
3 = from 69 to 121,6 cm³/rev

NOTE: the cover side pump must be at least one size smaller than the shaft side pump

Size:
- single pump
- shaft side pump
- shaft side cartridge
(see performances table, par. 3)

Size (only for double pumps)
- cover side pump
- cover side cartridge
(see performances table, par. 3)

Rotation direction (seen from the shaft side)
R = clockwise **L** = anticlockwise

Suction opening orientation compared with the delivery (omit for cartridges)
A = aligned on the same side
B = at 90°
C = opposed to each other
D = at 270°
} see par. 2

Cover side delivery port orientation compared with the shaft side delivery - for double pumps (omit for single pumps or cartridges)
A = aligned on the same side
B = at 90°
C = opposed to each other
D = at 270°
} see par. 2

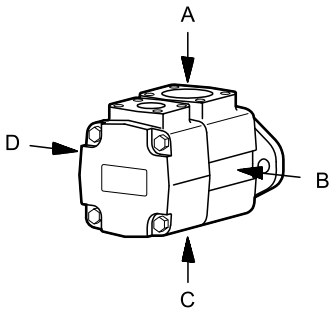
Type of shaft end
1 = with key
other shaft types are available upon request

Series No.
(the overall and mounting dimensions remain unchanged from 20 to 29)

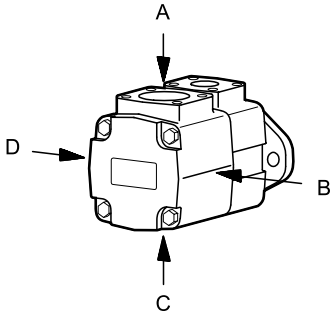
Seals: omit for mineral oils
V = viton for special fluids

2 - PORTS ORIENTATION

SINGLE PUMPS



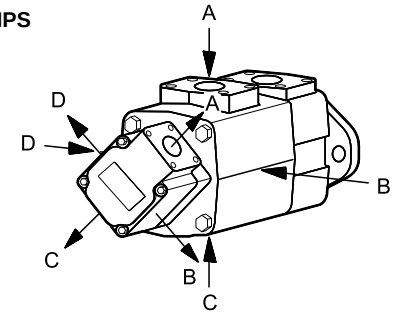
DFP1

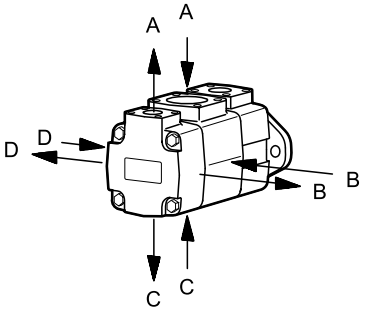


DFP2
DFP3
DFP4

DOUBLE PUMPS

DFP21
DFP31
DFP32
DFP41
DFP42





DFP43

3 - PERFORMANCES (obtained with mineral oil with viscosity of 32 cSt at 40°C)

PUMP SIZE	NOMINAL DIMENSION	DISPLACEMENT [cm³/rev]	MAX. FLOW RATE (at 1500 rpm) [l/min.]	MAX. OPERATING PRESSURE (at 1500 rpm) [bar]	MAX. ROTATION SPEED [rpm] (see par. 5)	MIN. ROTATION SPEED [rpm]
DFP1	05	18	26,1	210	2700	600
	08	27,4	39,4			
	11	36,4	52,6			
	12	39,5	58,7	160		
	14	45,9	69,6	140		
DFP2	12	40,1	58,8	210	2500	600
	14	45,4	65,7			
	17	55,2	80,2			
	19	60,1	88,7			
	21	67,5	99,8			
DFP3	21	69	101,4	210	2400	600
	25	81,6	120,1			
	30	97,7	141,2			
	35	112,7	167,2			
	38	121,6	177,3			
DFP4	42	138,6	203,4	175	2200	600
	47	153,5	222,7			
	50	162,2	234			
	57	183,4	267			
	60	193,4	285			

4 - HYDRAULIC FLUID

4.1 Fluid type

TYPE OF FLUID	MAXIMUM PRESSURE (bar)				MAXIMUM SPEED (rpm)				MAXIMUM FLUID TEMPERATURE [°C]
	DFP1	DFP2	DFP3	DFP4	DFP1	DFP2	DFP3	DFP4	
HFD PHOSPHATE ESTERS	175	175	175	175	1200	1200	1200	1200	≤ 70
HFC WATER GLYCOL	140	140	140	140	1500	1500	1500	1500	≤ 50

NOTE 1: The maximum suction pressure allowed, with all fluid types, is 1,4 bar. The minimum suction pressure varies from -0,2 bar with mineral oil to -0,1 bar with the other fluid types (the pressure values are to be considered relative).

The pressures, the maximum allowed speeds and the recommended temperatures according to the different types of hydraulic fluids used are shown in the table.

4.2 - Fluid viscosity

The operating fluid viscosity must be within the following range:

minimum viscosity	16 cSt	referred to the maximum temperature of 80 °C of the fluid
optimum viscosity	25 ÷ 50 cSt	referred to the operating temperature of the fluid in the tank
maximum viscosity	800 cSt	limited to only the pump start-up phase

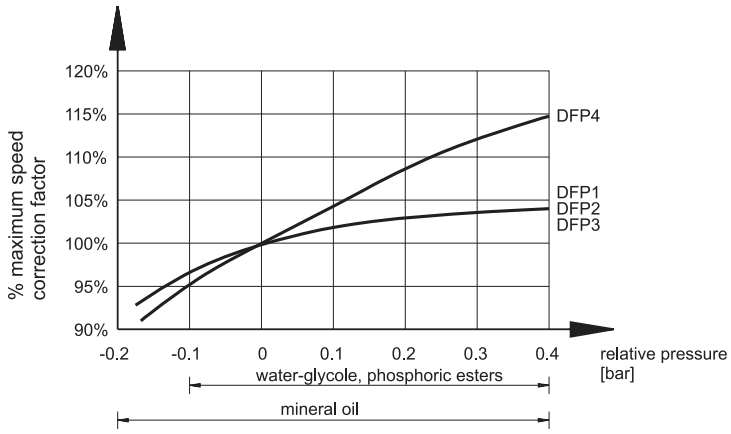
When choosing the fluid type, verify that the true viscosity at the operating temperature is within the above range.

4.3 - Degree of fluid contamination

The maximum degree of fluid contamination must be according to ISO 4406:1999 class 20/18/15; therefore, use of a filter with $\beta_{20} \geq 75$ is recommended. A degree of maximum fluid contamination according to ISO 4406:1999 class 18/16/13 is recommended for optimum endurance of the pump. Hence, use of a filter with $\beta_{10} \geq 100$ is recommended.

If there is a filter installed on the suction line, be sure that the pressure at the pump inlet is not lower than the values specified in the note 1, at paragraph 3. The suction filter must be equipped with a by-pass valve and, if possible, with a clogging indicator.

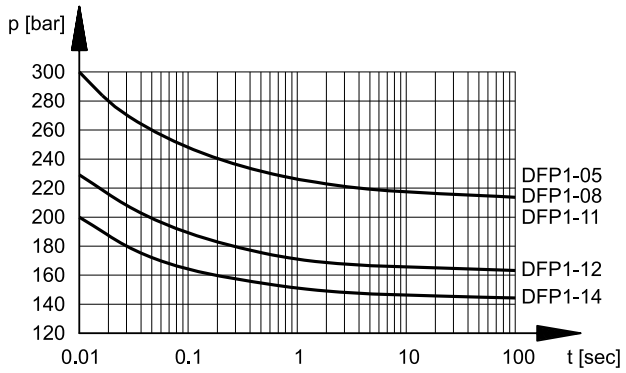
5 - MAXIMUM SPEED CORRECTION FACTOR

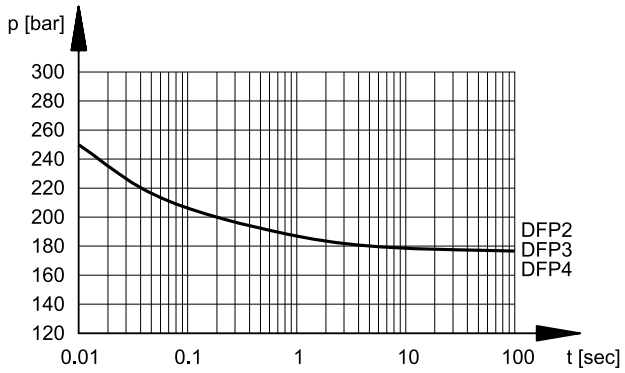


If the pressure in the suction line is different than zero, the maximum rotation speed shown in table 3 must be multiplied by the correction factor obtained from the diagram seen on the left.

6 - PRESSURE PEAK (values obtained with mineral oil with viscosity of 32 cSt at 40°C, delivery pressure 140 bar and suction pressure 0 bar)

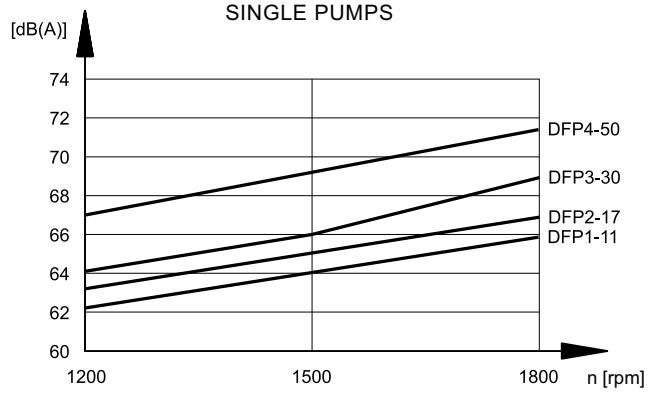
The maximum allowed over pressure on the pump delivery according to the pressure peak residency time is shown in the diagrams. The curves are valid for both single pumps and double pumps.

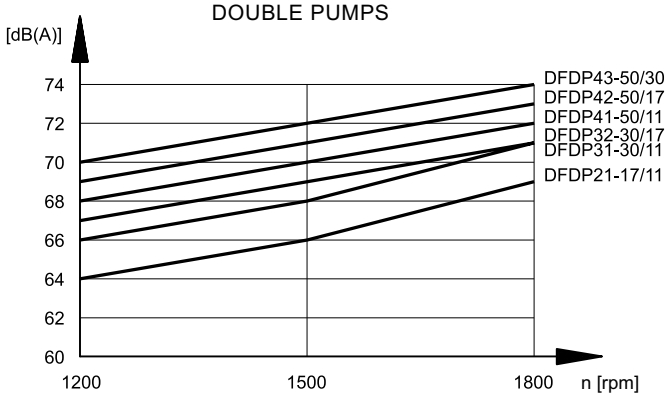




7- NOISE LEVEL (values obtained with mineral oil with viscosity of 32 cSt at 40°C, delivery pressure 140 bar and suction pressure 0 bar)

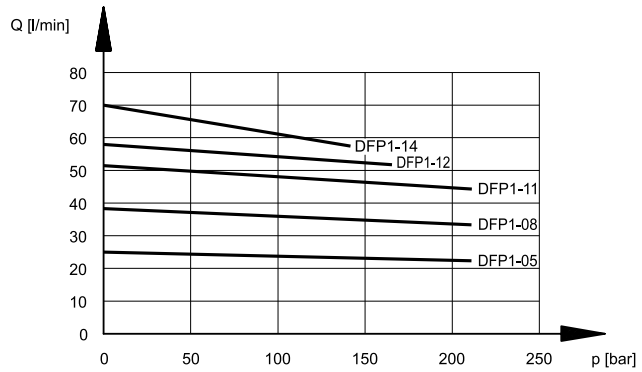
The diagram curves were measured in a semi-anechoic room according to ISO 4412/1 at a distance of 1 m from the pump. The values refer to the intermediate size pump.



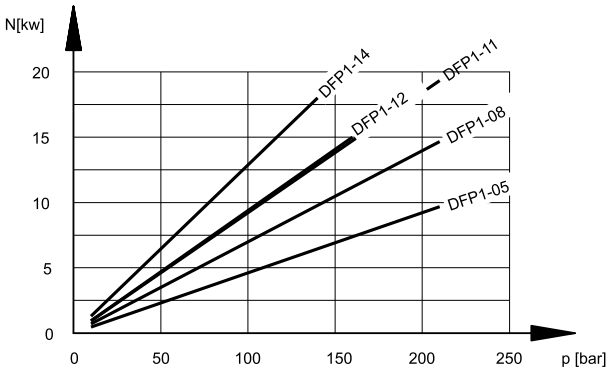


8 - DFP1 PUMP CHARACTERISTIC CURVES (obtained with mineral oil with viscosity of 32 cSt at 40°C)

FLOW RATE/PRESSURE CURVES (measured at 1500 rpm)

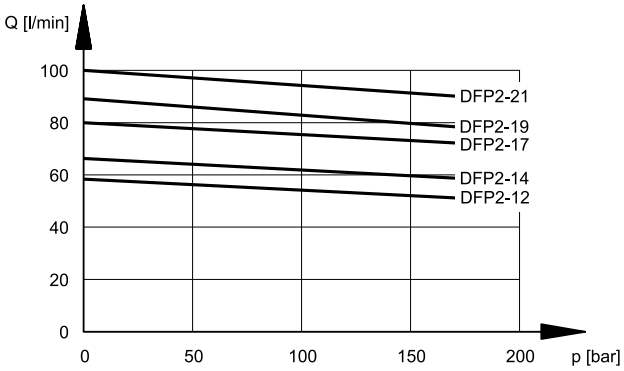


ABSORBED POWER/PRESSURE CURVES (measured at 1500 rpm)

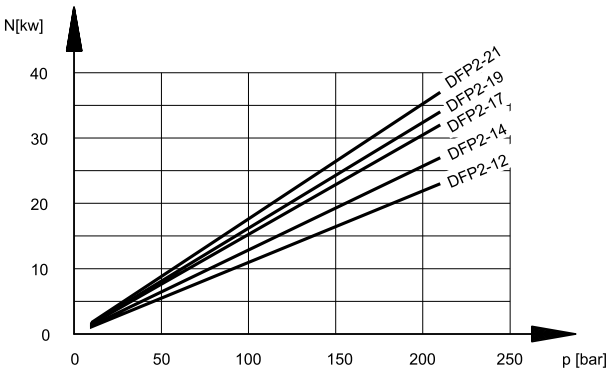


8 - DFP2 PUMP CHARACTERISTIC CURVES (obtained with mineral oil with viscosity of 32 cSt at 40°C)

FLOW RATE/PRESSURE CURVES (measured at 1500 rpm)

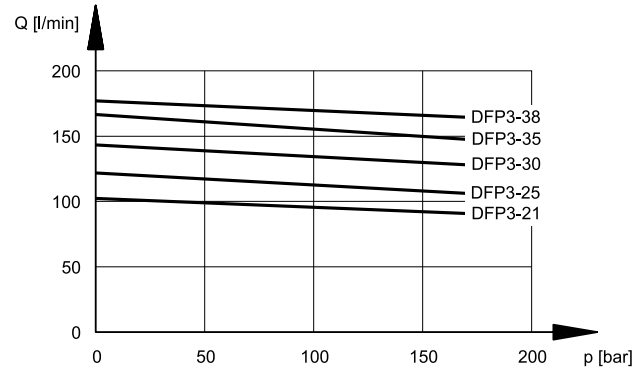


ABSORBED POWER/PRESSURE CURVES (measured at 1500 rpm)

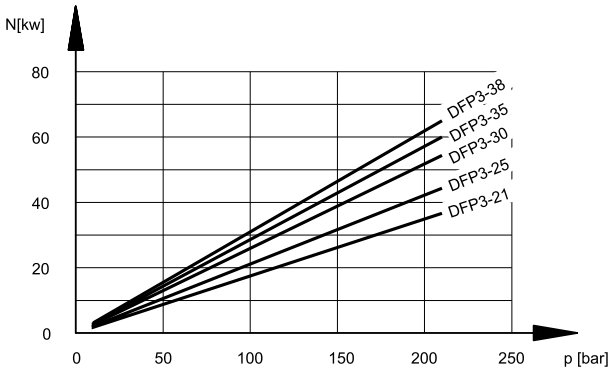


9 - DFP3 PUMP CHARACTERISTIC CURVES (values obtained with mineral oil with viscosity of 32 cSt at 40°C)

FLOW RATE/PRESSURE CURVES (measured at 1500 rpm)

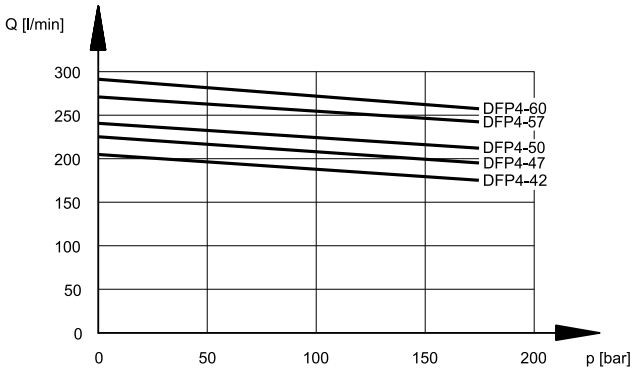


ABSORBED POWER/PRESSURE CURVES (measured at 1500 rpm)

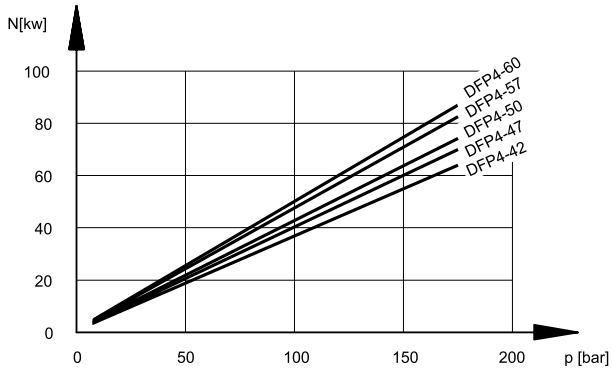


10 - DFP4 PUMP CHARACTERISTIC CURVES (values obtained with mineral oil with viscosity of 32 cSt at 40°C)

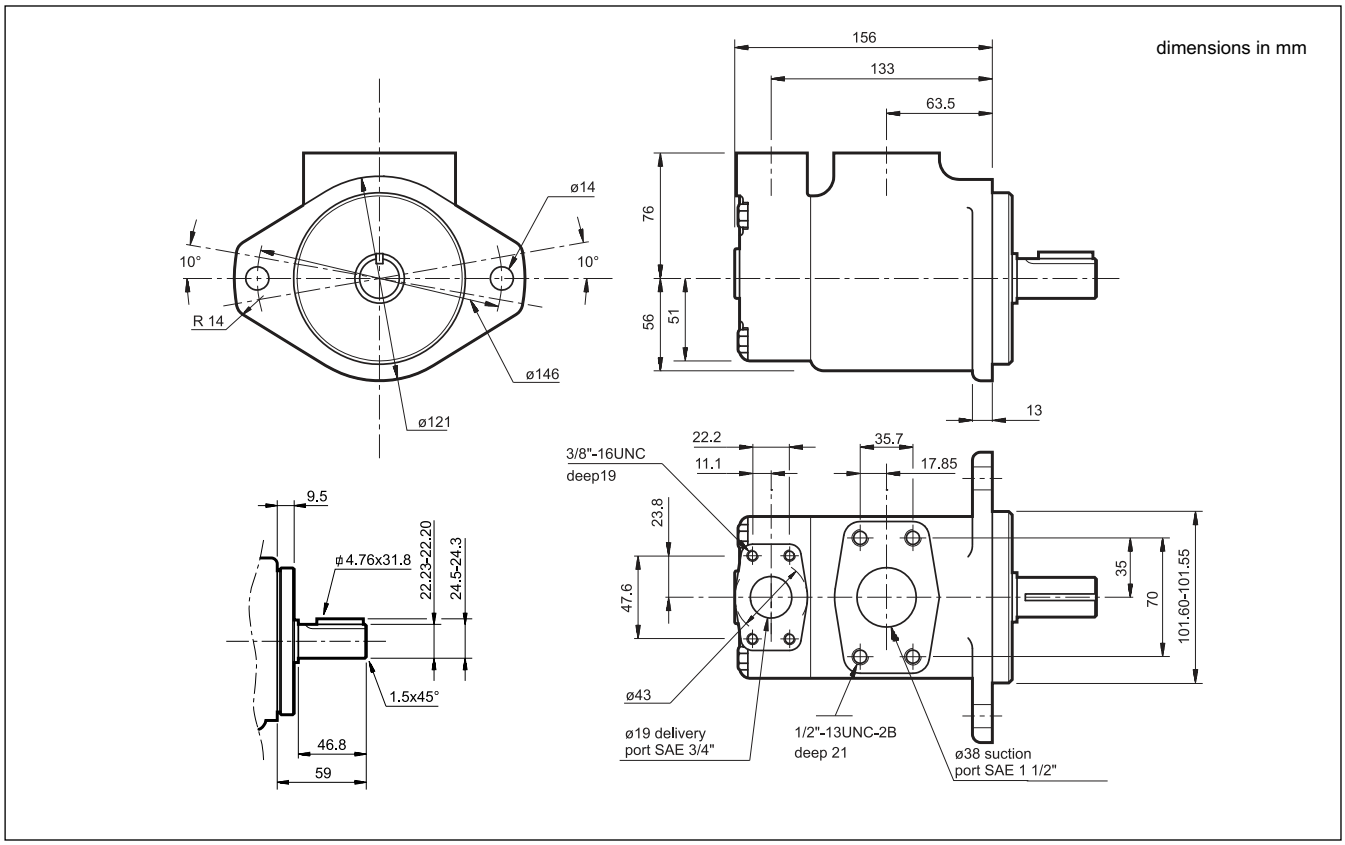
FLOW RATE/PRESSURE CURVES (measured at 1500 rpm)



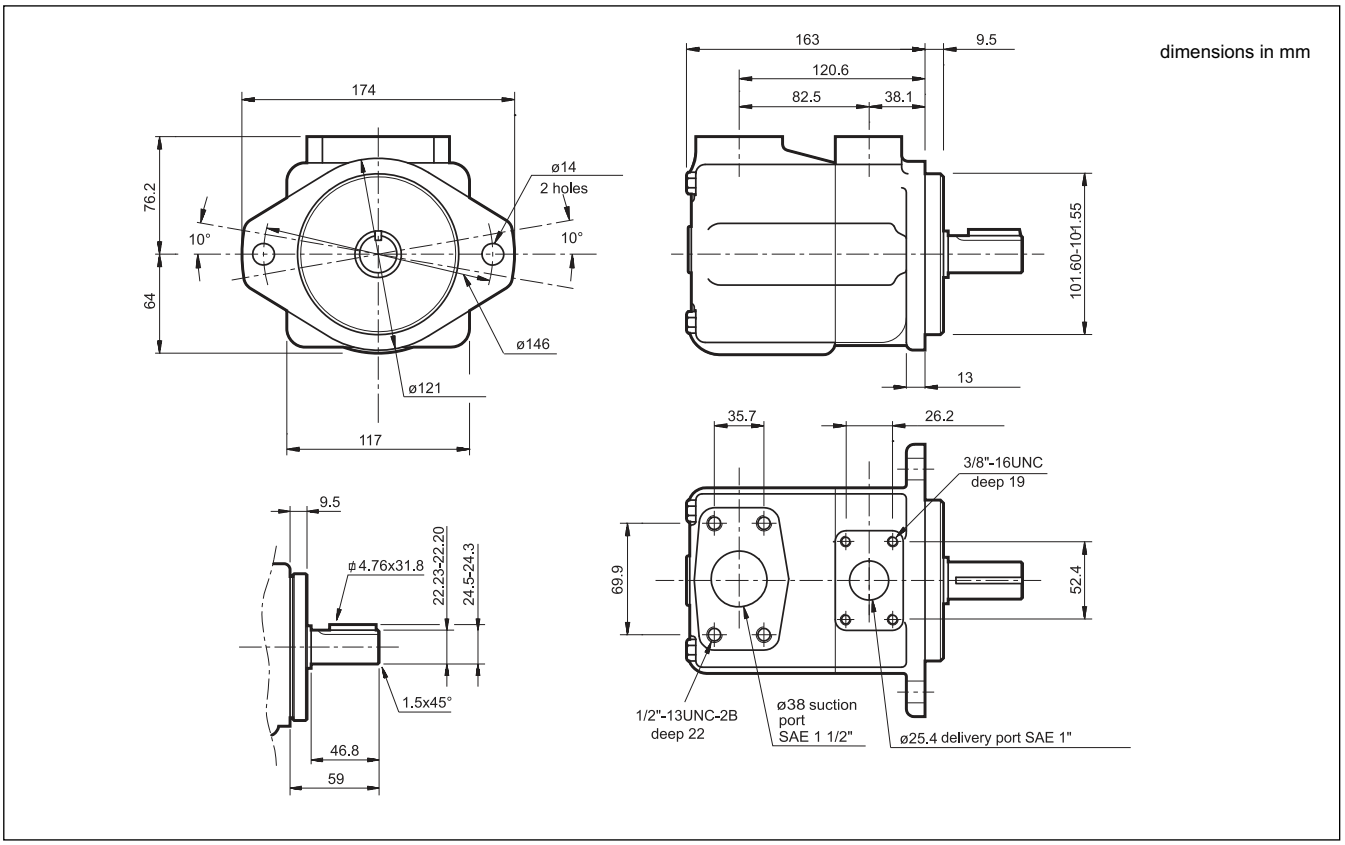
ABSORBED POWER/PRESSURE CURVES (measured at 1500 rpm)



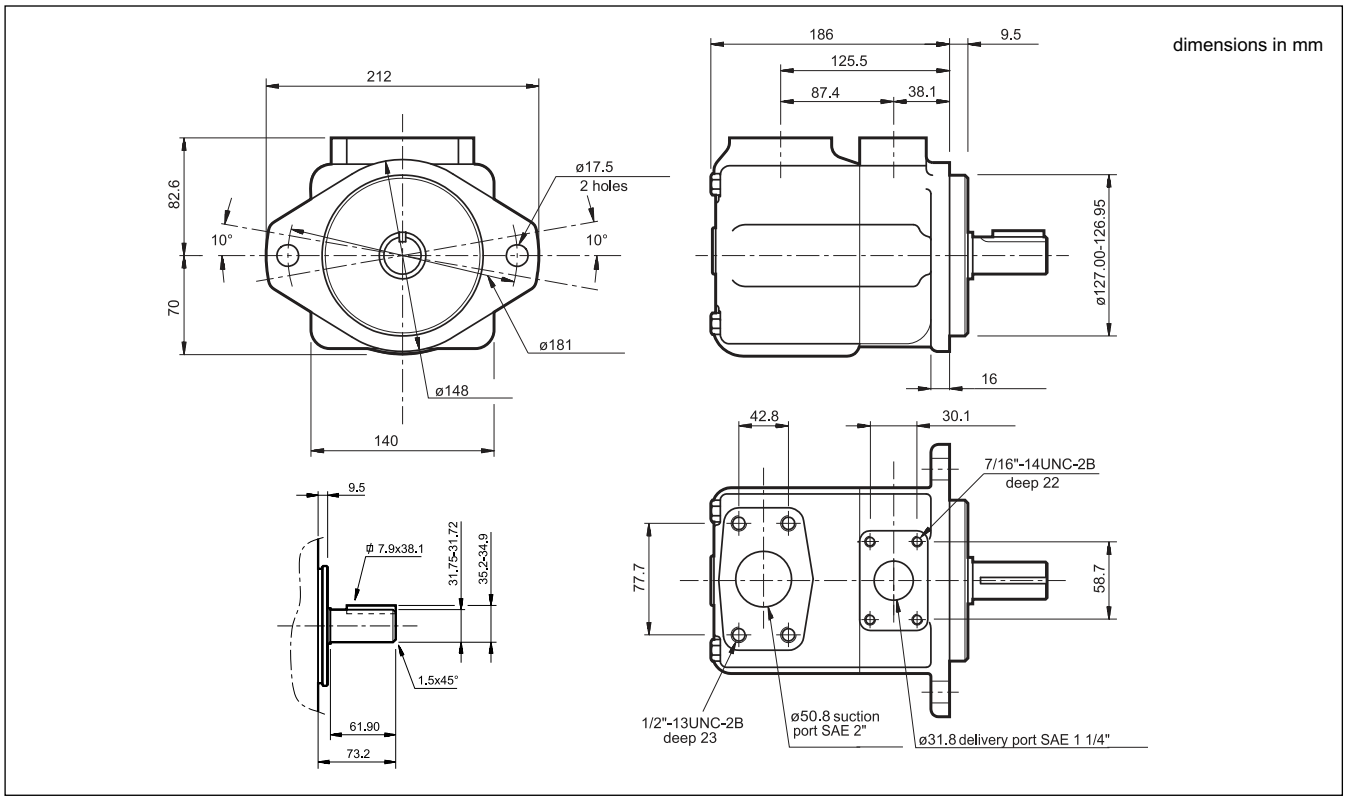
11 - DFP1 PUMP OVERALL AND MOUNTING DIMENSIONS



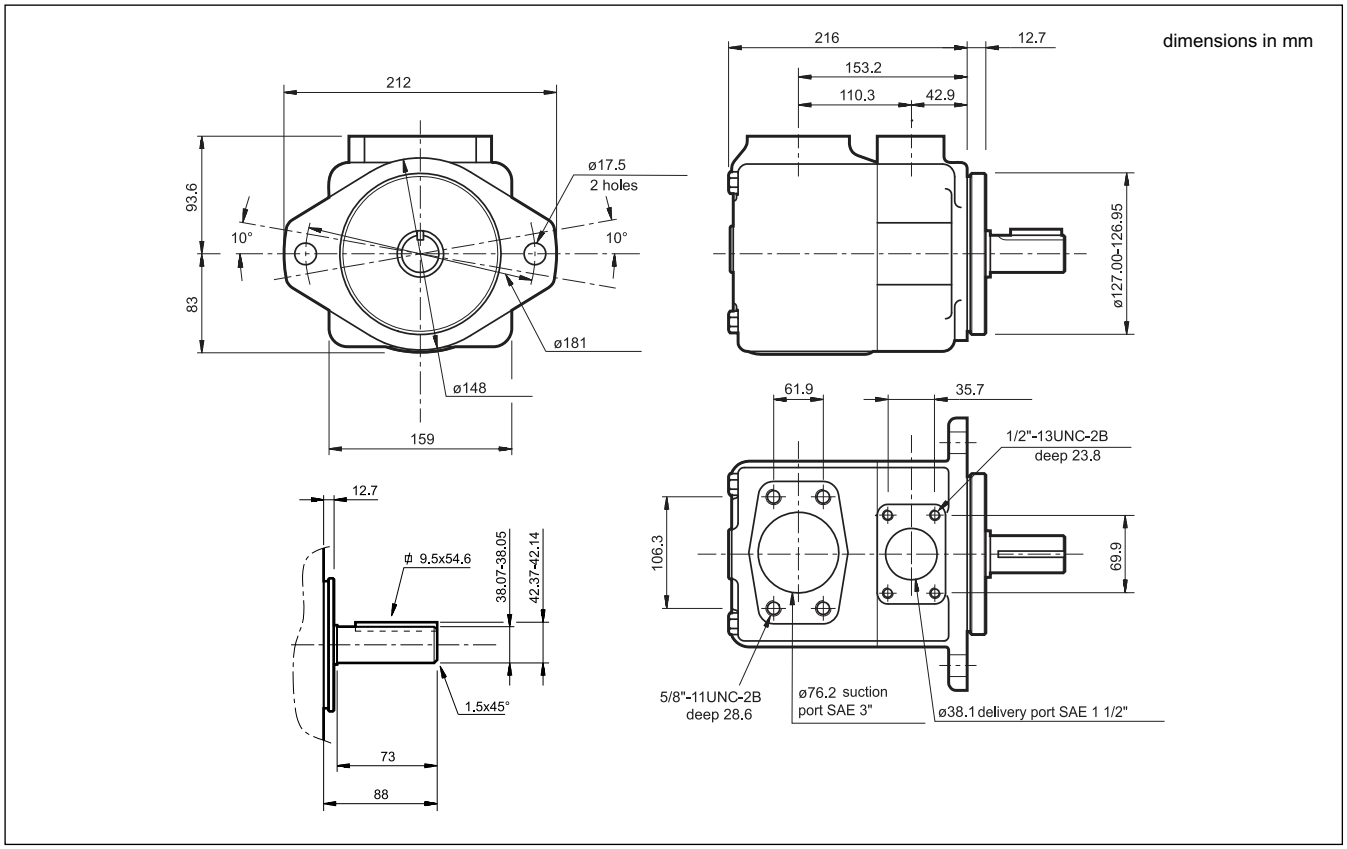
12 - DFP2 PUMP OVERALL AND MOUNTING DIMENSIONS



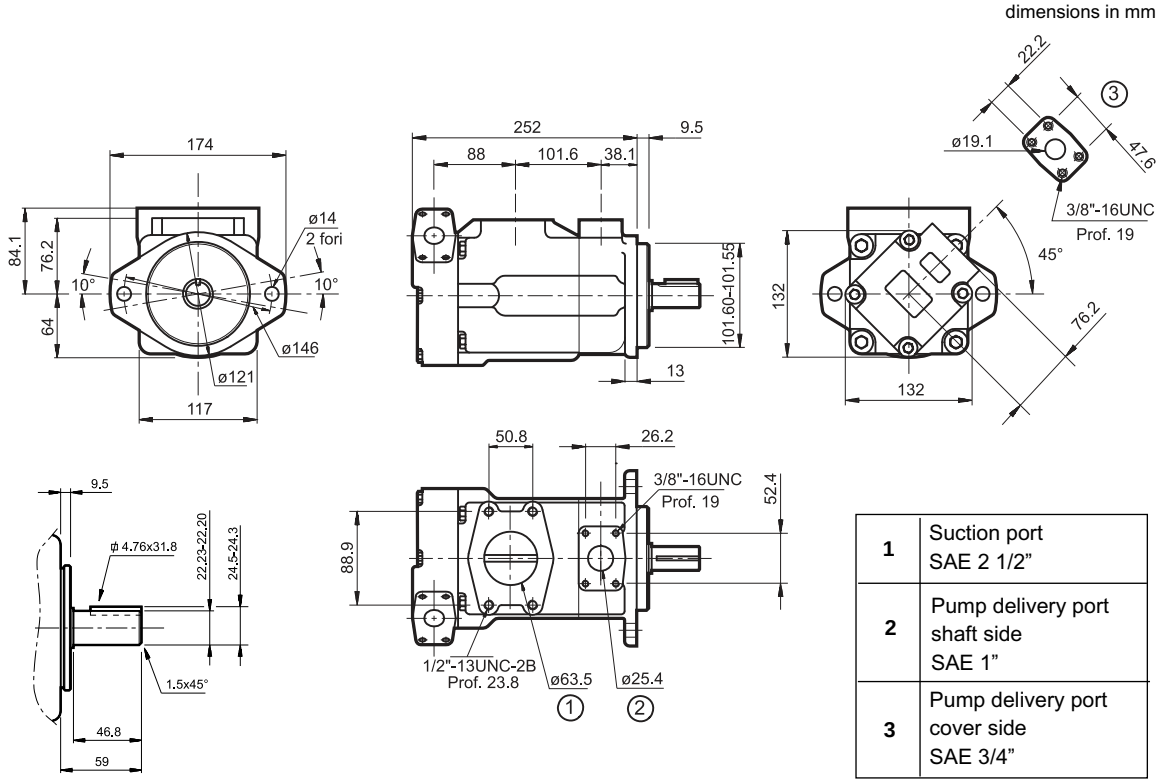
13 - DFP3 PUMP OVERALL AND MOUNTING DIMENSIONS



14 - DFP4 PUMP OVERALL AND MOUNTING DIMENSIONS

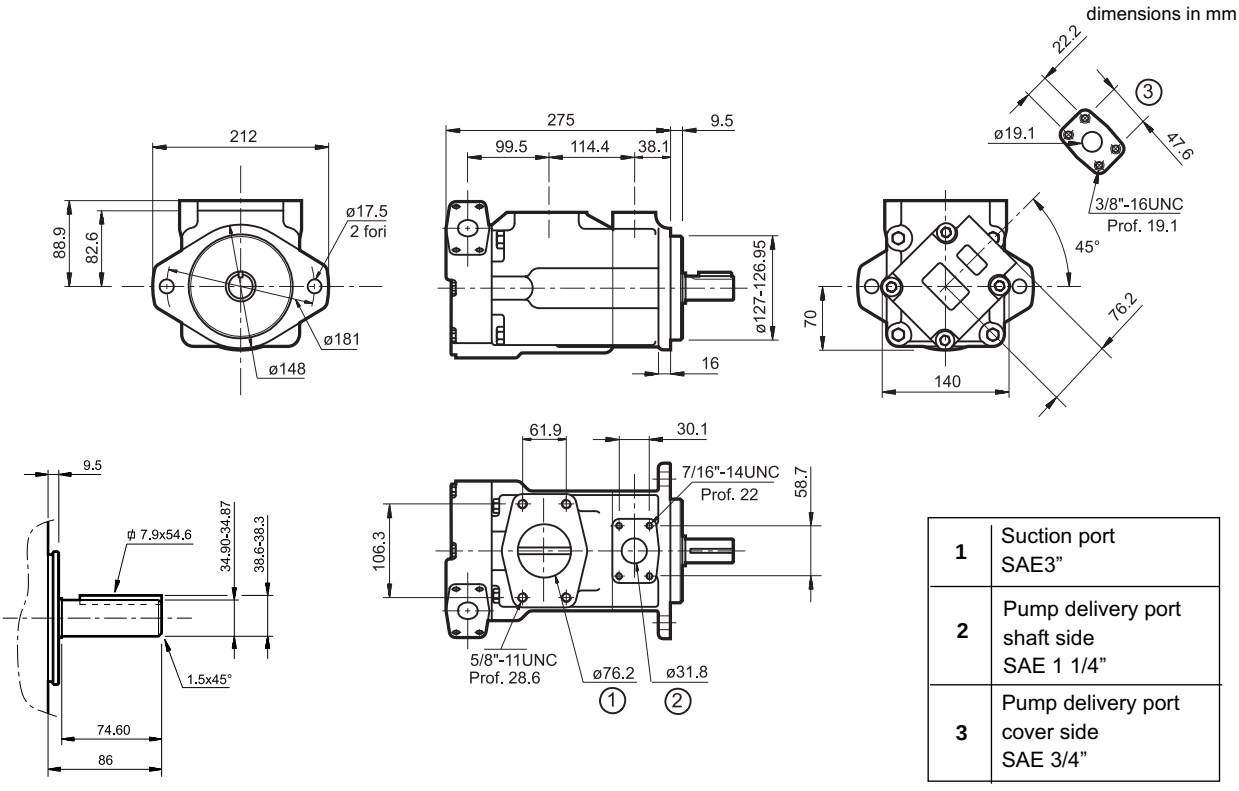


15 - DFDP21 DOUBLE PUMP OVERALL AND MOUNTING DIMENSIONS



1	Suction port SAE 2 1/2”
2	Pump delivery port shaft side SAE 1”
3	Pump delivery port cover side SAE 3/4”

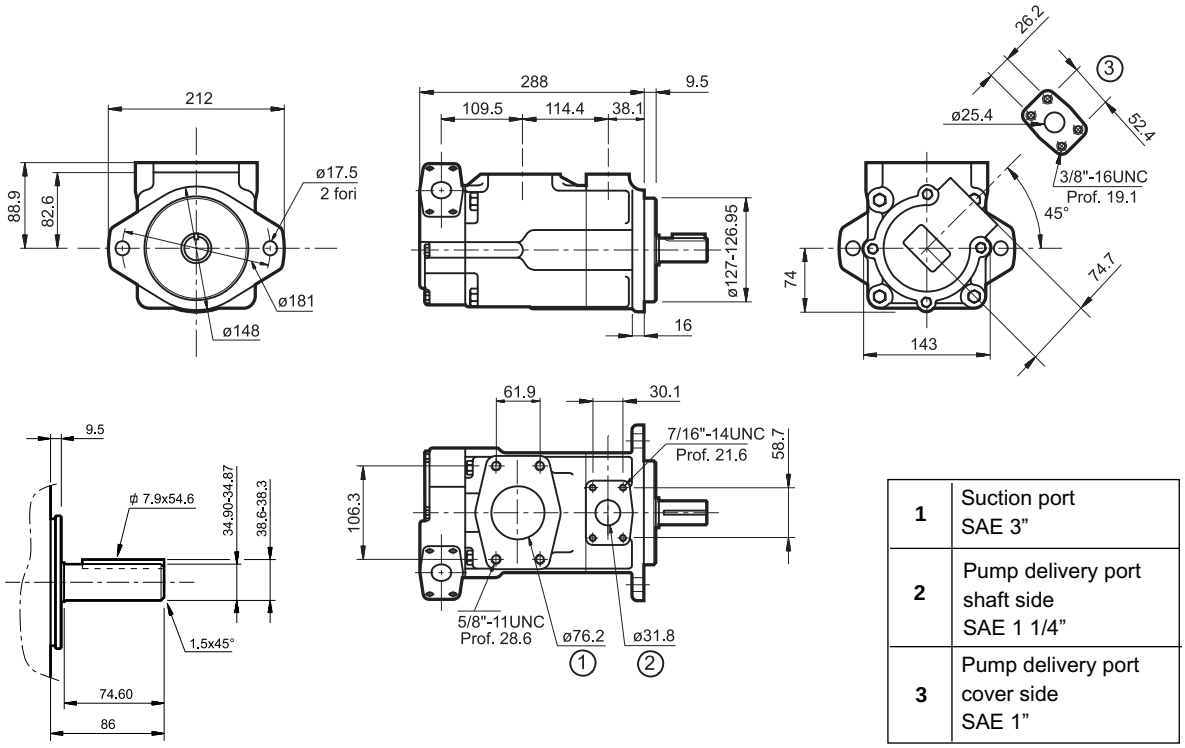
16 - DFDP31 DOUBLE PUMP OVERALL AND MOUNTING DIMENSIONS



1	Suction port SAE3”
2	Pump delivery port shaft side SAE 1 1/4”
3	Pump delivery port cover side SAE 3/4”

17 - DFDP32 DOUBLE PUMP OVERALL AND MOUNTING DIMENSIONS

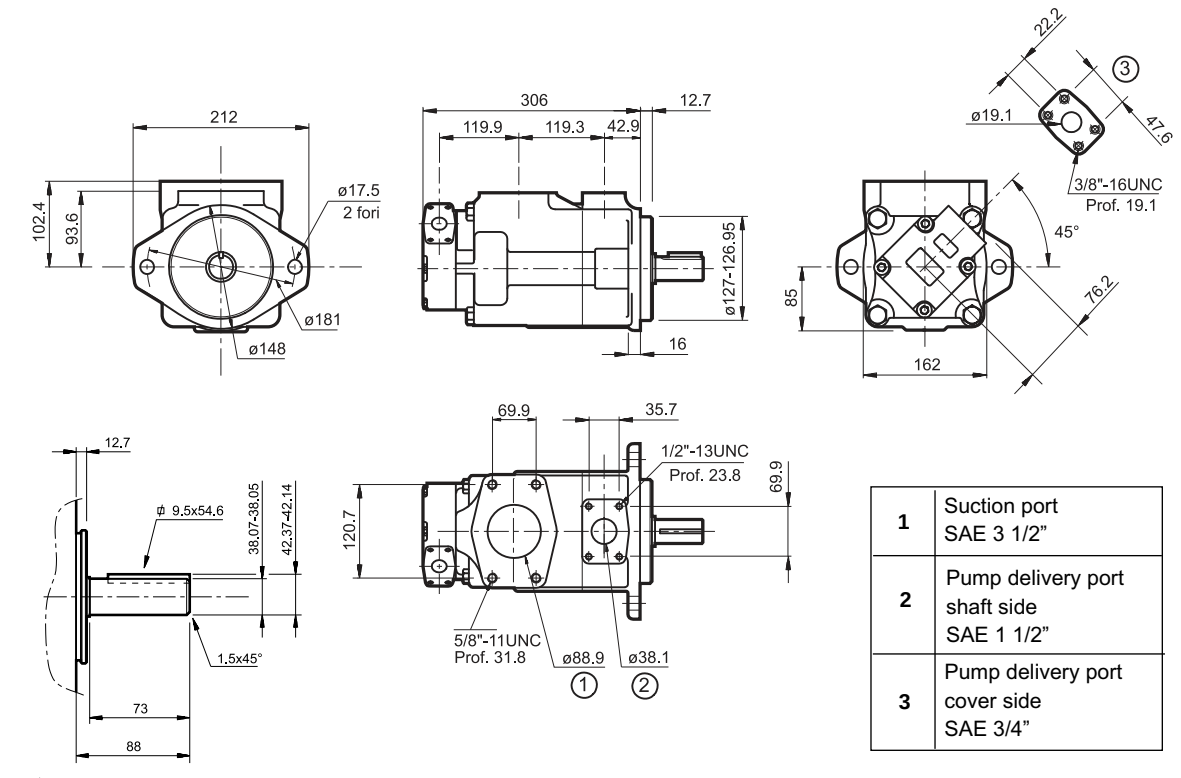
dimensions in mm



1	Suction port SAE 3”
2	Pump delivery port shaft side SAE 1 1/4”
3	Pump delivery port cover side SAE 1”

18 - DFDP41 DOUBLE PUMP OVERALL AND MOUNTING DIMENSIONS

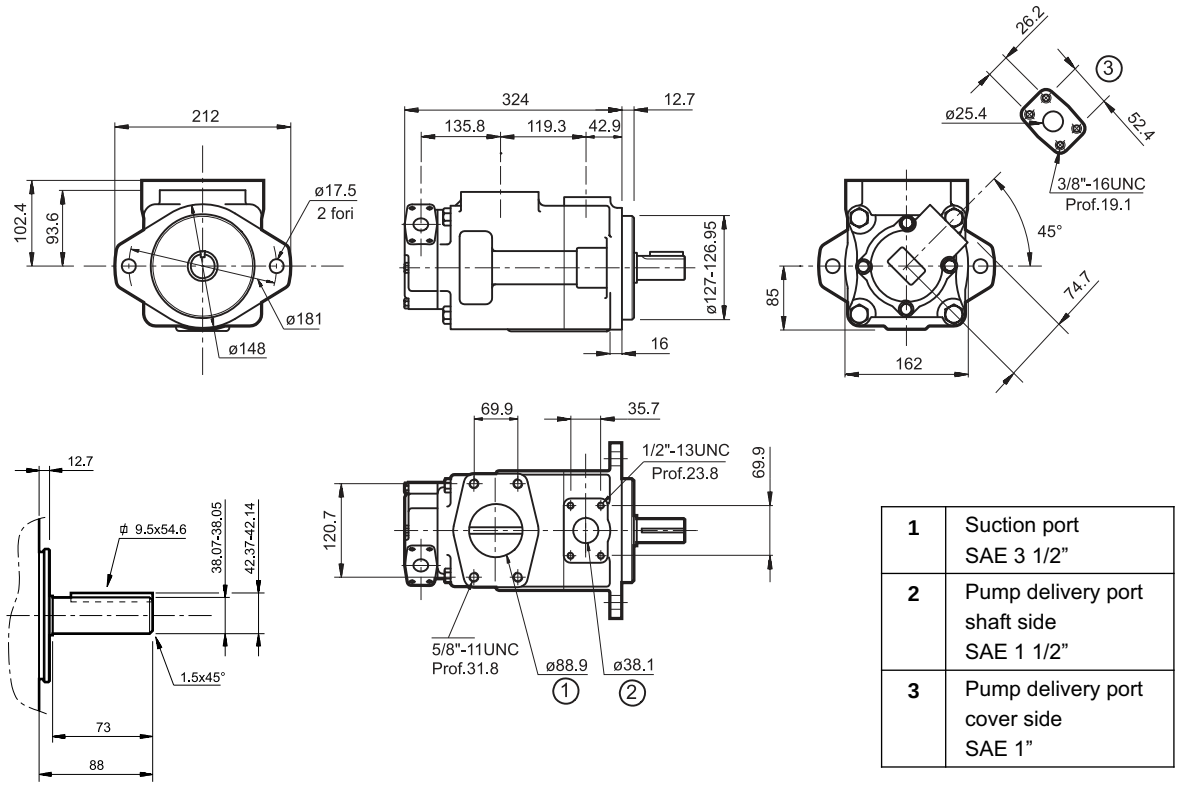
dimensions in mm



1	Suction port SAE 3 1/2”
2	Pump delivery port shaft side SAE 1 1/2”
3	Pump delivery port cover side SAE 3/4”

19 - DFDP42 DOUBLE PUMP OVERALL AND MOUNTING DIMENSIONS

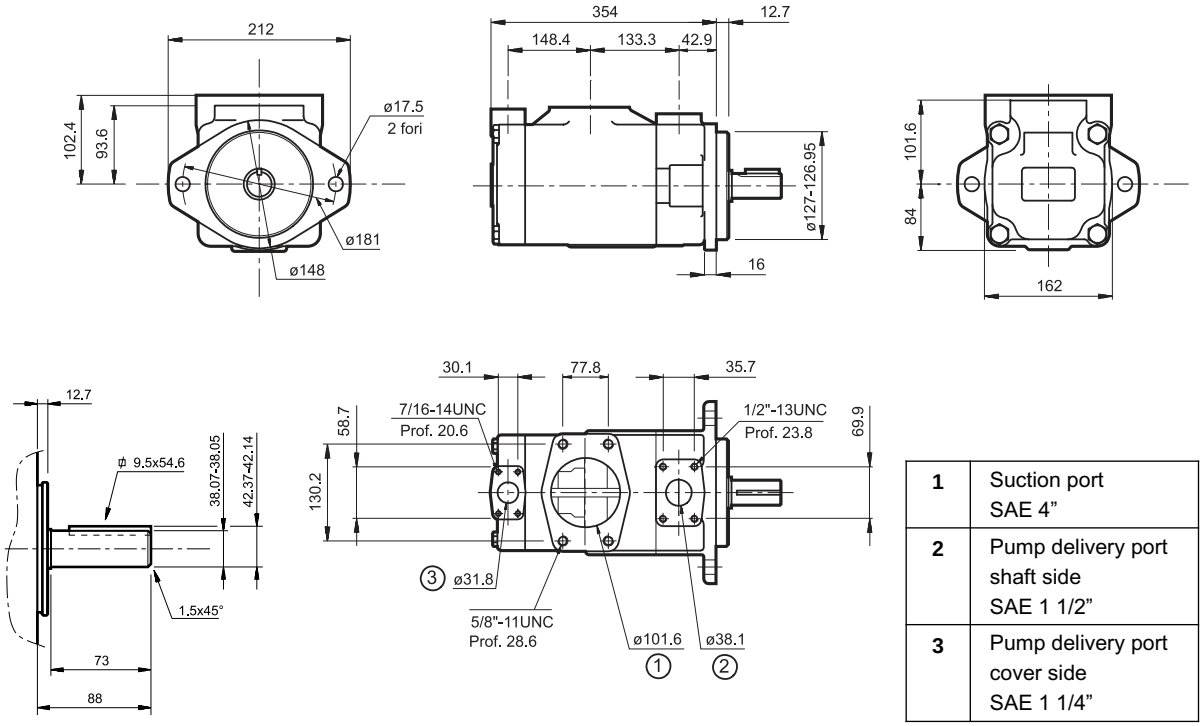
dimensions in mm



1	Suction port SAE 3 1/2”
2	Pump delivery port shaft side SAE 1 1/2”
3	Pump delivery port cover side SAE 1”

20 - DFDP43 DOUBLE PUMP OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	Suction port SAE 4”
2	Pump delivery port shaft side SAE 1 1/2”
3	Pump delivery port cover side SAE 1 1/4”

21 - INSTALLATION

— The DFP pumps can be installed with the shaft oriented in any position.

— Check that the rotation direction of the motor is according to the rotation direction of the pump before start up.

— The pump start up, especially at a cold temperature, should occur with the pump unloading.

— The suction line must be suitably sized to facilitate the flow of oil.
Bends and restrictions or an excessive line length can impair correct functioning of the pump.

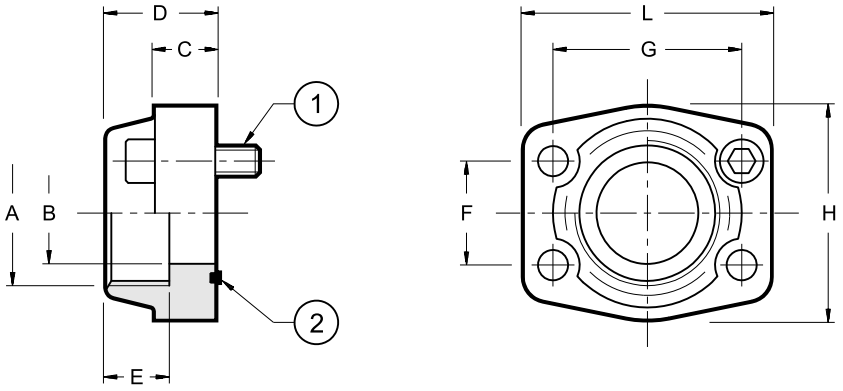
— The pumps are normally positioned directly above the oil tank.
Flooded suction port installation of the pumps is advisable in the case of circuits with high flow rates and pressures.

— The motor-pump coupling must be made directly with a flexible coupling.
Couplings that generate axial or radial loads on the pump shaft are not allowed.

— Refer to paragraph 4.3 for the characteristics and installation of the filtering elements.

22 - SAE J518 CONNECTION FLANGES

dimensions in mm



Flange code	Flange description	p_{max} [bar]	ØA	ØB	C	D	E	F	G	H	L	1 N. 4 SHC bolts	Bolts code	2
0610719	SAE - 3/4”	345	3/4” BSP	19	18	36	19	22,2	47,6	50	65	3/8” UNC x 1 1/2”	0530612	OR 4100
0610713	SAE - 1”	345	1” BSP	25	18	38	22	26,2	52,4	55	70			OR 4131
0610720	SAE - 1 1/4”	276	1 1/4” BSP	32	21	41	22	30,2	58,7	68	79	7/16” UNC x 1 1/2”	0530613	OR 4150
0610714	SAE - 1 1/2”	207	1 1/2” BSP	38	25	45	24	35,7	70	78	93	1/2” UNC x 1 3/4”	0530638	OR 4187
0610721	SAE - 2”	207	2” BSP	51	25	45	30	43	77,8	90	102			OR 4225
0610722	SAE - 2 1/2”	172	2 1/2” BSP	63	25	50	30	50,8	89	105	116			OR 4175
0610723	SAE - 3”	138	3” BSP	73	27	50	34	62	106,4	116	134	5/8” UNC x 2”	0530658	OR 4337
0610724	SAE - 3 1/2”	34	3 1/2” BSP	89	27	48	34	69,8	120,7	136	152			OR 4387
0773528	SAE - 4”	34	4” BSP	99	27	48	34	77,77	130,18	146	162			OR 4437

The fastening bolts and the O-Rings must be ordered separately.

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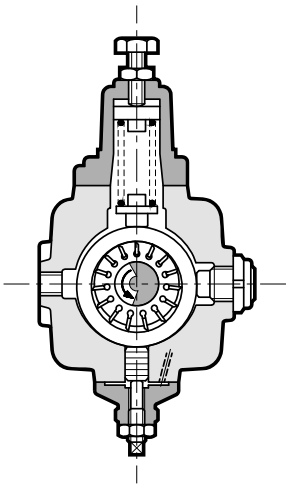


RV1D

VARIABLE DISPLACEMENT VANE PUMPS WITH DIRECT PRESSURE ADJUSTER

SERIES 10

OPERATING PRINCIPLE



— The RV1D pumps are variable displacement vane pumps with mechanical pressure compensator.

— The pressure compensator keeps the cam ring of the pumping group in the eccentric position with use of an adjustable load spring. When the delivery pressure equals the pressure corresponding to the spring setting, the cam ring is moved toward the center instantaneously, adjusting the flow rate to the values required by the plant.

— Energy consumption is reduced and adequate in every phase of the cycle.

— The pump group has hydrostatic axial compensation distribution plates, that improve the volumetric efficiency and reduce wear of the components.

— In zero flow demand conditions, the pump delivers fluid only to compensate any possible leaks and pilot lines, keeping constant the circuit pressure .

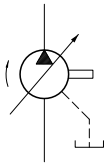
— The compensator response times are very low such as to make unnecessary the pressure relief valve.

PERFORMANCE RATINGS (measured with mineral oil with viscosity of 46 cSt at 40°C)

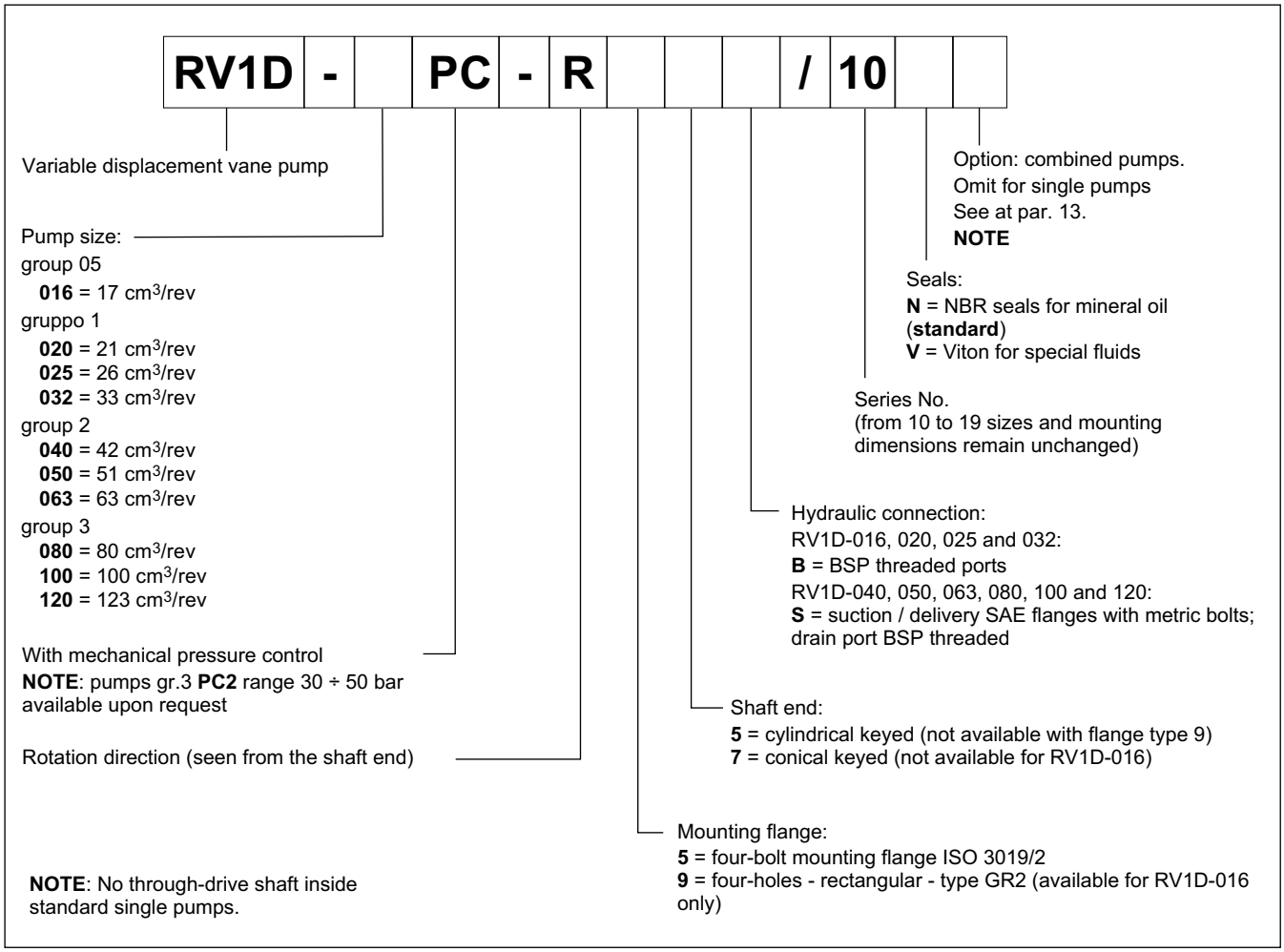
		016	020	025	032	040	050	063	080	100	120
Geometric displacement	cm^3/rev	16	20	25	32	40	50	63	80	100	120
Actual displacement (±3%)	cm^3/rev	17	21	26	33	42	51	63	80	100	123
Maximum flow at 1500 rpm	l/min	25,5	31,5	39	49,5	63	76,5	94,5	120	150	184,5
Max working pressure	bar	120	100			100			90		
Pressure adjustment range	bar	20 ÷ 120	30 ÷ 100			30 ÷ 100			50 ÷ 90		
Maximum drain port pressure allowed	bar	1									
Rotation speed range	rpm	800 ÷ 1800				800 ÷ 1500					
Rotation direction		clockwise (seen from the shaft side)									
Shaft loads		radial and axial loads are not allowed									
Max applicable torque on shaft: type R55 type R97	Nm	110 70	250 -			586 -			900 -		
Mass	kg	7,4	18,3			43,8			56		

Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	+15 / +60
Recommended viscosity	cSt	22 ÷ 68
Fluid viscosity range	see paragraph 2.2	
Degree of fluid contamination	see paragraph 2.3	

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE



2 - HYDRAULIC FLUID

2.1 - Fluid type

Use mineral oil based hydraulic fluids with anti-foam and antioxidant additives. For use of other types of fluid, keep in mind the limitations shown in the following table or consult our technical department for approval.

FLUID TYPE	NOTES
HFC (water glycol solutions with proportion of water ≤ 40%)	-The values shown in the performance ratings table must be reduced by at least 50% - The pump rotation speed must be limited to 1000 rpm. - Use NBR seals only
HFD (phosphate esters)	There are no particular limitations with this kinds of fluids. Operation with a fluid viscosity as close as possible to the optimum viscosity range specified in par. 2.2 is recommended. - Use FPM (Viton) seals only

2.2 - Fluid viscosity

The operating fluid viscosity must be within the following range:

optimum viscosity	22 ÷ 68 cSt	referred to the fluid working temperature in the tank
maximum viscosity	400 cSt	limited to only the start-up phase of the pump

When selecting the fluid type, be sure that the true viscosity is within the range specified above at the operating temperature.

2.3 - Degree of fluid contamination

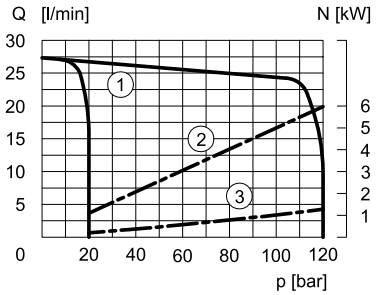
The maximum degree of fluid contamination must be according to ISO 4406:1999 class 20/18/15; therefore, use of a filter with $\beta_{20} \geq 75$ is recommended. A degree of maximum fluid contamination according to ISO 4406:1999 class 18/16/13 is recommended for optimum endurance of the pump. Hence, use of a filter with $\beta_{10} \geq 100$ is recommended.

The suction filter must be equipped with a by-pass valve and, if possible, with a clogging indicator. See installation section for details.

3 - CHARACTERISTIC CURVES RV1D-016 (GR. 05)

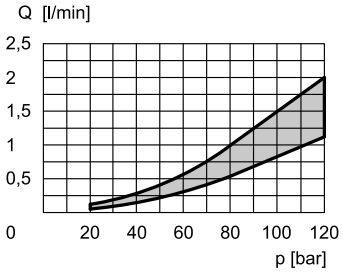
(obtained with viscosity of 46 cSt at 40°C)

FLOW RATE - PRESSURE - ABSORBED POWER

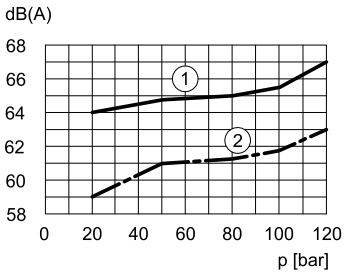


1) Flow rate - pressure curves, measured at 1500 rpm
2) Absorbed power at the maximum flow rate
3) Absorbed power at zero flow rate

DRAINAGE FLOW RATE



NOISE LEVEL



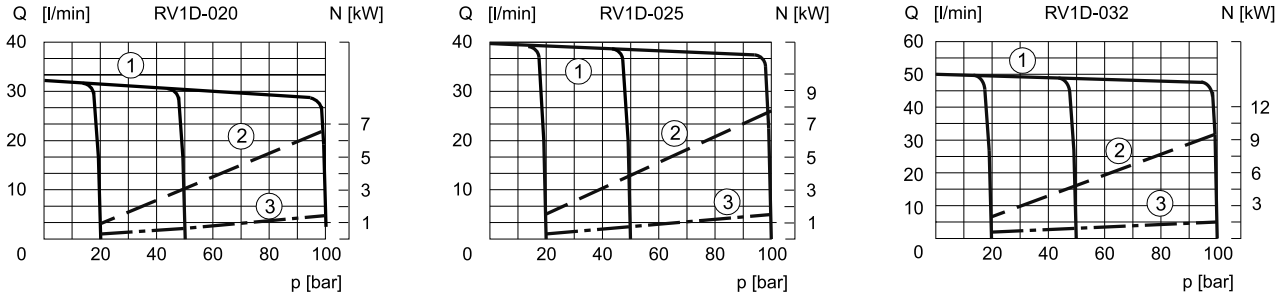
Approximate maximum values of noise level to minimum and maximum flow rate measured with the sound-level meter placed at one meter from pump coupling with flexible coupling.

1) noise at max flow
2) noise with zero flow

4 - CHARACTERISTIC CURVES OF RV1D-020, RV1D-025 AND RV1D-032 (GR. 1)

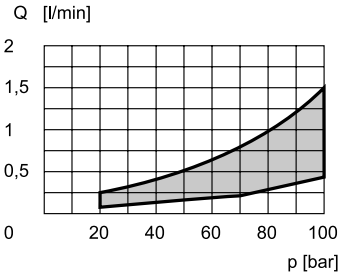
(obtained with viscosity of 46 cSt at 40°C)

FLOW RATE - PRESSURE - ABSORBED POWER

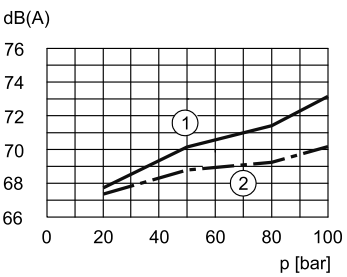


1) Flow rate - pressure curves, measured at 1500 rpm
2) Absorbed power at the maximum flow rate
3) Absorbed power at zero flow rate

DRAINAGE FLOW RATE



NOISE LEVEL



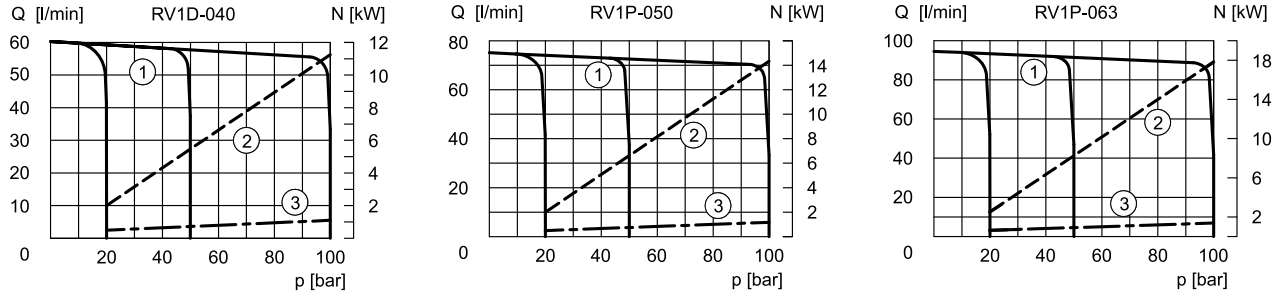
Approximate maximum values of noise level to minimum and maximum flow rate measured with the sound-level meter placed at one meter from pump coupling with flexible coupling.

1) noise at max flow
2) noise with zero flow

5 - CHARACTERISTIC CURVES FOR RV1D-040, RV1D-050 AND RV1D-063 (GR. 2)

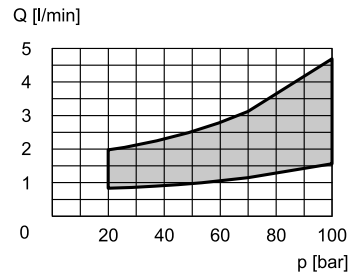
(values obtained with mineral oil with viscosity of 46 cSt at 40°C)

FLOW RATE - PRESSURE - ABSORBED POWER

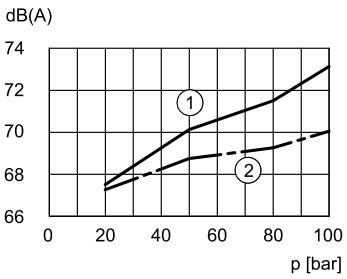


1) Flow rate - pressure curves, measured at 1500 rpm
2) Absorbed power at the maximum flow rate
3) Absorbed power at zero flow rate

DRAINAGE FLOW RATE



NOISE LEVEL



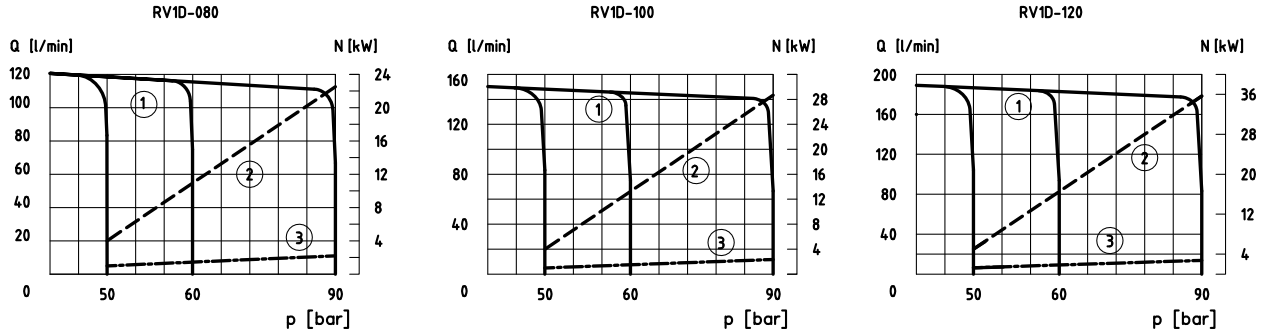
Approximate maximum values of noise level to minimum and maximum flow rate measured with the sound-level meter placed at one meter from pump coupling with flexible coupling.

1) noise at max flow
2) noise with zero flow

6 - CHARACTERISTIC CURVES FOR RV1D-080, RV1D-100 E RV1D-120 (GR. 3)

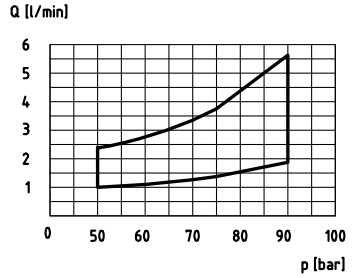
(values obtained with mineral oil viscosity of 46 cSt at 40°C)

FLOW RATE - PRESSURE - ABSORBED POWER

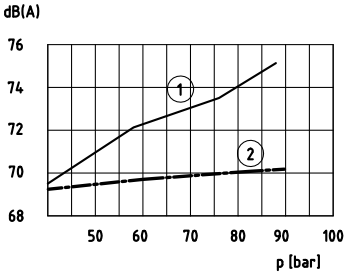


1) Flow rate - pressure curves, measured at 1500 rpm
2) Absorbed power at the maximum flow rate
3) Absorbed power at zero flow rate

DRAINAGE FLOW RATE



NOISE LEVEL



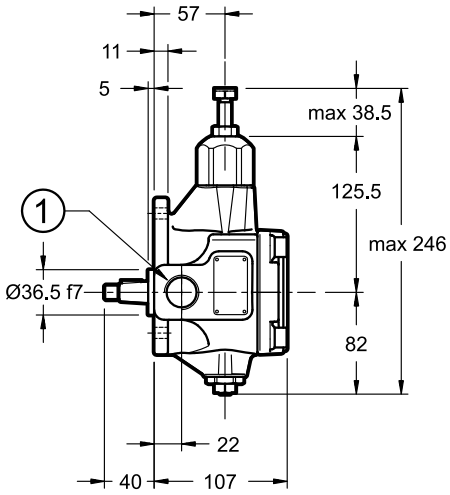
Approximate maximum values of noise level to minimum and maximum flow rate measured with the sound-level meter placed at one meter from pump coupling with flexible coupling.

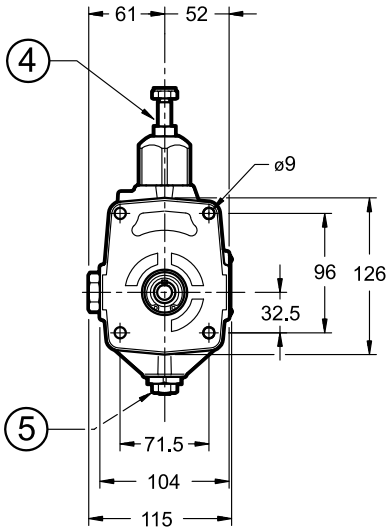
1) noise at max flow
2) noise with zero flow

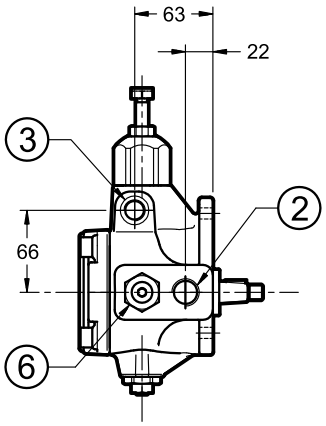
7 - OVERALL AND MOUNTING DIMENSIONS RV1D-016 (GR. 05)

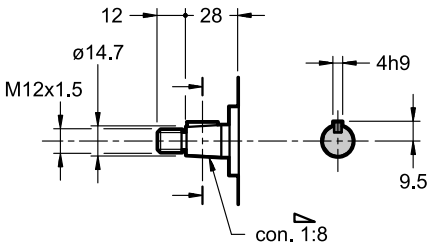
dimensions in mm

RV1D-016PC-R97B

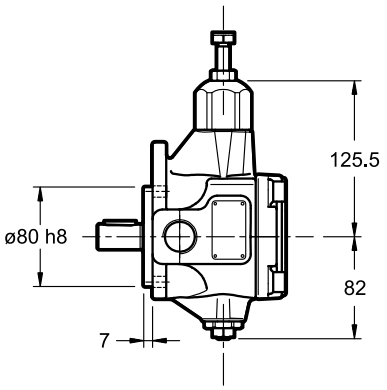


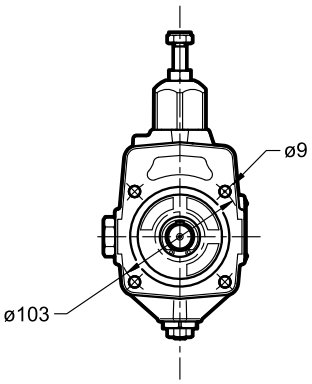




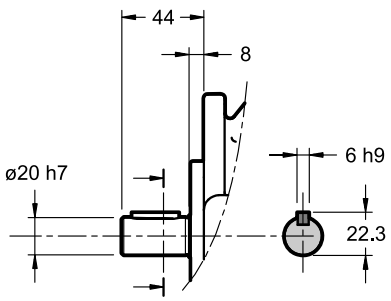


RV1D-016PC-R55B





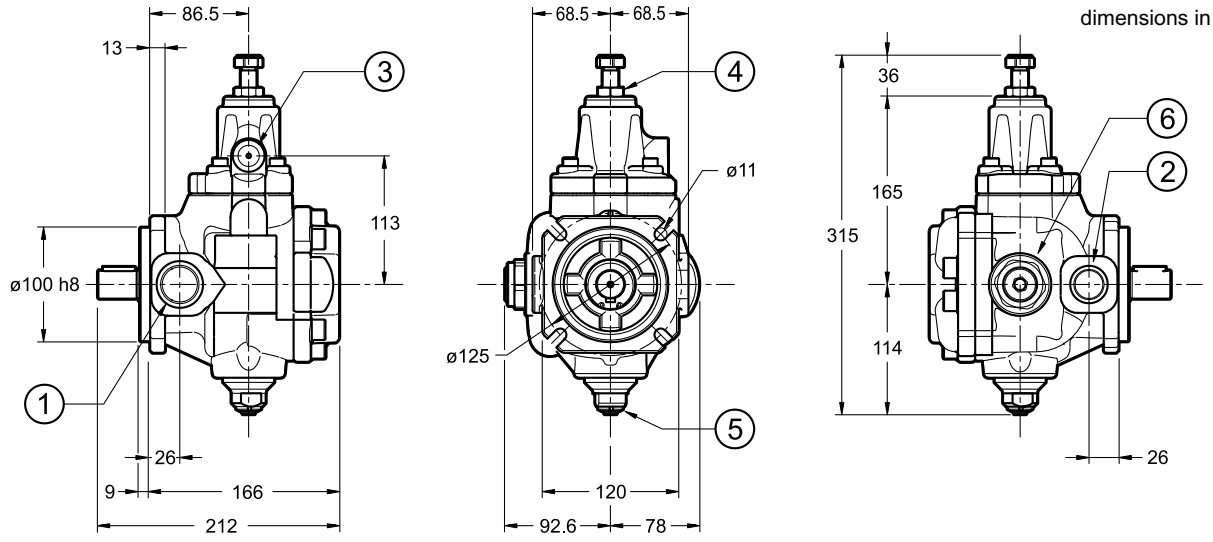
for non quoted dimensions
refer to the drawing
RV1D-016PC-R97B

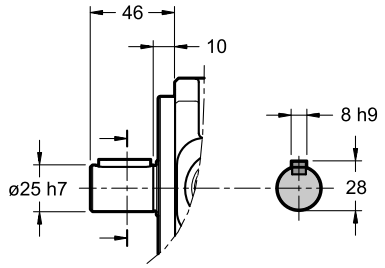


1	Suction port: 3/4” BSP
2	Delivery port: 1/2” BSP
3	Drainage port: 3/8” BSP
4	Pressure adjustment screw. Rotate clockwise to increase pressure. Spanner 17. Locking nut : spanner 17.
5	Flow adjustment screw. Rotate clockwise to decrease flow. socket hex screw, hex key 5.Locking nut: spanner 17.
6	Guide block balancing adjustment screw. **Do not tamper.**

8 - OVERALL AND MOUNTING DIMENSIONS RV1D-020, RV1D-025 AND RV1D-032 (GR.1)

dimensions in mm

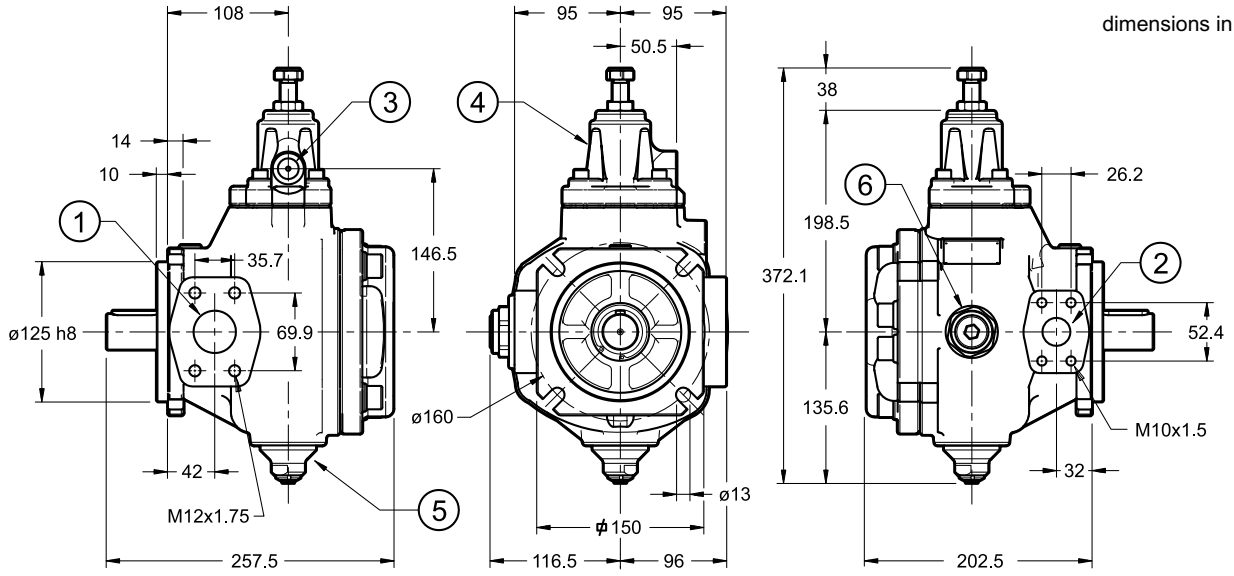


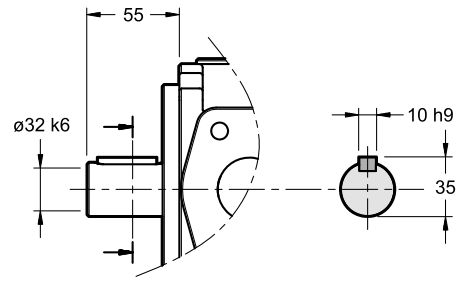


1	Suction port: 1” BSP
2	Delivery port: 3/4” BSP
3	Drainage port: 1/2” BSP
4	Pressure adjustment screw. Rotate clockwise to increase pressure. Spanner 22. Locking nut : spanner 22.
5	Flow adjustment screw. Rotate clockwise to decrease flow. Socket hex screw, Hex key 6. Retainer KM1 type.
6	Guide block balancing adjuster. **Do not tamper.**

10 - OVERALL AND MOUNTING DIMENSIONS RV1D-040, RV1D-050 AND RV1D-063 (GR.2)

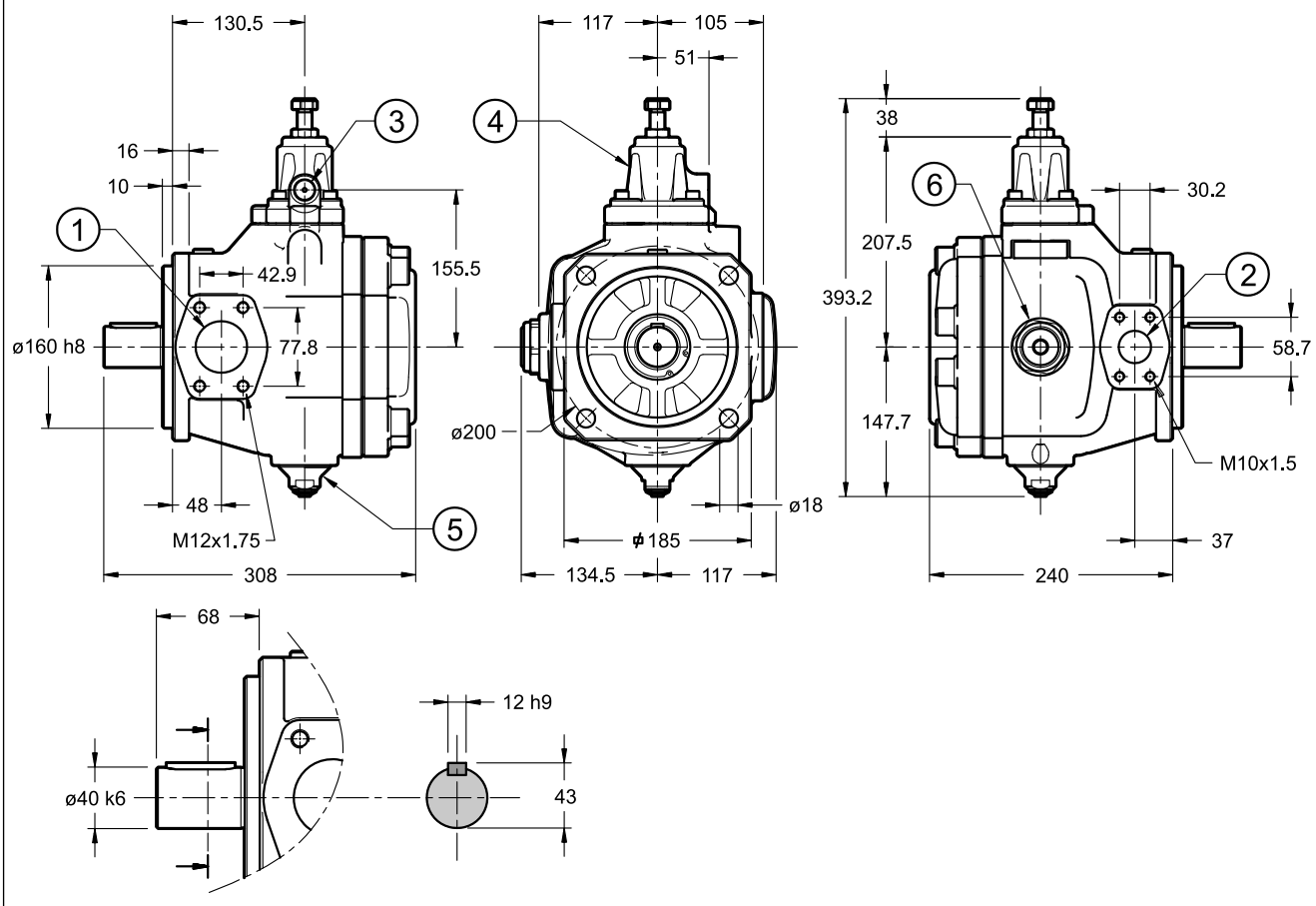
dimensions in mm





1	Suction port: SAE 3000 1 1/2”
2	Delivery port: SAE 3000 1”
3	Drainage port: 1/2” BSP
4	Pressure adjustment screw. Rotate clockwise to increase pressure. Spanner 22. Locking nut : spanner 22.
5	Flow adjustment screw. Rotate clockwise to decrease flow. Socket hex screw, Hex key 6. Retainer KM1 type.
6	Guide block balancing adjuster. **Do not tamper.**

9 - OVERALL AND MOUNTING DIMENSIONS RV1D-080, RV1D-100, RV1D-120 (GR. 3)



1	Suction port: SAE 3000 2”
2	Delivery port: SAE 3000 1 1/4”
3	Drainage port: 1/2” BSP
4	Pressure adjustment screw. Rotate clockwise to increase pressure. Spanner 22. Locking nut : spanner 22.
5	Flow adjustment screw. Rotate clockwise to decrease flow. Socket hex screw, Hex key 6. Retainer KM1 type.
6	Guide block balancing adjuster. **Do not tamper.**

11 - INSTALLATION

The instruction manual for pumps installation and commissioning is always included in the packaging with the pump. Observe restrictions in this document and follow the instructions.

— RV1D-016, RV1D-020, RV1D-025 and RV1D-032 pumps can be installed in any position.

All the other pumps need to be installed with the axis in horizontal position and with pressure compensator upward.

— Motor-pump coupling must be made with a self-aligning flexible coupling with convex teeth and a polyamide cam. Couplings that generate axial or radial loads on the pump shaft are not allowed.

— The suction line must be short, with a small number of bends and without internal section changes. The minimum section of the inlet pipe must be equal to the section of the thread of the pump inlet port.

The pipe-end inside the tank should be cut at 45°, should have a minimum distance from the tank bottom of not less than 50 mm, and there should always be a minimum height of suction of 100 mm. **The suction pipe should be completely airtight in order to avoid air intake which could be extremely damaging to the pump.**

Suction pressure should be between 0.8 and 1.5 bar absolute

— The drainage pipe must be connected directly to the tank by a line separate from other discharges, located as far as possible from the suction line and lengthened to below the minimum oil level in order to avoid foaming.

— The fluid tank must be suitably sized in order to exchange the thermal power generated by the various system components and to provide a low recycle rate (approximately: tank capacity = 4 times the pump flow rate per minute).
In systems where the pump runs for a long time under zero-flow setting conditions, it is advisable to provide a fluid cooling system.

The pressure in the drain line must not exceed 1 bar.

To ensure the maximum pump working life, the inlet fluid temperature must never be above 50°C. **The fluid temperature must never exceed 60 °C**

— **Ensure the pump shaft can be rotated manually without any resistance.**

— The pump must be started-up in full displacement (P→T) with flow to the tank without pressure for several minutes, to purge the air.
The pump should prime within 5 seconds. If it does not, switch it off and investigate the cause. The pump should not run empty.

— If the volume adjuster has been set for values less than 50% of the nominal flow-rate, start-up is allowed only if provided the system and the pump are completely filled with fluid.

— **It's essential that the difference between the fluid temperature and the ambient (pump body) temperature doesn't exceed 20 °C.**
If this is the case, the pump should be switched-on only for intervals of about 1-2 seconds (start/stop mode) without pressure, until the temperatures came balanced.

— The pumps are usually placed directly upon the fluid tank. Flooded suction port installation of the pump is recommended in the event of circuits with high flow rates and pressures.

12 - VOLUME ADJUSTMENT SCREW

The volume adjuster is fitted as standard on all the pumps.

It consists of an adjustment screw and a small balanced piston that limit the maximum eccentricity of the pumping group cam ring, changing the displacement. The maximum flow is reduced by turning the adjustment screw clockwise. Indicative data, sensitive to performance tolerances.

Nominal size		**016**	**020**	**025**	**032**	**040**	**050**	**063**	**080**	**100**	**120**
Reduction of displacement per turn	cm^3	9,7	10			16			16		
Minimum possible displacement	cm^3/rev	3,1	9,5	15	19	27,5	35,5	43,5	63	80	100

Tools required for adjustment:

RV1D-016: adjustment screw hexagon socket key 5. Locking nut spanner 17.
Other sizes: adjustment screw hexagon socket key 6. Tooth retainer KM1 type.

13 - MULTIPLE PUMPS

RV1D with through drive shaft are available. These pumps are designed to be connected one to the other in decreasing order of displacement. The RV1D-016 pump suitable for multiple pumps is the R55B version only (ISO 3019-2 four-bolt flange with cylindrical keyed shaft end)

RV1D pumps can be coupled also with RV1P type pumps (see catalogue 14 201) and with GP gear pumps (see catalogue 11 100). The torque on the shaft must be further reduced after the second pump.

Consult our Sales Support department for this kind of applications.

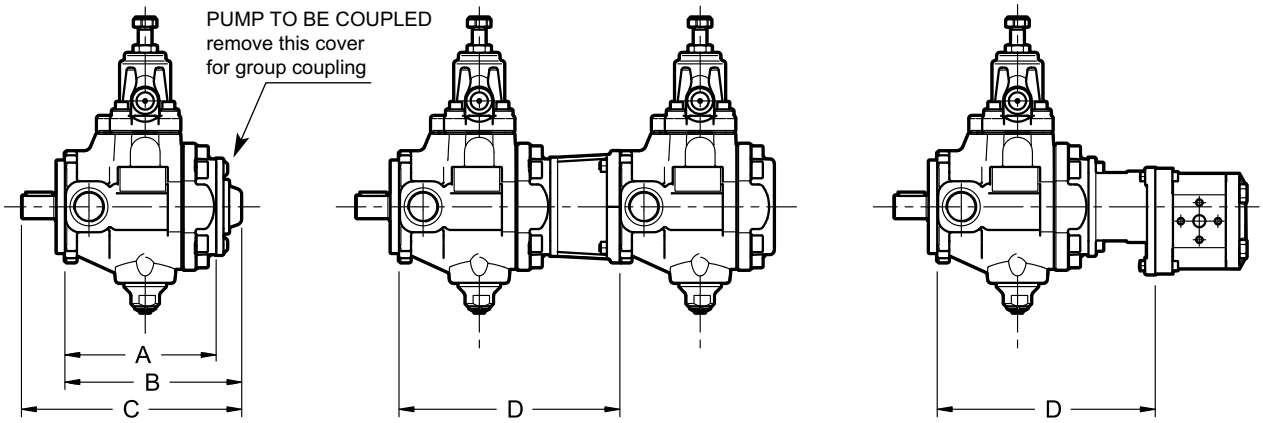
IDENTIFICATION CODE FOR MULTIPLE PUMPS

Both single pumps with through drive shaft (without mating joint) and multiple groups are available.
Fill the ordering code, by following the coupling sequence of the pumps. Insert the /F suffix after each pump with through drive shaft:

/ **F** — Version for multiple pumps:
/F = with through drive shaft

identification code front pump **/F** + identification code intermediate pump **/F** + identification code rear pump

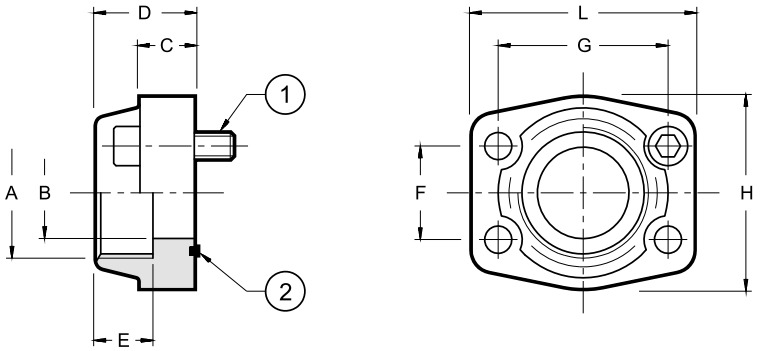
Examples:
Single pump with through drive shaft: RV1D-016PC-R55B/10V **/F**
Double pump identification: RV1D-016PC-R55B/10V **/F +** RV1D-016PC-R55B/10V
Triple pump identification: RV1D-025PC-R55B/10N **/F +** RV1D-025PC-R55B/10N **/F +** RV1D-025PC-R55B/10N
RV1D pump + gear pump identification: RV1D-050PC-R55B/10N **/F +** GP2-00208R97F/20N



Dimensions (mm)					
Group size	A	B	C	D with RV1D pump of same size group.	D with gear pump type GP1 / GP2 / GP3
05	104	131	175	177	168 / 176 / -
1	163	190	236	238	227 / 235 / -
2	199,5	246,5	301,5	301,5	289,5 / 289,5 / 290,5
3	237	284	352	354	327 / 327 / 328

Max torque applied to the shaft of the second pump (Nm)		
Group size Front pump	Second pump (same size group)	Second pump (smaller size group)
05	55	-
1	55	55
2	110	110
3	180	110

14 - CONNECTION FLANGES



the fastening bolts and the O-Rings must be ordered separately

flange code	flange description	p_{max} [bar]	ØA	ØB	C	D	E	F	G	H	L	(1) n° 4 bolts	(2)
0610713	SAE - 1”	345	1” BSP	25	18	38	22	26.2	52.4	22	70	SHC M10x35	OR 4131 (32.93x3.53)
0610720	SAE - 1 ¼”	276	1 ¼” BSP	32	21	41	22	30.2	58.7	68	79	SHC M10x35	OR 4150 (37.69x3.53)
0610714	SAE - 1 1/2”	207	1 1/2” BSP	38	25	44	24	35.7	70	78	93	SHC M12x45	OR 4187 (47.22x3.53)
0610721	SAE - 2”	207	2” BSP	51	25	45	30	43	77.8	90	102	SHC M12x40	OR 4225 (56.74x3.53)

DUPLOMATIC MOTION SOLUTIONS

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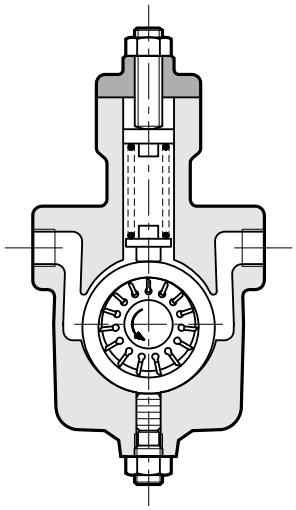


PVE

VARIABLE DISPLACEMENT VANE PUMPS WITH DIRECT PRESSURE ADJUSTMENT

SERIES 30

OPERATING PRINCIPLE



— The PVE pumps are variable displacement vane pumps with direct pressure regulator.

— The pump group is complete with hydrostatic axial compensation distribution plates that improve the volumetric efficiency and reduce wear of the components.

— The pressure regulator adjustable load spring keeps the pump group cam ring in eccentric position.

When the delivery pressure equals the pressure corresponding to the spring setting, the cam ring is moved so to reduce the displacement, adjusting the flow rate to the values required by the plant.

In zero flow demand conditions, the pump delivers oil only to compensate any possible bleedings, keeping the circuit pressure constant.

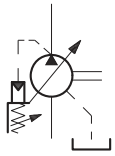
— The PVE pumps are available in four dimensions with maximum displacement from 6,6 to 22,2 cm^3/rev and with pressure regulator max setting values up to 35 bar and 70 bar (standard).

TECHNICAL SPECIFICATIONS

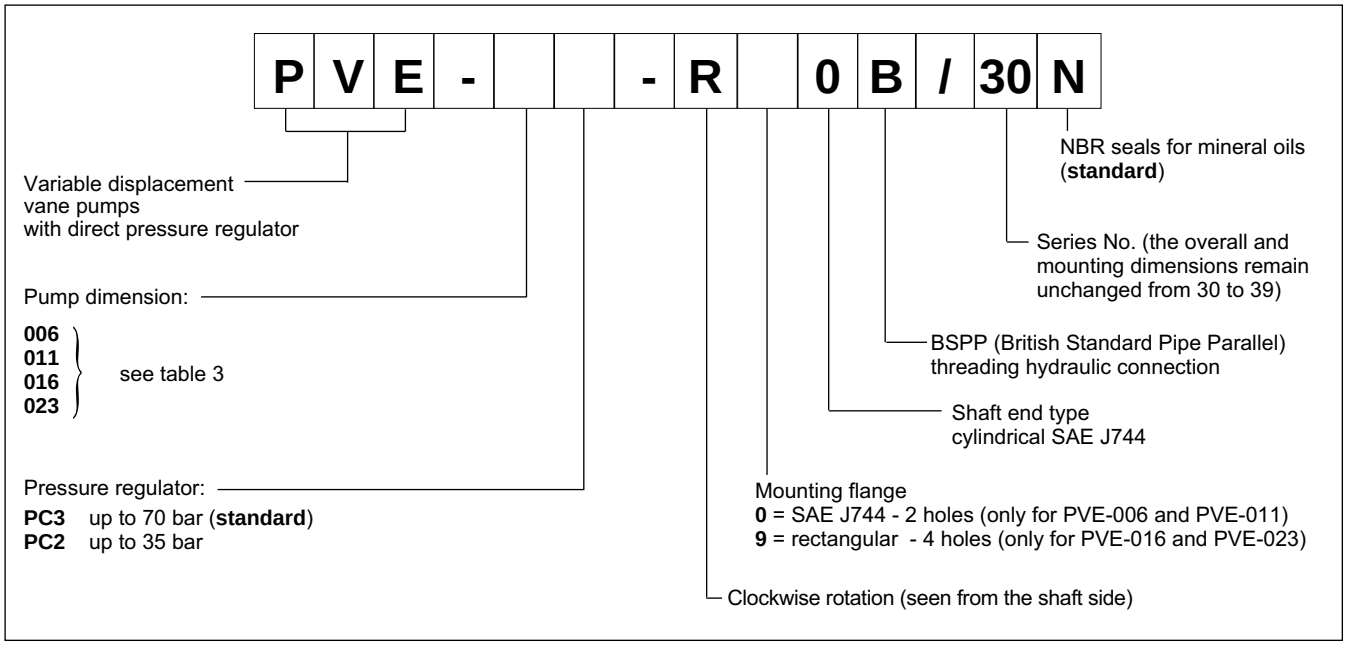
PUMP SIZE		006	011	016	023
Displacement	cm^3/rev	6,6	11,1	16,6	22,2
Flow rate (at 1.500 rpm and with 3.5 bar delivery pressure)	l/min	10,0	16,7	25,0	33,3
Operating pressure	bar	70			
Rotation speed	rpm	min 800 - max 1800			
Rotation direction		clockwise (seen from the shaft side)			
Shaft loads	N	radial and axial loads are not allowed			
Hydraulic connection		BSPP (parallel) threading fittings			
Type of mounting		SAE flange J744 - 2 holes		rectangular flange - 4 holes	
Mass	kg	5	6	9	9

Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-10 / +70
Fluid viscosity range	see paragraph 2.2	
Fluid contamination degree	see paragraph 2.3	
Recommended viscosity	cSt	25 ÷ 50

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE



2 - HYDRAULIC FLUID

2.1 - Fluid type

Use only HL and HLP mineral oil based hydraulic fluids according to ISO 6743/4.

2.2 - Fluid viscosity

The operating fluid viscosity must be within the following range:

minimum viscosity	16 cSt	referred to the maximum drainage fluid temperature of 70 °C.
optimum viscosity	25 ÷ 50 cSt	referred to the fluid working temperature in the tank.
maximum viscosity	800 cSt	limited to only the start-up phase of the pump.

When selecting the fluid type, be sure that the true viscosity is within the range specified above at the operating temperature.

2.3 - Degree of fluid contamination

The maximum degree of fluid contamination must be according to ISO 4406:1999 class 20/18/15; therefore, use of a filter with $\beta_{20} \geq 75$ is recommended. A degree of maximum fluid contamination according to ISO 4406:1999 class 18/16/13 is recommended for optimum endurance of the pump. Hence, use of a filter with $\beta_{10} \geq 100$ is recommended.

The filter must be equipped with a by-pass valve and, if possible, with a clogging indicator.

3 - PERFORMANCES (obtained with viscosity of 46 cSt at 40°C)

PUMP	REGULATOR	DISPLACEMENT [cm³/rev]	MAX FLOW RATE [l/min]		PRESSURE ADJUSTMENT RANGE [bar]		ROTATION SPEED [rpm]	
			1500 rev	1800 rev	min	max	min	max
PVE-006	PC2	6,6	10	12	15	35	800	1800
	PC3				50	70		
PVE-011	PC2	11,1	16,7	20	15	35		
	PC3				50	70		
PVE-016	PC2	16,6	25	30	15	35		
	PC3				50	70		
PVE-023	PC2	22,2	33,3	40	15	35		
	PC3				50	70		

NOTE: Flow rate values are obtained with delivery pressure = 3.5 bar

4 - NOISE LEVEL

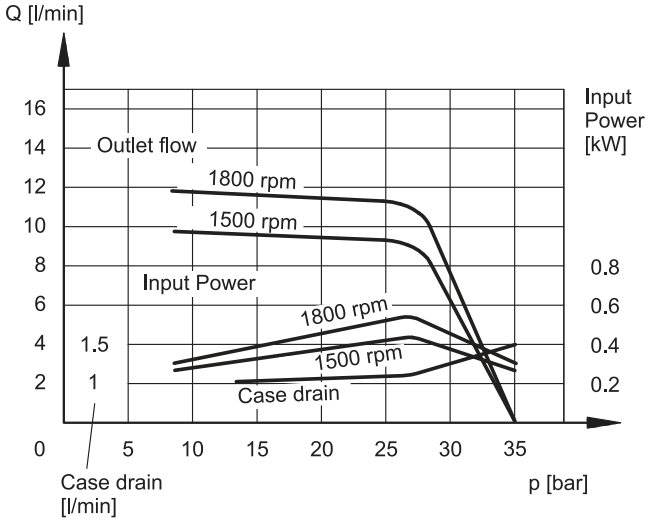
PUMP	NOISE LEVEL [dB (A)] null displacement	full displacement
PVE-006	61	63
PVE-011	62	65
PVE-016	64	68
PVE-023	64	70

The noise pressure levels were measured in a semi-anechoic room, at an axial distance of 1 m from the pump.
The values shown must be reduced by 5 dB(A) if they are to be considered in a completely anechoic room.

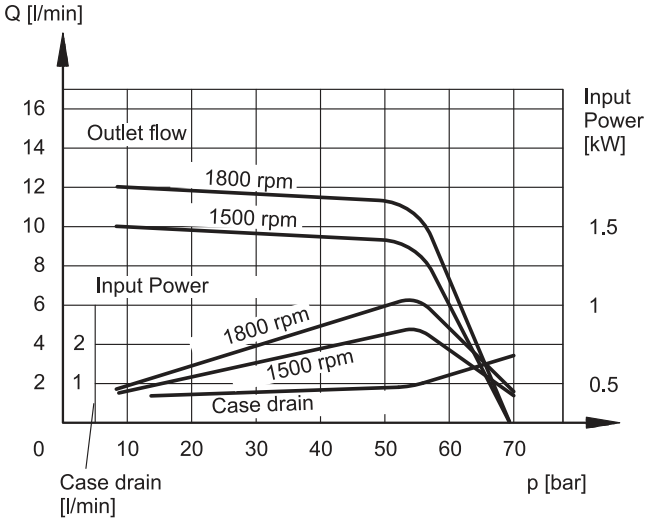
5 - CHARACTERISTIC CURVES (values obtained with mineral oil with viscosity of 46 cSt at 40°C)

The diagram curves were measured with a pump rotation speed of 1500 and 1800 rev/min.

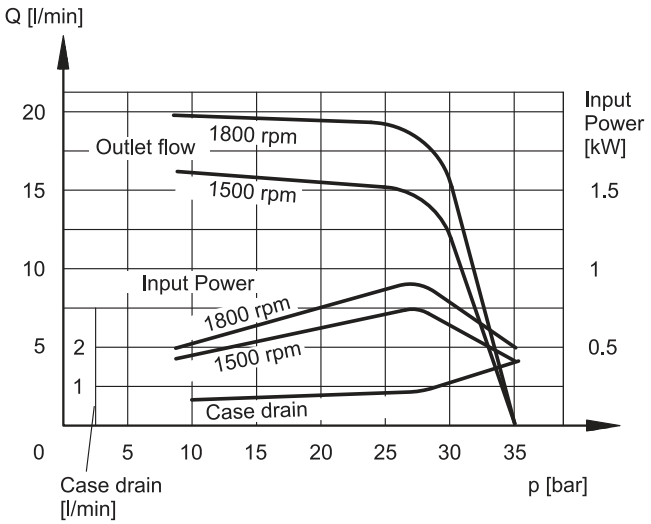
PVE-006PC2



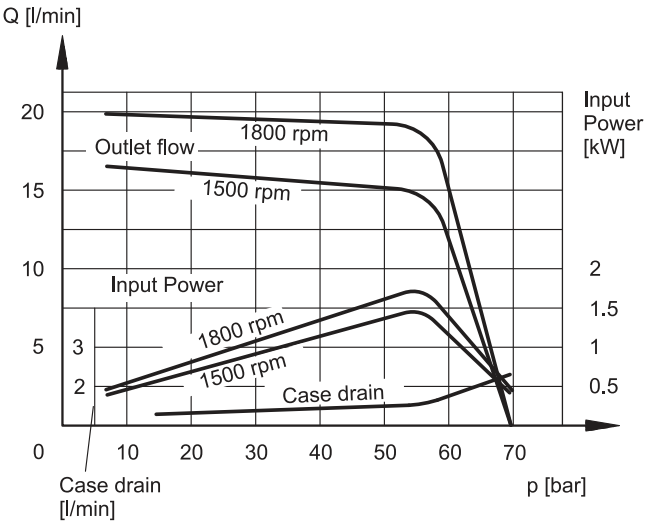
PVE-006PC3



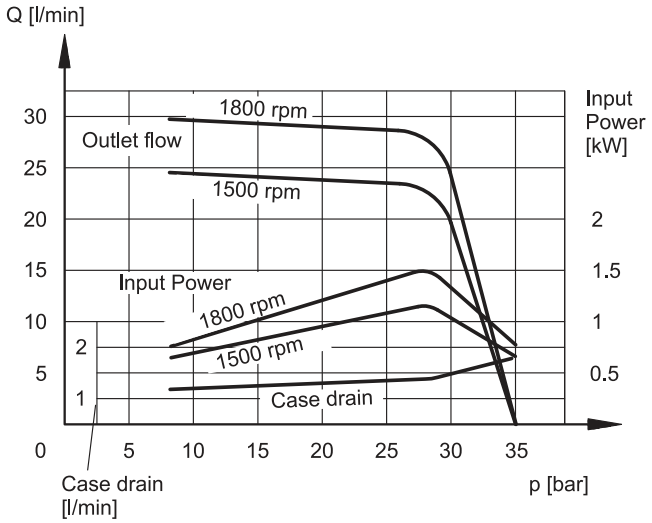
PVE-011PC2



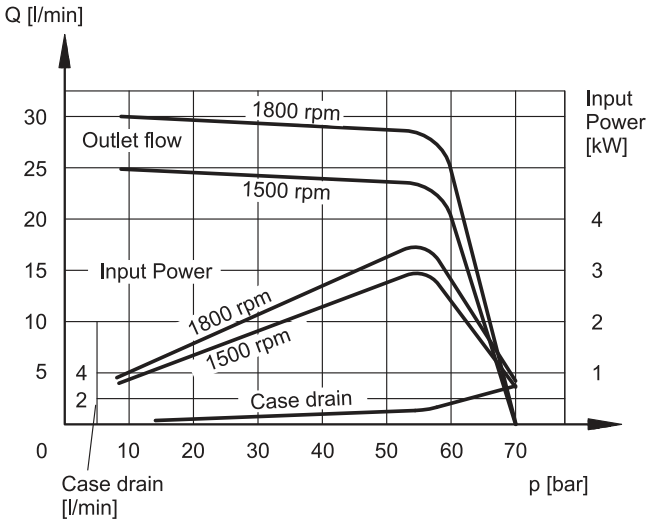
PVE-011PC3



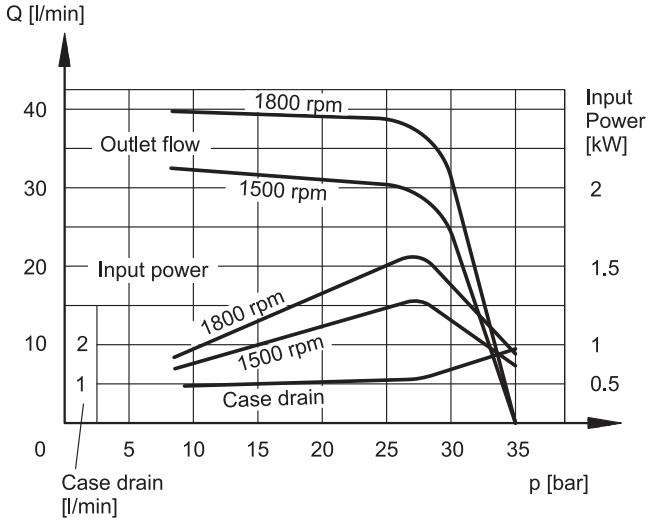
PVE-016PC2



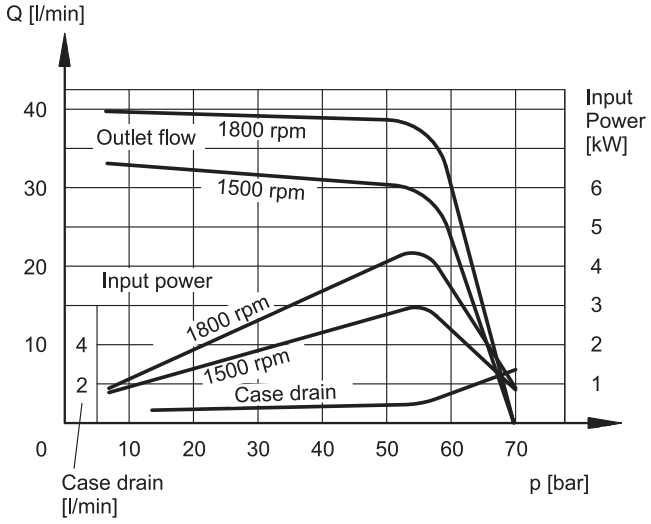
PVE-016PC3



PVE-023PC2

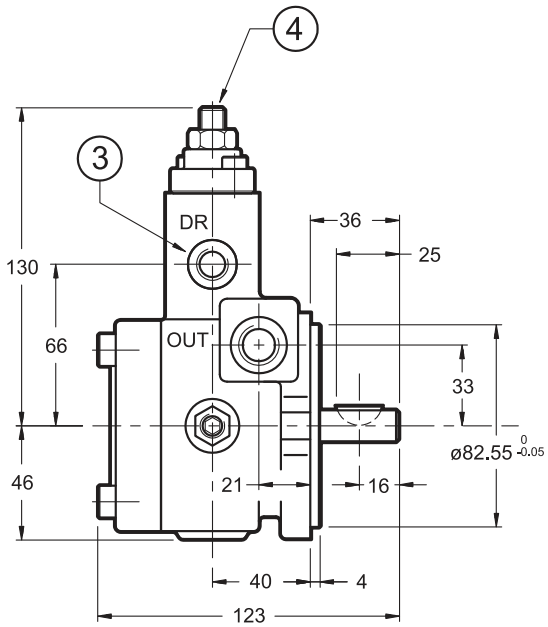


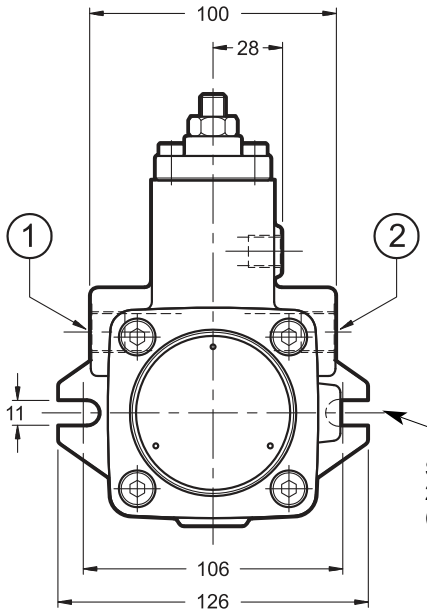
PVE-023PC3



6 - OVERALL AND MOUNTING DIMENSIONS PVE-006

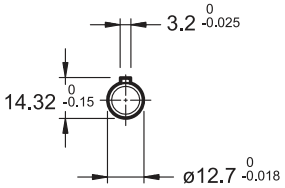
dimensions in mm





SAE J744 fitting flange
2 holes
(identification code: **0**)

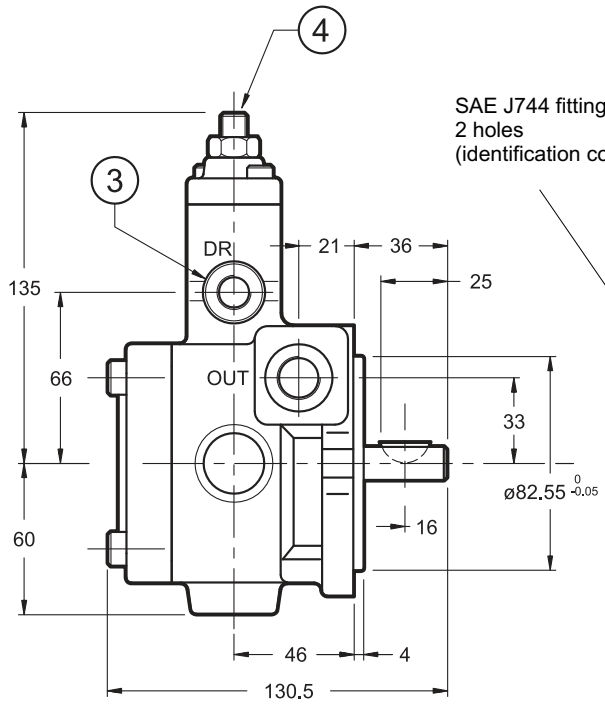
Cylindrical with
key shaft end SAE J744
(identification code: **0**)



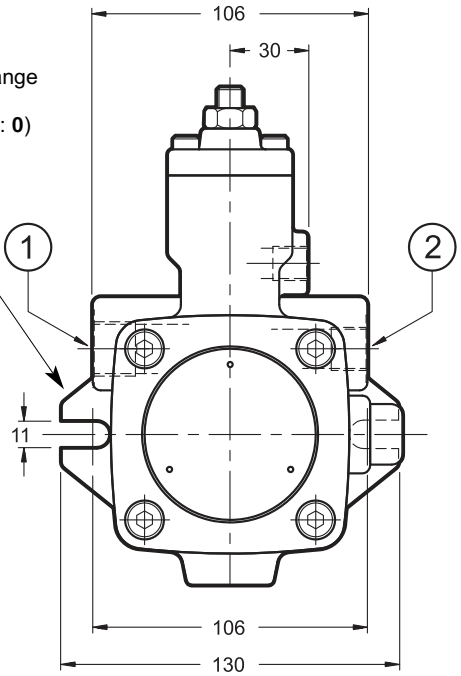
1	Suction port: 3/8” BSPP (parallel)
2	Delivery port: 3/8” BSPP (parallel)
3	Case drainage port: 1/4” BSPP (parallel)
4	Pressure compensator. Clockwise rotation to higher pressure.

7 - OVERALL AND MOUNTING DIMENSIONS PVE-011

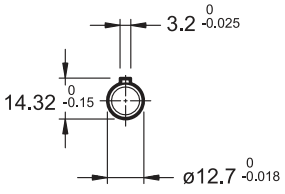
dimensions in mm



SAE J744 fitting flange
2 holes
(identification code: **0**)

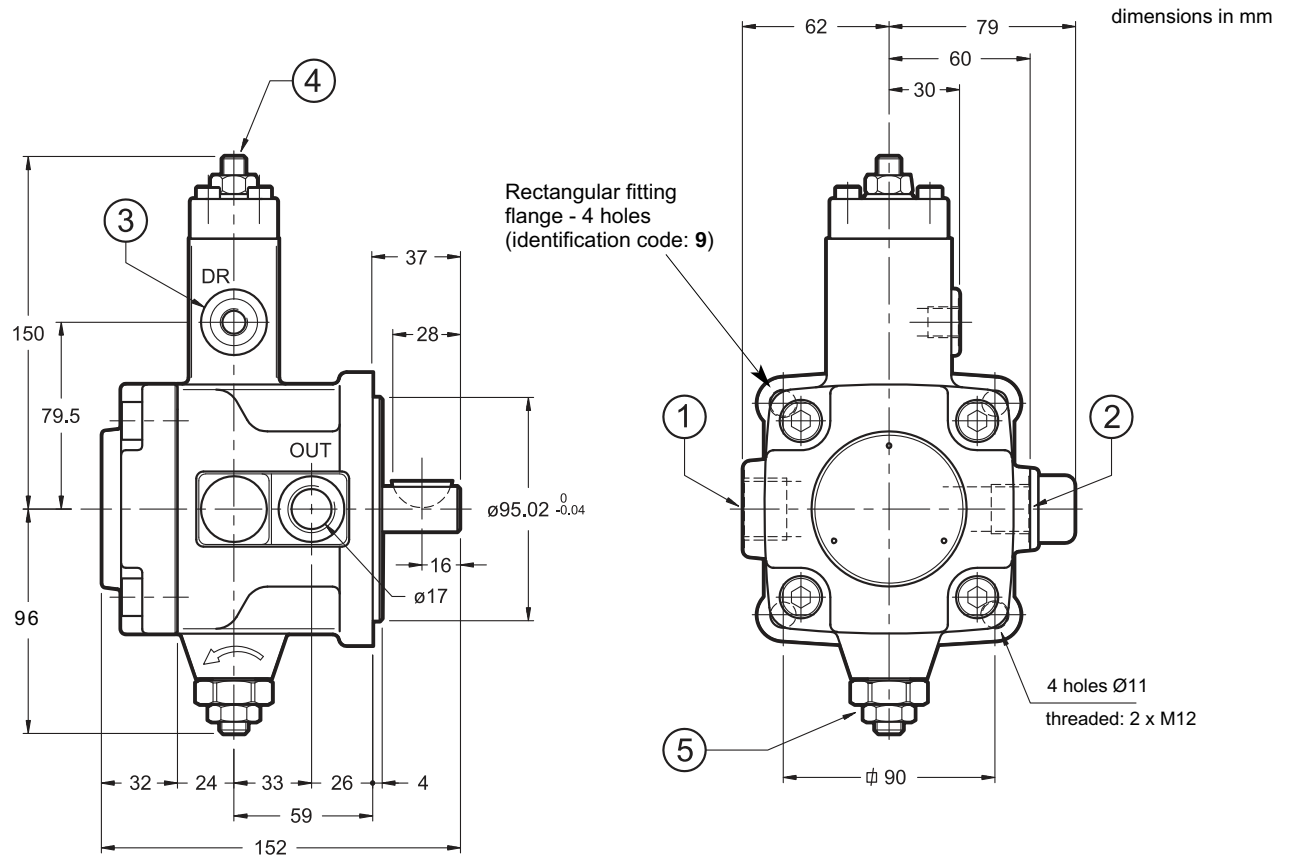


Cylindrical with key shaft end
SAE J744
(identification code: **0**)



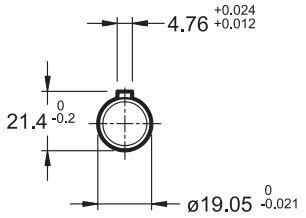
1	Suction port: 1/2” BSPP (parallel)
2	Delivery port: 3/8” BSPP (parallel)
3	Case drainage port: 1/4” BSPP (parallel)
4	Pressure compensator. Clockwise rotation to higher pressure.

8 - OVERALL AND MOUNTING DIMENSIONS PVE-016 AND PVE-023



Cylindrical with key shaft end
SAE J744

(identification code: **0**)



1	Suction port: 3/4” BSPP (parallel)
2	Delivery port: 1/2” BSPP (parallel)
3	Case drainage port: 1/4” BSPP (parallel)
4	Pressure compensator. Clockwise rotation to higher pressure.
5	Volume adjustment. Clockwise rotation to reduce flow.

9 - INSTALLATION

— The PVE pumps can be installed with the axis oriented in any position.

— The suction tube has to be suitably sized so that the suction pressure is never lower than -0.3 bar (relative). Bends or restrictions or an excessive tube length could further decrease the value of the suction pressure with a following increase in the noise emissions and a decrease in the pump lifetime.

— The drainage port must be connected directly to the tank by a line separate from other discharges, located far from the suction line and lengthened to below the minimum oil level so as to avoid formation of foam.

— **Before starting, the pump body has to be filled with the fluid.** The pump start up, especially at a cold temperature, should occur with the pump unloading. Start and stop motor several time in order to purge the air from pump and pipelines.

— The pumps are normally positioned directly above the oil tank. Flooded suction port installation of the pumps is advisable in the case of circuits with high flow rates and pressures.

— The drainage tube has to be sized so that the pressure inside the pump body is always lower than 0.3 bars (relative), even during the dynamic change and flow rate phases. The drainage tube has to unload inside the tank far from the suction area. We suggest to interpose a screen between the two lines.

— The motor-pump connection must be carried out directly with a flexible coupling. Couplings that generate axial or radial loads on the pump shaft are not allowed.

10 - MULTIPLE PUMPS

PVE-016 and PVE-023 pumps can be connected to external gear pumps (see available displacements in the table at par. 10.3). The possibility to couple two pumps makes possible to create multi-flow groups with independent hydraulic circuits.

10.1 - Maximum applicable torque

While sizing coupled pumps, consider that the shaft of the front pump must bear the torque generated by both pumps when they are loaded simoultaneusly.

NOTE: The maximum applicable torque at the shaft of the front pump is 62 Nm.

The input torque (M) for each pump is given by the following ratio:

$$M = \frac{9550 \cdot N}{n} = [Nm]$$

n = rotation speed [rpm]

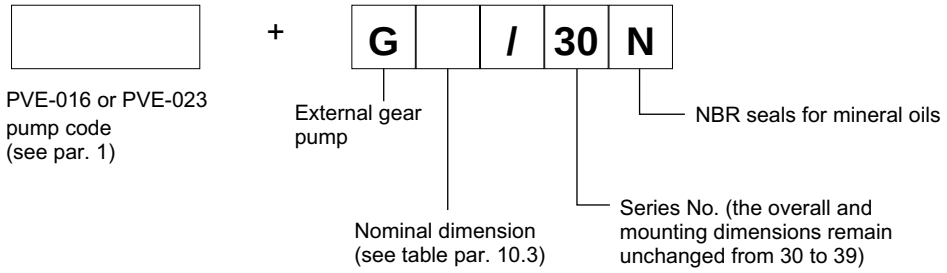
where the absorbed power (N) is given by:

$$N = \frac{Q \cdot \Delta p}{600 \cdot \eta_{tot}} = [kW]$$

Q = flow rate [l/min]
Δp = differential pressure between the pump suction and delivery [bar]
η_{tot} = total efficiency (coefficient = 0.8)

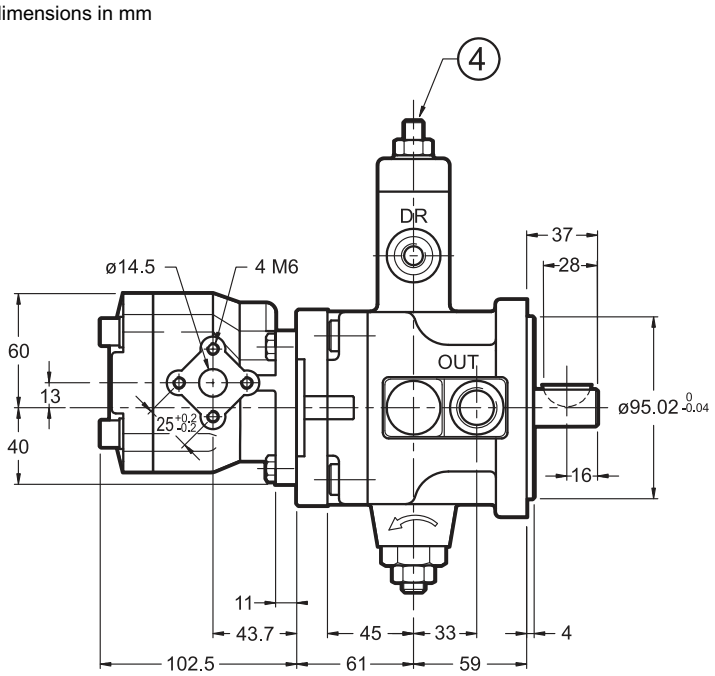
If the total of the obtained torques is higher than 62 Nm, it is necessary to reduce the working pressure / flow value of one or both the pumps until the total torque becomes lower than the maximum value indicated.

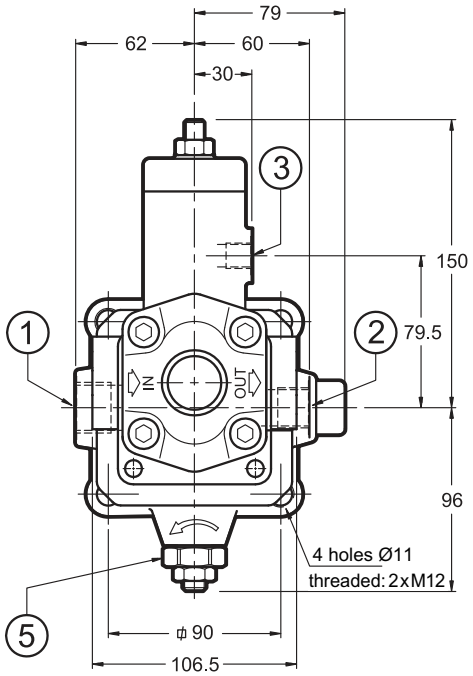
10.2 - Multiple pumps identification code



10.3 - Multiple pumps overall and mounting dimensions

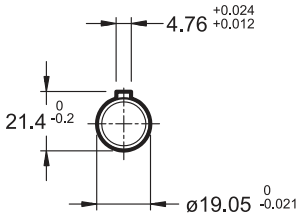
dimensions in mm





Cylindrical with key shaft end
SAE J744

(identification code: **0**)



AVAILABLE GEAR PUMPS

Nominal dimension	Displacement [cm³/rev]	Max working pressure [bar]	Peak pressure [bar]	Min speed [rev/min]
0020	2	210	250	900
0025	2.5			850
0030	3			
0040	4			800
0050	5			
0060	6			
0075	7.5			
0090	9			
0105	10.5			
0120	12	175	210	

Gear pump weight: 1.7 kg

1	Suction port: 3/4” BSPP (parallel)
2	Delivery port: 1/2” BSPP (parallel)
3	Case drainage port: 1/4” BSPP (parallel)
4	Pressure compensator. Clockwise rotation to higher pressure.
5	Volume adjustment. Clockwise rotation to reduce flow.

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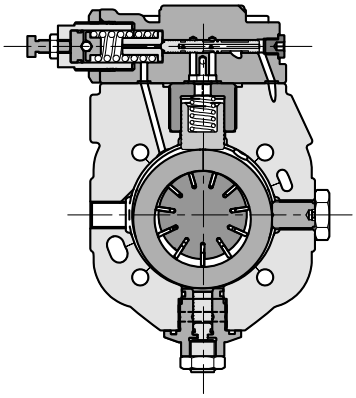
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RV1P
VARIABLE DISPLACEMENT VANE PUMPS

SERIES 10

OPERATING PRINCIPLE



— RV1P are variable displacement vane pumps with hydraulic operated pressure compensator, that permit instantaneous adjustment of the flow rate according to the circuit requirements. Energy consumption is reduced and adequate in every cycle phase.

— The pumping group is provided with double hydrostatic axial compensation, that improves the volumetric efficiency and reduces wear of the components. Both internal paths for inlet and outlet are double.

— The pressure compensator operates keeping the cam ring of the pumping group in the eccentric position by a piston hydraulically controlled by a pressure pilot stage. When the delivery pressure equals the pressure corresponding to the pilot stage setting, the cam ring is moved toward the center, adjusting the flow rate to the plant requirements. In zero flow demand conditions, the pump delivers oil only to compensate any possible bleedings and pilotings, keeping the circuit pressure constant.

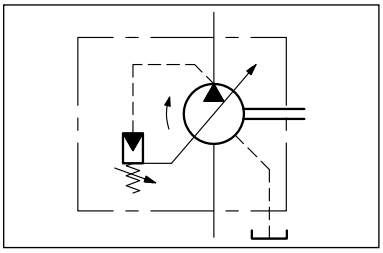
— The compensator response times are very restrained such as to allow the removal of the pressure relief valve.

TECHNICAL SPECIFICATIONS
(measured with mineral oil with viscosity of 46 cSt at 40°C)

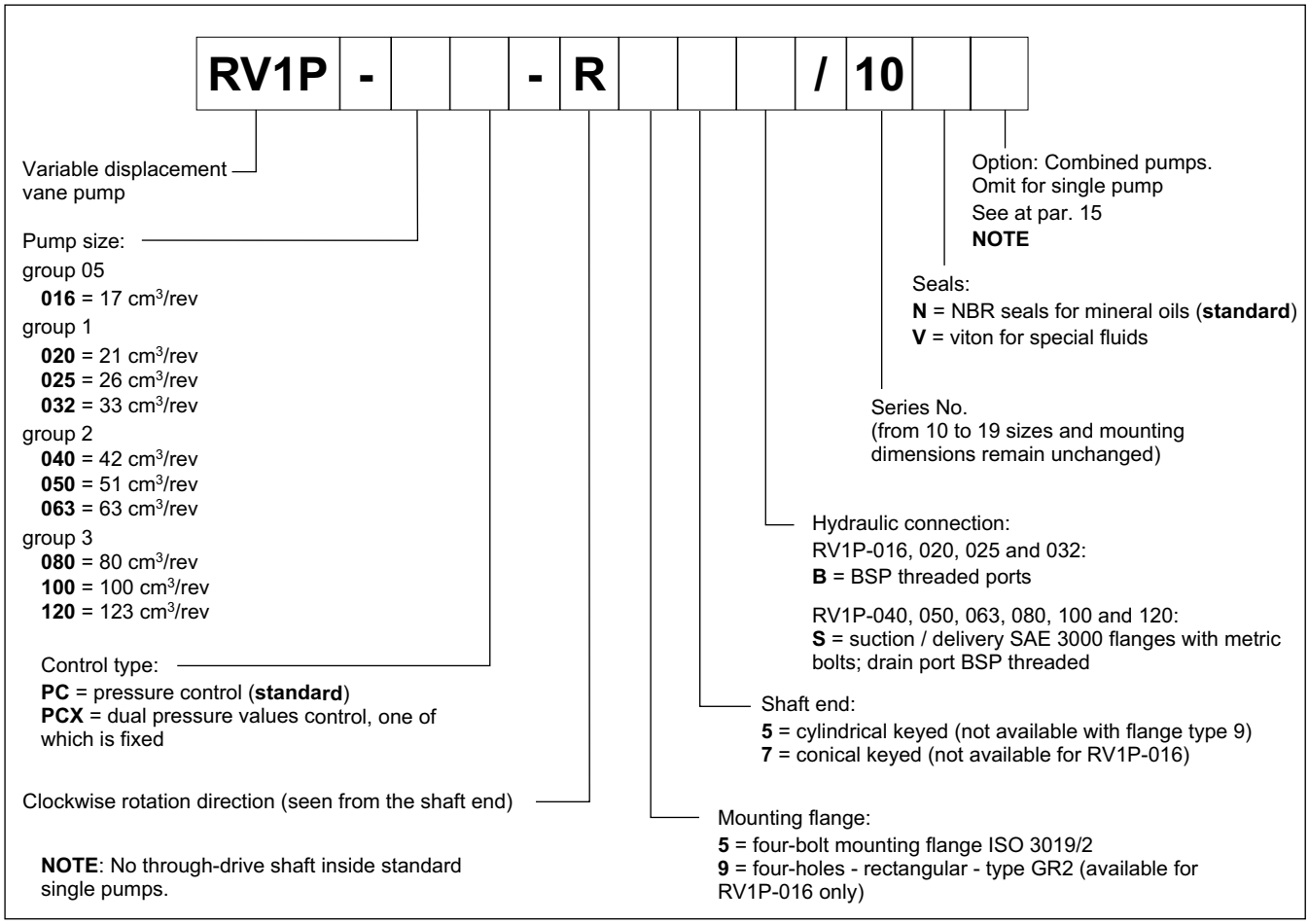
PUMP SIZE		016	020	025	032	040	050	063	080	100	120
Geometrical displacement (UNI ISO 3662)	cm^3/rev	16	20	25	32	40	50	63	80	100	120
Actual displacement (±3%)	cm^3/rev	17	21	26	33	42	51	63	80	100	123
Nominal flow rate (at 1500 rpm)	l/min	25,5	31,5	39	49,5	63	76,5	94,5	120	150	184,5
Maximum operating range	bar	250									210
Pressure adjustment range	bar	20 ÷ 250							40 ÷ 250		40 ÷ 210
Maximum pressure on drain port	bar	1									
Rotation speed range	rpm	800 ÷ 1800				800 ÷ 1500					
Rotation direction		clockwise (seen from the outlet shaft side)									
Loads on the shaft		loads radial and axial not allowed									
Maximum applicable shaft torque	Nm	130	250			586			900		
Mass (RV1P-*PC)	kg	16,5	18,5			43,7			57,2		

Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	+15 / +60
Recommended viscosity	cSt	22 ÷ 68
Fluid viscosity range	see paragraph 2.2	
Fluid contamination degree	see paragraph 2.3	

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE



2 - HYDRAULIC FLUID

2.1 - Fluid type

Use mineral oil based hydraulic fluids with anti-foam and antioxidant additives. For use of other types of fluid, keep in mind the limitations shown in the following table or consult our technical department for approval.

FLUID TYPE	NOTES
HFC (water glycol solutions with proportion of water ≤ 40%)	- The values shown in the performance ratings table must be reduced by at least 50% - The pump rotation speed must be limited to 1000 rpm. - The max fluid temperature must be lower than 50°C - Use NBR seals only
HFD (phosphate esters)	There are no particular limitations with this kinds of fluids. Operation with a fluid viscosity as close as possible to the optimum viscosity range specified in par. 2.2 is recommended. - Use FPM (Viton) seals only

2.2 - Fluid viscosity

The operating fluid viscosity must be within the following range:

optimum viscosity	22 ÷ 68 cSt	referred to the fluid working temperature in the tank
maximum viscosity	400 cSt	limited to only the start-up phase of the pump

When selecting the fluid type, be sure that the true viscosity is within the range specified above at the operating temperature.

2.3 - Degree of fluid contamination

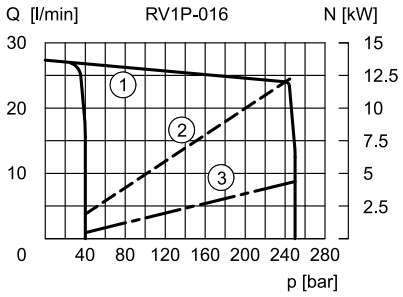
The maximum degree of fluid contamination must be according to ISO 4406:1999 class 20/18/15; therefore, use of a filter with $\beta_{20} \geq 75$ is recommended. A degree of maximum fluid contamination according to ISO 4406:1999 class 18/16/13 is recommended for optimum endurance of the pump. Hence, use of a filter with $\beta_{10} \geq 100$ is recommended.

The suction filter must be equipped with a by-pass valve and, if possible, with a clogging indicator. See installation section for details.

3 - CHARACTERISTIC CURVES RV1P-016 (GR. 05)

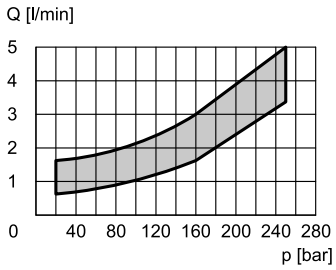
(obtained with viscosity of 46 cSt at 40°C)

FLOW RATE - PRESSURE - ABSORBED POWER

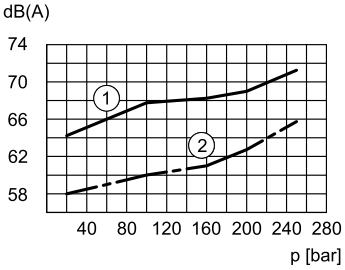


1) Flow rate - pressure curves, measured at 1500 rpm
2) Absorbed power at the maximum flow rate
3) Absorbed power at zero flow rate

DRAINAGE FLOW RATE



NOISE LEVEL



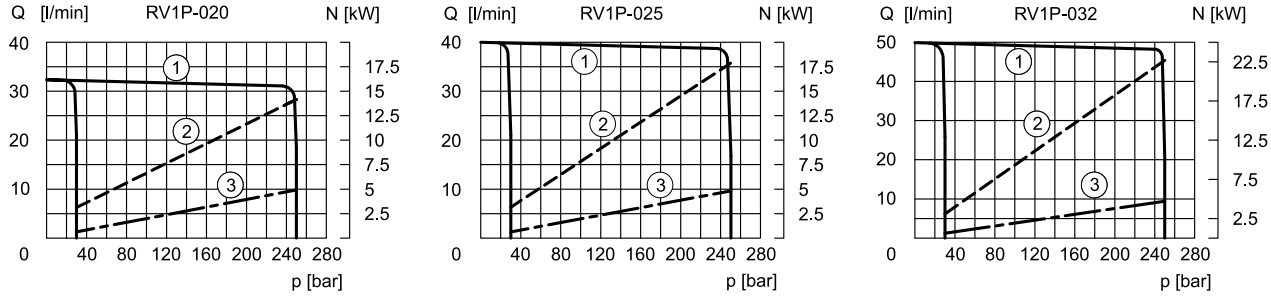
Approximate maximum values of noise level to minimum and maximum flow rate measured with the sound-level meter placed at one meter from pump coupling with flexible coupling.

1) noise at max flow
2) noise with zero flow

4 - CHARACTERISTIC CURVES OF RV1P-020, RV1P-025 AND RV1P-032 (GR. 1)

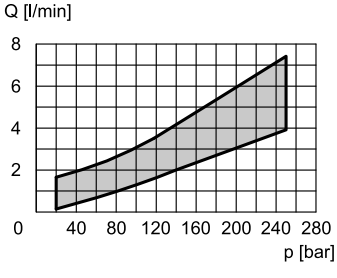
(obtained with viscosity of 46 cSt at 40°C)

FLOW RATE - PRESSURE - ABSORBED POWER

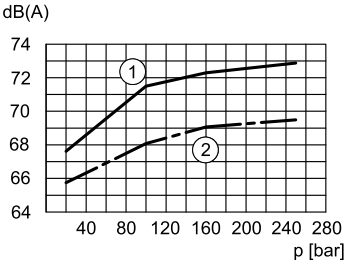


1) Flow rate - pressure curves, measured at 1500 rpm
2) Absorbed power at the maximum flow rate
3) Absorbed power at zero flow rate

DRAINAGE FLOW RATE



NOISE LEVEL



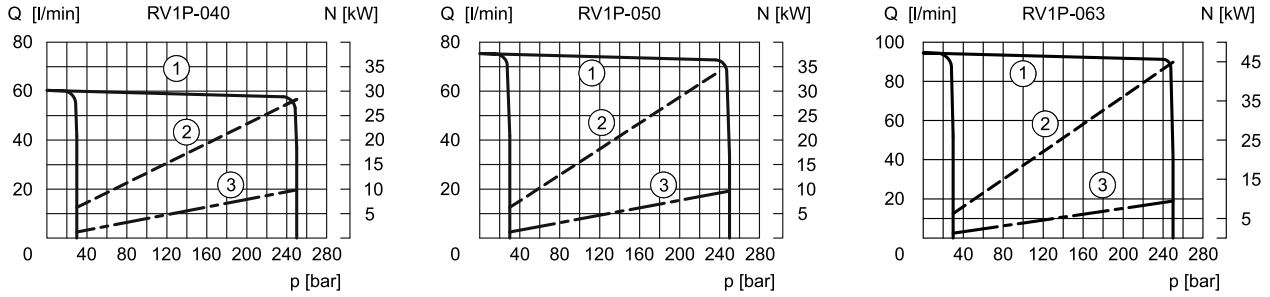
Approximate maximum values of noise level to minimum and maximum flow rate measured with the sound-level meter placed at one meter from pump coupling with flexible coupling.

1) noise at max flow
2) noise with zero flow

5 - CHARACTERISTIC CURVES FOR RV1P-040, RV1P-050 AND RV1P-063 (GR. 2)

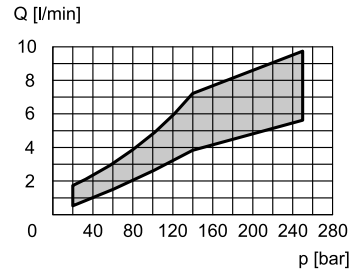
(values obtained with viscosity of 46 cSt at 40°C)

FLOW RATE - PRESSURE - ABSORBED POWER

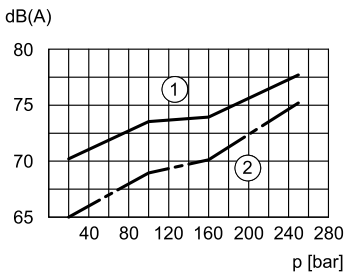


1) Flow rate - pressure curves, measured at 1500 rpm
2) Absorbed power at the maximum flow rate
3) Absorbed power at zero flow rate

DRAINAGE FLOW RATE



NOISE LEVEL



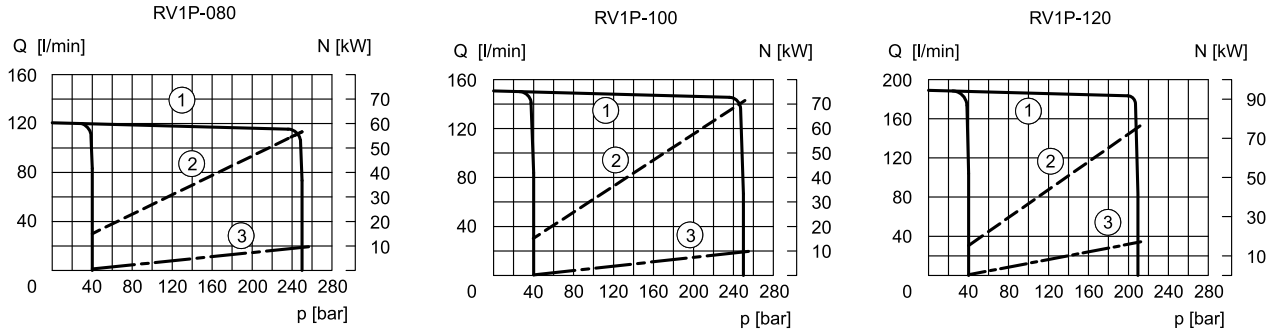
Approximate maximum values of noise level to minimum and maximum flow rate measured with the sound-level meter placed at one meter from pump coupling with flexible coupling.

1) noise at max flow
2) noise with zero flow

6 - CHARACTERISTIC CURVES FOR RV1P-080, RV1P-100, RV1P-120 (GR. 3)

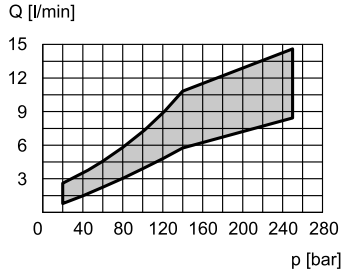
(values obtained with viscosity of 46 cSt at 40°C)

FLOW RATE - PRESSURE - ABSORBED POWER

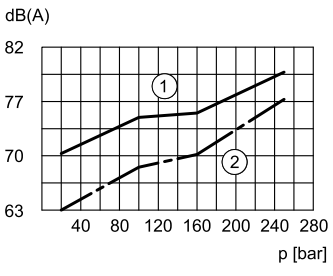


1) Flow rate - pressure curves, measured at 1500 rpm
2) Absorbed power at the maximum flow rate
3) Absorbed power at zero flow rate

DRAINAGE FLOW RATE



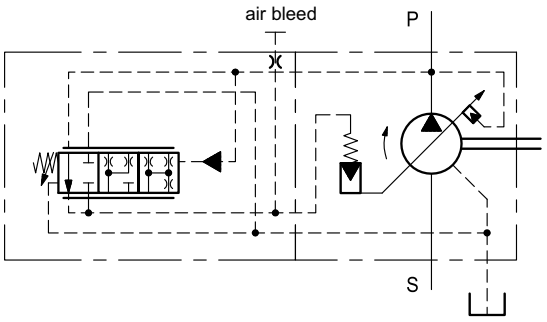
NOISE LEVEL



Approximate maximum values of noise level to minimum and maximum flow rate measured with the sound-level meter placed at one meter from pump coupling with flexible coupling.

1) noise at max flow
2) noise with zero flow

7 - PC PRESSURE CONTROL



The PC pressure regulator keeps the pressure at a constant set level in the circuit, thus adjusting automatically the pump flow rate according to the real need of the system.

The desired pressure can be set by manually adjusting the screw.

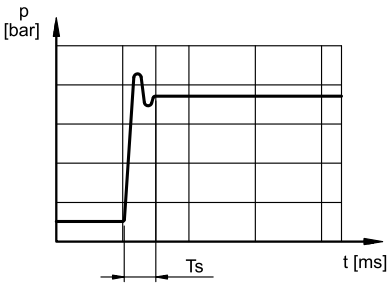
Overall dimensions at sections 9, 10, 11 and 12.

FEATURES OF THE PC CONTROL:

- adjustable pressure range:
  RV1P-016, 020, 025, 032, 040, 050 and 063 = 20 ÷ 250 bar
  RV1P-080 and 100 = 40 ÷ 250 bar
  RV1P-120 = 40 ÷ 210 bar

- default setting = 50 bar

7.1 - Response times and pressure peaks



Dynamic response curves obtained by switching the solenoid operated directional valve for closing the pump outlet.

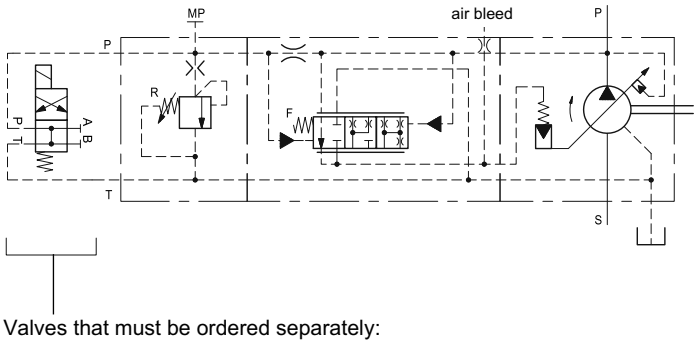
Pressure peaks exceeding 30% of the maximum operating pressure (10% for pumps gr.3) must be eliminated.

displacement	stabilization time Ts (ms)	
	15 → 210 bar	15 → 250 bar
016	50	40
020, 025, 032	80	60
040, 050, 063	100	80
080, 100, 120	120	100 (**NOTE**)

NOTE: for RV1P-120 range 15 → 210 bar

8 - PCX - DUAL PRESSURE CONTROL

Dual pressure value pump operating diagram



Valves that must be ordered separately:
solenoid switching valve DS3-SA2 (datasheet 41 150)

The PCX control, mated to a suitable two-position solenoid valve allows to electrically select the pump at null displacement and at a minimum delivery pressure value.

This function is useful for the start-up of a pump without load and allows to operate at minimum pressure in the system during the machine cycle pause, with considerable energy saving.

Pressure adjustment is obtained by a solenoid switching valve to be mounted on the control.

NOTE: The switching valve must be ordered separately.

FEATURES OF THE PCX CONTROL:

solenoid valve OFF = pump at null displacement and delivery pressure by fixed stage (F)

solenoid valve ON = pump at maximum displacement and delivery pressure set on control (R)

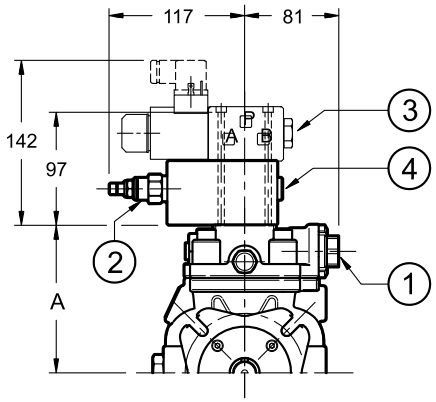
- fixed stage value (F):
  RV1P-016, 020, 025, 032, 040, 050 e 063 = 20 bar
  RV1P-080, 100 e 120 = 40 bar

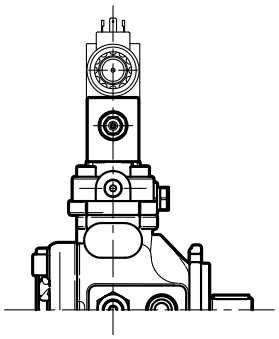
- adjustable pressure range (R):
  RV1P-016, 020, 025, 032, 040, 050 and 063 = 20 ÷ 250 bar
  RV1P-080 e 100 = 40 ÷ 250 bar
  RV1P-120 = 40 ÷ 210 bar

- default setting (R) = 50 bar

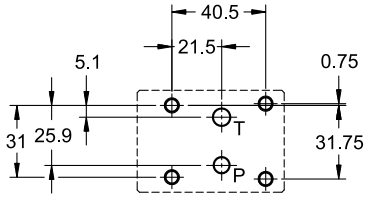
8.1 - Overall dimensions RV1P-*PCX

RV1P-016

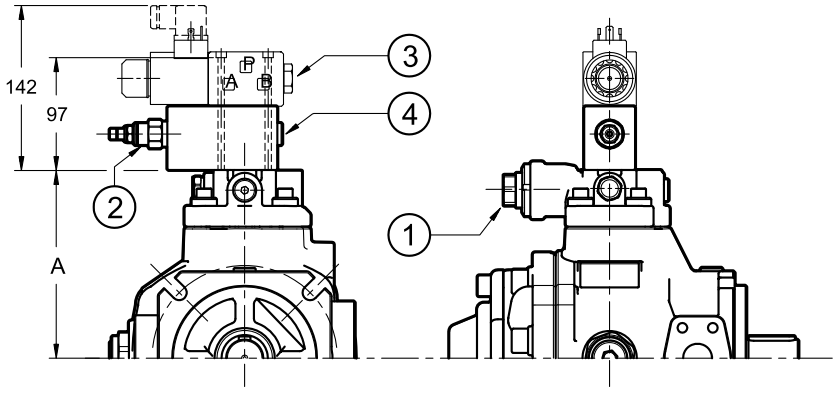




MOUNTING INTERFACE
ISO 4401-03



from RV1P-020 to RV1P-120



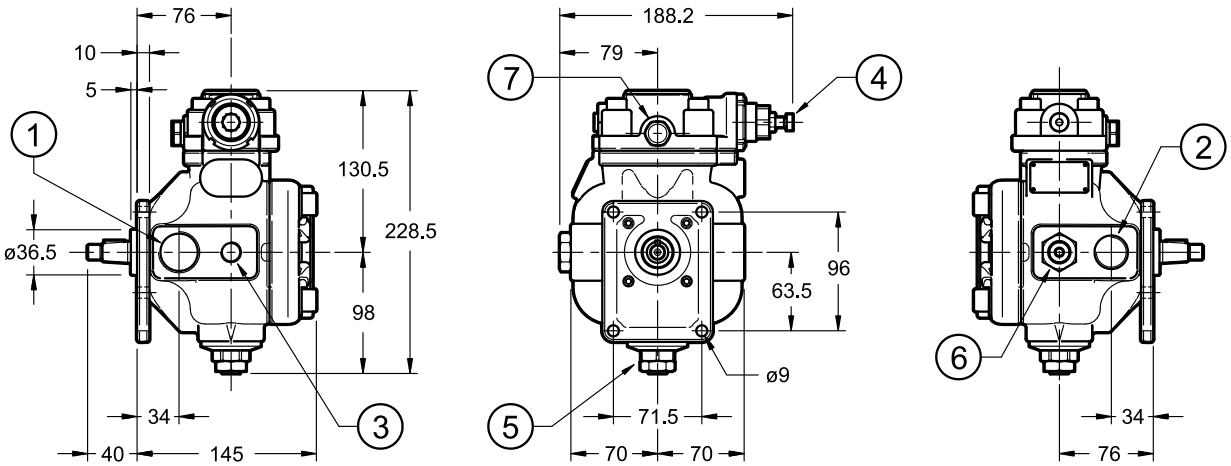
displacement	A (mm)
016	128
020, 025, 032	129
040, 050, 063	162,5
080, 100, 120	171,5

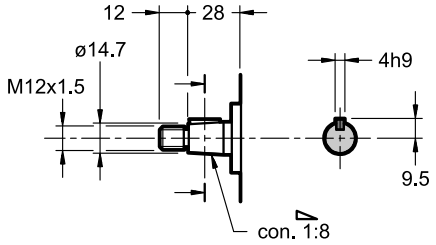
1	Main pressure stage. Fixed stage. **Do not tamper**
2	Pressure relief valve Clockwise rotation to increase pressure Socket hex screw 5/32” Locknut: hex screw 9/16”
3	Solenoid switching valve (to be ordered separately)
4	Gauge 1/4” BSP

9 - OVERALL AND MOUNTING DIMENSIONS RV1P-016 (GR. 05)

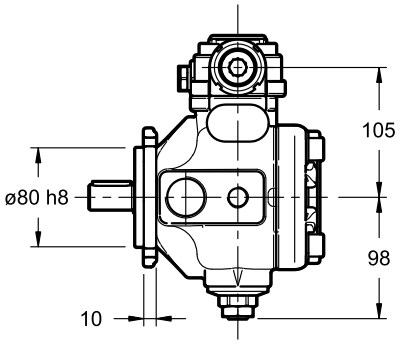
dimensions in mm

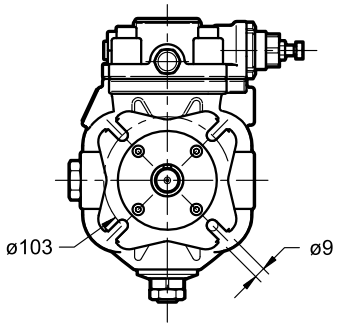
RV1P-016PC-R97B



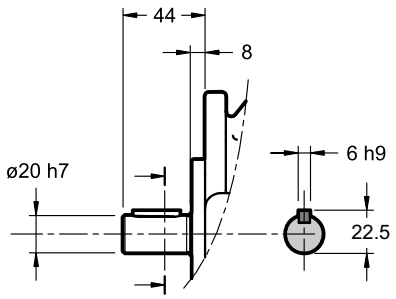


RV1P-016PC-R55B





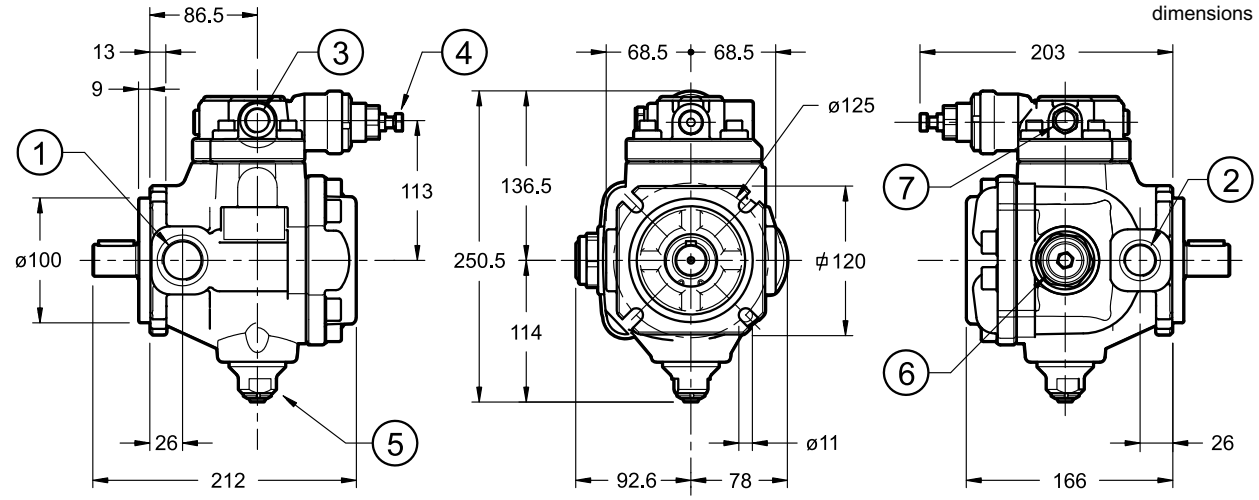
please refer to the drawing
RV1P-016PC-R97B for
non-quoted dimensions

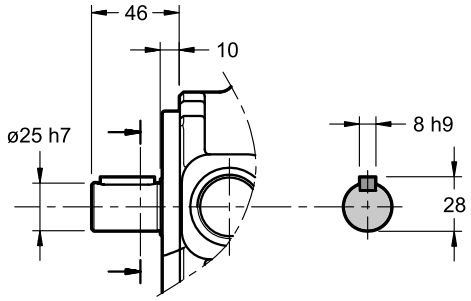


1	Suction port: 1” BSP
2	Delivery port: 3/4” BSP
3	Drain port: 3/8” BSP
4	Pressure adjustment screw. Rotate clockwise to increase pressure. Spanner 13 Locking nut : spanner 13
5	Flow adjustment screw. Rotate clockwise to decrease flow. Socket hex screw, Allen key 8. Locknut spanner 24
6	Guide block balancing adjuster. **Do not tamper.**
7	Air breather 1/4 BSP

10 - OVERALL AND MOUNTING DIMENSIONS RV1P-020, RV1P-025 AND RV1P-032 (GR. 1)

dimensions in mm

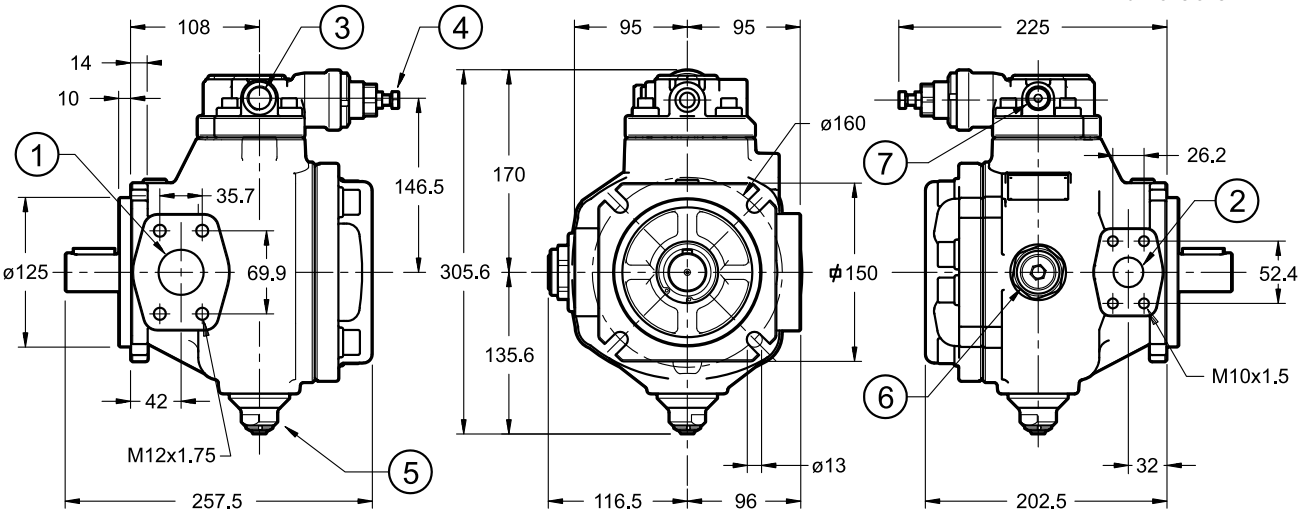


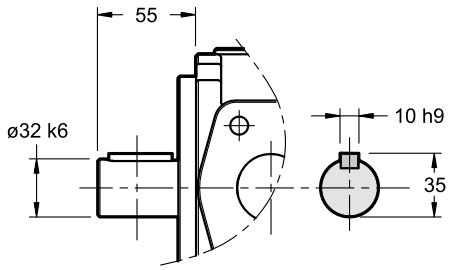


1	Suction port: 1” BSP
2	Delivery port: 3/4” BSP
3	Drain port: 1/2” BSP
4	Pressure compensator. Rotate clockwise to increase pressure. Spanner 13. Locking nut: spanner 13.
5	Flow adjustment screw. Rotate clockwise to decrease flow. Socket hex screw Allen key 6. Retainer KM1 type.
6	Guide block balancing adjuster. **Do not tamper.**
7	Air breather 1/4 BSP

11 - OVERALL AND MOUNTING DIMENSIONS RV1P-040, RV1P-050 AND RV1P-063 (GR. 2)

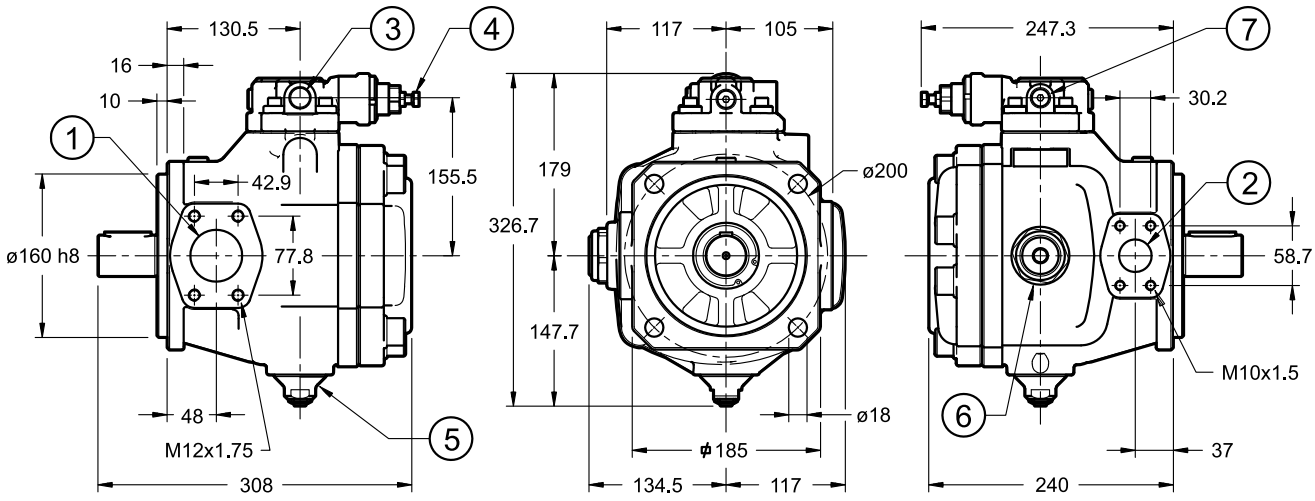
dimensions in mm





1	Suction port: SAE 3000 1 1/2” flange
2	Delivery port: SAE 3000 1” flange
3	Drain port: 1/2” BSP
4	Pressure compensator. Rotate clockwise to increase pressure. Spanner 13. Locking nut: spanner 13.
5	Flow adjustment screw. Rotate clockwise to decrease flow. Socket hex screw Allen key 6. Retainer KM1 type.
6	Guide block balancing adjuster. **Do not tamper.**
7	Air breather 1/4” BSP

12 - OVERALL AND MOUNTING DIMENSIONS RV1P-080, RV1P-100, RV1P-120 (GR. 3)



1	Suction port: SAE 3000 2” flange
2	Delivery port: SAE 3000 1 1/4” flange
3	Drain port: 1/2” BSP
4	Pressure compensator. Rotate clockwise to increase pressure. Spanner 13. Locking nut: spanner 13.
5	Flow adjustment screw. Rotate clockwise to decrease flow. Socket hex screw Allen key 6. Retainer KM1 type.
6	Guide block balancing adjuster. **Do not tamper.**
7	Air breather 1/4” BSP

12 - INSTALLATION

The instruction manual for pumps installation and commissioning is always included in the packaging with the pump. Observe restrictions in this document and follow the instructions.

— RV1P-016, RV1P-020, RV1P-025 and RV1P-032 pumps can be installed in any position. The other pumps need to be installed with the axis in horizontal position and with pressure compensator upward.

— Motor-pump coupling must be made with a self-aligning flexible coupling with convex teeth and a polyamide cam. **Couplings that generate axial or radial loads on the pump shaft are not allowed**.

— The suction line must be short, with a small number of bends and without internal section changes. The minimum section of the inlet pipe must be equal to the section of the thread of the pump inlet port.

The pipe-end inside the tank should be cut at 45°, should have a minimum distance from the tank bottom of not less than 50 mm, and there should always be a minimum height of suction of 100 mm. **The suction pipe should be completely airtight in order to avoid air intake which could be extremely damaging to the pump**.

Suction pressure should be between 0.8 and 1.5 bar absolute.

— The drainage pipe must be connected directly to the tank by a line separate from other discharges, located as far as possible from the suction line and lengthened to below the minimum oil level in order to avoid foaming.

— The fluid tank must be suitably sized in order to exchange the thermal power generated by the various system components and to provide a low recycle rate (approximately: tank capacity = 4 times the pump flow rate per minute).
In systems where the pump runs for a long time under zero-flow setting conditions, it is advisable to provide a fluid cooling system.

The pressure in the drain line must not exceed 1 bar.

To ensure the maximum pump working life, the inlet fluid temperature must never be above 50°C. **The fluid temperature must never exceed 60 °C**

— **Ensure the pump shaft can be rotated manually without any resistance.**

— Fill the pump with the fluid through the drain port. The pump must be started-up in full displacement (P→T) with flow to the tank without pressure. During this step bleed the air, unscrewing the cap of the air bleed port on the pressure compensator device, (see drawings) and then close the cap.

The pump should prime within 5 seconds. If it does not, switch it off and investigate the cause. The pump should not run empty.

Subsequents start-up under zero flow setting conditions are admissible only with pressure not exceeding 30 bar, and with the system and pump completely filled with fluid.

— If the volume adjuster has been set for values less than 50% of the nominal flow-rate, start-up is allowed only if provided the system and pump are fully filled of fluid.

— **It's essential that the difference between the fluid temperature and the ambient temperature (pump body) doesn't exceed 20 °C.**
If this is the case, the pump should be switched-on only for intervals of about 1-2 seconds (start/stop mode) without pressure, until the temperatures came balanced.

— The pumps are usually placed directly upon the oil tank. Flooded suction port installation of the pump is recommended in the event of circuits with high flow rates and pressures.

14- VOLUME ADJUSTMENT SCREW

The volume adjuster is fitted as standard on all the pumps.

It consists of an adjustment screw and a small balanced piston that limit the maximum eccentricity of the pumping group cam ring, changing the displacement. The maximum flow is reduced by turning the adjustment screw clockwise. Indicative data, sensitive to performance tolerances.

Nominal size		**016**	**020**	**025**	**032**	**040**	**050**	**063**	**080**	**100**	**120**
Reduction of displacement per turn	cm^3	11	10			16			16		
Minimum possible displacement	cm^3/rev	3,3	9,5	15	19	27,5	35,5	43,5	63	80	100

Tools required for adjustment:

RV1P-016: adjustment screw hexagon socket key 8. Locking nut spanner 24.
Other sizes: adjustment screw hexagon socket key 6. Tooth retainer KM1 type.

15 - MULTIPLE PUMPS

RV1P with through drive shaft are available. These pump are sdesigned to be connected one to the other in decreasing order of displacement. The RV1P-016 pump suitable for multiple pumps is the R55B version only (ISO 3019-2 four-bolt flange with cylindrical keyed shaft end)

RV1P pumps can be coupled also with RV1D type pumps (see catalogue 14 101) and with gear pumps (see catalogue 11 100).
The torque on the shaft must be further reduced after the second pump.

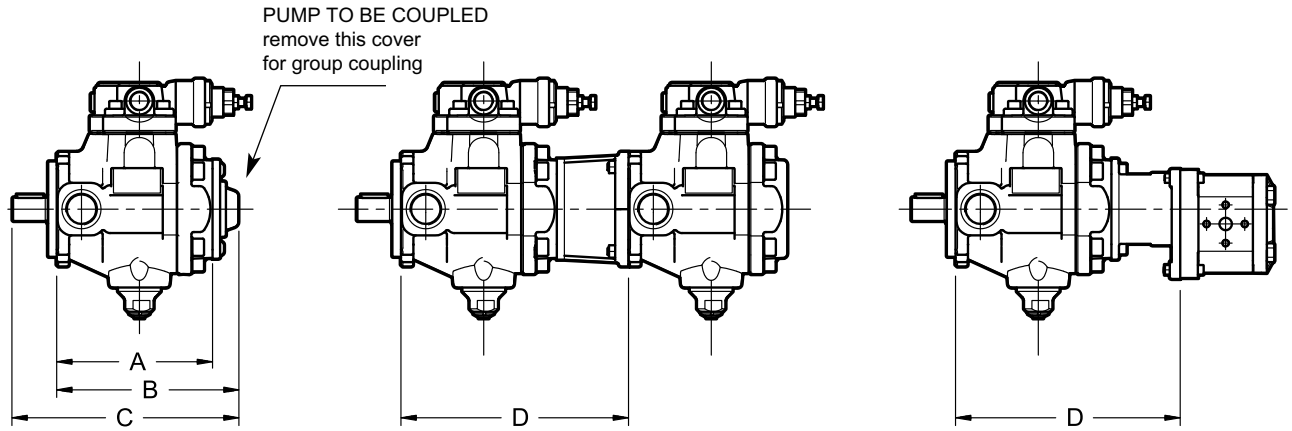
Consult our Sales Support department for this kind of applications.

IDENTIFICATION CODE FOR MULTIPLE PUMPS
Both single pumps with through drive shaft (without mating joint) and multiple groups are available.
Fill the ordering code, by following the coupling sequence of the pumps. Insert the /F suffix after each pump with through drive shaft:

/ F — Version for multiple pumps:
/F = with through drive shaft

identification code front pump **/F** + identification code intermediate pump **/F** + identification code rear pump

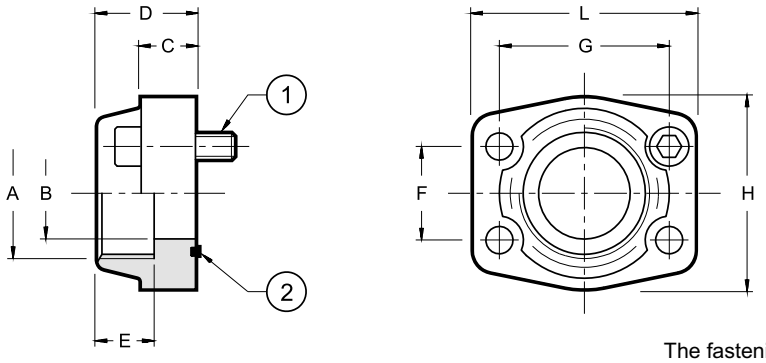
Examples:
Single pump with through drive shaft: RV1P-025PC-R55B/10V
Double pump identification: RV1P-025PC-R55B/10V **/F +** RV1P-025PC-R55B/10V
Triple pump identification: RV1P-040PC-R55S/10N **/F +** RV1P-040PC-R55S/10N **/F +** RV1P-040PC-R55S/10N
RV1P pump + gear pump identification: RV1P-050PCX-R55S/10N **/F +** GP2- 00208R97F/20N



Dimensions (mm)					
Group size	A	B	C	D with RV1P pump of same size group	D with gear pump type GP1 / GP2 / GP3
05	139	166	210	212	203 / 211 / -
1	163	190	236	238	227 / 235 / -
2	199,5	246,5	301,5	301,5	289,5 / 289,5 / 290,5
3	237	284	352	354	327 / 327 / 328

Max. torque applied to the shaft of the second pump (Nm)		
Group size front pump	Second pump (same size group)	Second pump (smaller size group)
05	55	-
1	55	55
2	110	110
3	180	110

16 - CONNECTION FLANGES



The fastening bolts and the O-Rings must be ordered separately

flange code	flange description	p_{max} [bar]	ØA	ØB	C	D	E	F	G	H	L	(1) n° 4 bolts	(2)
0610713	SAE - 1”	345	1” BSP	25	18	38	22	26.2	52.4	22	70	SHC M10x35	OR 4131 (32.93x3.53)
0610720	SAE - 1 ¼”	276	1 ¼” BSP	32	21	41	22	30.2	58.7	68	79	SHC M10x35	OR 4150 (37.69x3.53)
0610714	SAE - 1 1/2”	207	1 1/2” BSP	38	25	44	24	35.7	70	78	93	SHC M12x45	OR 4187 (47.22x3.53)
0610721	SAE - 2”	207	2” BSP	51	25	45	30	43	77.8	90	102	SHC M12x40	OR 4225 (56.74x3.53)

DUPLOMATIC MOTION SOLUTIONS

DUPLOMATIC MS S.p.A.
via M. Re Depaolini 24 • 20015 PARABIAGO (MI) • ITALY
tel. +39 0331.895.111 • www.duplomatic.com • e-mail: sales.exp@duplomatic.com

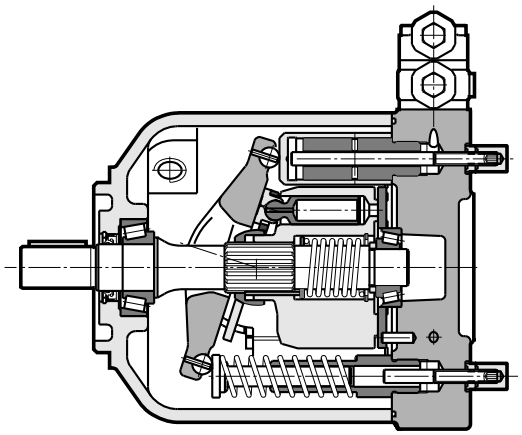
REPRODUCTION IS FORBIDDEN. THE COMPANY RESERVES THE RIGHT TO APPLY ANY MODIFICATIONS



VPPM

VARIABLE DISPLACEMENT AXIAL-PISTON PUMPS

OPERATING PRINCIPLE



— The VPPM pumps are variable displacement axial-piston pumps with variable swash plate, suitable for applications with open circuits.

— They are available in three different frame sizes with maximum displacements up to 29, 46, 73 and 87cm^3/rev.

— The pump flow rate is proportional to the rotation speed and to the angle of the swash plate, which can be continuously modulated. The maximum and minimum angle can be limited mechanically via suitable regulating screws.

— The pumps feature medium-high working pressures (up to 280 bar constant and 350 bar peak). Thanks to some particular design features, these pumps are able to bear high axial and radial loads on the shaft.

— They are usually supplied with a ISO 3019/2 mounting flange, with the exception of the rear and intermediate pumps, if multiple pumps, which are only available with a SAE J744 2-holes flange and a SAE J744 splined shaft (see paragraph 16).

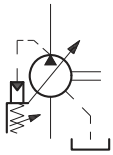
— They are available with seven different types of regulating control, each according to the application needs (see paragraphs 8 ÷ 14).

TECHNICAL SPECIFICATIONS

PUMP SIZE		**029**	**046**	**073**	**087**
Maximum displacement	cm^3/rev	29	46	73	087
Max. delivery pressure (relative): - continuous - intermittent (**NOTE 1**) - peak	bar		280 315 350		250 280 315
Maximum rotation speed at maximum displacement (**NOTE 2**)	rpm	3000	2600	2200	1850
Rotation direction		clockwise or anticlockwise (looking at the drive shaft)			
Hydraulic connection		SAE flange fittings (see paragraph 24)			
Type of mounting (single pump)		ISO 3019/2 flange			
Mass (empty single pump)	kg	18	24	33	33

Ambient temperature range	°C	-15 / +70
Fluid temperature range	°C	-25 / +80
Fluid viscosity range	see paragraph 2.2	
Fluid contamination degree	see paragraph 2.3	
Recommended viscosity	cSt	15 ÷ 35

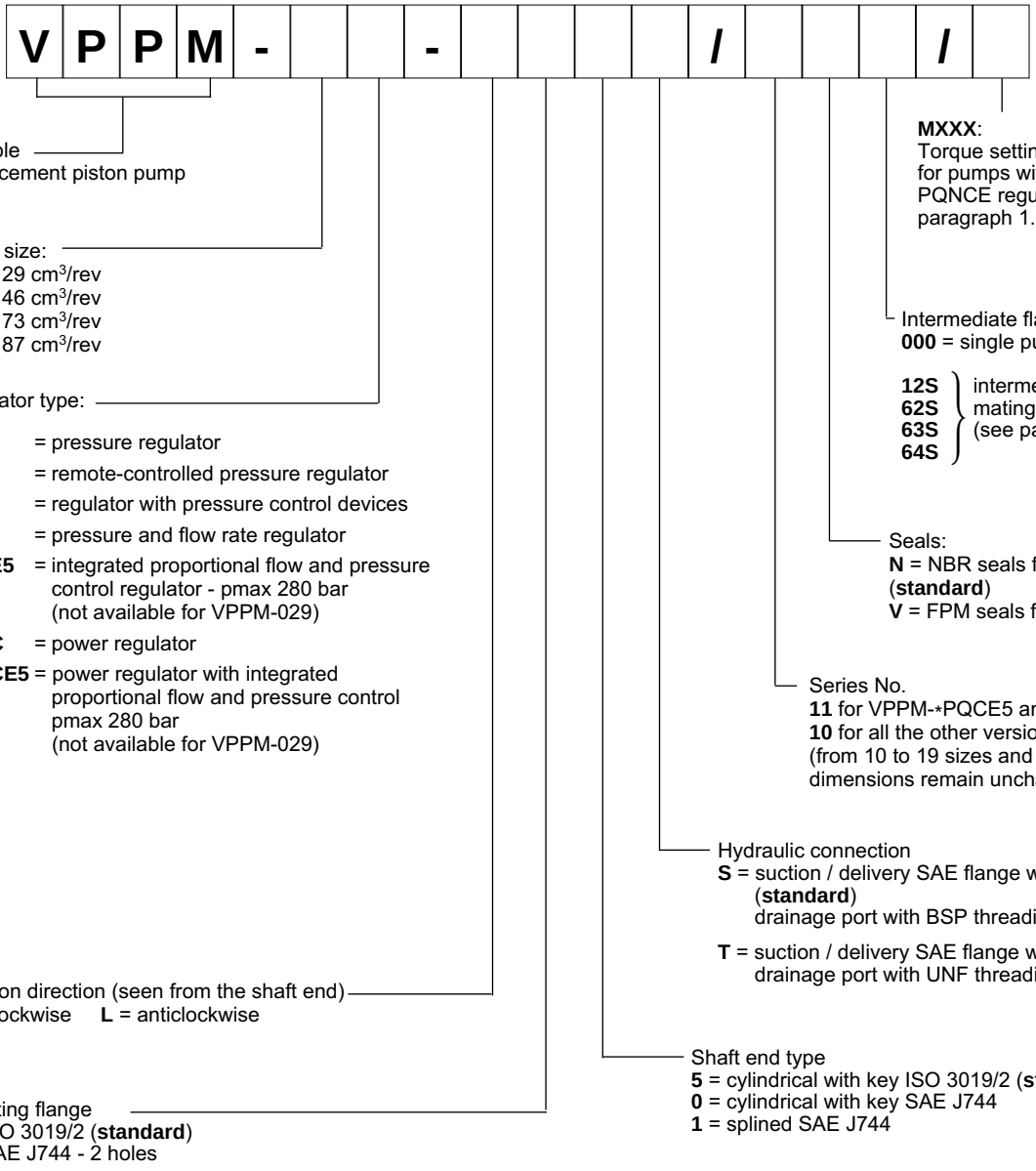
HYDRAULIC SYMBOL



NOTE 1: Allowed intermittent duty pressures with a duration equal to 6 seconds per minute.
NOTE 2: Values referring to a zero bar pressure (relative) on the suction port.

1 - IDENTIFICATION CODES

1.1 - Identification code for single and front pumps with a through output shaft



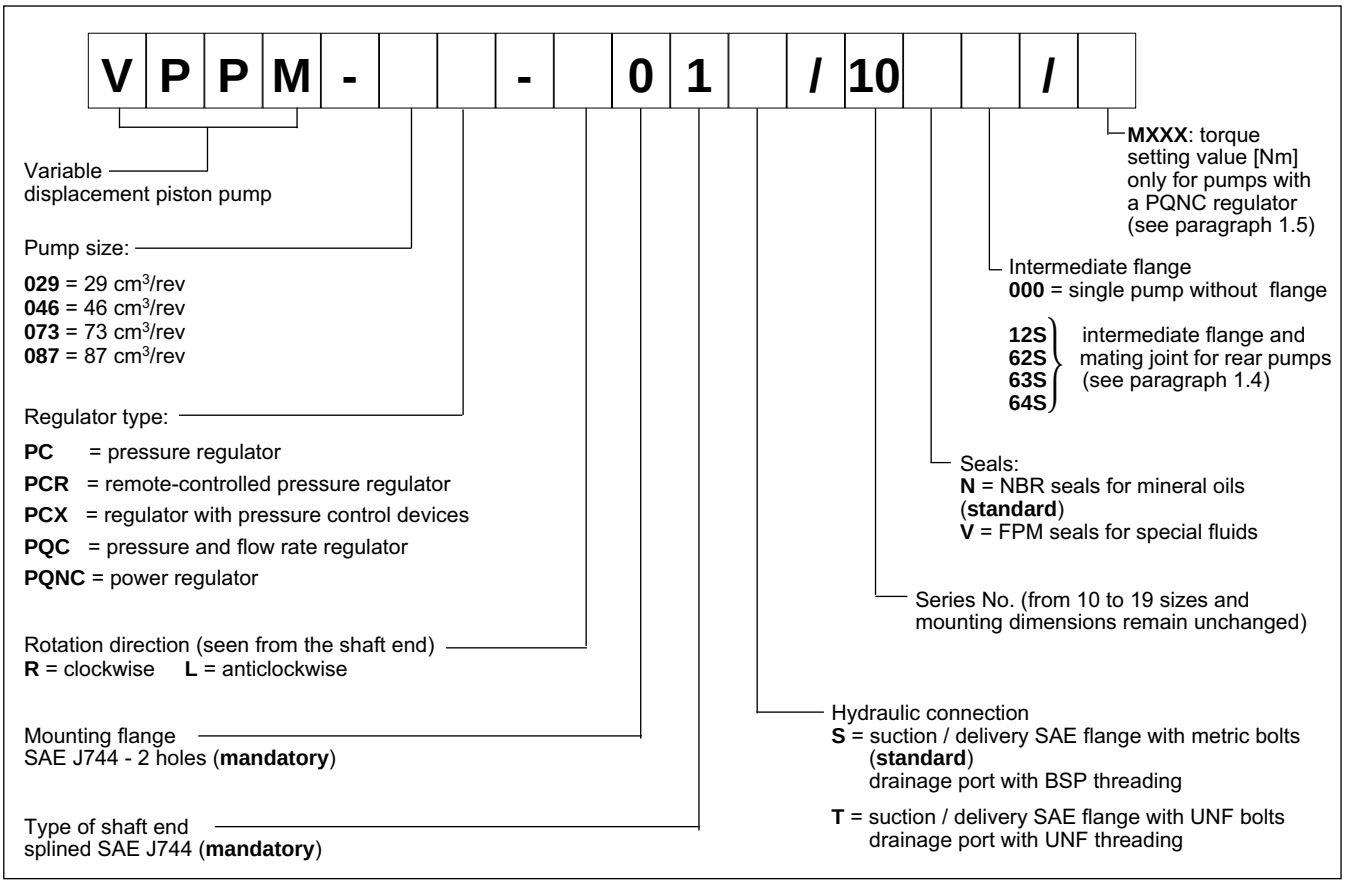
NOTE 1: See at table below compatibility among mounting flange, type of shaft and type of hydraulic connection

Compatibility among mounting flange, type of shaft and type of hydraulic connection

FLANGE CODE	SHAFT CODE			HYDRAULIC CONNECTION CODE	
	5	0	1	S	T
5	yes	no	no	yes	no
0	no	yes	yes	yes	yes

VPPM pumps are supplied as standard with mechanical minimum and maximum displacements limit controls.
These devices are not available for front and intermediate pumps with a through output shaft.

1.2 - Identification code for intermediate pumps with a through output shaft and rear pumps



1.3 - Identification code for double pumps

identification code + identification code
1st pump 2nd pump

1.4 - Identification code for intermediate flange and mating joint for pumps with a through output shaft

According to the pump to be coupled, it is necessary to define, into the identification code, the flange and mating joint type to be applied to the pump with a through output shaft.
The following table states the flange and joint reference code according to the different pump types to be pulled, stating also the possible coupling combinations.

Identification code for intermediate flange + mating joint	intermediate flange	mating joint	pump to be mated	possible combinations for VPPM pump with a through output shaft			
				29	46	73	87
12S	SAE J744 2 holes - type “A”	SAE J744 splined 16/32 D.P. - 9T	GP 2 external gear	yes	yes	yes	yes
62S	SAE J744 2 holes - type “B”	SAE J744 splined 16/32 D.P. - 13T	GP 3 external gear VPPM-029	yes	yes	yes	yes
63S	SAE J744 2 holes - type “B”	SAE J744 splined 16/32 D.P. - 15T	VPPM-046	no	yes	yes	yes
64S	SAE J744 2 holes - type “C”	SAE J744 splined 12/24 D.P. - 14T	VPPM-073	no	no	yes	yes
64S	SAE J744 2 holes - type “C”	SAE J744 splined 12/24 D.P. - 14T	VPPM-087	no	no	no	yes

NOTE: For the flange type and dimensions see paragraph 20.

1.5 - Standardized torque values for PQNC and PQNCE regulators

ELECTRICAL MOTOR 4 POLES		VPPM-029		VPPM-046		VPPM-073		VPPM-087	
Power [kW]	N [rpm]	**torque [Nm]**	p regulation start. [bar]	**torque [Nm]**	p regulation start. [bar]	**torque [Nm]**	p regulation start. [bar]	**torque [Nm]**	p regulation start. [bar]
4	1425	**26 (#)**	46	**-**	-	**-**	-	**-**	-
5,5	1440	**36 (#)**	62	**36 (#)**	41	**-**	-	**-**	-
7,5	1450	**50**	84	**50 (#)**	56	**-**	-	**-**	-
9,2	1460	**60**	103	**60 (#)**	68	**60 (#)**	44	**-**	-
11	1455	**72**	124	**72**	82	**72 (#)**	53	**-**	-
15	1460	**98**	168	**98**	111	**98 (#)**	72	**-**	-
18,5	1460	**-**	-	**122**	137	**122**	89	**-**	-
22	1465	**-**	-	**144**	163	**144**	105	**-**	-
30	1470	**-**	-	**-**	-	**196**	143	**196**	126
37	1470	**-**	-	**-**	-	**240**	175	**240**	156
45	1470	**-**	**-**	**-**	**-**	**-**	**-**	**293**	190
55	1475	**-**	**-**	**-**	**-**	**-**	**-**	**356**	231

(#) With this adjustment value the pump is in venting position with a pressure lower than 280 bar.

1.6 - Identification examples

a) 29 cm^3/rev single pump with pressure regulator - ISO mounting flange and shaft (standard)
VPPM-029PC-R55S/10N000

b) 46 cm^3/rev single pump with pressure regulator with remote control - SAE mounting flange and SAE splined shaft
VPPM-046PCR-R01S/10N000

c) 73 cm^3/rev single pump with pressure control devices - ISO mounting flange and shaft (standard)
VPPM-073PCX-R55S/10N000

d) 46 cm^3/rev single pump with integrated proportional flow and pressure control regulator - pressure regulation up to 280 bar
VPPM-046PQCE5-R55S/11N000

e) 46 cm^3/rev single pump with power regulator set at 18,5 kW at 1460 rpm (torque = 122 Nm)
VPPM-046PQNC-R55S/10N000/M122

f) 73 cm^3/rev single pump with power regulator with integrated proportional flow and pressure control - power regulator set at 98 Nm - pressure regulation up to 280 bar
VPPM-073PQNCE5-R55S/11N000/M098

g) 73 cm^3/rev front pump with pressure regulator, ready to mate to a VPPM-029 pump
VPPM-073PC-R55S/10N62S

h) double pump made of: - 46 cm^3/rev front pump with pressure and flow rate regulator
- 29 cm^3/rear pump with pressure regulator
VPPM-046PQC-R55S/10N62S + VPPM-029PC-R01S/N000

i) triple pump made of: - 73 cm^3/rev front pump with flow rate and pressure regulator
- 46 cm^3/rev intermediate pump with pressure regulator
- 14 cm^3/rev rear gear pump group 2
VPPM-073PQC-R55S/10N63S + VPPM-046PC-R01S/10N12S + GP2-0140R01F/20N

2 - HYDRAULIC FLUID

2.1 - Fluid type

Use mineral oil based hydraulic fluids with anti-foam and antioxidant additives according to the DIN 51524 norm.
For use with other types of fluid, keep in mind the limitations shown in the following table or consult our technical department for authorization of use.

FLUID TYPE	NOTES
HFC (water glycol solutions with proportion of water ≤ 40%)	The performance ratings shown in the table 'PERFORMANCES' must be reduced as follows: max continuous pressure: 170 bar max peak pressure: 200 bar max rotation speed: VPPM-029 = 2100 rpm VPPM-046 = 2000 rpm VPPM-073 and VPPM-087 = 1700 rpm - The suction pressure must be lower than 0,8 absolute bars (-0,2 relative bars) - The fluid maximum temperature must be between 0°C and 50°C. - Use NBR seals only.
HFD (phosphate esters)	Such fluids do not require any particular performance limitation. It is suggested to operate with continuous duty pressures not higher than 200 bar and pressure peaks not higher than 240 bar. - The operating temperature must be between -10°C and 90°C. - Use VITON seals

2.2 - Fluid viscosity

The operating fluid viscosity must be within the following range:

minimum viscosity	10 cSt	referred to a maximum temperature of 90 °C for the drainage fluid
optimum viscosity	15÷ 35 cSt	referred to the operating temperature of the fluid in the tank
maximum viscosity	1000 cSt	limited only to the cold start-up of the pump, which has to be carried out with the plant at minimum pressure.

When selecting the fluid type, be sure that the true viscosity is within the range specified above at the operating temperature.

2.3 - Degree of fluid contamination

The maximum degree of fluid contamination must be according to ISO 4406:1999 class 20/18/15; therefore the use of a delivery or return filter with $\beta_{10\,(c)} \geq 75$ is suggested.

A degree of maximum fluid contamination according to ISO 4406:1999 class 18/16/13 is recommended for optimum endurance of the pump. Hence, the use of a filter with $\beta_{10\,(c)} \geq 100$ is recommended.

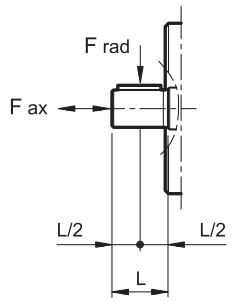
In the event that the filter is installed on the suction line, be sure that the pressure at the pump inlet is not lower than the values specified in the table of paragraph 3.

The suction filter must be equipped with a by-pass valve and, if possible, with a clogging indicator and should be oversized to avoid cavitation problems.

3 - PERFORMANCES (measured with mineral oil with viscosity of 36 cSt at 50°C)

PUMP SIZE		029	046	073	087
Maximum displacement	cm^3/rev	29	46	73	87
Maximum flow rate: - at 1500 rpm - at max rotation speed	l/min	43,5 87	69 119,6	109,5 160,5	131,9 162,6
Input pressure (absolute): - min - max	bar (abs)	0,8 25			
Max. delivery pressure (absolute): - continuous - intermittent (**NOTE 1**) - peak		280 315 350			250 280 315
Max pressure on drainage port	bar (abs)	2			
Maximum power (Δp = 280 bar): - at 1500 rpm - at max rotation speed	kW	20,3 40,6	32,2 55,8	51,1 74,9	54,9 67,8
Max velocity at maximum displacement	rpm	3000	2600	2200	1850
Moment of inertia on the shaft	kgm^2	0,0020	0,0030	0,0080	0,0080
Max absorbed torque: - Δp = 100 bar - Δp = 280 bar	Nm	46,2 129,3	73,2 205	116,2 325,3	139,9 349,8
Max operating pressure with NBR seals - minimum - continuous - peak	°C	-25 80 100			
Max operating pressure with Viton seals - minimum - continuous - peak	°C	-10 110 125			
Oil volume in the pump body	lt	0,7	0,9	1,5	1,5

NOTE 1: Allowed intermittent duty pressures with a duration equal to 6 seconds per minute.

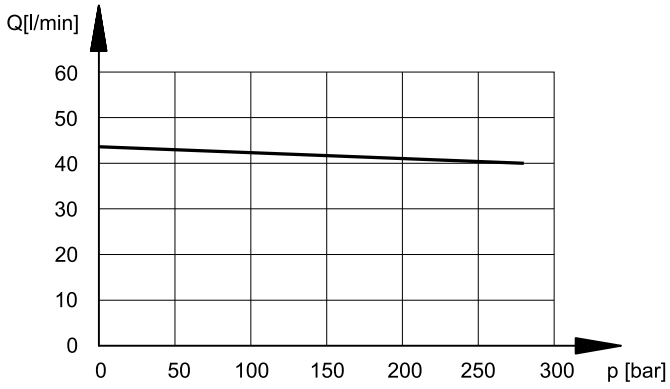


Loads on the shaft: - axial load (F_{ax}) - radial load (F_{rad})	N	1000 1500	1500 1500	2000 3000	2000 3000

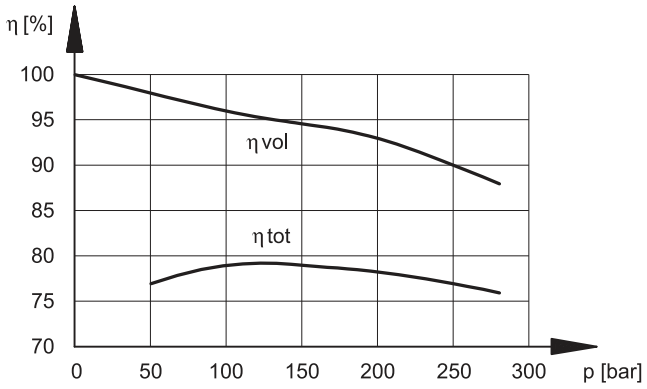
4 - VPPM-029 PUMP CHARACTERISTIC CURVES (values obtained with mineral oil with viscosity of 36 cSt at 50°C)

The diagram curves were measured with a pump rotation speed of 1500 rpm.

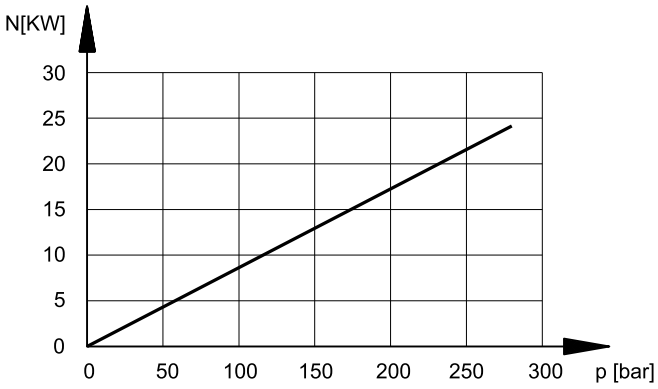
FLOW RATE/PRESSURE CURVES



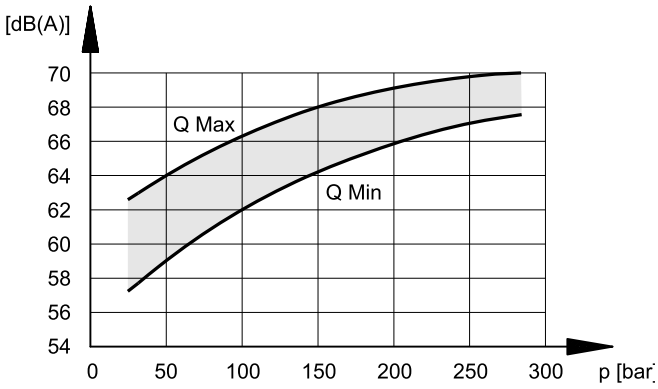
VOLUMETRIC AND TOTAL EFFICIENCY



ABSORBED POWER



NOISE LEVEL

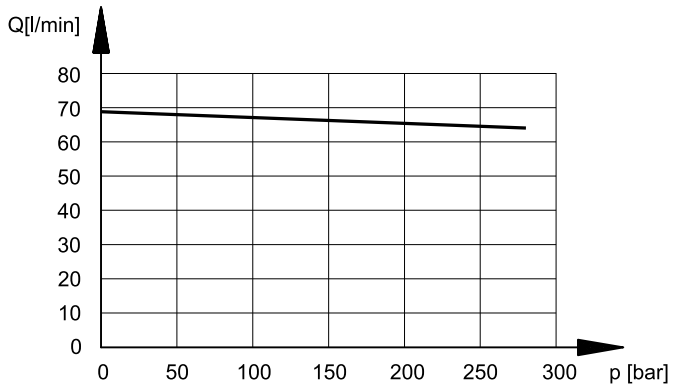


The noise pressure levels were measured in a semi-anechoic chamber, at a distance of 1 m from the pump and with a tolerance of ± 2 dB(A). The values shown must be reduced by 5 dB(A) if they are to be considered in a completely anechoic room.

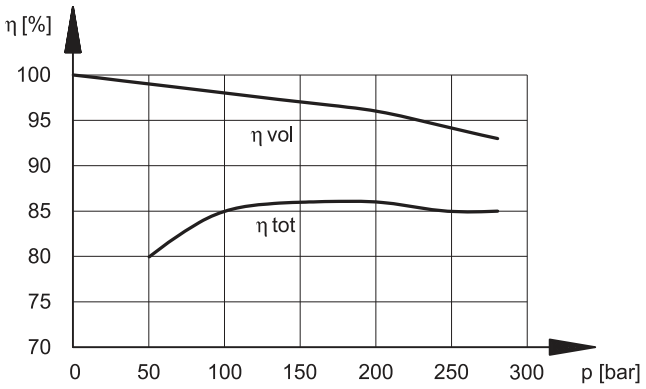
5 - VPPM-046 PUMP CHARACTERISTIC CURVES (values obtained with mineral oil with viscosity of 36 cSt at 50°C)

The diagram curves were measured with a pump rotation speed of 1500 rpm.

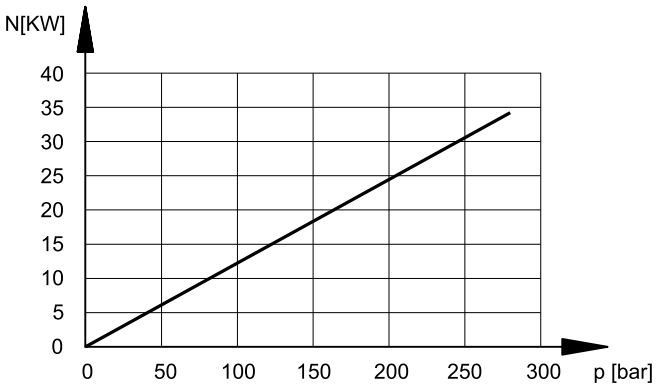
FLOW RATE/PRESSURE CURVES



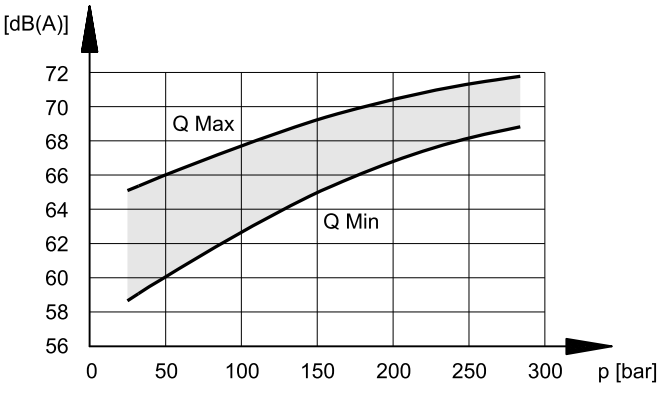
VOLUMETRIC AND TOTAL EFFICIENCY



ABSORBED POWER



NOISE LEVEL

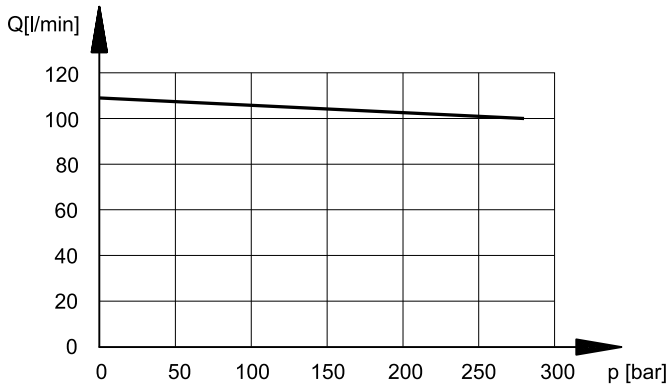


The noise pressure levels were measured in a semi-anechoic chamber, at a distance of 1 m from the pump and with a tolerance of ± 2 dB(A). The values shown must be reduced by 5 dB(A) if they are to be considered in a completely anechoic room.

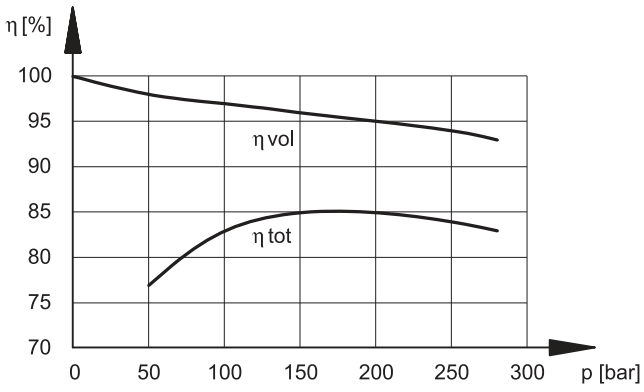
6 - VPPM-073 PUMP CHARACTERISTIC CURVES (values obtained with mineral oil with a viscosity of 36 cSt at 50°C)

The diagram curves were measured with a pump rotation speed of 1500 rpm.

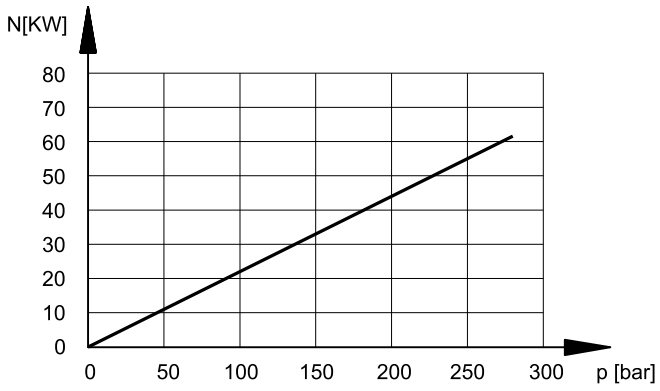
FLOW RATE/PRESSURE CURVES



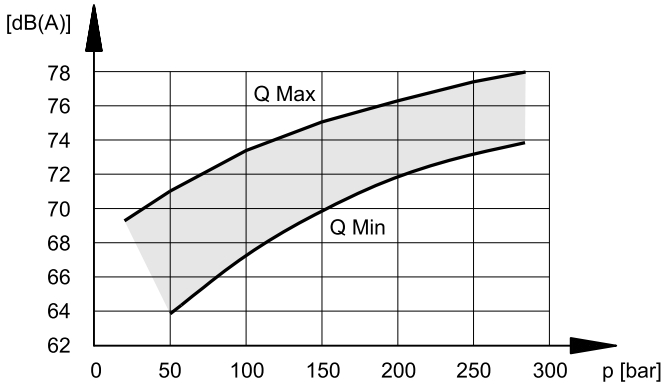
VOLUMETRIC AND TOTAL EFFICIENCY



ABSORBED POWER



NOISE LEVEL

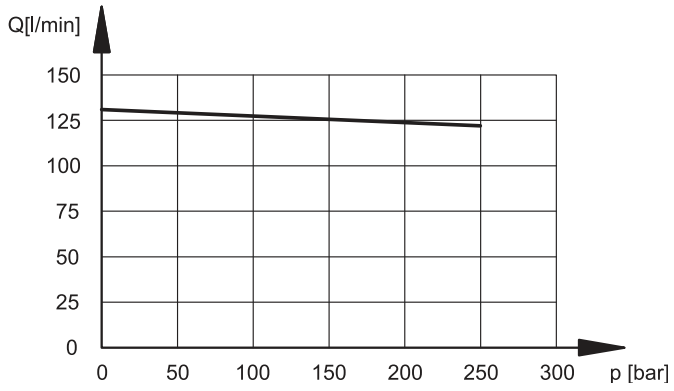


The noise pressure levels were measured in a semi-anechoic chamber, at a distance of 1 m from the pump and with a tolerance of ± 2 dB(A). The values shown must be reduced by 5 dB(A) if they are to be considered in a completely anechoic room.

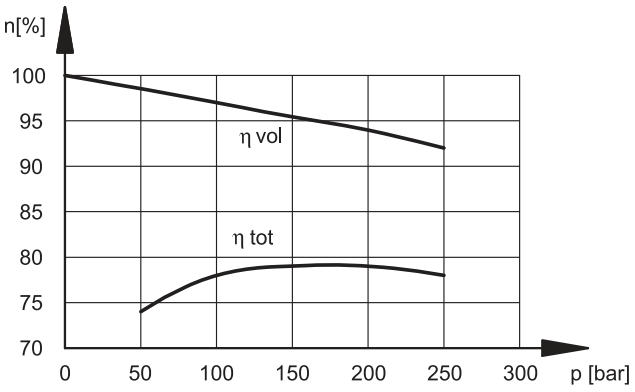
7 - VPPM-087 PUMP CHARACTERISTIC CURVES (values obtained with mineral oil with viscosity of 36 cSt at 50°C)

The diagram curves were measured with a pump rotation speed of 1500 rpm.

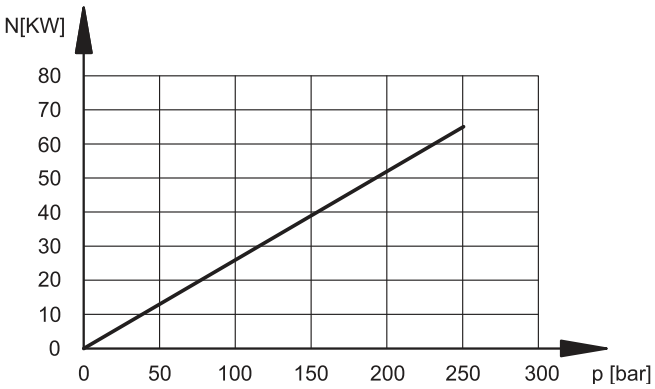
FLOW RATE/PRESSURE CURVES



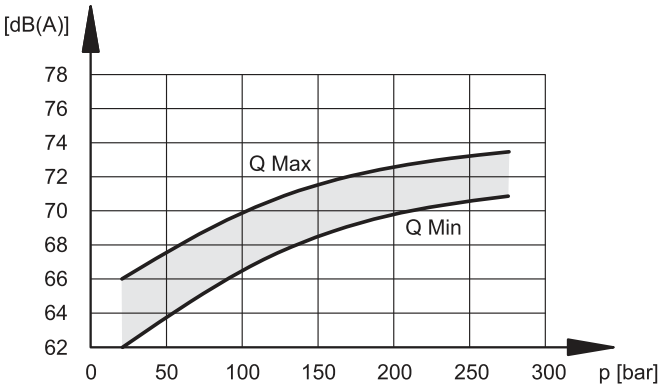
VOLUMETRIC AND TOTAL EFFICIENCY



ABSORBED POWER



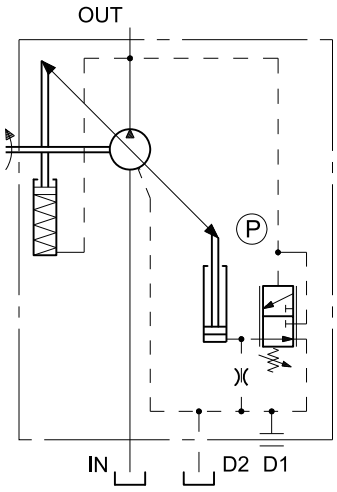
NOISE LEVEL



The noise pressure levels were measured in a semi-anechoic chamber, at a distance of 1 m from the pump and with a tolerance of ± 2 dB(A). The values shown must be reduced by 5 dB(A) if they are to be considered in a completely anechoic room.

8 - PRESSURE REGULATOR: PC

FUNCTIONAL DIAGRAM



The PC pressure regulator keeps the pressure at a constant set level in the circuit, thus adjusting automatically the pump flow rate according to the real need of the system.
The desired pressure can be set by manually adjusting the (P) regulation valve.

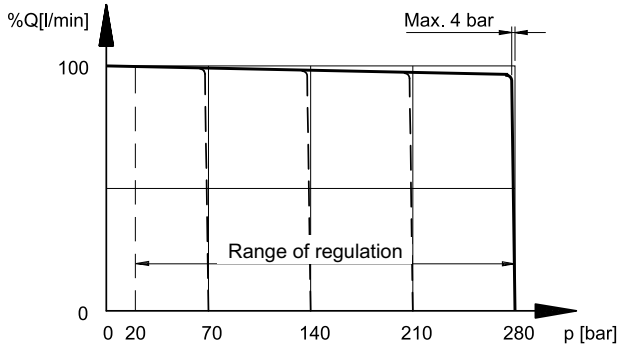
FEATURES OF THE PC REGULATOR:

- pressure regulating range (P) = 20 ÷ 350 bars
- default setting (P) = 280 bars

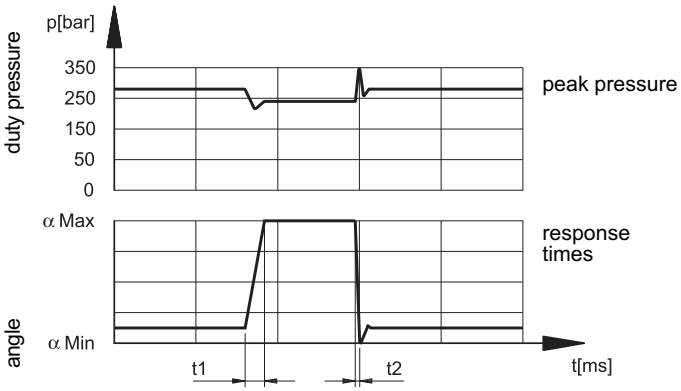
8.1 - Characteristic curves of the PC regulator (values obtained with mineral oil with a viscosity of 36 cSt at 50°C)

The diagram curves were measured with a pump rotation speed of 1500 rpm and an oil temperature of 50°C.

FLOW RATE/PRESSURE FEATURE



RESPONSE TIMES AND PEAK PRESSURE



t1 = response time for a change from a min. to a max. displacement.
t2 = response time for a change from a max. to a min. displacement.

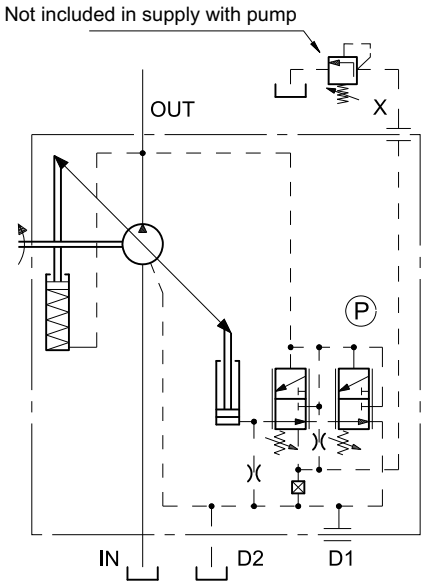
PC pressure regulator set at 280 bars

pump size	t1 [ms]	t2 [ms]
029	30	20
046	45	25
073	50	30
087	53	28

The values stated in the table are obtained from the opening until the instant the delivery level is achieved, by using a maximum pressure valve set at 350 bars for a load simulation, placed at a distance of 1 m from the pump delivery port.

9 - REMOTE-CONTROLLED PRESSURE REGULATOR: PCR

FUNCTIONAL DIAGRAM



The PCR regulator, apart from limiting the line maximum pressure (P valve), allows a remote-control of the device via a remote control connected to the X port (typical application for submerged pumps). In case a pressure regulating valve is used for the remote-control, it is suggested to use a direct operated valve with a size suitable to 1,5 l/min pilot flow rate.

N.B. The maximum length of the connection between the valve and the pump X port must not be longer than 2 m.

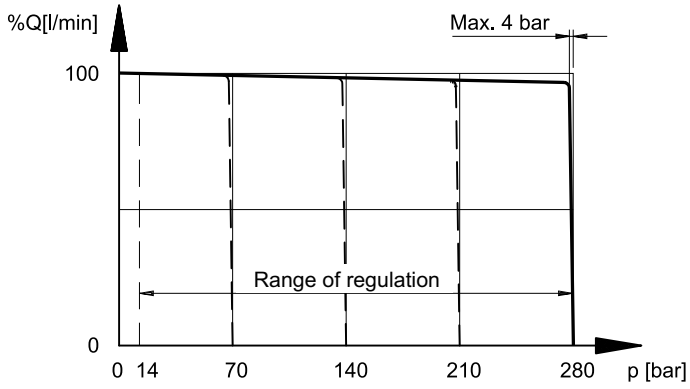
PCR FEATURES:

- pressure regulating range (P) = 20 ÷ 350 bars
- default setting (P) = 280 bars
- remote-regulated pressure range = 14 ÷ 315 bars
- flow rate available on the X port for the remote-control = about 1,5 l/min

9.1- Characteristic curves of the PCR regulator (values obtained with mineral oil with a viscosity of 36 cSt at 50°C)

The diagram curves were measured with a pump rotation speed of 1500 rpm and an oil temperature of 50°C.

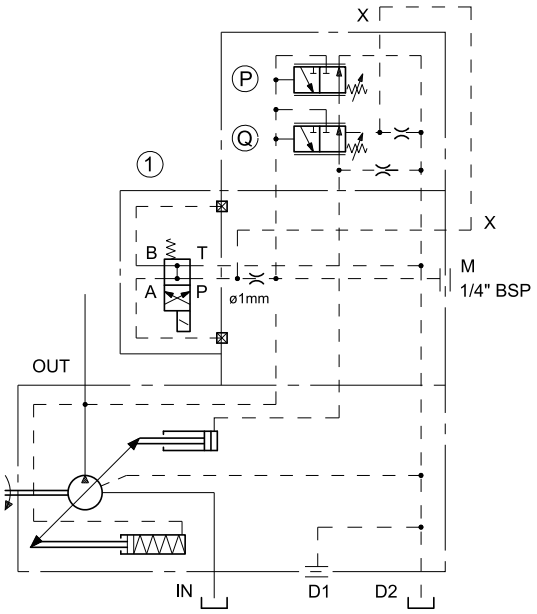
FLOW RATE / PRESSURE FEATURE



10 - REGULATOR WITH PRESSURE CONTROL DEVICES: PCX

10.1 - Electrical unloading

FUNCTIONAL DIAGRAM



The PCX regulator, mated to a suitable two-position solenoid valve, allows the electrical switching of the pump displacement in null condition and with minimum delivery pressure.

This function is useful for the pump unloading at the start-up or to operate at minimum pressure in the system during the machine cycle pause, with considerable energy saving.

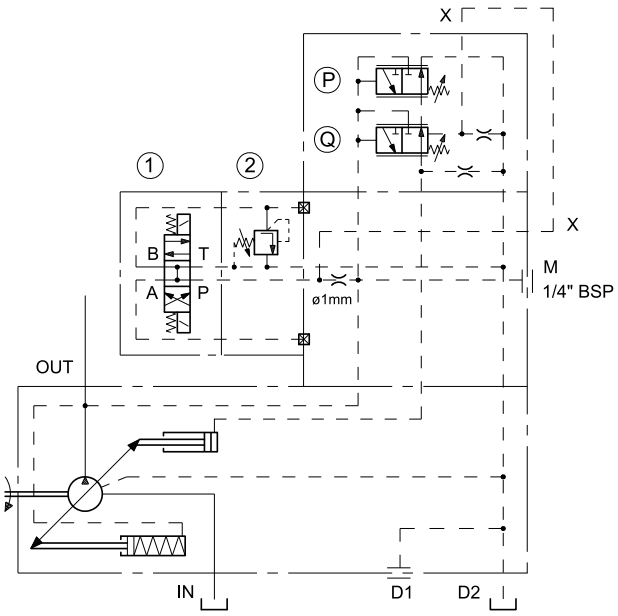
The pressure switching is made by means of a solenoid valve (to be ordered separately) installed on the pump regulator directly.

PCX FEATURES (electrical unloading):

- solenoid switching valve (1) = DS3-SA2 (to be ordered separately see cat. 41 150)
- solenoid valve OFF = pump at null displacement and delivery pressure = 20 bar
- solenoid valve ON = maximum displacement and delivery pressure set on regulator (P).
- pressure regulating range (P) = 20 ÷ 350 bar
- default setting (P) = 280 bar

10.2 - Two pressure settings + unloading

FUNCTIONAL DIAGRAM



This type of regulator allows to select, by means of a three-position solenoid valve, two different working pressures; it allows also the pump unloading.

The solenoid valve (1) and the relief valve (2) for the intermediate pressure setting are directly installed on the pump regulator and they are to be ordered separately.

PCX FEATURES (two pressure settings + unloading):

- solenoid switching valve (1) = DS3-S2 (to be ordered separately see catalogue 41 150)
- solenoid valve OFF = pump unloading - delivery pressure = 20 bar
- solenoid side “a” ON = maximum displacement and delivery pressure set on relief valve (2) (intermediate value)
- solenoid side “b” ON = maximum displacement and delivery pressure set on regulator (P) (maximum value)

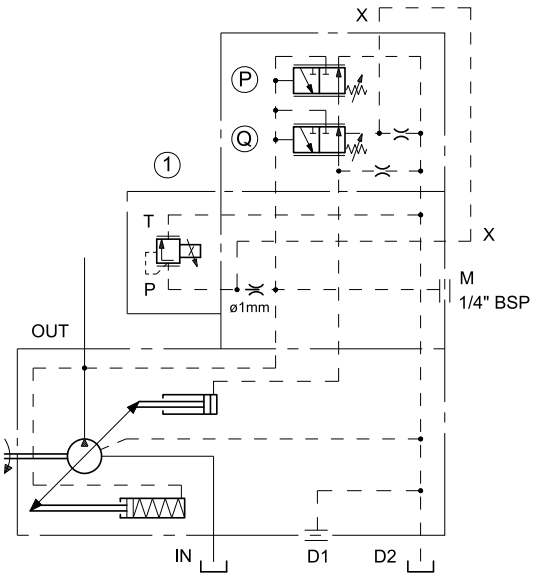
- pressure relief valve (2) = MCD*-SBT (to be ordered separately - see cat. 61 200)
- pressure regulating range (2) = MCD3-SBT 20 ÷ 100 bar
  MCD5-SBT 20 ÷ 250 bar

- pressure regulating range (P) = 20 ÷ 350 bar
- default setting (P) = 280 bar

NOTE: For PCX regulators characteristic curves (with two pressure settings + unloading functions), see PC regulator diagrams at paragraph 8.1.

10.3 - Pressure regulation with electric proportional control

FUNCTIONAL DIAGRAM



The PCX regulator mated with a proportional pressure relief valve, allows a continuous control and modulation of the system pressure.

The proportional pressure relief valve (to be ordered separately) is installed on the pump regulator directly.

PCX FEATURES (proportional pressure regulation):

- pressure regulating range (P) = 20 ÷ 350 bar
- default setting (P) = 280 bar

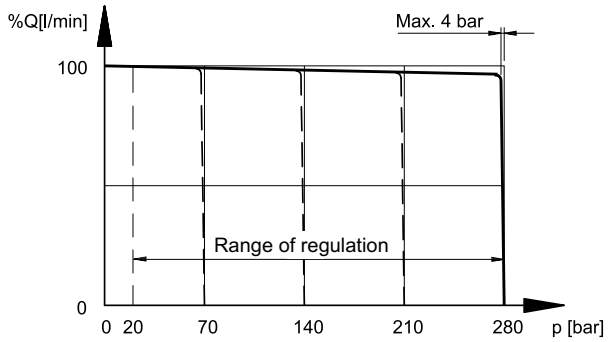
- proportional pressure relief valve (1) = PRED3 (to be ordered separately with its relative electronic control unit - see catalogue 81 210)
- proportional pressure regulating range:
  PRED3-070 20 ÷ 100 bar
  PRED3-210 20 ÷ 240 bar

Hysteresis = < 5% of p nom
Repeatability = < ± 1,5% of p nom

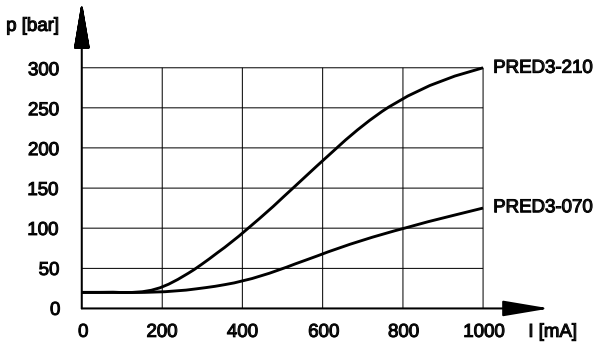
10.3.1 - Characteristic curves (values obtained with mineral oil with a viscosity of 36 cSt at 50°C)

The diagram curves were measured with a pump rotation speed of 1500 rpm and an oil temperature of 50°C.

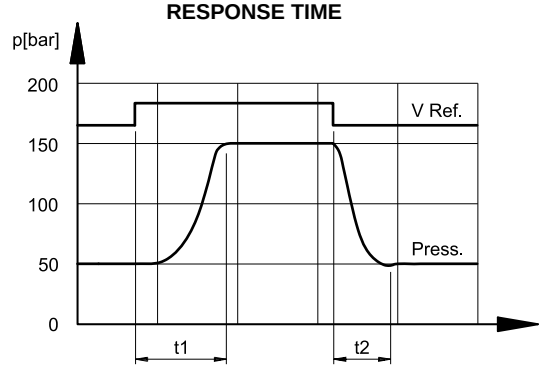
FLOW RATE / PRESSURE FEATURE



CURRENT / PRESSURE FEATURE



RESPONSE TIME

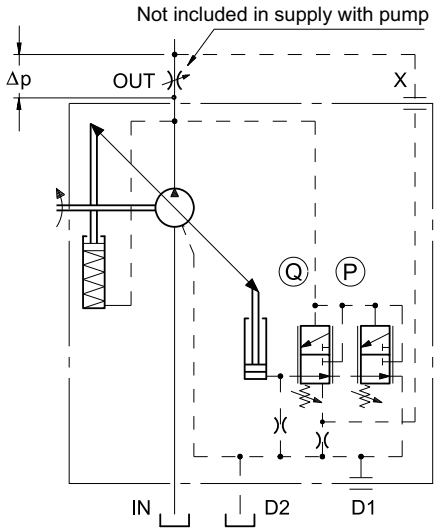


The response times are obtained with a VPPM-046 pump, by changing the reference signal (V Ref) on the proportional valve in order to have a line pressure variation from 50 to 150 bar and vice versa, with an oil volume of 5 lt.

t1 = 80 ms (response time for an increasing pressure change)
t2 = 60 ms (response time for a decreasing pressure change)

11 - FLOW RATE AND PRESSURE REGULATOR: PQC

FUNCTIONAL DIAGRAM



This regulator, apart from regulating the pressure (as for the PC model), allows the pump flow rate to be regulated according to the Δp pressure drop measured on either side of a throttle valve installed on the user line. The connection pipe between the X port and the flow line downstream the restrictor (or valve) must always be made (customer charge).

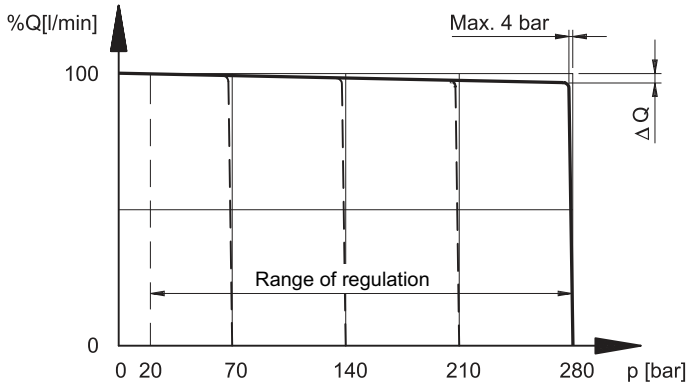
PQC FEATURES:

- pressure regulating range (P) = 20 ÷ 350
- default setting (P) = 280 bar
- differential pressure regulating range (Q) = 10 ÷ 40 bars
- default setting = 14 bar
- Min. discharge head = 18 ± 2 bar
  (with a zero flow rate, X discharge pilot and with a default (Q) setting of the differential regulator)

11.1 - Characteristic curves of the PQC regulator (values obtained with mineral oil with a viscosity of 36 cSt at 50°C)

The diagram curves were measured with a pump rotation speed of 1500 rpm and an oil temperature of 50°C.

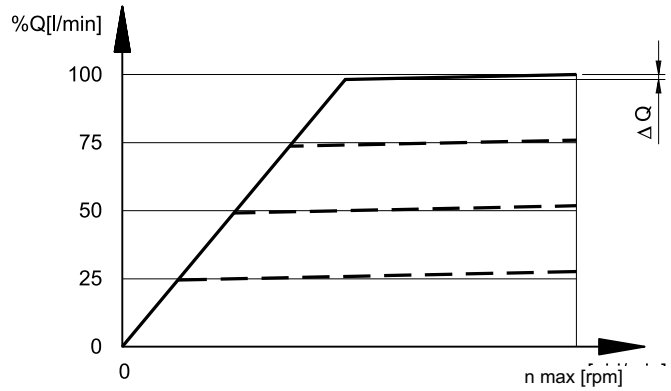
FLOW RATE / PRESSURE FEATURE



Flow variation between minimum and maximum pressure with pump set at max displacement

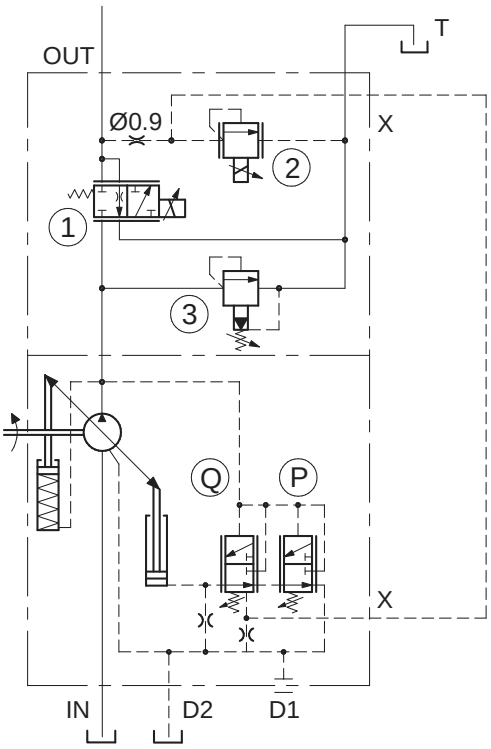
pump size	ΔQ max [l/min]
029	0.9
046	1.7
073	2.5
087	2.5

FLOW RATE / ROTATION SPEED STATIC FEATURE



12 - INTEGRATED PROPORTIONAL FLOW AND PRESSURE CONTROL REGULATOR: PQCE5

FUNCTIONAL DIAGRAM



This regulator allows an independent regulation of the pump flow and pressure, both with an electric proportional control.

The pump flow is regulated through the proportional valve (1) which operates directly on the pump delivery, while the system pressure is controlled by means of the proportional relief valve (2) working as a pilot stage of the differential regulator (Q).

The maximum system pressure is limited by the regulator (P). The regulator is also equipped of a built-in pressure relief valve (3) with manual adjustment, which limits the pressure peak due to quick flow variations in the system.

PQCE5 FEATURES

- pressure regulating range (P) = 20 ÷ 350 bar
- default setting (P) = 280 bar

- differential pressure regulating range (Q) = 10 ÷ 30 bar
- default setting = 16 bar

- proportional pressure regulating range:
  20 ÷ 250 bar (for VPPM-*PQCE5 pump)

- proportional flow regulating range:
  0 ÷ 69 l/min (for VPPM-046 PQCE5 pump)
  0 ÷ 109,5 l/min (for VPPM-073 PQCE5 pump)
  0 ÷ 132 l/min (for VPPM-073 PQCE5 pump)

PERFORMANCES and ELECTRICAL CHARACTERISTICS

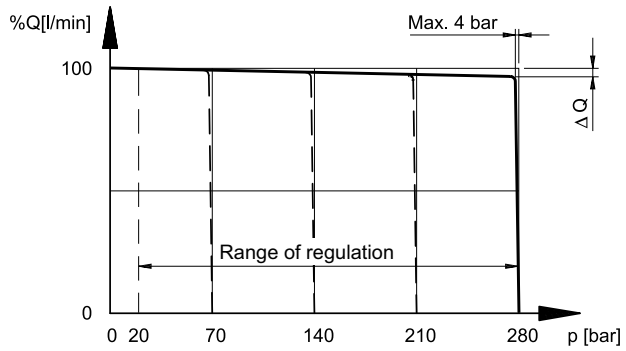
	FLOW REGULATION (1) (DSE5 valve)	PRESSURE REGULATION (2) (CRE valve)
HYSTERESIS	< 6% of Q max	< 5% of p nom
REPEATABILITY	< ±1,5% of Q max	< ±1,5% of p nom
NOMINAL VOLTAGE	24 VDC	24 VDC
COIL RESISTANCE (at 20°C)	8,65 Ω	16,6 Ω
MAXIMUM CURRENT	1,6 A	0,85 A
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2004/108/CEE	
DEGREE OF PROTECTION : Atmospheric agents (CEI EN 60529)	IP 65	
ELECTRONIC CONTROL UNITS for proportional valves	EDM-M3312 see cat. 89 250	

12.1 - Characteristic curves of the PQCE5 regulator

(values obtained with mineral oil with a viscosity of 36 cSt at 50°C)

The diagram curves were measured with a pump rotation speed of 1500 rpm and an oil temperature of 50°C.

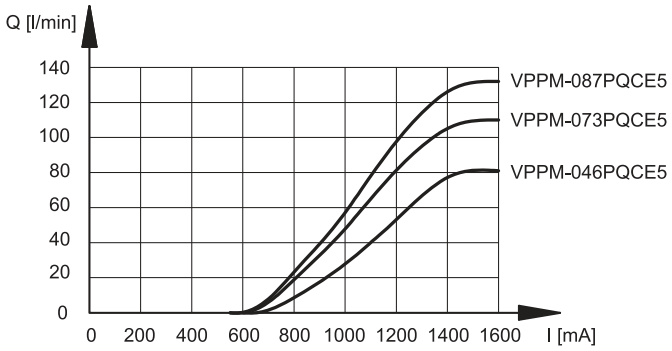
FLOW RATE / PRESSURE CURVE



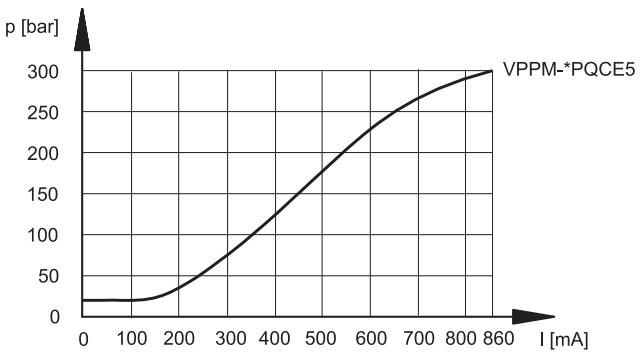
Flow variation
between minimum and maximum pressure
with pump set at max displacement

pump size	ΔQ max [l/min]
046	1.7
073	2.5
087	2.5

CURRENT / FLOW CURVE

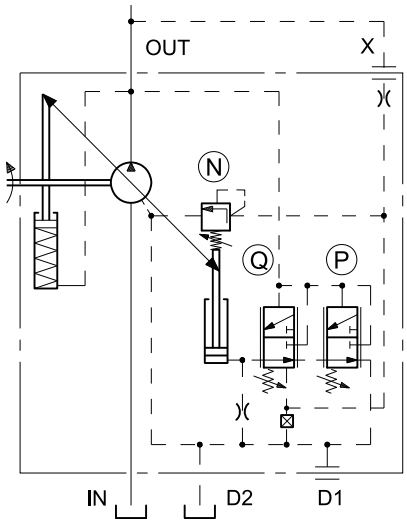


CURRENT / PRESSURE CURVE



13 - POWER REGULATOR: PQNC

FUNCTIONAL DIAGRAM



Such regulator keeps the pump torque at a constant level by changing the displacement according to the delivery pressure, so that the ratio p x (Q) (absorbed power) remains unchanged. The functions limiting the (P) maximum pressure and regulating the (Q) flow rate are always present, if a restrictor has been installed on the user line.

In the 1/8" BSP coupling supplied for the X port, there is a restrictor of Ø0,8 orifice.

Note: The connection pipe between the X port and the pump outlet must always be made (customer charge).

PQNC FEATURES:

- pressure regulating range (P) = 20 ÷ 350
- default setting (P) = 280 bar

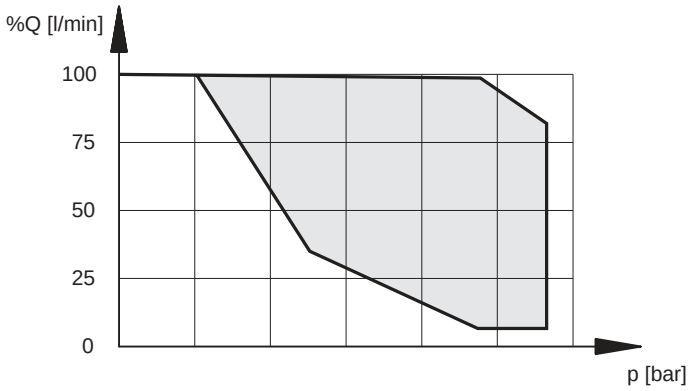
- differential pressure regulating range (Q) = 10 ÷ 30 bar
- default setting = 16 bar

- min. discharge head = 18 ± 2 bar
  (with a zero flow rate, X discharge pilot and with a default Q setting of the differential regulator)
- the power regulator is factory set. The setting value has to be specified with the order, by stating into the identification code the Nm torque value (see paragraph 1).
- Start of the regulation: looking at values table of paragraph 1.5

13.1 - Characteristic curves of the PQNC regulator (values obtained with mineral oil with a viscosity of 36 cSt at 50°C)

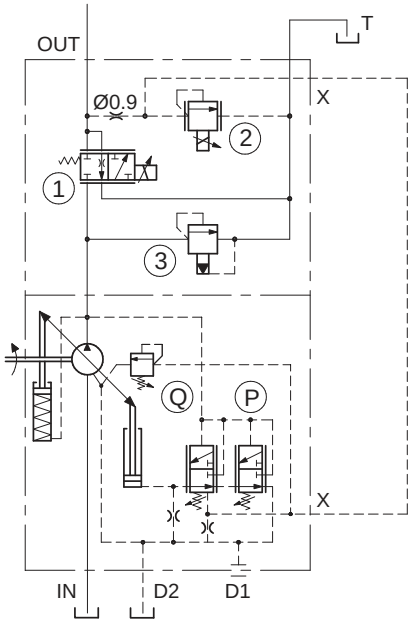
The diagram curves were measured with a pump rotation speed of 1500 rpm and an oil temperature of 50°C.

FLOW RATE / PRESSURE CURVE



14 - POWER REGULATOR WITH INTEGRATED PROPORTIONAL FLOW AND PRESSURE CONTROL: PQNCE5

FUNCTIONAL DIAGRAM



This system combines all the functions of the constant power control as a standard PQNC5 regulator, and moreover it allows the independent proportional regulation of the pump flow and pressure at values behind the power curve characteristic set on the regulator (N).

PQNCE5 FEATURES

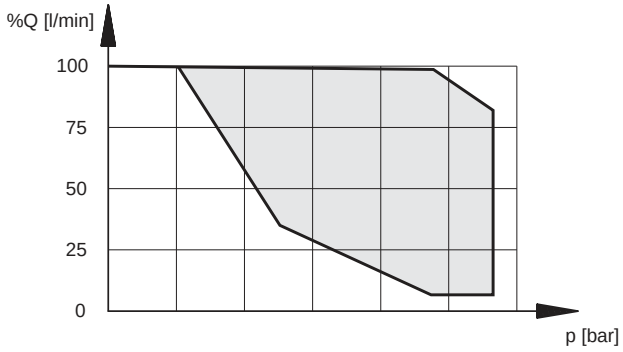
For technical characteristics and settings of regulator, see paragraph 13.

14.1 - Characteristic curves of the PQNCE5 regulator

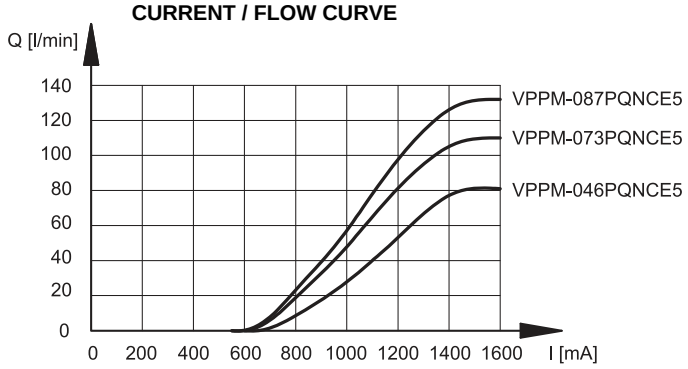
(values obtained with mineral oil with viscosity of 36 cSt at 50°C with driver EDM-M3312)

The diagram curves were measured with a pump rotation speed of 1500 rpm and an oil temperature of 50°C.

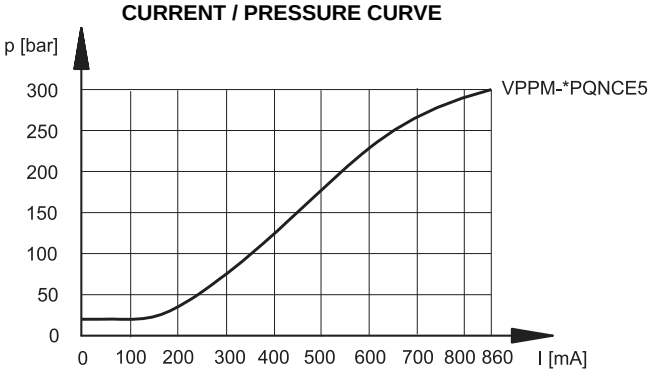
FLOW RATE / PRESSURE CURVE



CURRENT / FLOW CURVE

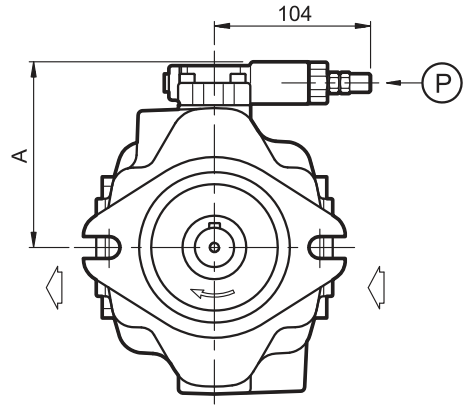


CURRENT / PRESSURE CURVE



15 - REGULATOR OVERALL DIMENSIONS

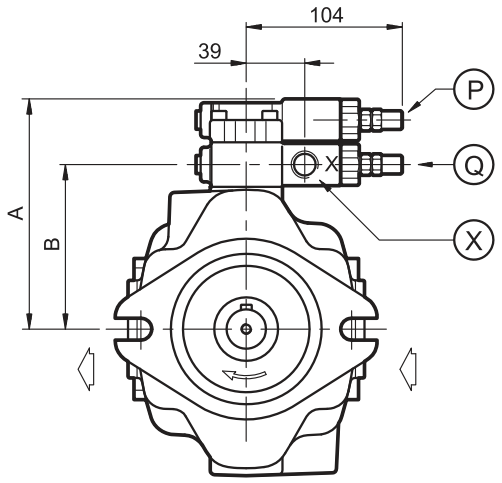
dimensions in mm



PRESSURE REGULATOR PC

pump size	A [mm]
029	114
046	123
073 / 087	136

P	Pressure regulator countersunk hex adjustment screw: spanner 4 Clockwise rotation to increase pressure Locknut: spanner 13

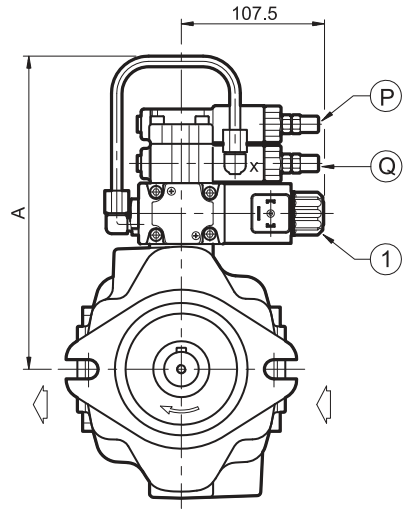


REMOTE-CONTROLLED PRESSURE REGULATOR PCR

pump size	A [mm]	B [mm]
029	144	100
046	153	109
073 / 087	165	122

P	Pressure regulator countersunk hex adjustment screw: spanner 4 Clockwise rotation to increase pressure Locknut: spanner 13
Q	Differential pressure regulator countersunk hex adjustment screw: spanner 4 Clockwise rotation to increase differential pressure Locknut: spanner 13
X	Pilot port for remote control X: 1/8” BSP

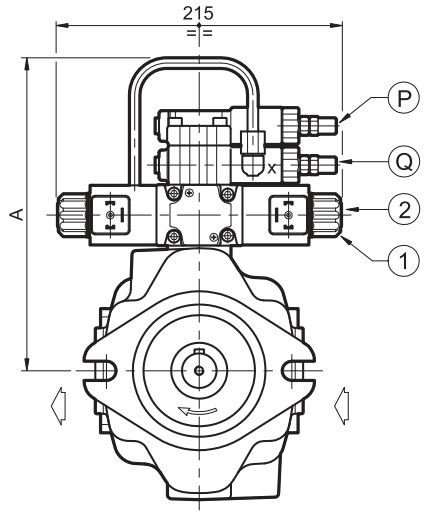
dimensions in mm



PCX REGULATOR WITH ELECTRICAL UNLOADING

pump size	A [mm]
029	244
046	253
073 / 087	265

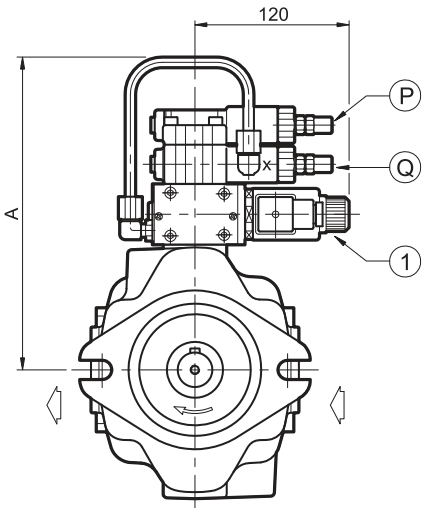
P	Pressure regulator countersunk hex adjustment screw: spanner 4 Clockwise rotation to increase pressure Locknut: spanner 13
Q	Differential pressure regulator countersunk hex adjustment screw: spanner 4 Clockwise rotation to increase differential pressure Locknut: spanner 13
1	Solenoid switching valve type DS3-SA2



PCX REGULATOR WITH TWO PRESSURE SETTINGS + UNLOADING

pump size	A [mm]
029	244
046	253
073 / 087	265

P	Pressure regulator countersunk hex adjustment screw: spanner 4 Clockwise rotation to increase pressure Locknut: spanner 13
Q	Differential pressure regulator countersunk hex adjustment screw: spanner 4 Clockwise rotation to increase differential pressure Locknut: spanner 13
1	Solenoid switching valve type DS3-S2
2	Relief valve for the intermediate pressure setting MCI*-SBT

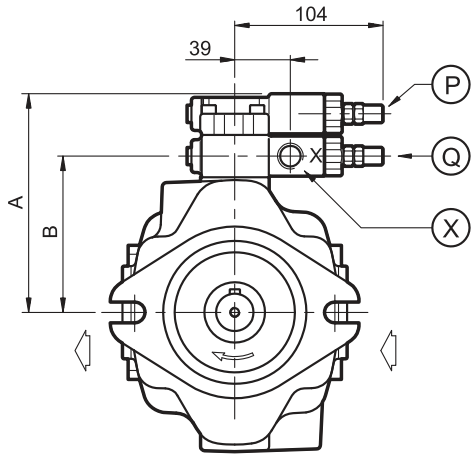


PCX REGULATOR FOR PRESSURE REGULATION WITH ELECTRIC PROPORTIONAL CONTROL

pump size	A [mm]
029	244
046	253
073 / 087	265

P	Pressure regulator countersunk hex adjustment screw: spanner 4 Clockwise rotation to increase pressure Locknut: spanner 13
Q	Differential pressure regulator countersunk hex adjustment screw: spanner 4 Clockwise rotation to increase differential pressure Locknut: spanner 13
1	Proportional pressure relief valve PRED3 type

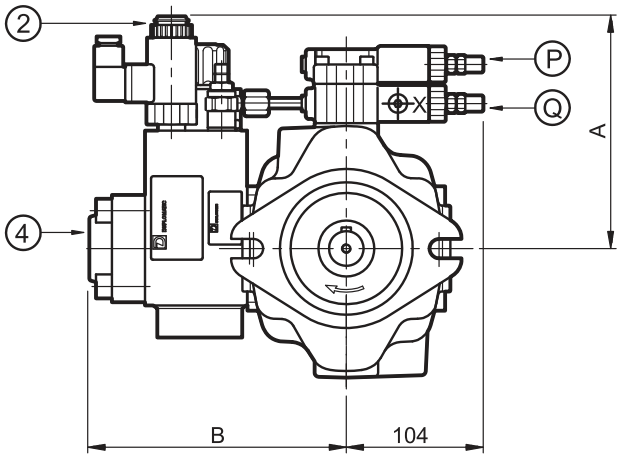
dimensions in mm



FLOW RATE AND PRESSURE REGULATOR PQC

pump size	A [mm]	B [mm]
029	144	100
046	153	109
073 / 087	165	122

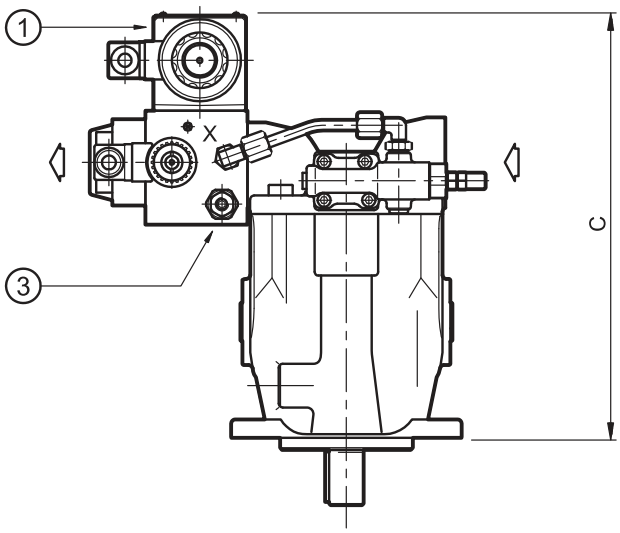
P	Pressure regulator countersunk hex adjustment screw: Spanner 4 Clockwise rotation to increase pressure Locknut: spanner 13
Q	Differential pressure regulator countersunk hex adjustment screw: spanner 4 Clockwise rotation to increase differential pressure Locknut: spanner 13
X	Pilotage port X: 1/8” BSP (see paragraph 11)



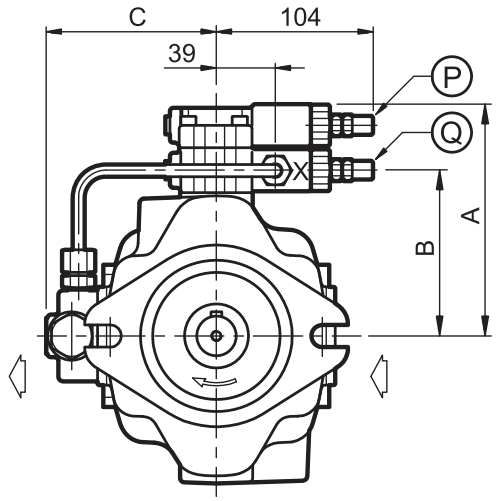
PQCE REGULATOR WITH INTEGRATED PROPORTIONAL FLOW AND PRESSURE CONTROL

pump size	A [mm]	B [mm]	C [mm]
046	175	194	337
073 / 087	181	207	345

P	Pressure regulator countersunk hex adjustment screw: Spanner 4 Clockwise rotation to increase pressure Locknut: spanner 13
Q	Differential pressure regulator countersunk hex adjustment screw: spanner 4 Clockwise rotation to increase differential pressure Locknut: spanner 13
1	Proportional flow control valve type: DSE5-P070B - DSE5-P110SB
2	Proportional pressure valve type: CRE-250
3	Safety pressure relief valve
4	Delivery port SAE 6000 flange 1” for VPPM-046 - 1 ¼” for VPPM-073 and -087



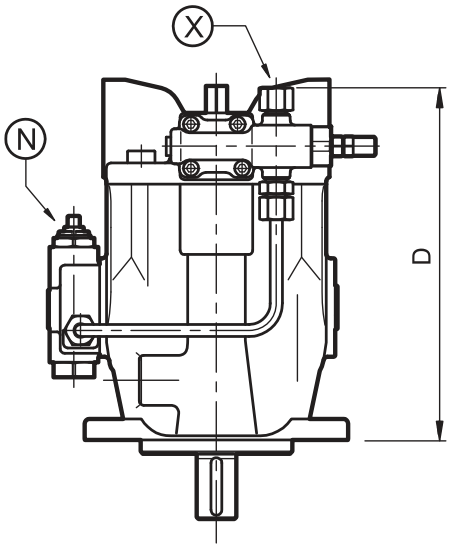
dimensions in mm



POWER REGULATOR PQNC

pump size	A [mm]	B [mm]	C [mm]	D [mm]
029	144	100	104	211
046	153	109	111	235
073 / 087	165	122	120	258

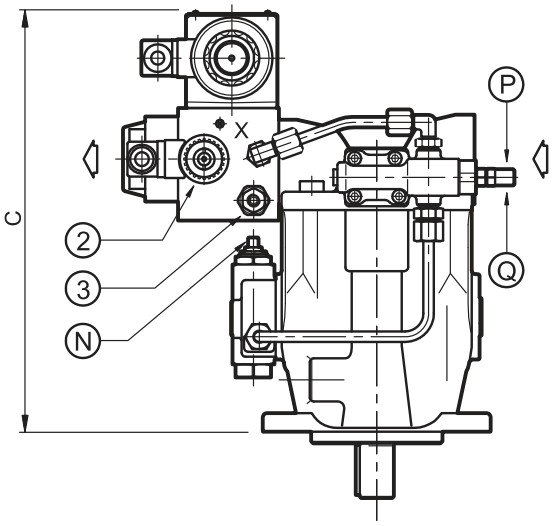
P	Pressure regulator countersunk hex adjustment screw: spanner 4 Clockwise rotation to increase pressure Locknut: spanner 13
Q	Differential pressure regulator countersunk hex adjustment screw: spanner 4 Clockwise rotation to increase differential pressure Locknut: spanner 13
X	Pilotage port X: 1/8" BSP (restrictor with Ø0,8 orifice included - see paragraph 13)
N	Power regulator

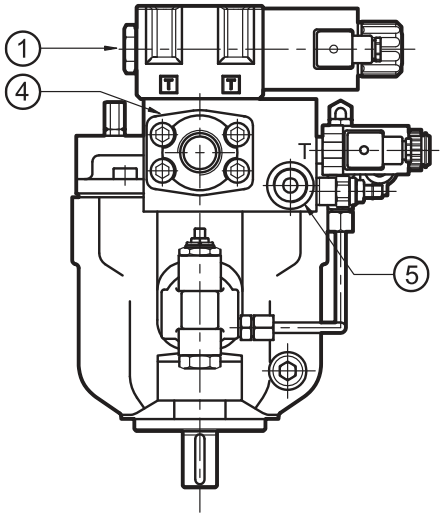


POWER REGULATOR WITH INTEGRATED PROPORTIONAL FLOW AND PRESSURE CONTROL PQNCE5

(for dimensions see PQCE5 page 22)

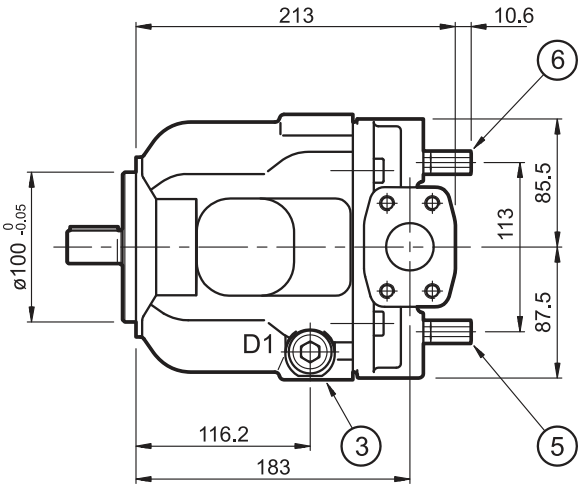
P	Pressure regulator countersunk hex adjustment screw: spanner 4. Clockwise rotation to increase pressure Locknut: spanner 13
Q	Differential pressure regulator countersunk hex adjustment screw: spanner 4 Clockwise rotation to increase differential pressure Locknut: spanner 13
N	Power regulator
1	Proportional flow control valve type: DSE5-P070SB - DSE5-P110SB
2	Proportional pressure control valve type: CRE-250
3	Safety pressure relief valve
4	Delivery port SAE 6000 flange: 1" for VPPM-046 - 1 ¼" for VPPM-073 and -087
5	Outlet port T: 3/4" BSP

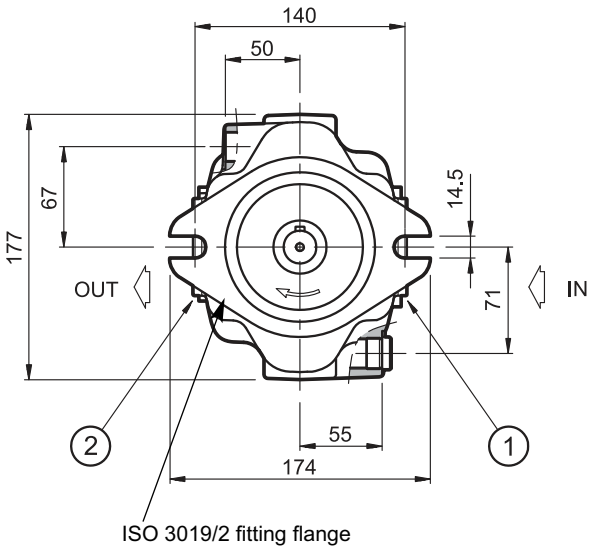




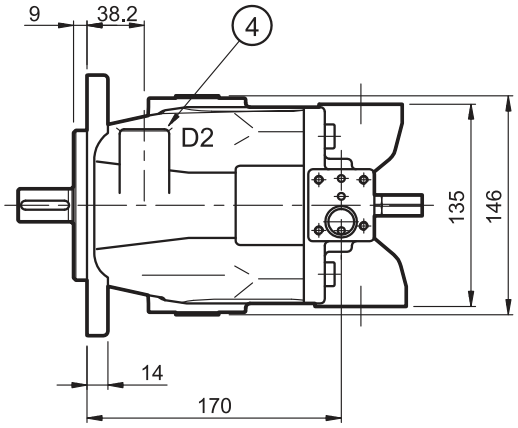
16 - VPPM-029 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



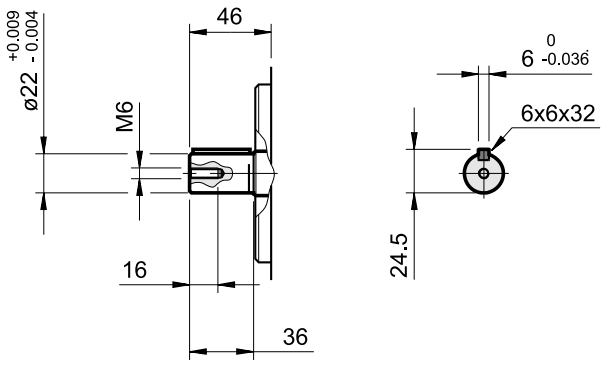


ISO 3019/2 fitting flange
(standard, identification code **5**)



1	Suction port: IN flange SAE 3000 1¼” (for overall dimensions see paragraph 24)
2	Delivery port: OUT flange SAE 6000 3/4” (for overall dimensions see paragraph 24)
3	Additional port drainage D1: 1/2” BSP (closed)
4	Drainage port D2: 1/2” BSP
5	Minimum displacement limit control (**NOTE**) - Locknut: spanner 14 - countersunk hex adjustment screw: spanner 4 - displacement regulation range: 0 ÷ 50 % max. displacement
6	Maximum displacement limit control - Locknut: spanner 14 - countersunk hex adjustment screw: spanner 4 - torque: 10 Nm - displacement regulation range: 100 ÷ 70% max. displacement Δ displacement / screw round = 1,5 cm^3

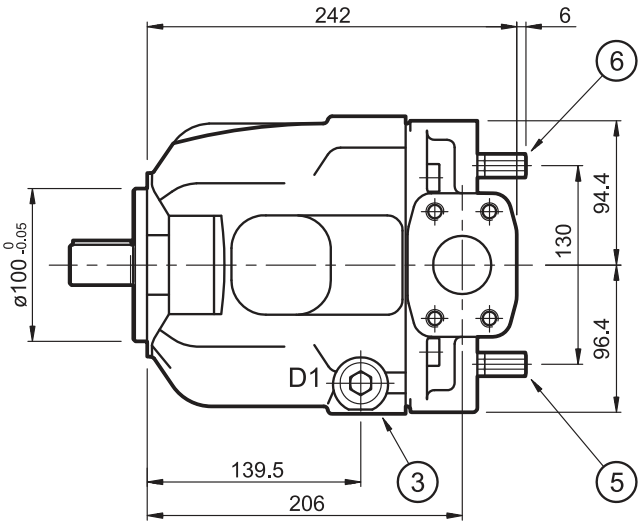
Cylindrical shaft end with ISO 3019/2 key
(standard, identification code **5**)

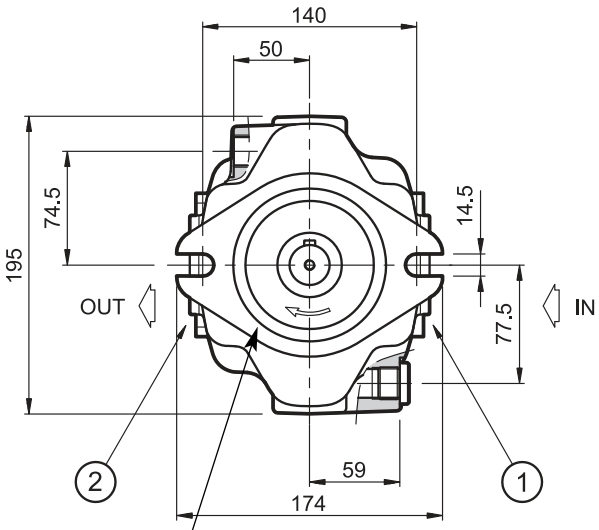


NOTE: The limit control is supplied factory set at zero minimum displacement and is sealed up with red paint.
Any modification of this setting by the user makes the pump unable to reach the null displacement condition.

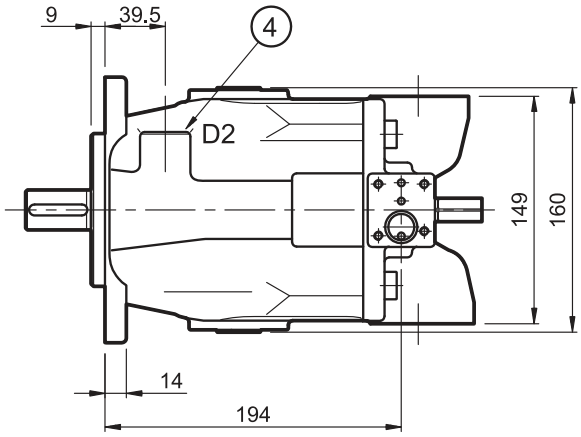
17 - VPPM-046 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



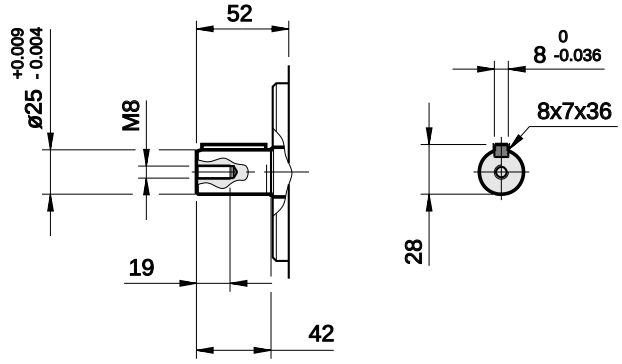


ISO 3019/2 fitting flange
(standard, identification code **5**)



1	Suction port: IN flange SAE 3000 1½” (for overall dimensions see paragraph 24)
2	Delivery port: OUT flange SAE 6000 1” (for overall dimensions see paragraph 24)
3	Additional port drainage D1: 1/2” BSP (closed)
4	Drainage port D2: 1/2” BSP
5	Minimum displacement limit control (**NOTE**) - Locknut: spanner 14 - countersunk hex adjustment screw: spanner 4 - displacement regulation range: 0 ÷ 50 % max. displacement
6	Maximum displacement limit control - Locknut: spanner 14 - countersunk hex adjustment screw: spanner 4 - torque: 10 Nm - displacement regulation range: 100 ÷ 70% max. displacement Δ displacement / screw round = 2,2 cm^3

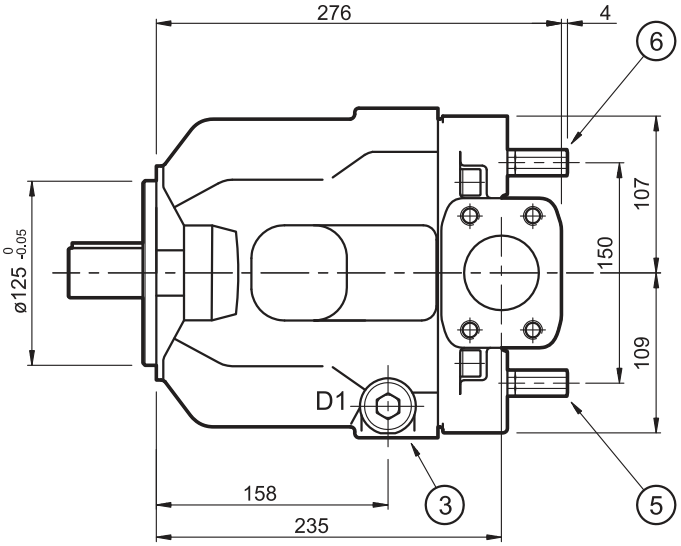
Cylindrical shaft end with ISO 3019/2 key
(standard, identification code **5**)

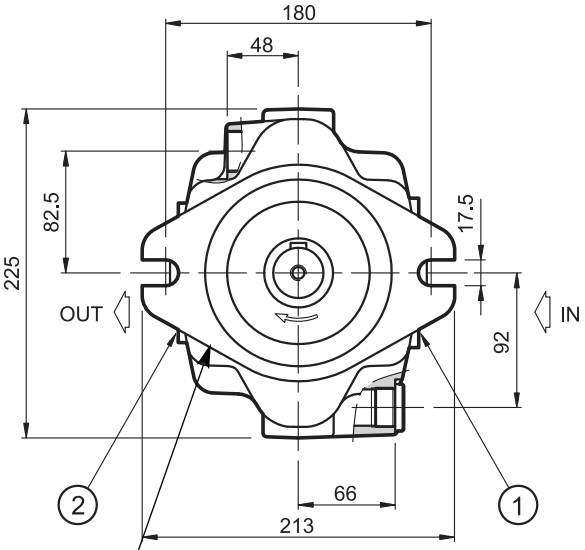


NOTE: The limit control is supplied factory set at zero minimum displacement and is sealed up with red paint.
Any modification of this setting by the user makes the pump unable to reach the null displacement condition.

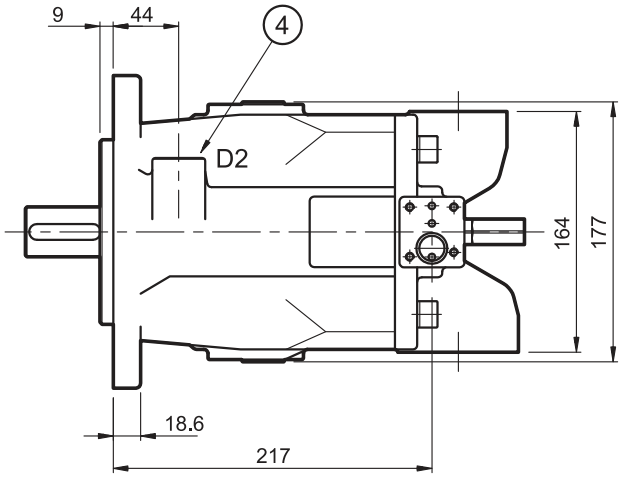
18 - VPPM-073 AND VPPM-087 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

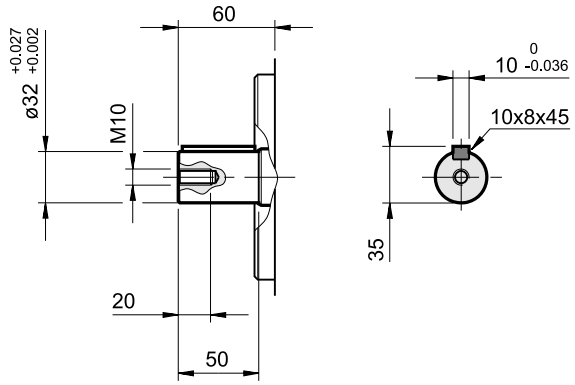




ISO 3019/2 fitting flange
(standard, identification code **5**)



Cylindrical shaft end with ISO 3019/2 key
(standard, identification code **5**)

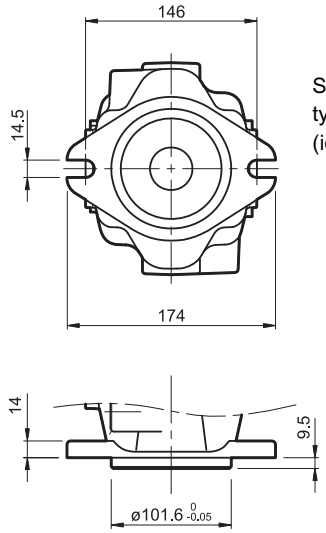


1	Suction port: IN flange SAE 3000 2” (for overall dimensions see paragraph 24)
2	Delivery port: OUT flange SAE 6000 1 ¼” (for overall dimensions see paragraph 24)
3	Additional port drainage D1: 1/2” BSP (closed)
4	Drainage port D2: 1/2” BSP
5	Minimum displacement limit control (**NOTE**) - Locknut: spanner 17 - countersunk hex adjustment screw: spanner 5 - displacement regulation range: 0 ÷ 50 % max. displacement
6	Maximum displacement limit control - Locknut: spanner 17 - countersunk hex adjustment screw: spanner 5 - torque: 10 Nm - displacement regulation range: 100 ÷ 50% max. displacement Δ displacement / screw round = 3,9 cm^3

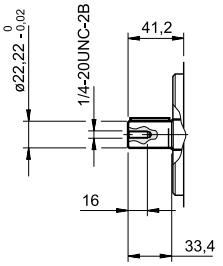
NOTE: The limit control is supplied factory set at zero minimum displacement and is sealed up with red paint.
Any modification of this setting by the user makes the pump unable to reach the null displacement condition.

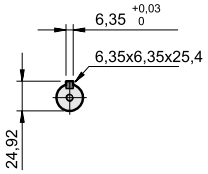
19 - OVERALL DIMENSIONS FOR FLANGES AND SHAFTS TYPE SAE J744

VPPM-029



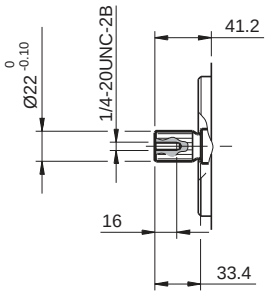
SAE J744 - 2-hole fitting flange
type “B”
(identification code: **0**)





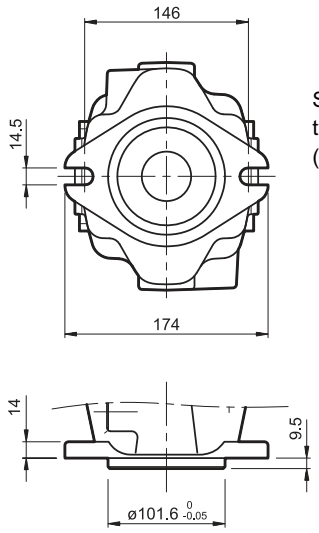
cylindrical with key shaft end
SAE J744
(identification code: **0**)

SAE J744 splined shaft end
16/32 d.p. - 13T
(identification code: **1**)

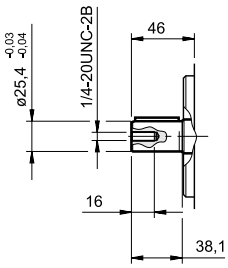


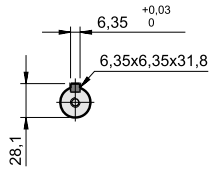
dimensions in mm

VPPM-046



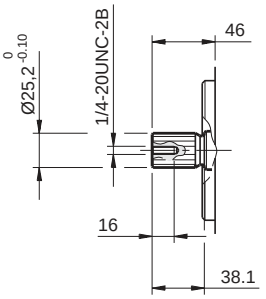
SAE J744 - 2-hole fitting flange
type “B”
(identification code: **0**)





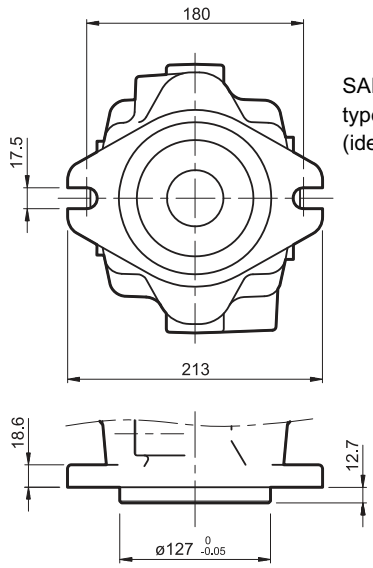
cylindrical with key shaft end
SAE J744
(identification code: **0**)

SAE J744 splined shaft end
16/32 d.p. - 15T
(identification code: **1**)

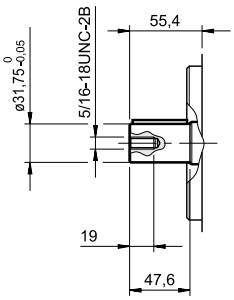


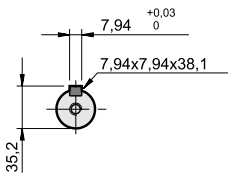
dimensions in mm

VPPM-073
VPPM-087



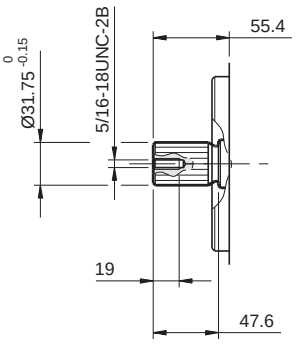
SAE J744 - 2-hole fitting flange
type “C”
(identification code: **0**)





cylindrical with key shaft end
SAE J744
(identification code: **0**)

SAE J744 splined shaft end
12/24 d.p. - 14T
(identification code: **1**)



dimensions in mm

20 - INSTALLATION

- The VPPM pumps can be installed both in a horizontal and vertical position, with the shaft in an upward position.

  N.B.: The drainage port has to be oriented so that the oil level inside the pump body is never lower than 3/4 of its volume (according to the installation use the D1 or D2 drainage ports).

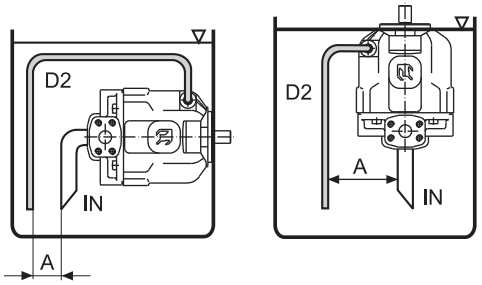
- Installation below the oil reservoir is suggested. As for an installation above the oil level, check that the min. suction pressure is not lower than -0.2 bars (relative). If a low noise emission level is required, the installation inside the tank is suggested.

  In case of an installation inside the tank, with an oil level which does not grant complete pump submersion, it is suggested that the drain tube is adjusted so that the pump higher bearing can be always lubricated.

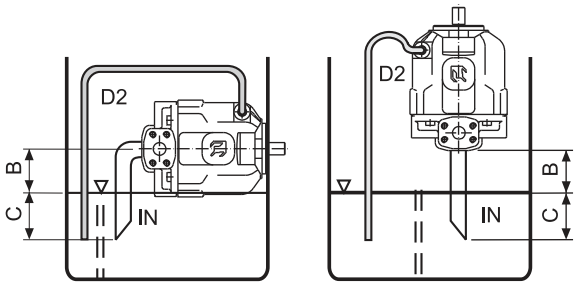
- **Before starting, the pump body has to be filled with the fluid.**
- It is necessary to vent the air from the delivery connection before operating it the first time. The pump start up, especially at a cold temperature, should occur with the plant at minimum pressure.
- The suction tube has to be suitably sized so that the suction pressure is never lower than -0.2 bar (relative). Bends or restrictions or an excessive tube length could further decrease the value of the suction pressure with a following increase in the noise emissions and a decrease in the pump lifetime.
- The drainage tube has to be sized so that the pressure inside the pump body is always lower than 2 bar (absolute), even during the dynamic change and flow rate phases. The drainage tube has to unload inside the tank far from the suction area. We suggest to interpose a screen between the two lines.
- The drain pressure can be max 0.5 bar higher than the suction pressure but it can never exceed the max of 2 bar of absolute pressure.
- No check valves allowed on the suction line.
- The motor-pump connection must be carried out directly with a flexible coupling. Radial and axial loads have to be lower than the values specified in the table at paragraph 3.
- As for details and the installation of filter elements, see par. 2.3.

MOUNTING INSIDE THE TANK

Minimum level of oil in the tank at or above the surface of the pump flange
A ≥ 200 mm

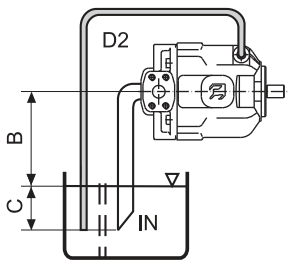


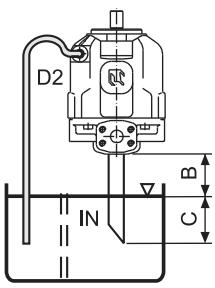
Minimum level of oil in the tank below the surface of the pump flange
Minimum inlet pressure = -0,2 bar (relative)
B ≤ 800 mm C = 200 mm



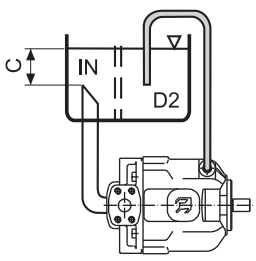
MOUNTING OUTSIDE THE TANK

Minimum inlet pressure = -0,2 bar (relative)
B ≤ 800 mm C = 200 mm





C = 200 mm



21 - THROUGH OUTPUT SHAFT

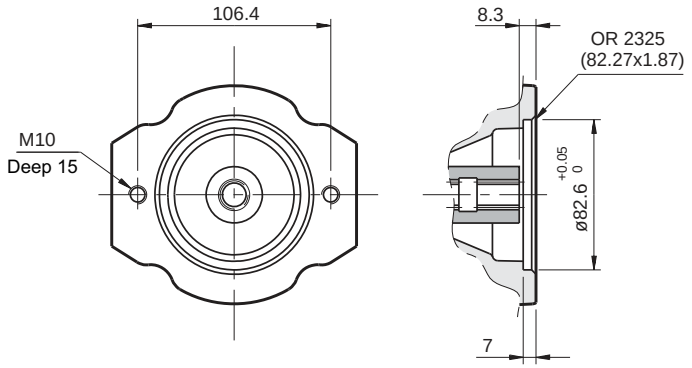
The VPPM pumps can be supplied with a through output shaft, which allows coupling with other pump models.

N.B.: The pumps with a through output shaft are supplied with an intermediate 2-hole flange type SAE J744 - and with a mating joint for splined shaft type SAE J744.

The mechanical adjustment for the min and max displacement are not available on these front or intermediate pumps: VPPM-029 with flange 62S, VPPM-073 with flange 64S, VPPM-087 with flange 64S.

As for identification see par. 1 “Identification code”. For the pump overall dimensions (intermediate flange included) see paragraph 23 “overall dimensions for multiple pumps”.

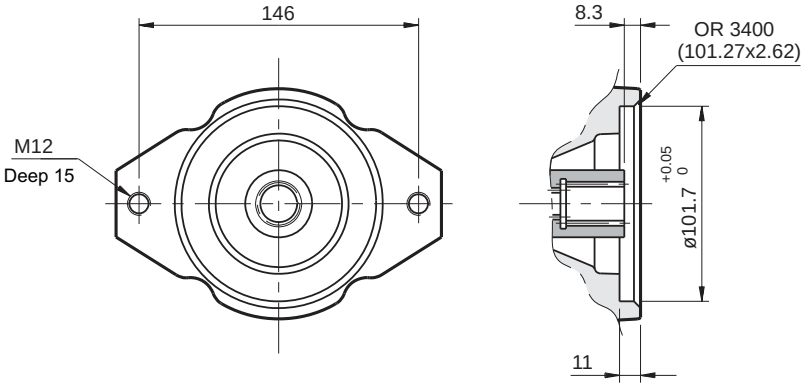
FLANGE + JOINT FOR THE COUPLING OF A GEAR PUMP GROUP 2
identification code **12S**



SAE J744 - 2-hole intermediate flange
type “A”

mating joint for a SAE J744 splined shaft
16/32 D.P. - 9T

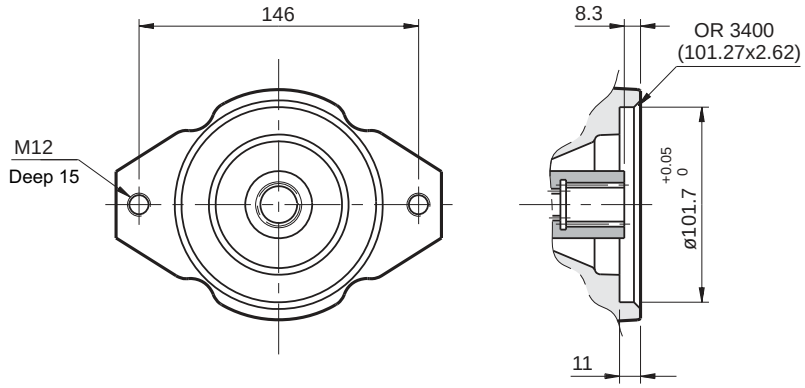
FLANGE + JOINT FOR THE COUPLING OF A PUMP TYPE VPPM-029
OR OF A GEAR PUMP GROUP 3
identification code **62S**



SAE J744 - 2-holes intermediate flange type “B”

mating joint for a SAE J744 splined shaft
16/32 D.P. - 13T

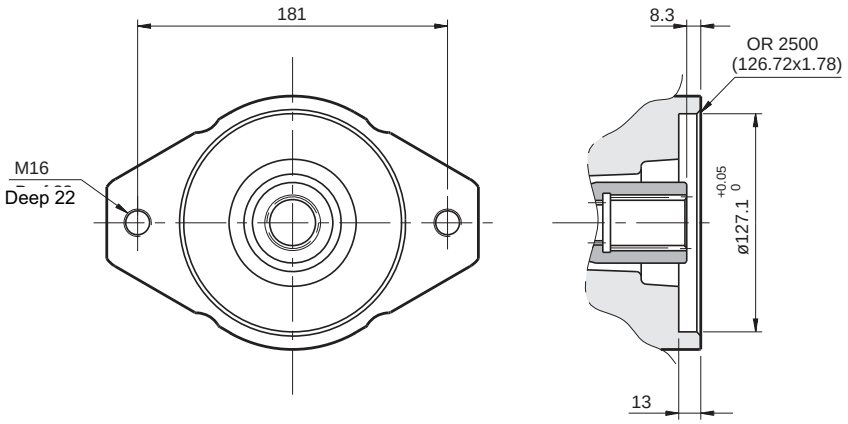
FLANGE + JOINT FOR THE COUPLING OF A PUMP TYPE VPPM-046
identification code **63S**



SAE J744 - 2-holes intermediate flange type“B”

mating joint for a SAE J744 splined shaft
16/32 D.P. - 15T

FLANGE + JOINT FOR THE COUPLING OF A PUMP TYPE VPPM-073
identification code **64S**



SAE J744 - 2-holes intermediate flange type “C”

mating joint for a SAE J744 splined shaft 12/24 D.P. - 14T

22 - MULTIPLE PUMPS

The possibility to couple several pumps makes it possible to create multi-flow groups with independent hydraulic circuits. While sizing coupled pumps, it’s necessary to make reference to the following conditions:

- The coupling can be carried out between pumps with the same dimensions or to a size of decreasing order.
- The max. rotation speed is determined by the pump with the lowest speed.
- The values of the max. applicable torque can not be exceeded.

22.1 - Max. applicable torque

The input torque (M) for each pump is given by the following ratio:

$$M = \frac{9550 \cdot N}{n} = [Nm]$$

where the absorbed power (N) is given by:

$$N = \frac{Q \cdot \Delta p}{600 \cdot \eta_{tot}} = [kW]$$

n = rotation speed [rpm]

Q = flow rate [l/min]
Δp = differential pressure between the pump suction and delivery [bar]
η_{tot} = total efficiency (obtainable from the diagrams in par. 4-5-6)

or it can be obtained from the diagrams ABSORBED POWER (see par. 4 - 5 - 6 -7).

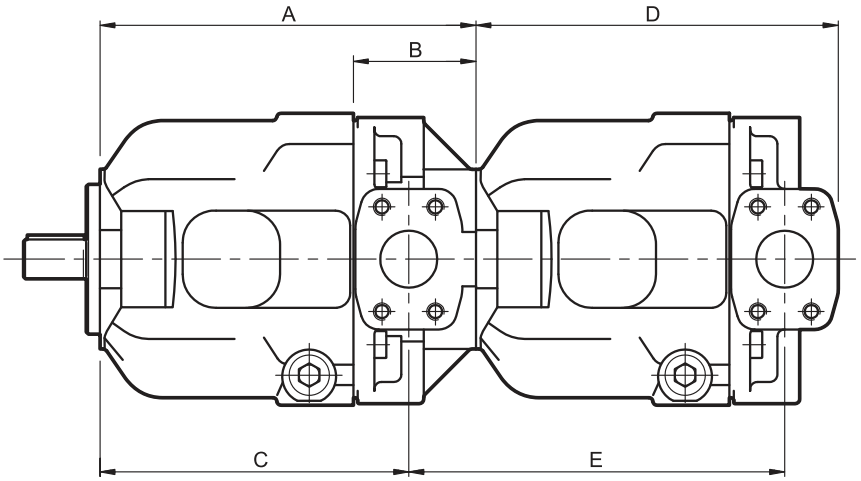
If several pumps are coupled, the torque of each single pump has to be added to the torque of subsequent pumps when they are loaded simultaneously.
The obtained torque value for each pump has to be lower than the value specified in the table below :

pump with a through output shaft	MAXIMUM TORQUE APPLICABLE AT THE FRONT PUMP SHAFT [Nm]			MAXIMUM TORQUE APPLICABLE AT THE PUMP TO BE COUPLED [Nm] (not simultaneously to the front pump)					
	cylindrical ISO 3019/2 (cod. 5)	cylindrical SAE J744 (cod. 0)	splined SAE J744 (cod. 1)	GP2 external gear	GP3 external gear	VPPM-029	VPPM-046	VPPM-073	VPPM-087
VPPM-029	170	200	190	100	135	135	-	-	-
VPPM-046	220	230	330	135	250	250	250	-	-
VPPM-073	450	490	620	135	330	330	400	440	-
VPPM-087	450	490	620	135	330	330	400	440	440

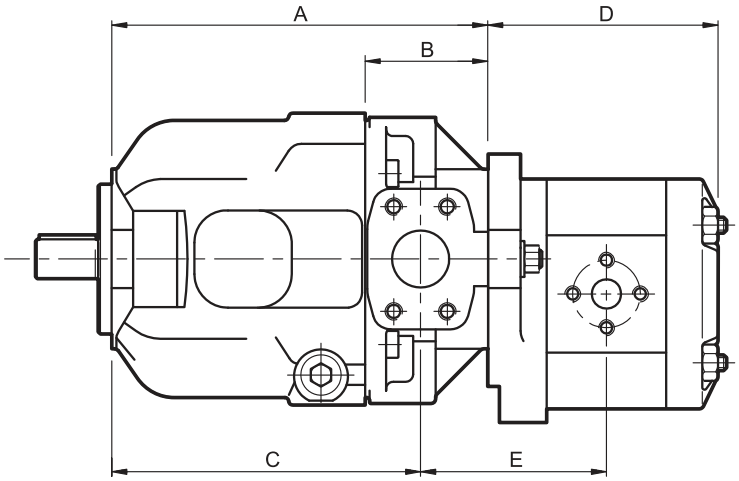
The maximum transmissible torque for those pumps with a through output shaft is determined by the coupling used for the transmission. If the obtained torque values are higher than the ones stated in the table, it is necessary to reduce the working pressure value or to replace the overloaded pump with a pump suitable to bear the required torque.

23 - OVERALL DIMENSIONS FOR MULTIPLE PUMPS

dimensions in mm



	REAR PUMP														
	VPPM-029					VPPM-046					VPPM-073 / 087				
	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
VPPM-029	222	77	183	213	222	-	-	-	-	-	-	-	-	-	-
VPPM-046	251	82	206	213	220	251	82	206	242	251	-	-	-	-	-
VPPM-073 VPPM-087	291	99	235	213	226	291	99	235	242	249	296	104	235	276	296



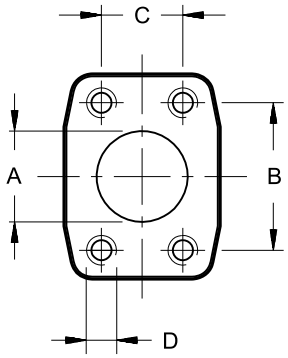
	REAR PUMP									
	external gear GP2					external gear GP3				
	A	B	C	D	E	A	B	C	D	E
VPPM-029	222	77	183	99 ÷121	86 ÷ 97	-	-	-	-	-
VPPM-046	251	82	206	99 ÷121	85 ÷ 96	251	82	206	132 ÷ 147	103 ÷ 110
VPPM-073 VPPM-087	291	99	235	99 ÷121	91 ÷ 102	291	99	235	132 ÷ 147	109 ÷ 116

NOTE: The D and E values in the table make reference to the dimensions of the gear pumps according to the available min. and max. displacement range. For further details apply to our Technical department.

24 - SUCTION AND DELIVERY PORTS DIMENSIONS FOR SAE FLANGES

SUCTION PORT: "IN" (SAE 3000)						
Pump	**nominal size**	**A** mm	**B** mm	**C** mm	**D** threading and depth (mm) METRIC	UNC
VPPM 029	1 ¼"	32	58,7	30,2	M 10x28	7/16 -14 UNC-2B 28
VPPM 046	1 ½"	38,1	70	35,7	M12x26	½ -13 UNC-2B 26
VPPM 073 VPPM 087	2"	50,8	77,8	43	M12x25	½ -13 UNC-2B 25

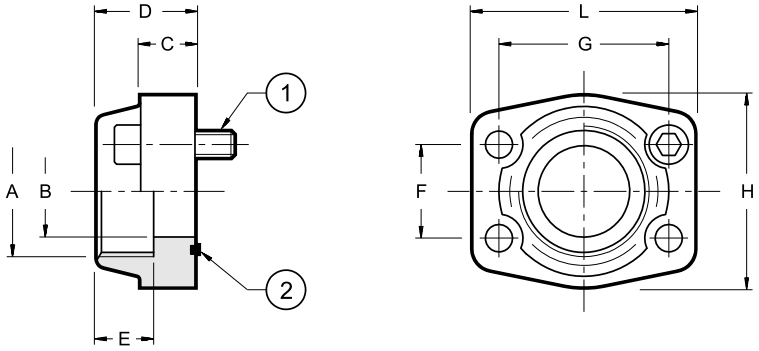
DELIVERY PORT "OUT" (SAE 6000)						
Pump	**nominal size**	**A** mm	**B** mm	**C** mm	**D** threading and depth (mm) METRIC	UNC
VPPM 029	3/4"	19	50,8	23,8	M10x24	⅜ - 16 UNC-2B 24
VPPM 046	1"	25,4	57,1	27,7	M12x20	7/16 -14 UNC-2B 20
VPPM 073 VPPM 087	1 ¼"	32	66,7	31,7	M14x23	½ - 13 UNC-2B 23



25 - CONNECTION FLANGES

dimensions in mm

The fastening bolts and the O-Rings must be ordered separately



	Flange code	Flange description
SAE 3000	0610720	OR 4150 (37.69x3.53)
	0610714	OR 4187 (47.22x3.53)
	0610721	OR 4225 (56.74x3.53)
SAE 6000	0770075	OR 4100 (24.99x3.53)
	0770092	OR 4131 (32.93x3.53)
	0770106	OR 4150 (37.69x3.53)

	Flange code	Flange description	p_{max} [bar]	ØA	ØB	C	D	E	F	G	H	L	1 metric SHCS	1 UNC SHCS
SAE 3000	0610720	SAE - 1 ¼"	280	1 ¼" BSP	32	21	41	22	30,2	58,7	68	79	n° 4 - M10x35	n° 4 - 7/16 UNC x 1 ½"
	0610714	SAE - 1 ½"	210	1 ½" BSP	38	25	45	24	35,7	70	78	94	n° 4 - M12x45	n° 4 - ½ UNC x 1 ¾"
	0610721	SAE - 2"	210	2" BSP	51	25	45	30	43	77,8	90	102	n° 4 - M12x45	n° 4 - ½ UNC x 1 ¾"
SAE 6000	0770075	SAE - 3/4"	420	3/4" BSP	19	21	35	22	23,8	50,8	55	71	n° 4 - M10x35	n° 4 - ⅜ x 1 ½"
	0770092	SAE - 1"	420	1" BSP	25	25	42	24	27,7	57,1	65	81	n° 4 - M12x45	n° 4 - 7/16 x 1 ¾"
	0770106	SAE - 1 ¼"	420	1 ¼" BSP	32	27	45	25	31,7	66,7	78	95	n° 4 - M14x50	n° 4 - ½ x 1 ¾"

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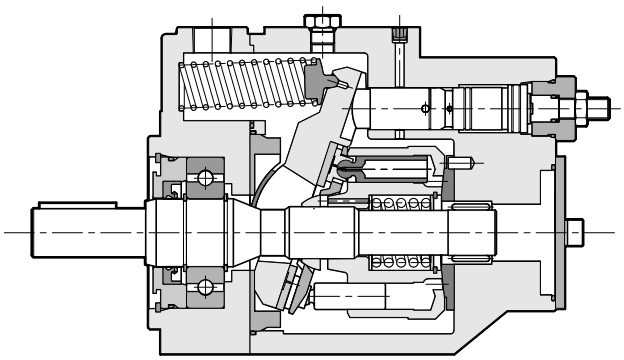


VPPL

VARIABLE DISPLACEMENT AXIAL-PISTON PUMPS FOR MEDIUM PRESSURE

SERIES 20

OPERATING PRINCIPLE



— The VPPL are variable-displacement axial piston pumps with swash plate, suitable for medium-pressure open-circuit applications.

— They are available in seven sizes, with displacements of 8, 16, 22, 36, 46, 70 and 100 cm³/rev.

— The delivered flow is proportional to the rotational speed and to the swash plate angle, which can be continuously modulated. The maximum swash-plate angle can be mechanically limited by means of an adjustment screw.

— The pumps are supplied with a 2-holes mounting flange and cylindrical keyed shaft in accordance with SAE J744 standard.

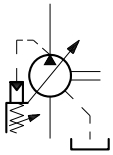
— Four types of regulators are available, to be selected according to the specific application requirements.

TECHNICAL SPECIFICATIONS

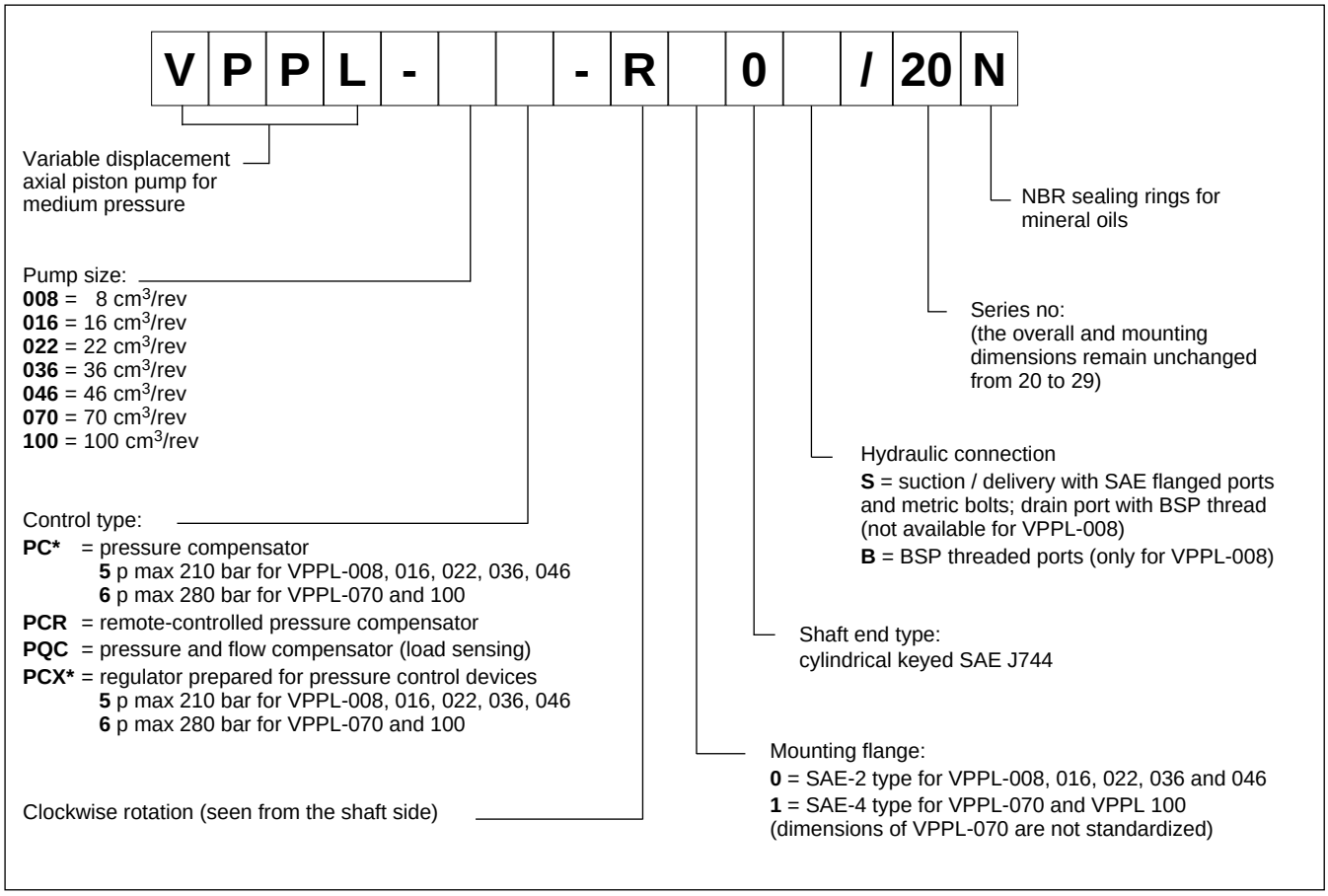
PUMP SIZE		008	016	022	036	046	070	100
Maximum displacement	cm³/rev	8	16	22	36	46	70	100
Maximum flow rate at 1500 rpm	l/min	12	24	33	54	69	105	150
Maximum operating pressure	bar	210					280	
Rotation speed	rpm	min 500 - max 2000					min 500 - max 1800	
Direction of rotation		clockwise						
Hydraulic connections		BSPP threaded ports / SAE flanges						
Type of mounting		SAE flange J744 - 2 holes						
Oil volume in the pump body	dm³	0,2	0,3		0,6		1	1,8
Mass (PC control)	kg	9	13	13	21	23	43	62

Ambient temperature range	°C	-10 / +50
Fluid temperature range	°C	-10 / +70
Fluid contamination degree	see point 2.3	
Recommended viscosity	cSt	20 ÷ 50

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE



2 - HYDRAULIC FLUID

2.1 - Fluid type

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. With these fluids use NBR seals. Using fluids at temperatures higher than 70 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

2.2 - Fluid viscosity

The operating fluid viscosity must be within the following range:

minimum viscosity	10 cSt	referred to a maximum temperature of 90 °C for the drainage fluid
optimum viscosity	20 ÷ 50 cSt	referred to the operating temperature of the fluid in the tank
maximum viscosity	1000 cSt	limited only to the cold start-up of the pump, which has to be carried out with the plant at minimum pressure.

When selecting the fluid type, be sure that the true viscosity is within the range specified above at the operating temperature.

2.3 - Fluid contamination degree

The maximum degree of fluid contamination must be according to ISO 4406:1999 class 20/18/15; therefore the use of a delivery or return filter with $\beta_{20} \geq 75$ is recommended.

A degree of maximum fluid contamination according to ISO 4406:1999 class 20/16/13 is advised to ensure optimum pump service life. Accordingly, a filter with a $\beta_{10} \geq 100$ is recommended.

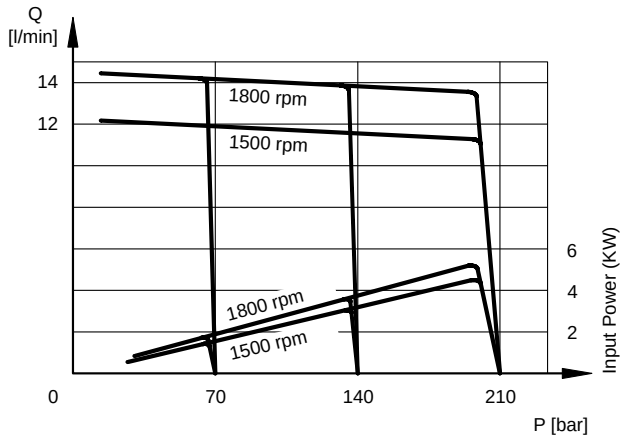
For the installation of a filter on the suction line, see point 10. The suction filter must be equipped with a by-pass valve and, if possible, with a clogging indicator, and it should be oversized to prevent cavitation issues.

3 - CHARACTERISTIC CURVES

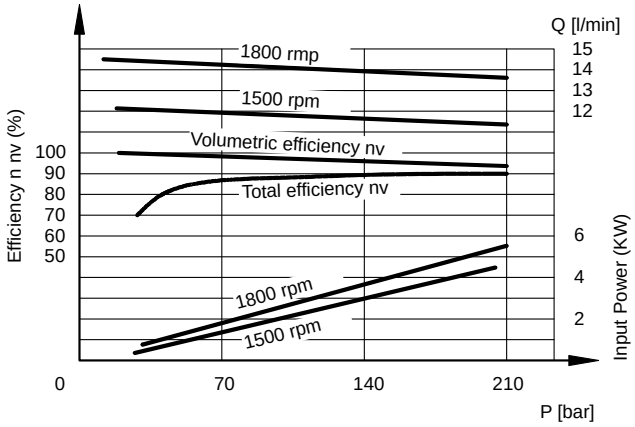
(values obtained with mineral oil with viscosity of 36 cSt at 50 °C)

3.1 - VPPL-008 pump characteristic curves

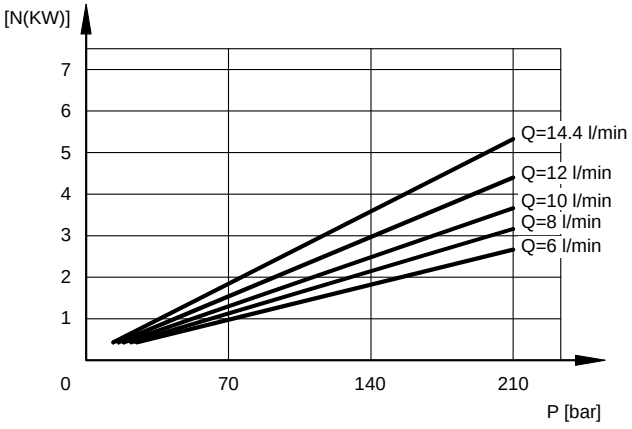
FLOW RATE / PRESSURE CURVES



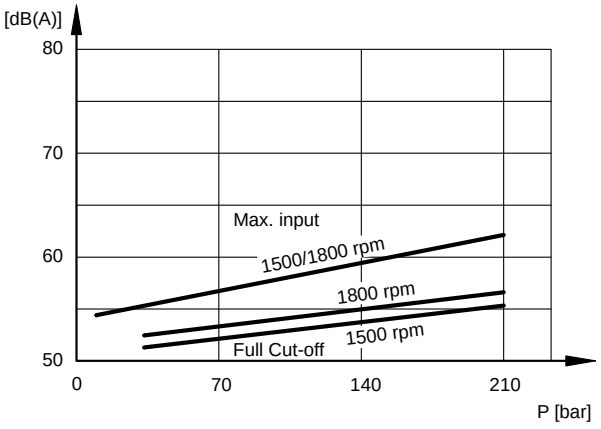
VOLUMETRIC AND TOTAL EFFICIENCY



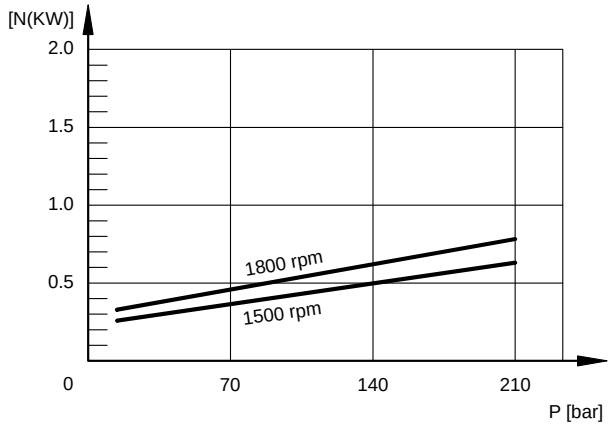
ABSORBED POWER



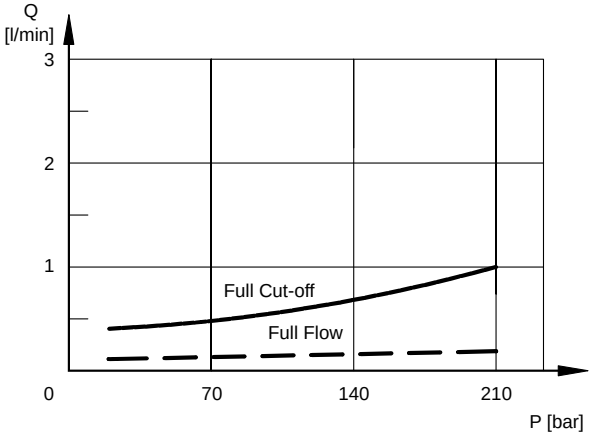
NOISE LEVEL



INPUT POWER AT FULL CUT-OFF

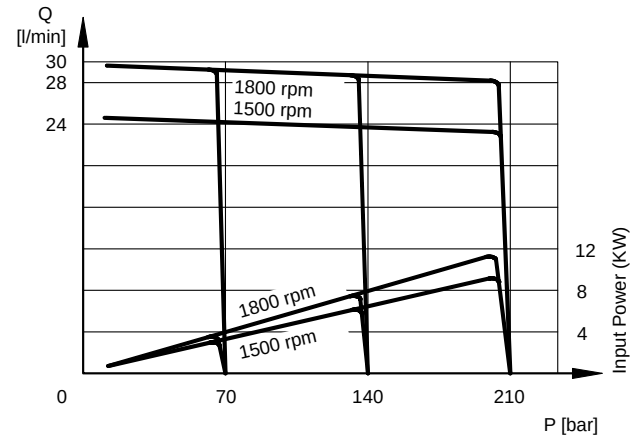


DRAIN FLOW RATE

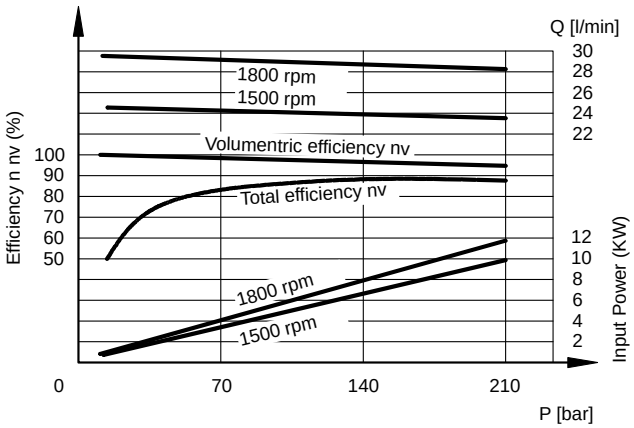


3.2 - VPPL-016 pump characteristic curves

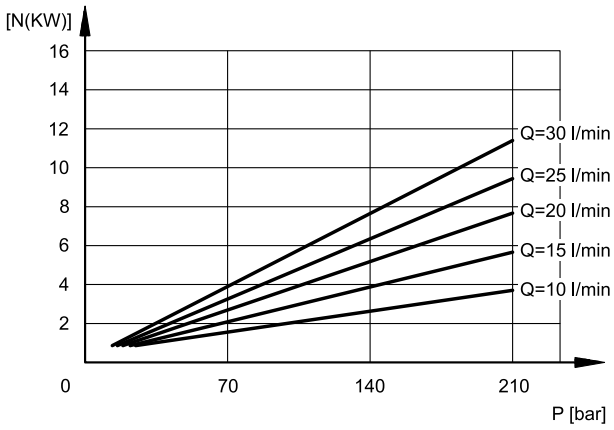
FLOW RATE / PRESSURE CURVES



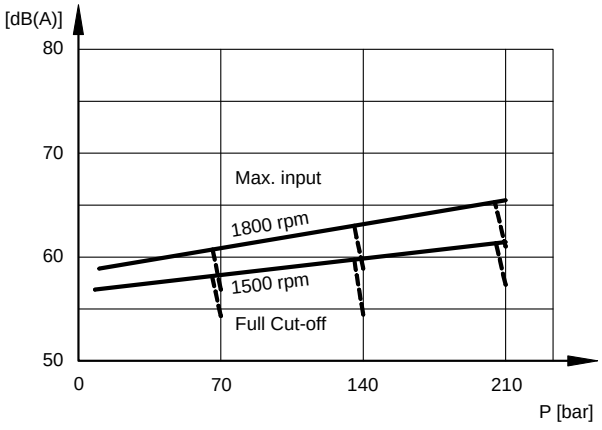
VOLUMETRIC AND TOTAL EFFICIENCY



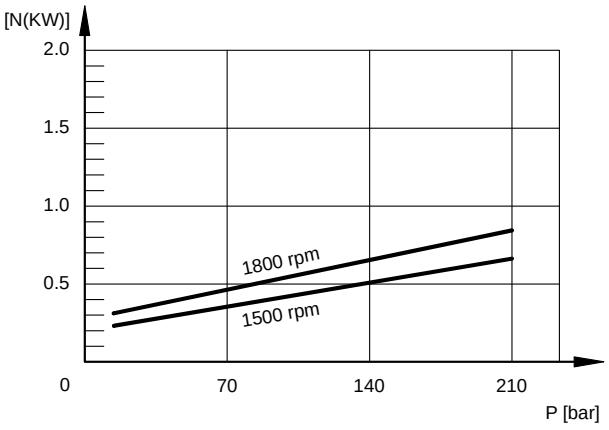
ABSORBED POWER



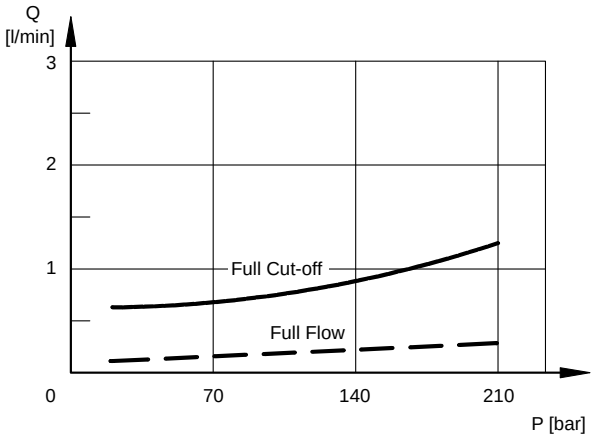
NOISE LEVEL



INPUT POWER AT FULL CUT-OFF

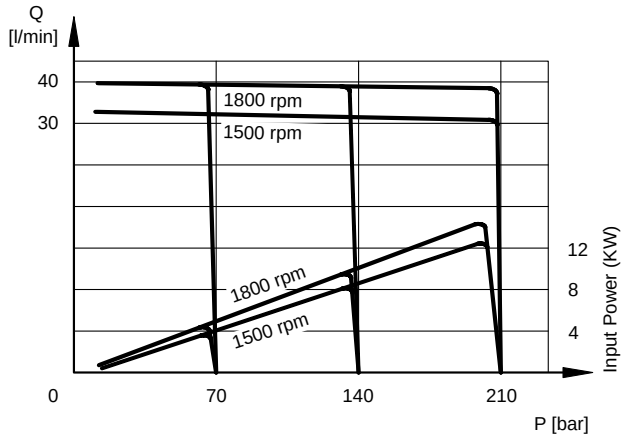


DRAIN FLOW RATE

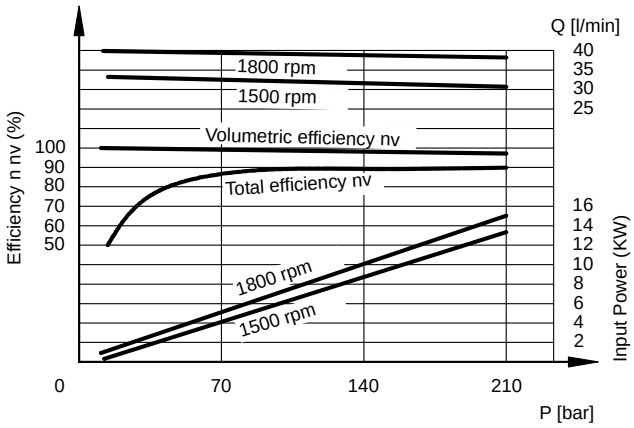


3.3 - VPPL-022 pump characteristic curves

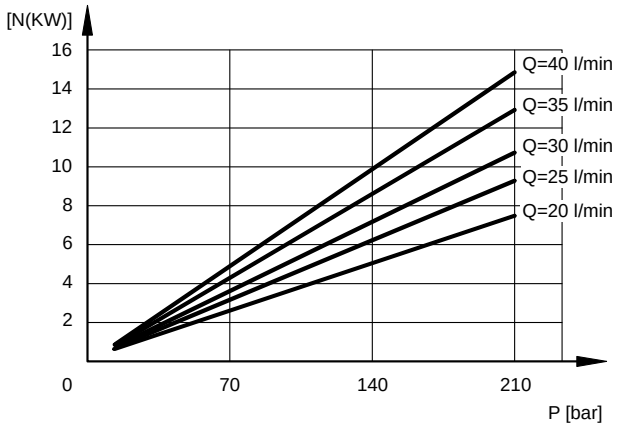
FLOW RATE / PRESSURE CURVES



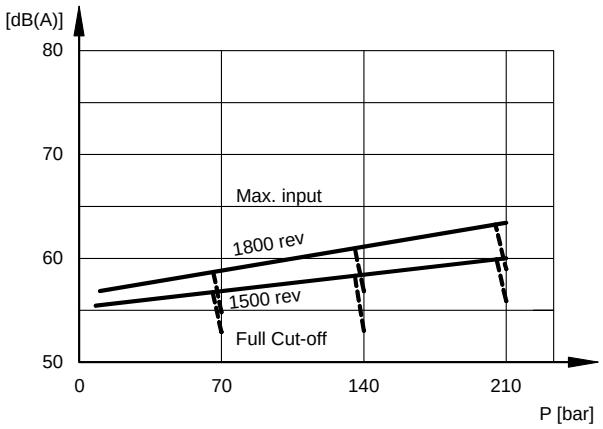
VOLUMETRIC AND TOTAL EFFICIENCY



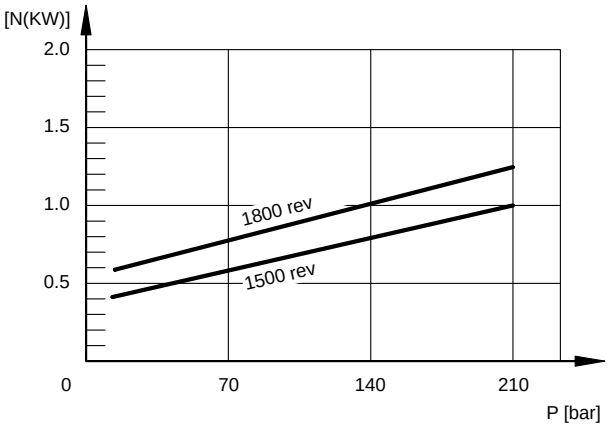
ABSORBED POWER



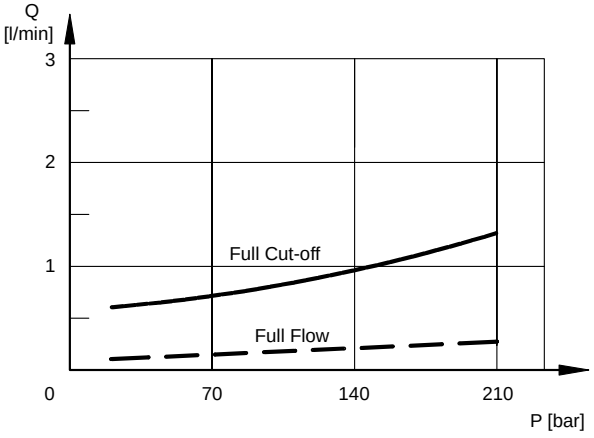
NOISE LEVEL



INPUT POWER AT FULL CUT-OFF

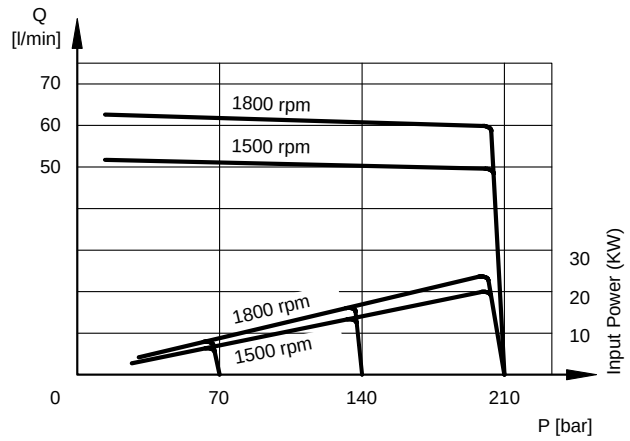


DRAIN FLOW RATE

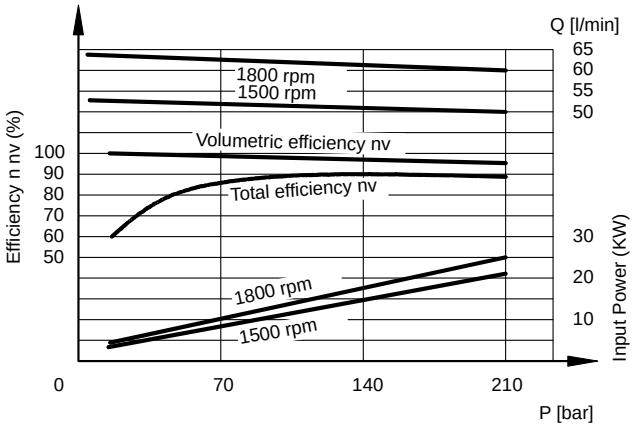


3.4 - VPPL-036 pump characteristic curves

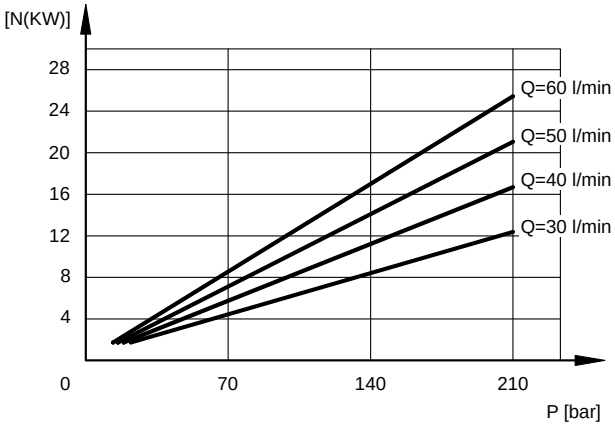
FLOW RATE / PRESSURE CURVES



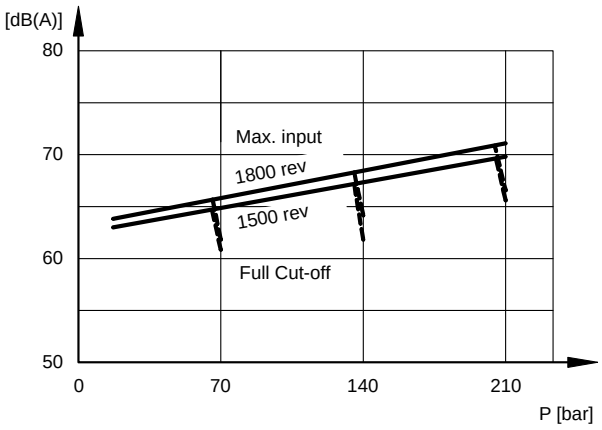
VOLUMETRIC AND TOTAL EFFICIENCY



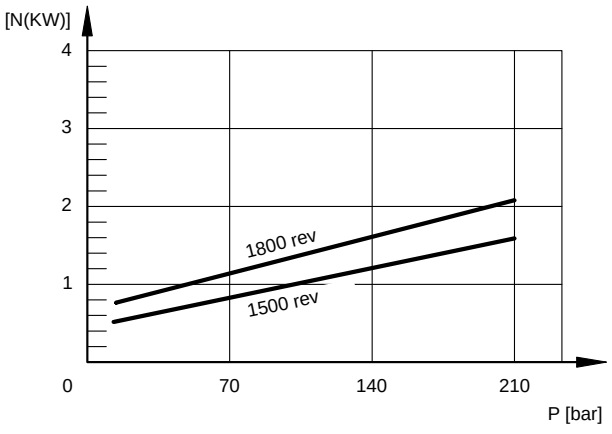
ABSORBED POWER



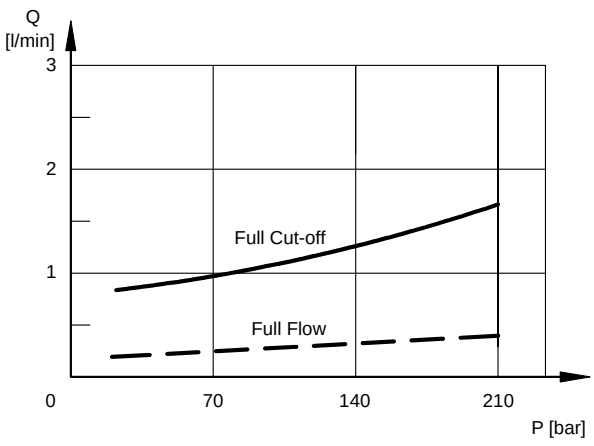
NOISE LEVEL



INPUT POWER AT FULL CUT-OFF

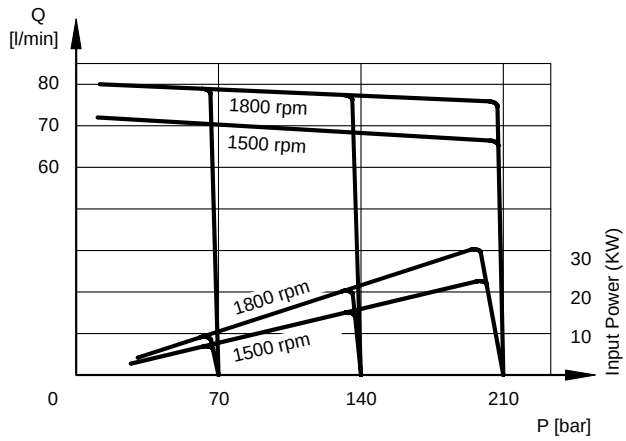


DRAIN FLOW RATE

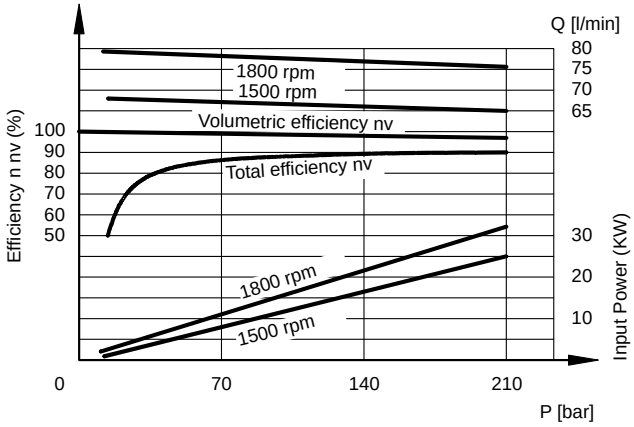


3.5 - VPPL-046 pump characteristic curves

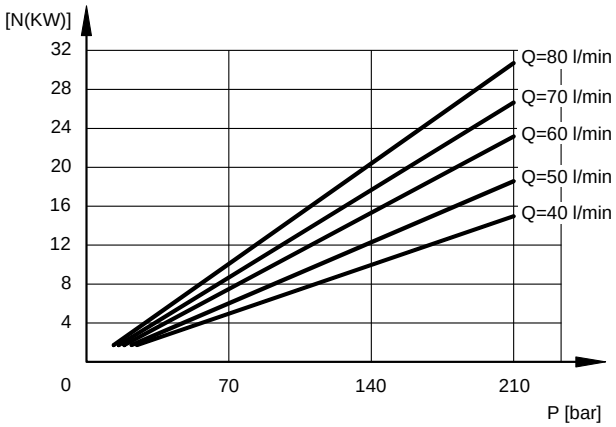
FLOW RATE / PRESSURE CURVES



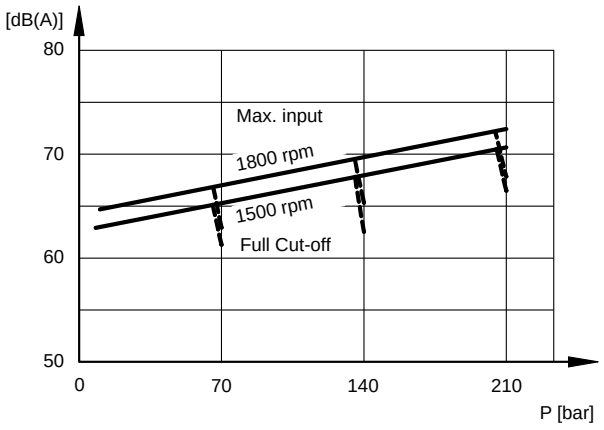
VOLUMETRIC AND TOTAL EFFICIENCY



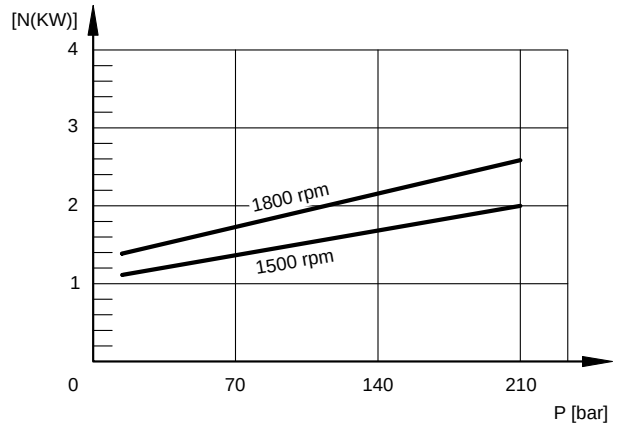
ABSORBED POWER



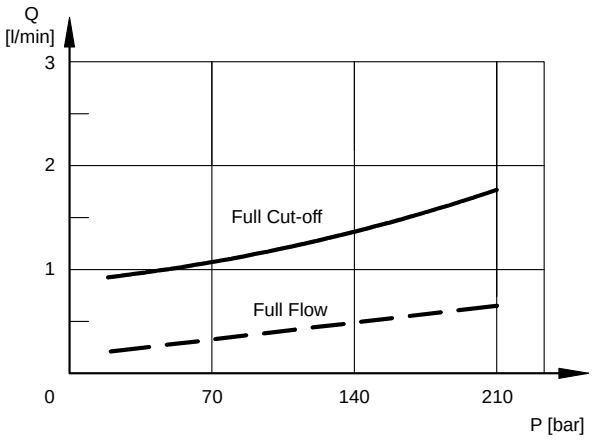
NOISE LEVEL



INPUT POWER AT FULL CUT-OFF

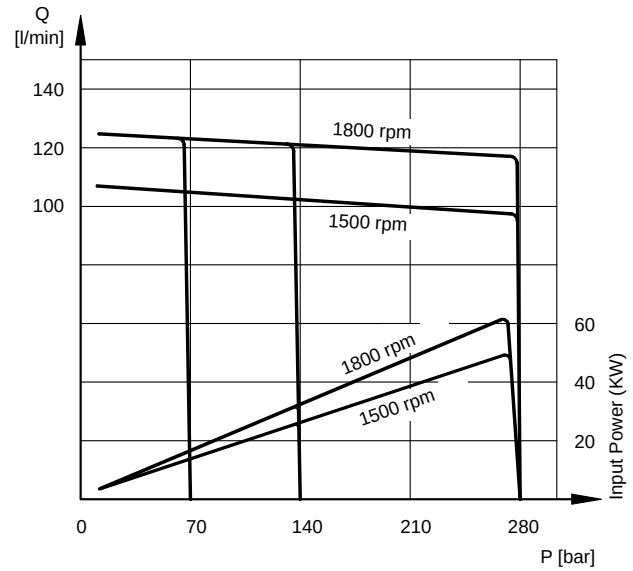


DRAIN FLOW RATE

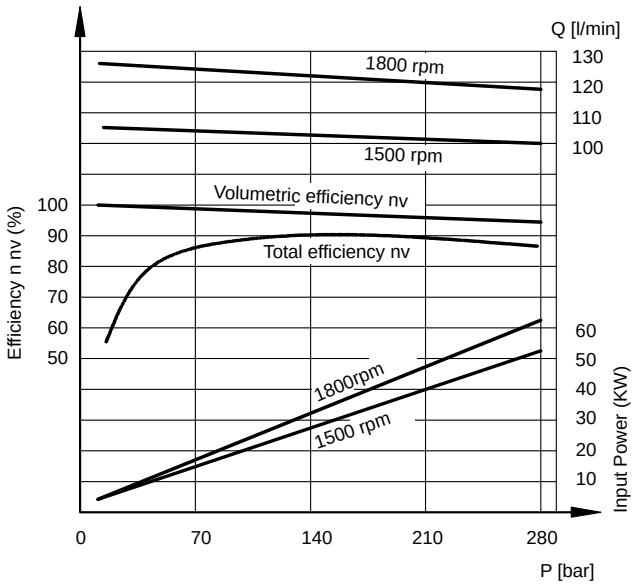


3.6 - VPPL-070 pump characteristic curves

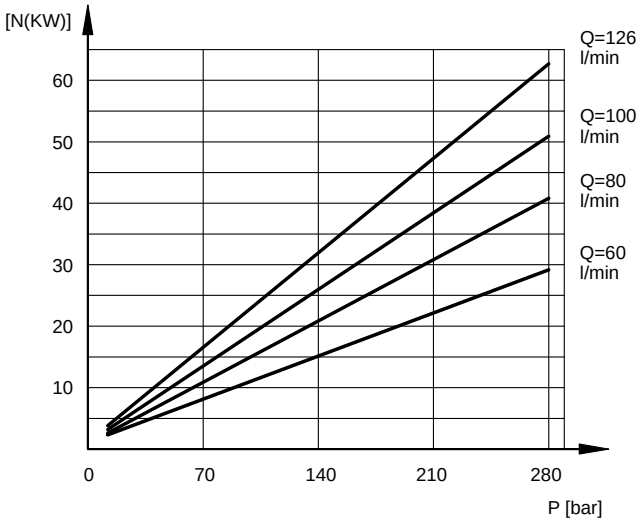
FLOW RATE / PRESSURE CURVES



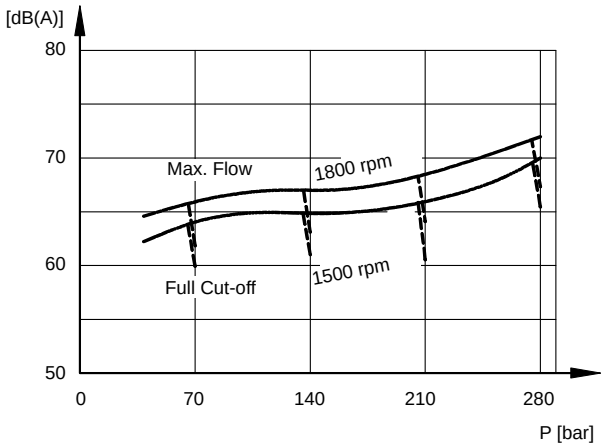
VOLUMETRIC AND TOTAL EFFICIENCY



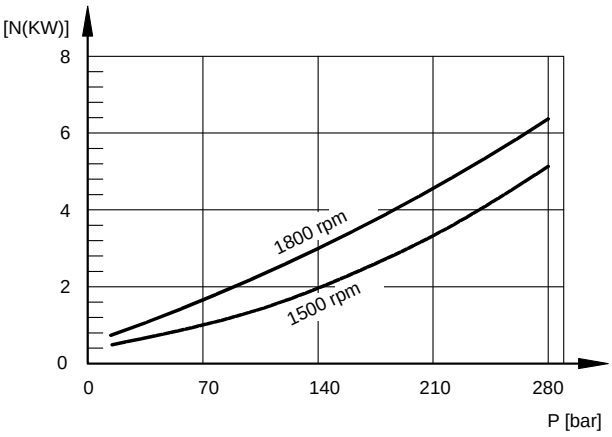
ABSORBED POWER



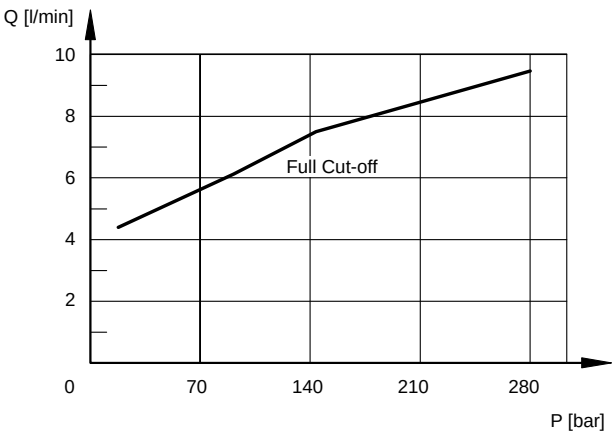
NOISE LEVEL



INPUT POWER AT FULL CUT-OFF

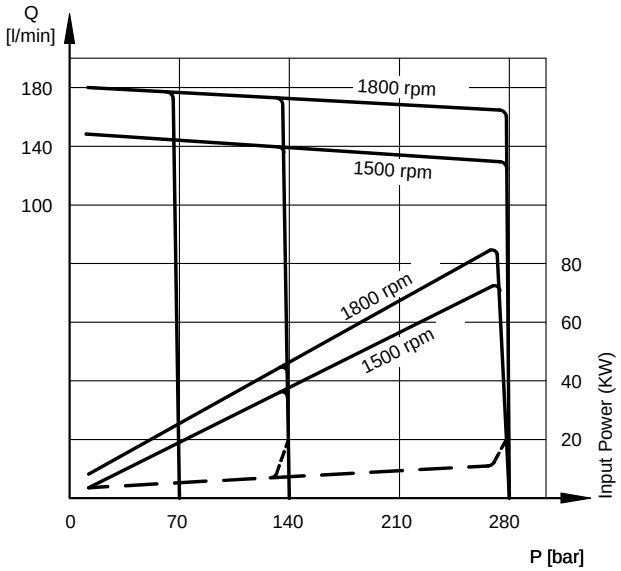


DRAIN FLOW RATE

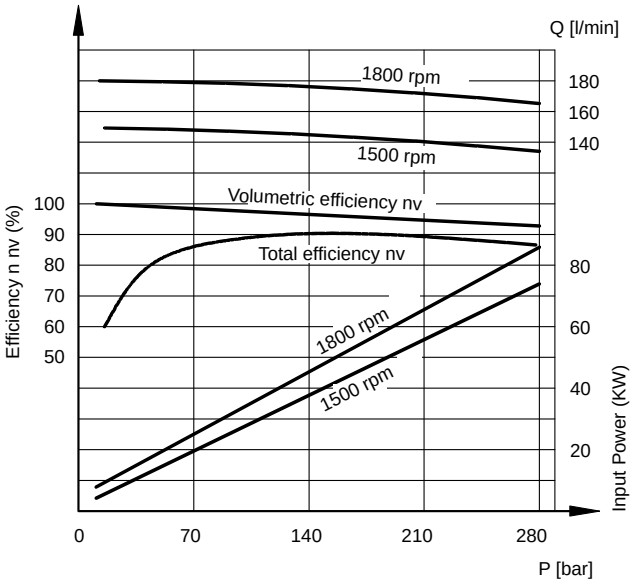


3.7 - VPPL-100 pump characteristic curves

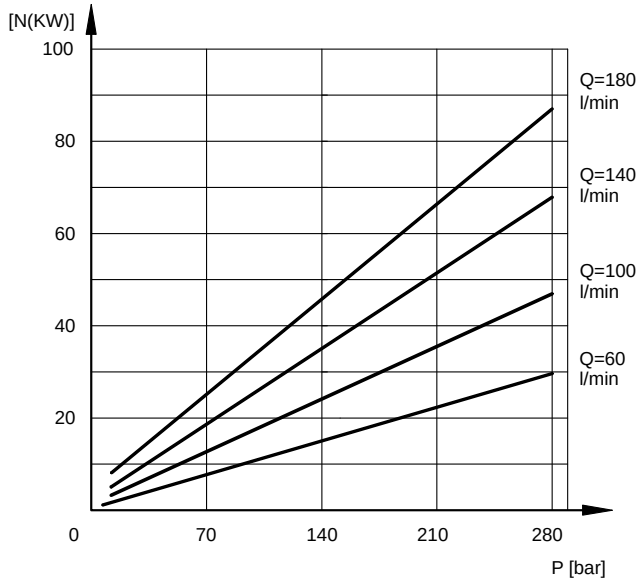
FLOW RATE / PRESSURE CURVES



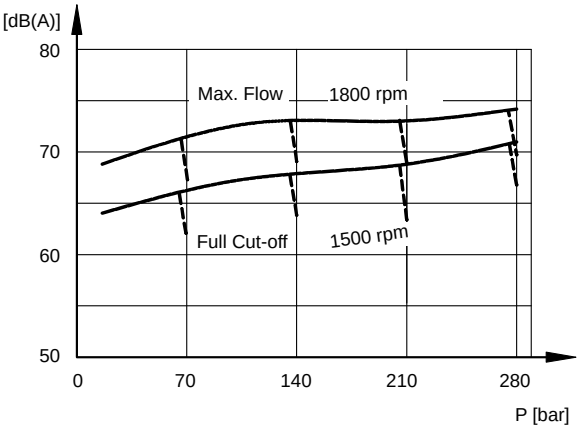
VOLUMETRIC AND TOTAL EFFICIENCY



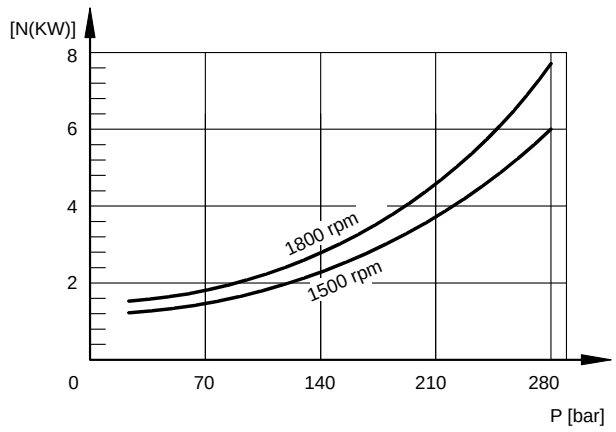
ABSORBED POWER



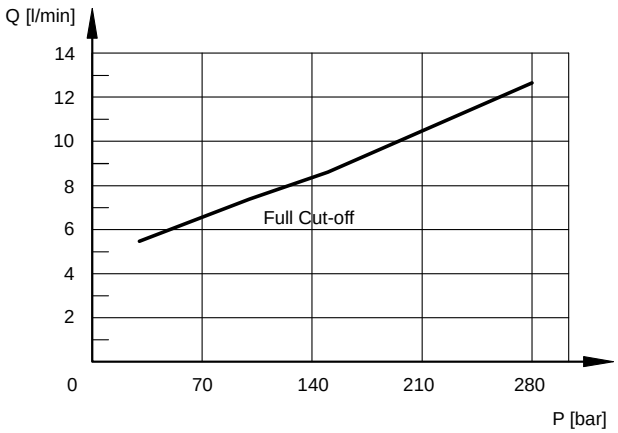
NOISE LEVEL



INPUT POWER AT FULL CUT-OFF

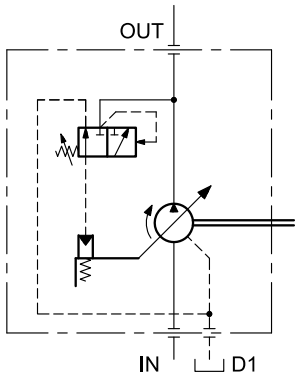


DRAIN FLOW RATE



4 - CONTROLS

4.1 - PC* pressure compensator



The PC* pressure compensator keeps the system pressure constant at the selected set value by automatically adapting the pump flow rate according to the actual system demand.

The desired pressure is set manually by turning the adjustment screw on the compensator.

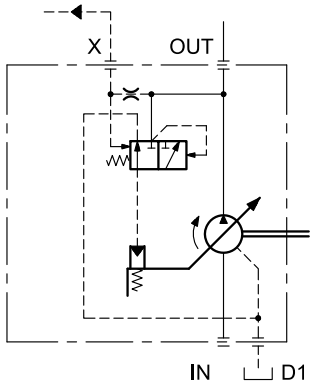
- clockwise rotation increases the set pressure.

- pressure adjustment range:
  PC5 = 30 ÷ 210 bar (for VPPL-008, 016, 022, 036 and 046)
  pressure increase per turn of the screw: 69 bar
  PC6 = 30 ÷ 280 bar (for VPPL-070 and VPPL-100)
  pressure increase per turn of the screw: 78 bar

- factory setting:
  minimum value of the pressure range, maximum displacement.

4.2 - PCR* remote-controlled pressure compensator

hydraulic diagram for displacements
008, 016, 022, 036 and 046



The PCR pressure compensator keeps the system pressure constant at the selected set value by automatically adapting the pump flow rate according to the actual system demand, through a remote control connected to port X of the pump ((a typical arrangement for submerged pumps).

The pressure is determined by the regulating valve installed in the external circuit; therefore, the adjustment screw on the compensator must not be modified

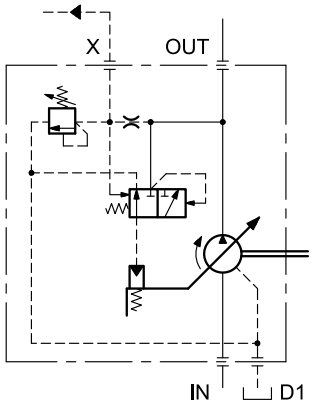
NOTE: If the remote control is implemented using a pressure-regulating valve, it is recommended to use a direct-acting type, properly sized for the pilot flow rate.

The length of the line between the remote control device and port X of the pump must not exceed 2 m.

PCR for VPPL-008, 016, 022, 036 and 046:

- pressure adjustment range = 30 ÷ 210 bar
- required flow rate for pilot signal at X port = 1,5 l/min (approx.)
- factory-set differential pressure: 15 bar

hydraulic diagram for displacements 070 and 100

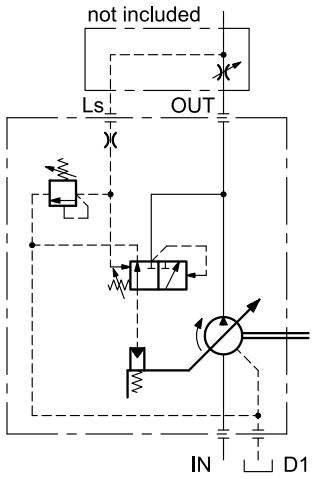


PCR for VPPL-070 and VPPL-100:

The VPPL-070 and VPPL-100 pumps also feature a pressure relief valve on the delivery line.

- pressure adjustment range = 30 ÷ 280 bar
- pressure increase per turn of the relief valve adjustment screw: 78 bar
- required flow rate for pilot signal at X port = 1,5 l/min (approx.)
- factory-set differential pressure: 15 bar

4.3 - PQC pressure and flow compensator (Load Sensing)



The PQC compensator, in addition to providing pressure control like the PC* type, regulates the pump flow rate according to the pressure drop (Δp) across a throttle (or valve) installed in the working line.

N.B. The connecting line between port X and the downstream side of the throttle (or valve) must always be arranged and installed by the customer.

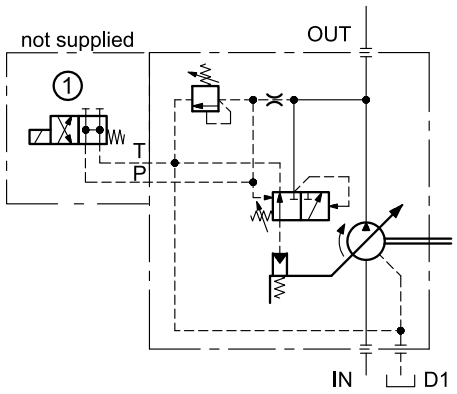
- pressure adjustment range:
  15 ÷ 210 bar for VPPL-008, 016, 022, 036 and 046
  15 ÷ 280 bar for VPPL-070 and VPPL-100
- pressure increase per turn of the adjustment screw: 78 bar
- factory-set differential pressure: 15 ÷ 16 bar (**NOTE**)
- minimum delivery pressure = 15 bar

NOTE: This factory setting ensures the delivery of the pump's nominal flow in most applications.

In circuits with high pressure drops or undersized valves, it may be necessary to increase the value (up to 28 bar) to guarantee maximum flow delivery.

4.4 - PCX* - Regulator prepared for pressure-control devices (unloading or proportional pressure control)

hydraulic diagram for electrical pump unloading at minimum pressure



The PCX* regulator, when combined with a two position solenoid valve with an ISO 4401-03 mounting surface (to be ordered separately and installed directly on the compensator), allows the pump to be electrically switched to zero displacement and with the minimum delivery pressure.

This function is designed to unload the pump during start-up or to operate at the minimum system pressure during idle phases of the cycle, ensuring significant energy savings.

When combined with a proportional pressure control valve, the PCX* compensator provides continuous electro-proportional pressure control.

- factory setting:
  PCX5 = 210 bar for VPPL-008, 016, 022, 036 and 046.
  PCX6 = 280 bar for VPPL-070 and VPPL-100
- pressure increase per turn of the adjustment screw = 78 bar
- factory-set differential pressure: 15 ÷ 16 bar (**NOTE**)

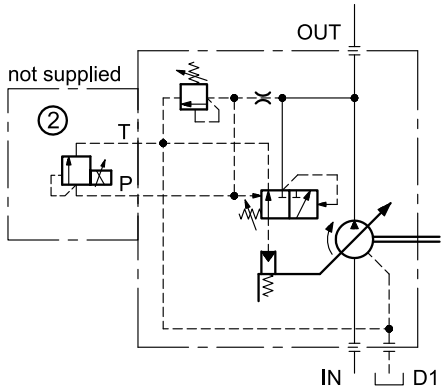
NOTE: This factory setting ensures the delivery of the pump's nominal flow in most applications.

In circuits with high pressure drops or undersized valves, it may be necessary to increase the value (up to 28 bar) to guarantee maximum flow delivery.

For the pressure selection function, order the switching valve (1) type DS3-SA2 (see catalogue 41 150)

- pressure adjustment range::
  PCX5 = 15 ÷ 210 bar for VPPL 008, 016, 022, 036 and 046
  PCX6 = 15 ÷ 280 bar for VPPL 070 and 100
- solenoid valve OFF = delivery pressure 20 bar and pump at zero displacement
- solenoid valve ON = delivery pressure set on the compensator and pump at maximum displacement

hydraulic diagram for proportional pressure control



For proportional pressure control, order proportional pressure valve (2) type PDE3 in the desired pressure range (see catalogue 81 211)

- proportional pressure range:
  PDE3-070 20 ÷ 85 bar
  PDE3-210 20 ÷ 225 bar
  hysteresis = < 5% of p nom repeatability = < ±1,5% of p nom
  Available control card: EDM-M* catalogue 89 252

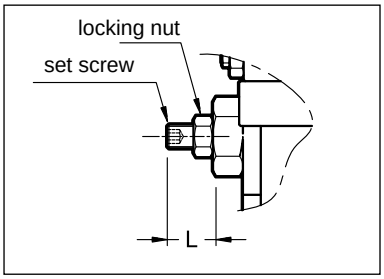
5 - MAXIMUM DISPLACEMENT ADJUSTMENT

The adjustment screw is placed on the pump back.

The pumps are factory-set to maximum displacement. Turn clockwise to decrease the pump displacement.

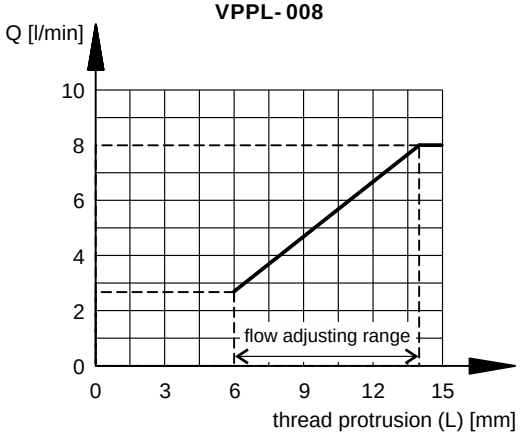
The delivery rate can be roughly judged from the protruding length of the adjusting screw (L).

Do not tighten the screw beyond the adjustment range.

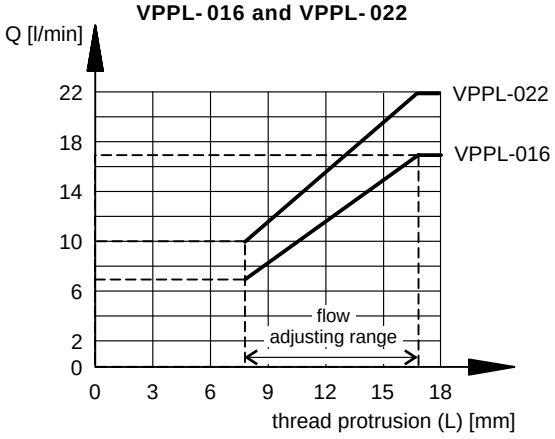


5.1 - Maximum delivery depending on the screw protrusion

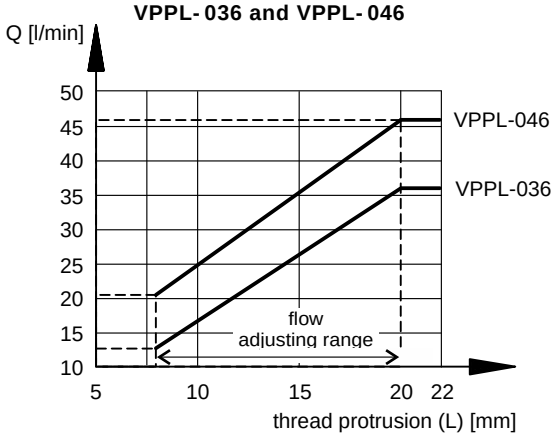
VPPL- 008



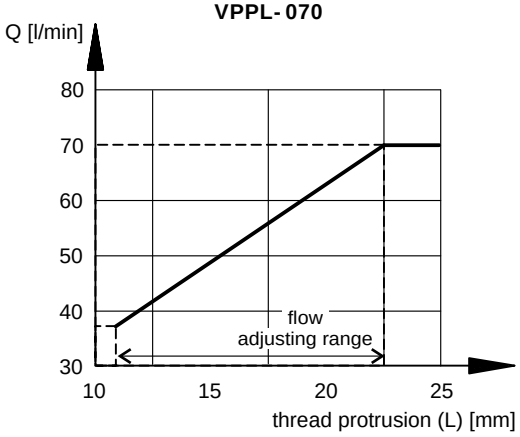
VPPL- 016 and VPPL- 022



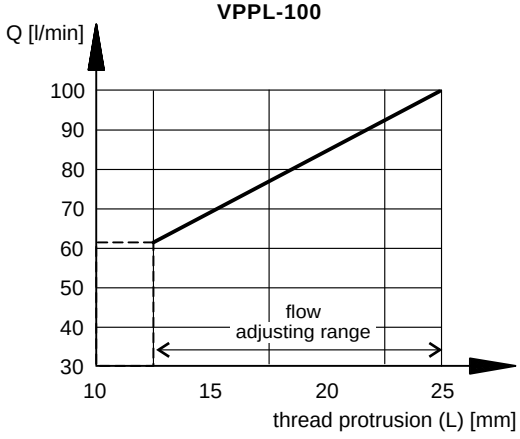
VPPL- 036 and VPPL- 046



VPPL- 070



VPPL-100

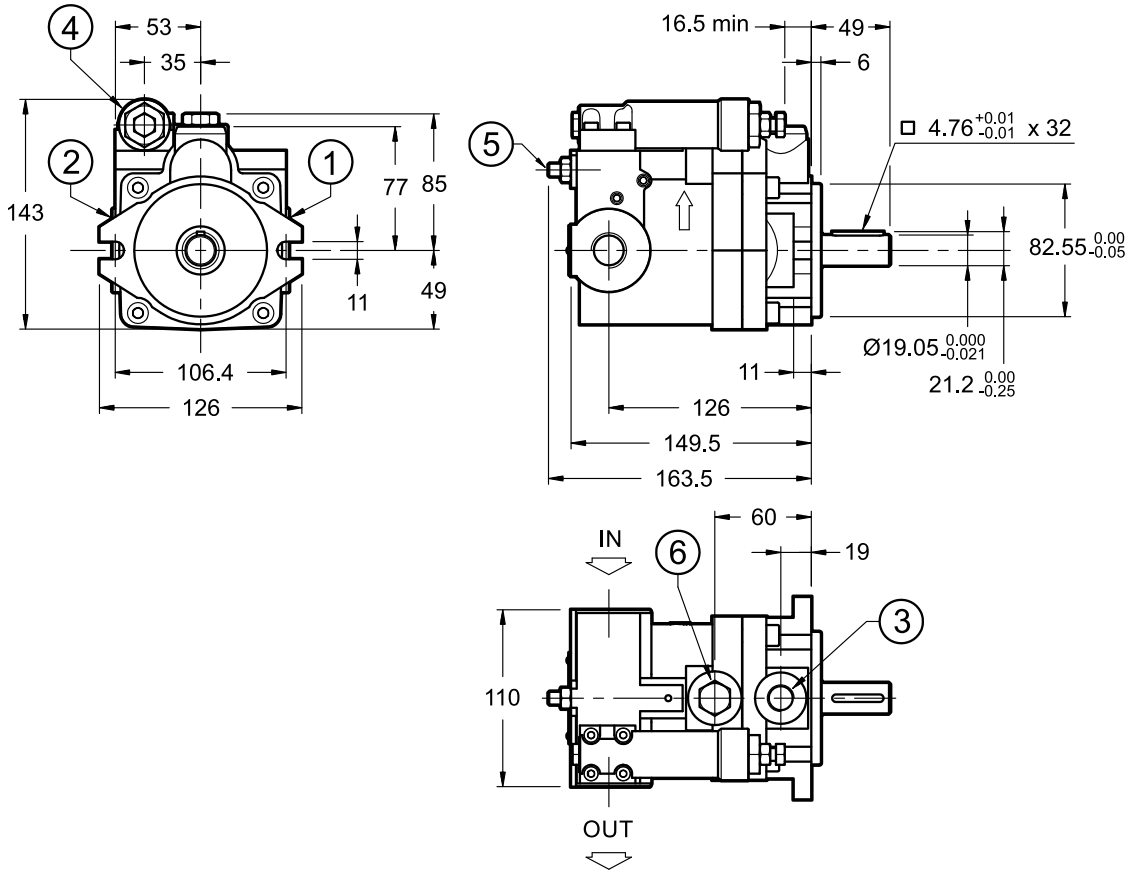


	Δ **displacement / turn** [cm³ / turn]
VPPL- 008	0.8
VPPL- 016	1.5
VPPL- 022	2.0
VPPL- 036	2.6
VPPL- 046	3.2
VPPL- 070	4.1
VPPL-100	5.1

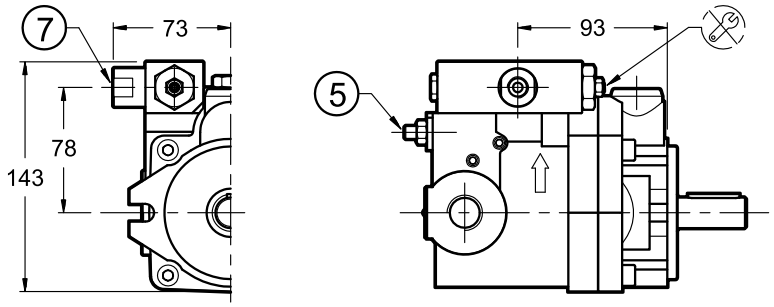
5 - VPPL-008 PUMPS OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

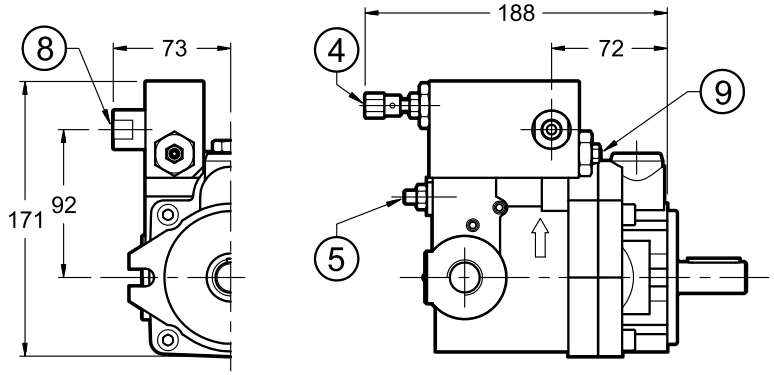
VPPL- 008PC5



VPPL- 008PCR



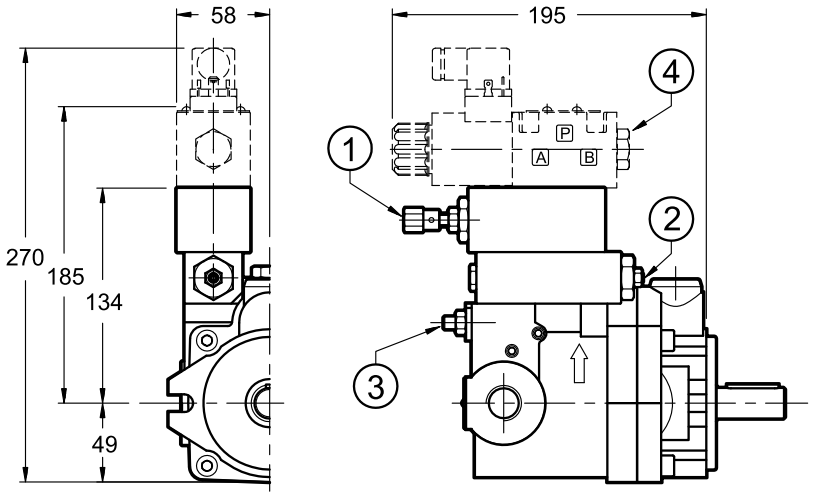
VPPL- 008PQC



1	Suction port IN: 1/2” BSP
2	Delivery port OUT: 1/2” BSP
3	Drain port: 3/8” BSP
4	Pressure adjustment screw
5	Displacement set screw: Allen key 6 Locking nut: spanner 13
6	Oil filling port: 3/8” BSPT
7	Remote pressure control port: 1/4" BSP
8	Load sensing port: 1/4" BSP
9	Factory-set differential pressure, See NOTE p. 4.3

VPPL- 008PCX5

dimensions in mm



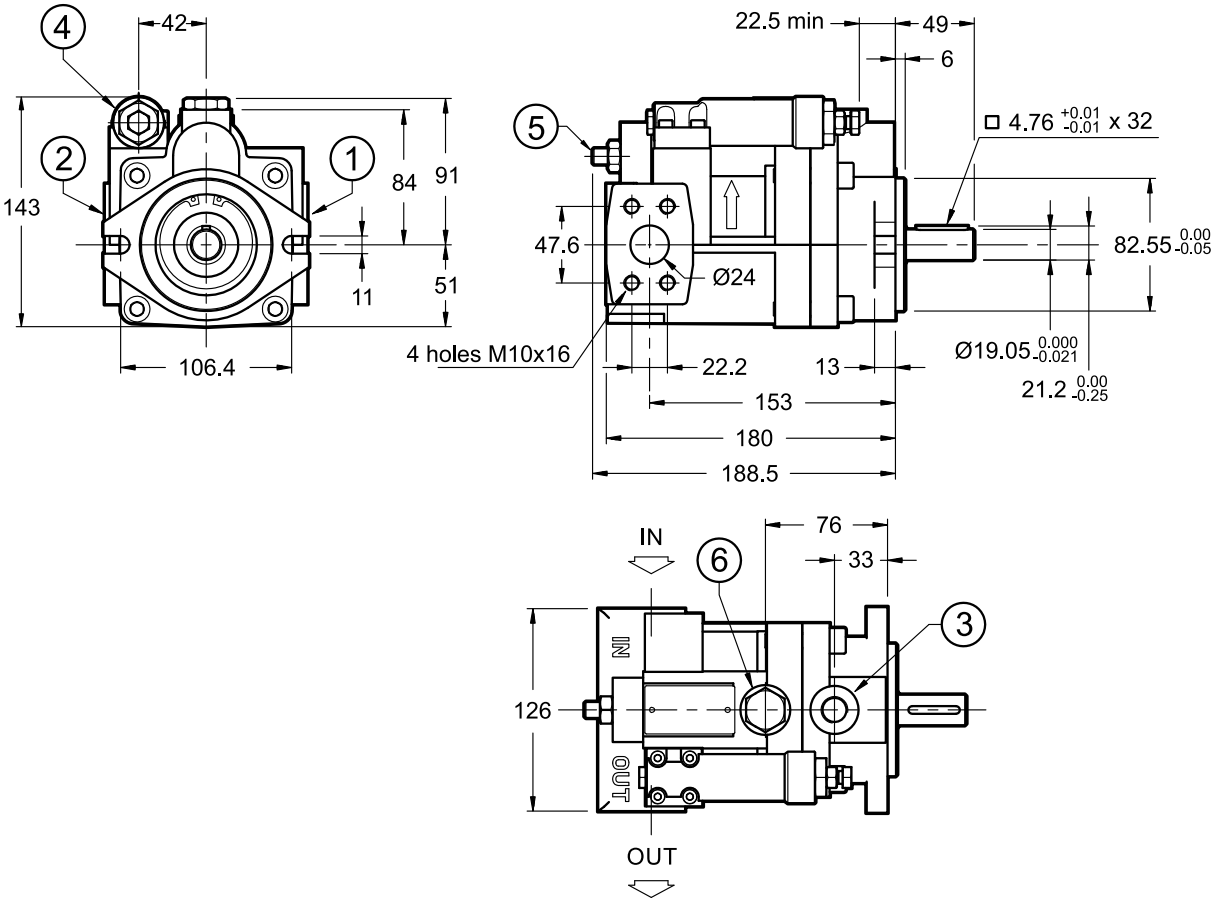
1	Pressure adjustment screw
2	Factory-set differential pressure. See NOTE p. 4.3
3	Displacement set screw: Allen key 6 Locking nut: spanner 13
4	Switching solenoid valve, DS3-SA2 type (to be ordered separately; see cat. 41 150)

NOTE: for missing dimensions, see drawing VPPL-008PC5

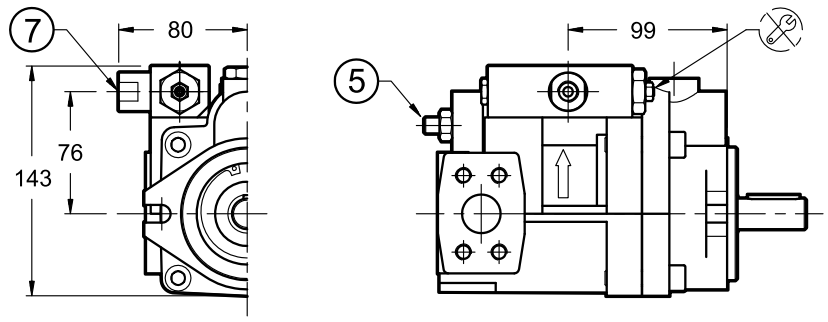
7 - VPPL- 016 AND VPPL- 022 PUMPS OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

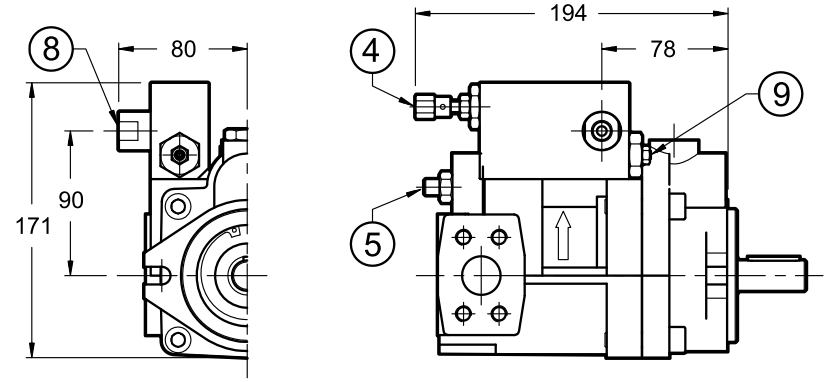
VPPL- 016PC5 and VPPL- 022PC5



VPPL- 016PCR and VPPL- 022PCR



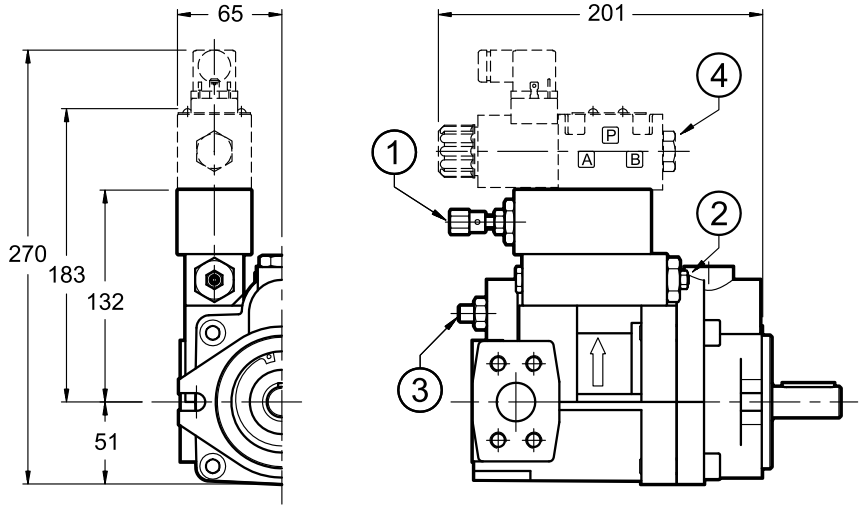
VPPL- 016PQC and VPPL- 022PQC



1	Suction port IN: SAE 3000 1” flange (see point 12)
2	Delivery port OUT: SAE 3000 3/4” flange (see point 12)
3	Drain port: 3/8” BSP
4	Pressure adjustment screw
5	Displacement set screw: Allen key 8 Locking nut: spanner 17
6	Oil filling port: 3/8” BSPT
7	Remote pressure control port: 1/4" BSP
8	Load sensing port: 1/4" BSP
9	Factory-set differential pressure. See NOTE point 4.3

VPPL- 016PCX5 and VPPL- 022PCX5

dimensions in mm



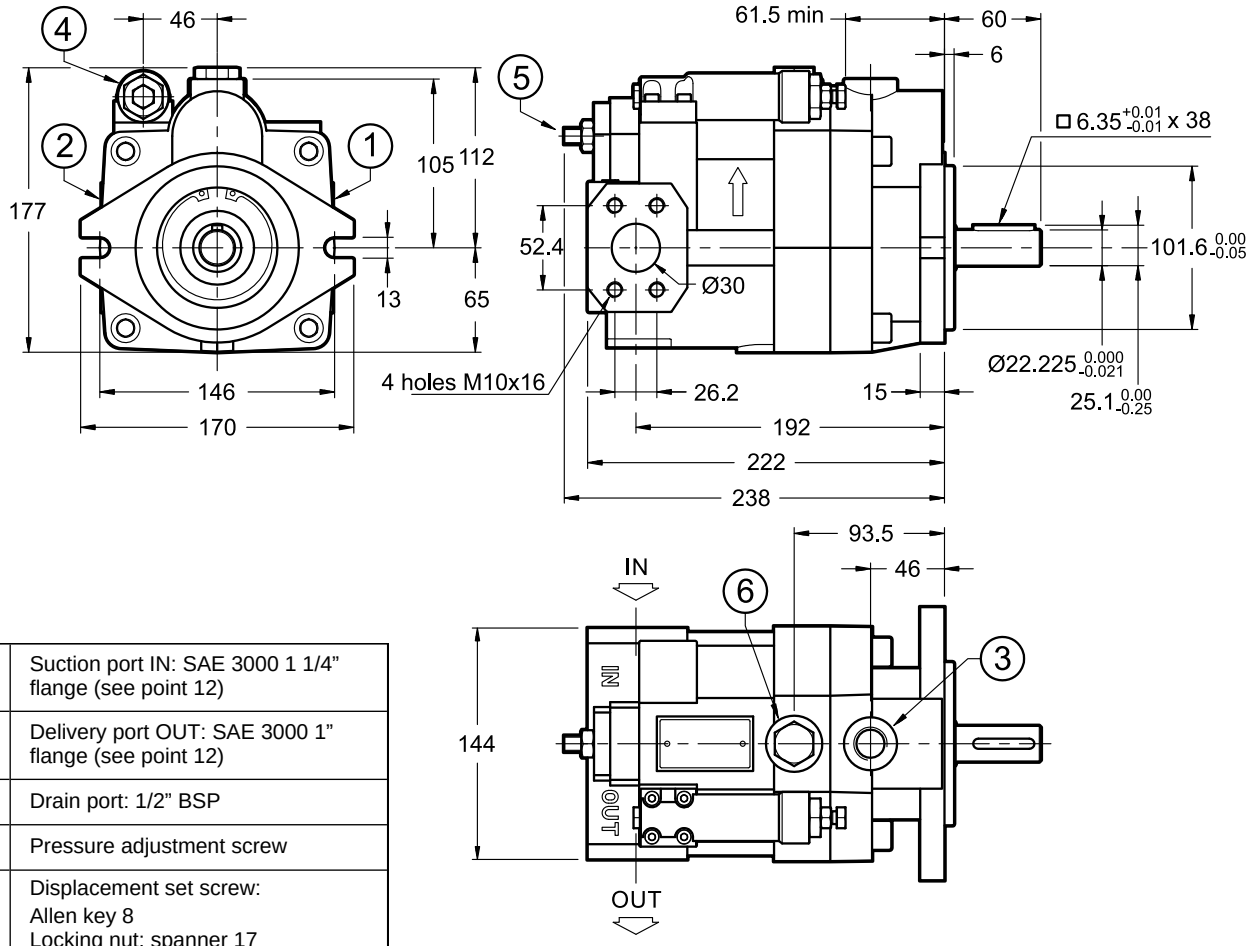
1	Pressure adjustment screw
2	Displacement set screw: Allen key 8 Locking nut: spanner 17
3	Factory-set differential pressure See NOTE p. 4.4
4	Switching solenoid valve, DS3-SA2 type (to be ordered separately; see cat. 41 150)

NOTE: see drawing on the previous page for missing dimensions,

8 - VPPL- 036 AND VPPL- 046 PUMPS OVERALL AND MOUNTING DIMENSIONS

VPPL- 036PC5 and VPPL- 046PC5

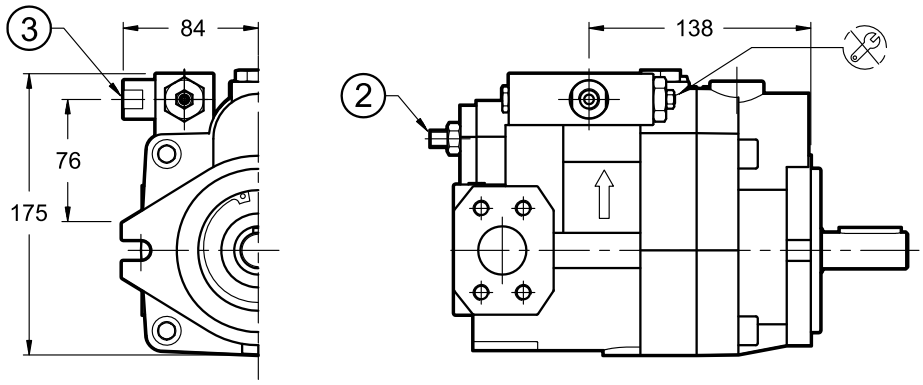
dimensions in mm



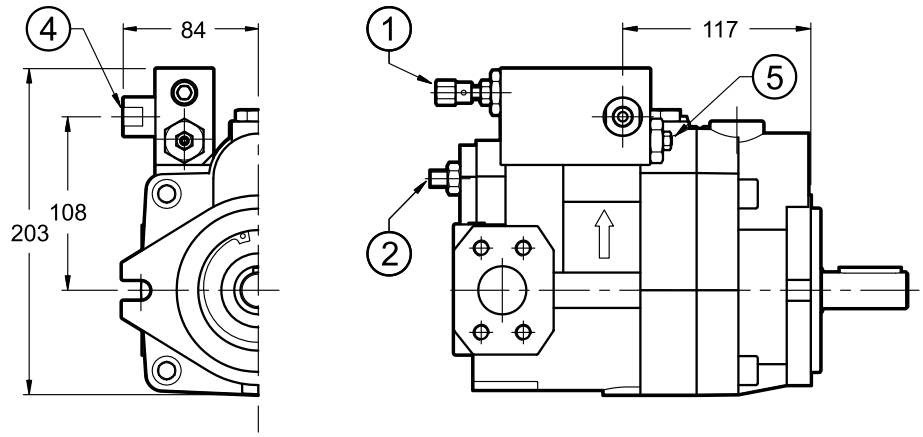
1	Suction port IN: SAE 3000 1 1/4” flange (see point 12)
2	Delivery port OUT: SAE 3000 1” flange (see point 12)
3	Drain port: 1/2” BSP
4	Pressure adjustment screw
5	Displacement set screw: Allen key 8 Locking nut: spanner 17
6	Oil filling port: 1/2” BSPT

VPPL- 036PCR and VPPL- 046PCR

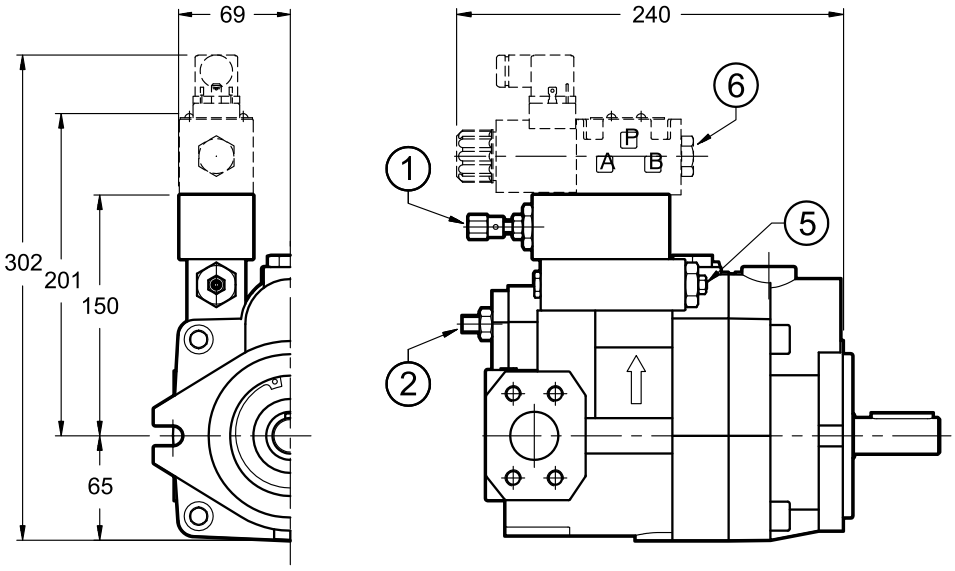
dimensions in mm



VPPL- 036PQC and VPPL- 046PQC



VPPL- 036PCX5 and VPPL- 046PCX5



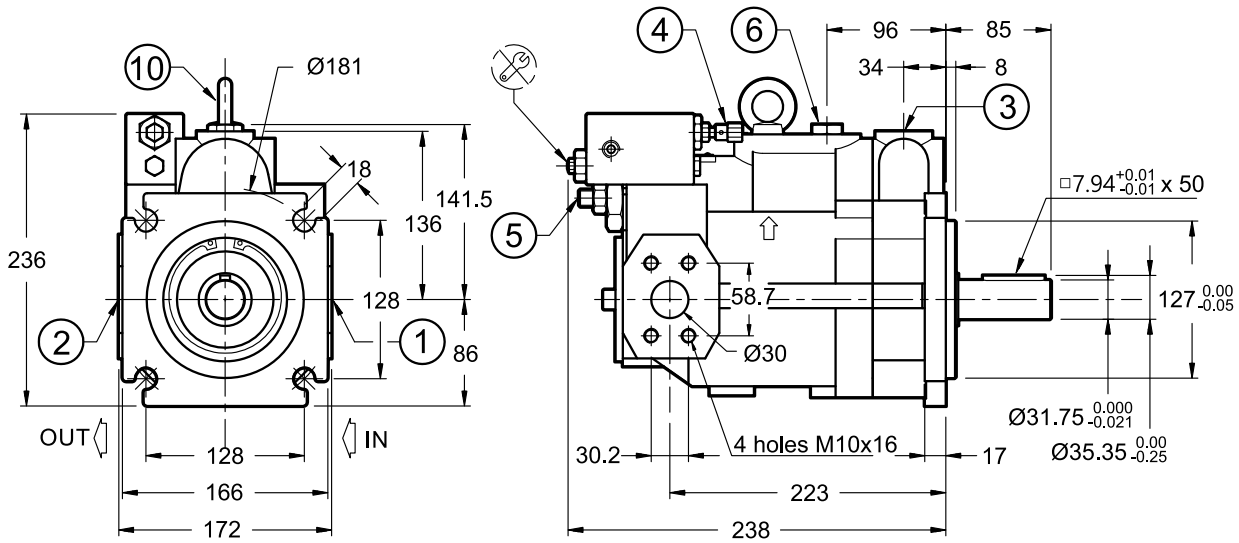
1	Pressure adjustment screw
2	Displacement set screw: Allen key 8 Locking nut: spanner 17
3	Remote pressure control port: 1/4" BSP
4	Load Sensing port: 1/4” BSP
5	Factory-set differential pressure. For PQC: see NOTE point 4.3 For PCX*: see NOTE point 4.4
6	Switching solenoid valve, DS3-SA2 type (to be ordered separately; see cat. 41 150)

NOTE: see drawing on the previous page for missing dimensions,

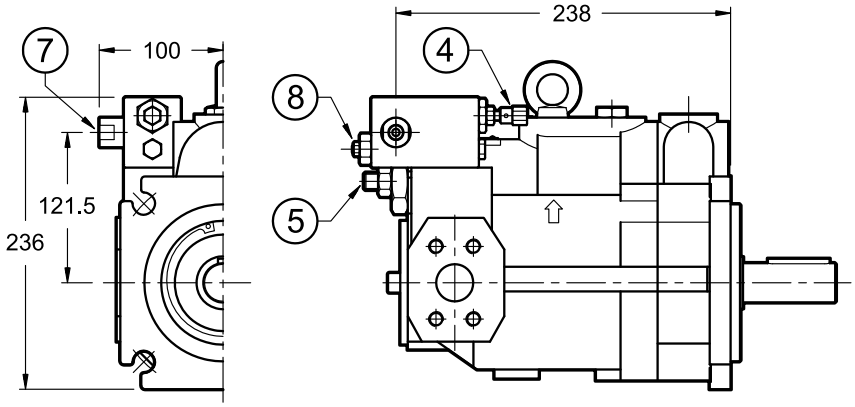
9 - VPPL-070 PUMPS OVERALL AND MOUNTING DIMENSIONS

VPPL- 070PC6

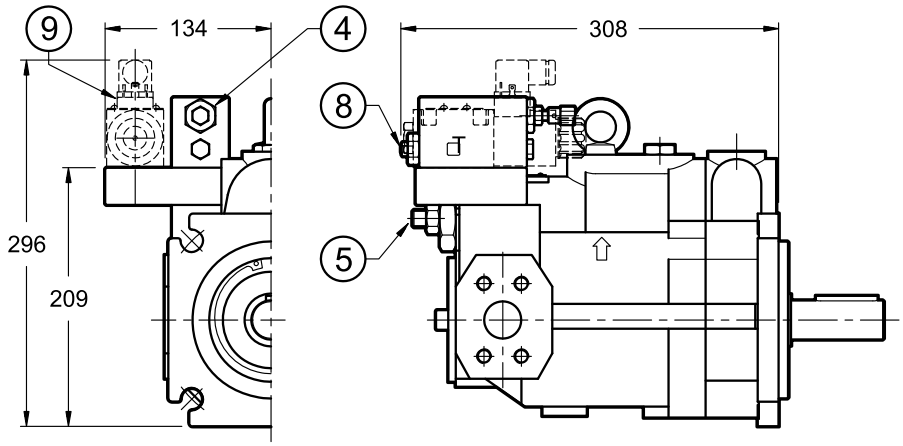
dimensions in mm



VPPL- 070PCR and VPPL- 070PQC



VPPL-100PCX6

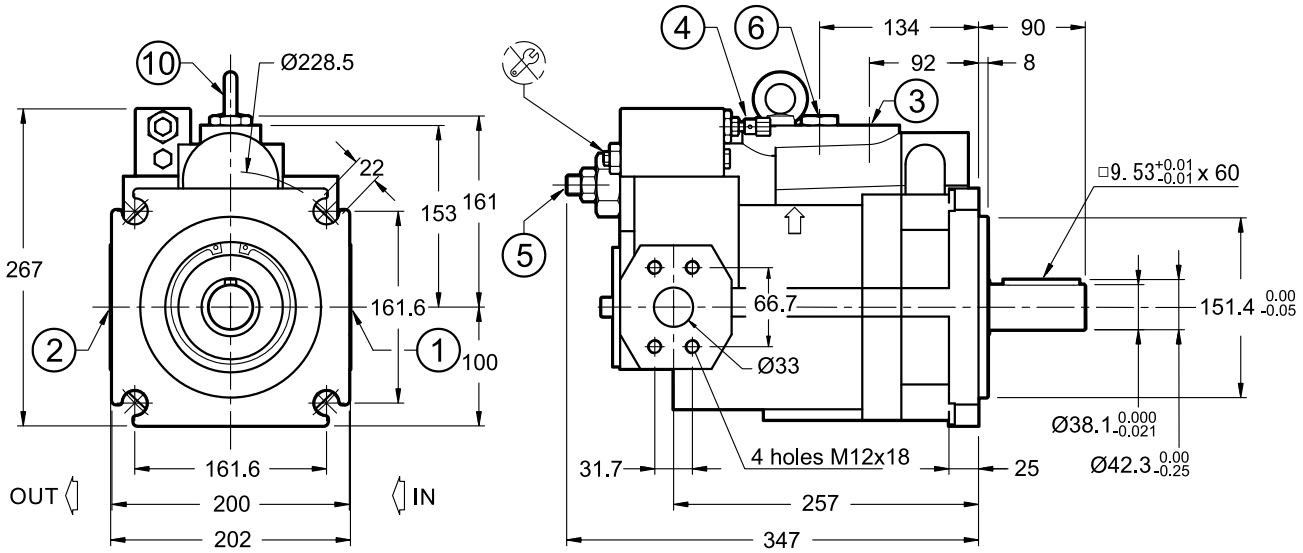


1	Suction port IN: SAE 3000 1 1/2" flange (see point 12)
2	Delivery port OUT: SAE 3000 1 1/4" flange (see point 12)
3	Drain port: 1/2" BSP
4	for PCR : adjustment of the pressure relief valve for PQC: pressure adjustment
5	Displacement set screw: Allen key 12 Locking nut: spanner 22
6	Oil filling port: 1/2" BSPT
7	Port 1/4" BSP: for PCR: remote pressure control port for PQC: load sensing port
8	Factory-set differential pressure. For PQC: see NOTE point 4.3 For PCX*: see NOTE point 4.4
9	Switching solenoid valve, DS3-SA2 type (to be ordered separately; see cat. 41 150)
10	Lifting eye bolt

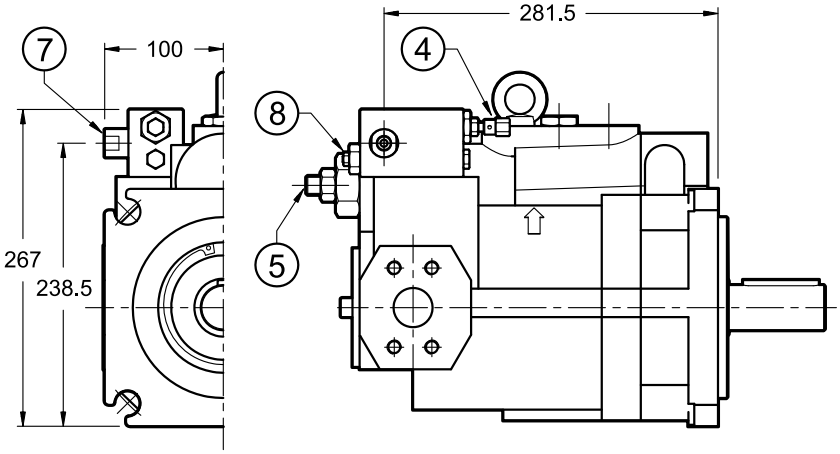
10 - VPPL-100 PUMPS OVERALL AND MOUNTING DIMENSIONS

VPPL-100PC6

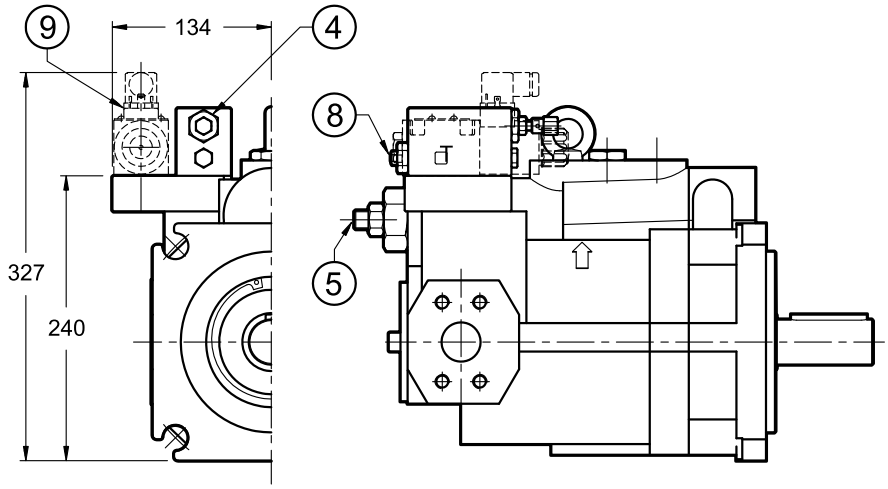
dimensions in mm



VPPL-100PCR and VPPL-100PQC



VPPL-100PCX6



1	Suction port IN: SAE 3000 2” flange (see point 12)
2	Delivery port OUT: SAE 6000 1 1/4” flange (see point 12)
3	Drain port: 1/2” BSP
4	for PCR : adjustment of the pressure relief valve for PQC: pressure adjustment
5	Displacement set screw: Allen key 14 Locking nut: spanner 24
6	Oil filling port: 1/2” BSPT
7	Port 1/4” BSP: for PCR: remote pressure control port for PQC: load sensing port
8	Factory-set differential pressure. For PQC: see NOTE point 4.3 For PCX*: see NOTE point 4.4
9	Switching solenoid valve, DS3-SA2 type (to be ordered separately; see cat. 41 150)
10	Lifting eye bolt

11 - INSTALLATION

- VPPL pumps can be installed in either horizontal or vertical position, with the shaft facing upward.

  NOTE: The drain port must be oriented so that the oil level inside the pump housing never falls below 3/4 of its internal volume.

- For installations above the free oil level, ensure that the minimum inlet (suction) pressure does not exceed –0.2 bar (relative). If low noise emissions are required, installation inside the tank is recommended.

  When installed inside the tank and the oil level does not ensure complete pump submersion, the drain line should be arranged so as to ensure constant lubrication of the upper pump bearing.

- **Before commissioning, fill the pump housing with the system fluid.**

- Verify that the direction of rotation is correct.

- During the first start-up, vent the air from the pressure line, keeping the line at free discharge. If the circuit has difficulty purging air, the use of a dedicated air-vent valve is recommended.

  Start-up, especially at low ambient temperatures, must be performed with the system at minimum pressure.

- The suction line must be properly sized so that the suction pressure does not exceed –0.2 bar (relative). Bends, restrictions, or excessive line length may further reduce suction pressure, leading to increased noise emissions and reduced pump service life.

- The drain pipe must be sized so that the pressure inside the pump housing always remains below 0.5 bar (relative), including during transient phases (speed/load changes and flow adjustments).The minimum line size is 3/8″ for pump types 008, 016, and 022; at least 1/2″ for types 036 and 046; and 3/4″ for types 070 and 100.

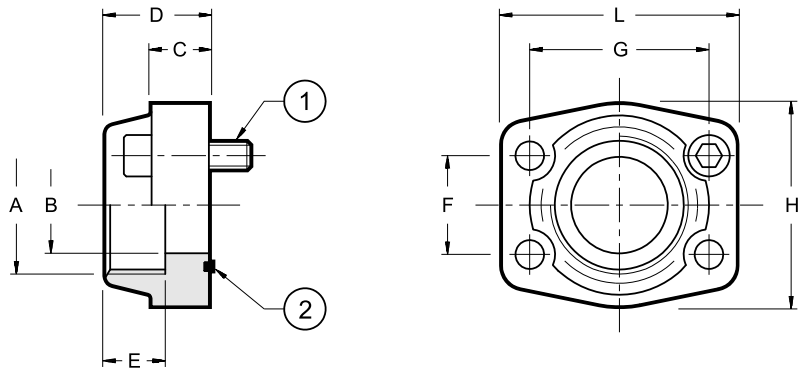
- The drain line must discharge inside the tank, away from the suction zone.

- Check valves are not allowed on the suction line. For filter elements characteristics and installation please refer to point 2.3.

- The motor–pump connection must be made using a flexible coupling in order to minimize axial and radial loads on the pump shaft. The shaft alignment error between motor and pump must be kept within 0.05 mm.

12 - CONNECTION FLANGES

dimensions in mm



Bolts and O-rings must be ordered separately.

	Flange code	Flange description	p_{max} [bar]	ØA	ØB	C	D	E	F	G	H	L	1 SHC bolts ISO 4762	2
SAE 3000	0610719	SAE - 3/4”	345	3/4” BSP	19	18	36	19	22,2	47,6	50	65	n° 4 - M10x35	OR 4100 (24.99x3.53)
	0610713	SAE - 1”	345	1” BSP	25	18	38	22	26,2	52,4	55	70		OR 4131 (32.93x3.53)
	0610720	SAE - 1 ¼”	276	1 ¼” BSP	32	21	41	22	30,2	58,7	28	79		OR 4150 (37.69x3.53)
	0610714	SAE - 1 ½”	207	1 ½” BSP	38	25	45	24	35,7	69,9	78	93	n° 4 - M12x45	OR 4187 (47.23x3.53)
	0610721	SAE - 2”	207	2” BSP	51	25	45	30	42,9	77,8	90	102	n° 4 - M12x45	OR 4225 (56.74x3.53)
SAE 6000	0770106	SAE - 1 ¼”	420	1 ¼” BSP	32	27	45	25	31,7	66,7	78	95	n° 4 - M14x50	OR 4150 (37.69x3.53)

DUPLOMATIC MOTION SOLUTIONS
a member of DAIKIN group

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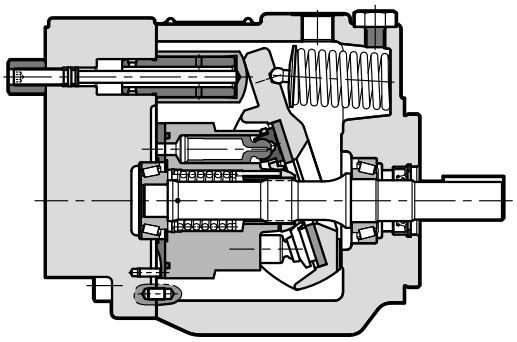


VPPD

VARIABLE DISPLACEMENT AXIAL-PISTON PUMPS FOR INTERMEDIATE PRESSURE

SERIES 10

OPERATING PRINCIPLE



— VPPD pumps are variable displacement axial-piston pumps with variable swash plate, suitable for applications with open circuits and intermediate pressures.

— They are available in three displacements of 15, 23 and 38 cm^3/rev.

— The pump flow rate is proportional to the rotation speed and to the angle of the swash plate, which can be continuously modulated. The maximum angle can be limited mechanically via a suitable regulating screw.

— They are supplied with a SAE J744 2-holes pilot flange and cylindrical keyed shaft end, with BSPP threaded ports.

— They are available with three types of regulating control, each according to the application needs.

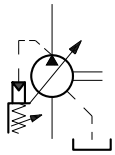
TECHNICAL SPECIFICATIONS

PUMP DISPLACEMENT		**015**	**023**	**038**
Maximum displacement	cm^3/rev	14.8	23.0	37.7
Maximum flow rate at 1500 rpm (**NOTE**)	l/min	22.2	34.5	56.6
Maximum operating pressure	bar	210	250	250
Rotation speed	rpm	min 500 - max 1800		
Rotation direction		clockwise / counterclockwise		
Hydraulic connection		BSPP threaded ports		
Type of mounting		SAE flange J744 - 2 holes		
Oil volume in the pump body	dm^3	0.5		0.9
Mass (side ports)	kg	14.5 ÷ 16.0	21.5 ÷ 23.0	26.0 ÷ 28.7

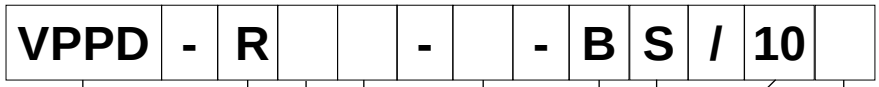
NOTE: theoretical value.

Ambient temperature range	°C	-10 / +50
Fluid temperature range	°C	0 / +60
Fluid contamination degree	see point 2.3	
Recommended viscosity	cSt	20 ÷ 50

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE



Variable displacement axial piston pump for intermediate pressure

Rotation (seen from the shaft side)
R = clockwise (**standard**)
L = counterclockwise (on request)

Displacement
015 = 14.8 cm^3/rev
023 = 23.0 cm^3/rev
038 = 37.7 cm^3/rev

Pump controls:
PC* pressure compensator
- **4** = 15 to 140 bar
- **5** = 35 to 210 bar (for VPPD-*015 only)
- **6** = 35 to 250 bar (for VPPD-*023 and VPPD-*038 only)

PCR* remote pressure compensator
- **5** = 15 to 210 bar (for VPPD-*015 only)
- **6** = 15 to 250 bar (for VPPD-*023 and VPPD-*038 only)

PQC* pressure and flow compensator (load sensing)
- **4** = 15 to 140 bar
- **5** = 35 to 210 bar (for VPPD-*015 only)
- **6** = 35 to 250 bar (for VPPD-*023 and VPPD-*038 only)

Mounting flange and shaft end:
SAE J744 flange 2-holes and cylindrical keyed shaft
- **A034P** = SAE A for VPPD-*015
- **B078P** = SAE B for VPPD-*023 and VPPD-*038

Hydraulic connections: BSPP threaded
See drawings

Hydraulic ports position
S = side (**standard**)
R = rear (on request)

Series No. (overall and mounting dimensions do not change from 10 to 19)

Seals:
N = NBR seals for mineral oils (**standard**)
V = FPM seals for special fluids

2 - PERFORMANCE RATINGS

(values obtained with mineral oil with viscosity of 46 cSt at 40 °C)

NOMINAL DISPLACEMENT	DISPLACEMENT [cm^3/rev]	MAX FLOW RATE at 1500 rpm [l/min]	MAX OPERATING PRESSURE at 1500 rpm [bar]	SPEED [rpm]		MIN SUCTION PRESSURE [bar]
				max	min	
015	14.8	22.2	210	1800	500	- 0.17
023	23.0	34.5	250			
038	37.7	56.6	250			

NOTE: The pressure inside the pump case must not exceed 0.35 bar.

3 - HYDRAULIC FLUID

3.1 - Fluid type

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. With these fluids use NBR seals. Using fluids at temperatures higher than 60 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

Phosphate ester- based hydraulic fluids may be used. Following limitations apply:

HYDRAULIC FLUID TYPE	SPEED [rpm]	MAX FLUID TEMPERATURE [°C]	MAX OPERATING PRESSURE [bar]	MIN SUCTION PRESSURE [bar]	SEALS
Phosphate ester hydraulic fluids	800 ÷ 1800	+50	210	-0.10	VITON

3.2 - Fluid viscosity

The operating fluid viscosity must be within the following range: 15 ÷ 400 cSt, with fluid operating temperature range 0 ÷ 60 °C.

When selecting the fluid type, be sure that the true viscosity is within the range specified above at the operating temperature.

3.3 - Degree of fluid contamination

The maximum degree of fluid contamination must be according to ISO 4406:1999 class 20/18/15; therefore the use of a pressure or a return filter with $\beta_{20} \geq 75$ is suggested.
A degree of maximum fluid contamination according to ISO 4406:1999 class 20/16/13 is recommended for optimum endurance of the pump. Hence, the use of a filter with $\beta_{10} \geq 100$ is recommended.
For the installation of filters on the suction line, make sure to comply with the min. suction pressure values indicated in this document. The suction filter should be oversized to avoid cavitation issues, it must be equipped with a by-pass valve and, if possible, with a clogging indicator.

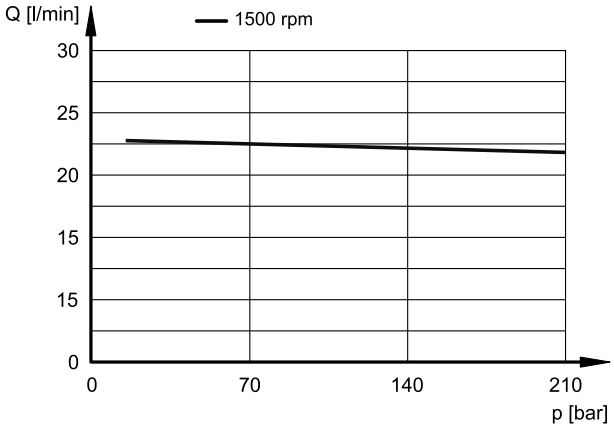
4 - CHARACTERISTIC CURVES

(values obtained with mineral oil with viscosity of 36 cSt at 50 °C)

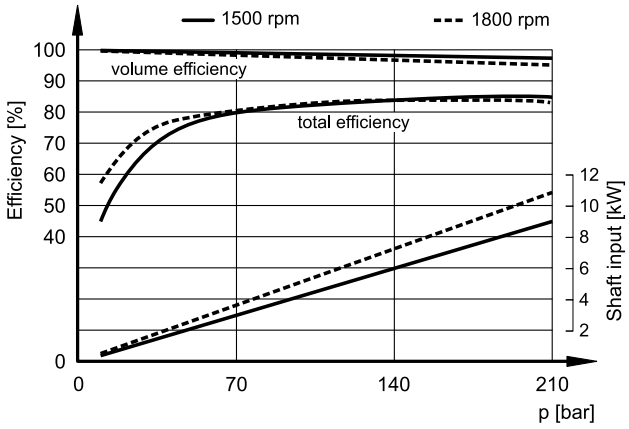
Unless otherwise stated, values are valid for both 1500 rpm and 1800 rpm.
The efficiency varies depending on the delivery rate setting. In order to select the right motor capacity, refer to absorbed power characteristics.

4.1 - VPPD-*015 pump characteristic curves

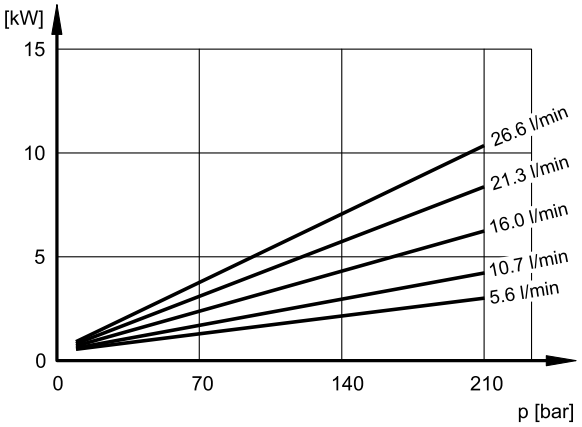
FLOW RATE / PRESSURE CURVES



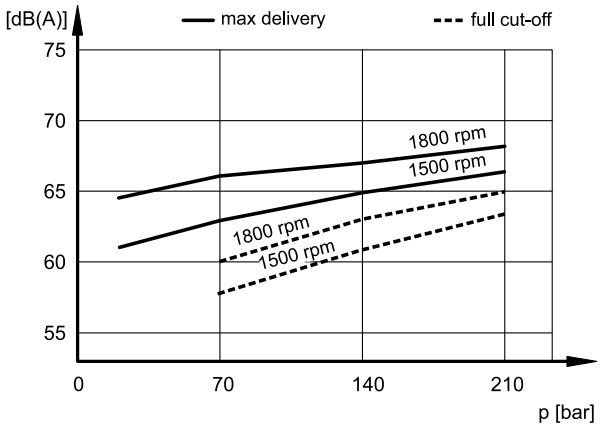
VOLUMETRIC AND TOTAL EFFICIENCY



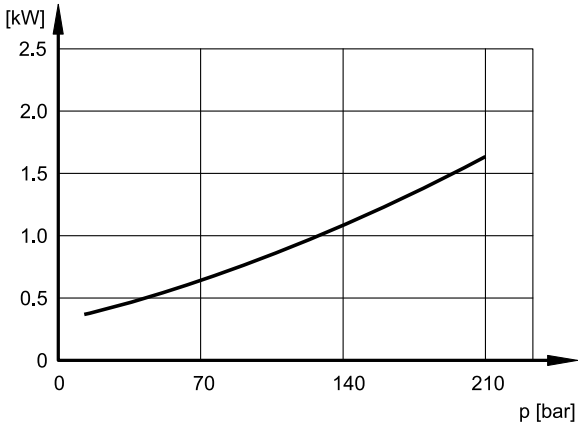
ABSORBED POWER



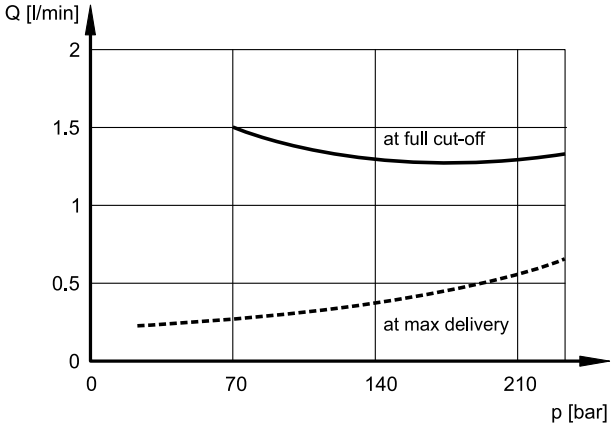
NOISE LEVEL
(detection at 1 m from the pump)



INPUT POWER AT FULL CUT-OFF

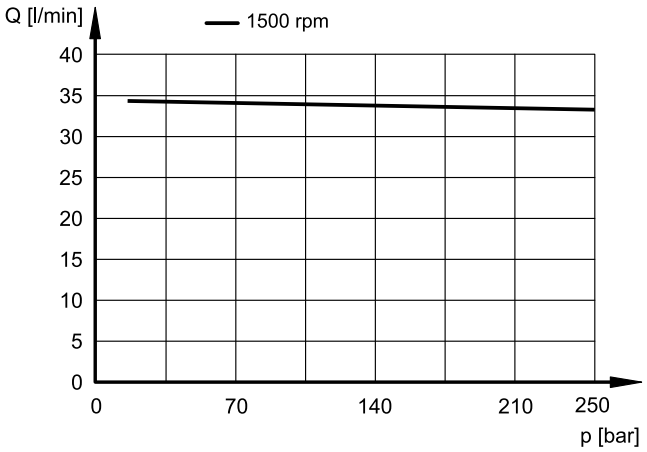


DRAIN FLOW RATE

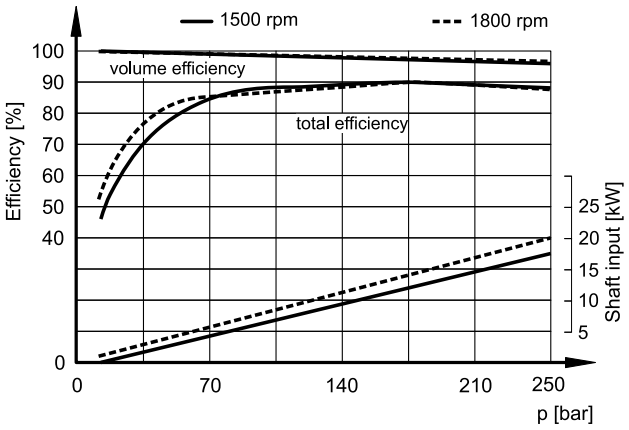


4.2 - VPPD-*023 pump characteristic curves

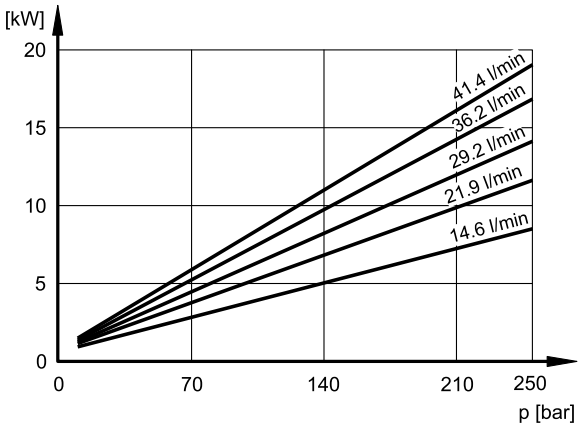
FLOW RATE / PRESSURE CURVES



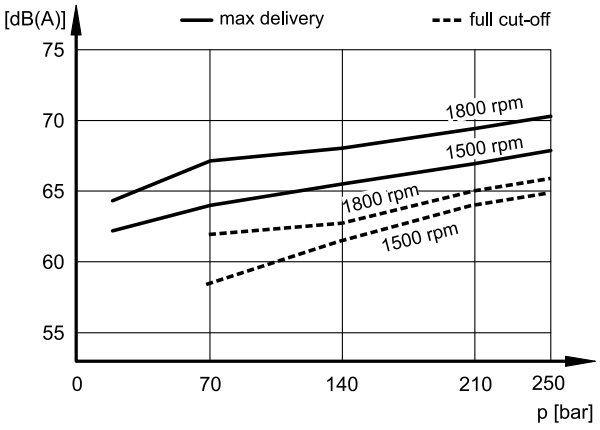
VOLUMETRIC AND TOTAL EFFICIENCY



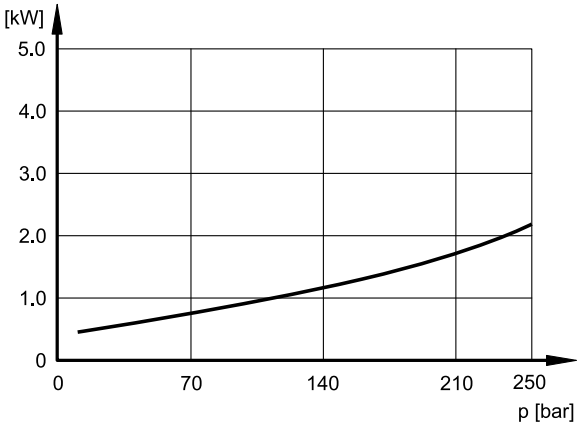
ABSORBED POWER



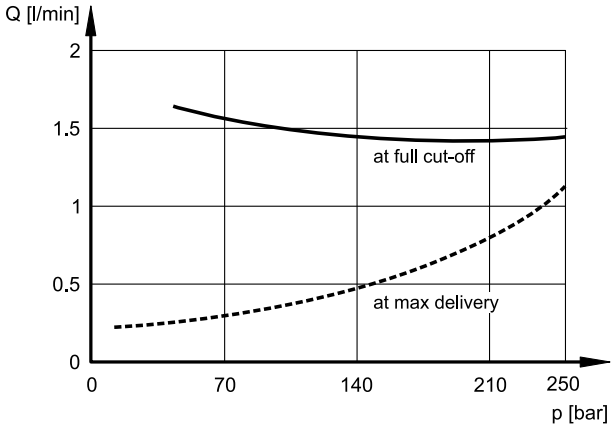
NOISE LEVEL
(detection at 1 m from the pump)



INPUT POWER AT FULL CUT-OFF

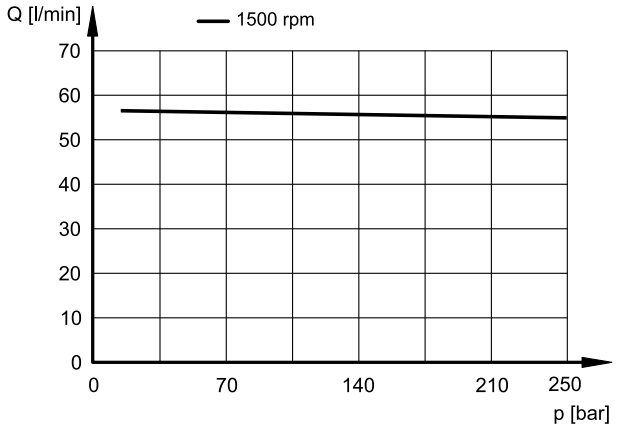


DRAIN FLOW RATE

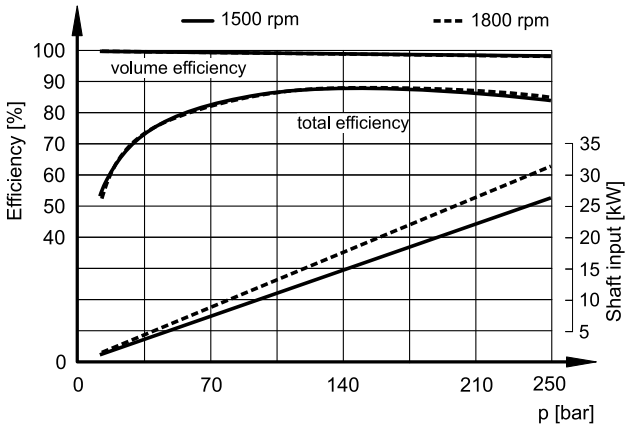


4.3 - VPPD-*038 pump characteristic curves
(values obtained with mineral oil with viscosity of 36 cSt at 50°C)

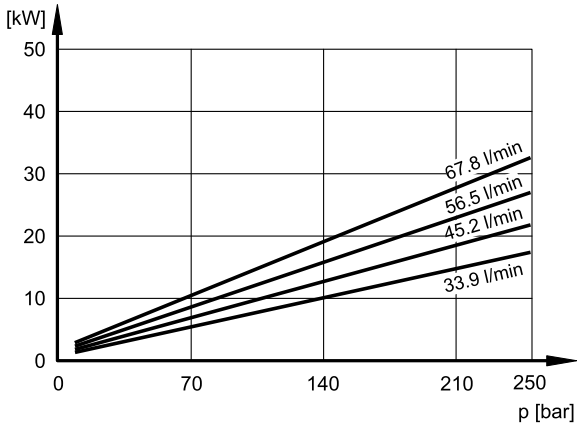
FLOW RATE / PRESSURE CURVES



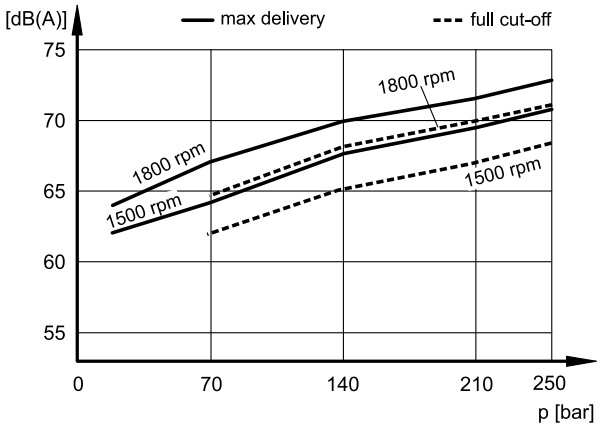
VOLUMETRIC AND TOTAL EFFICIENCY



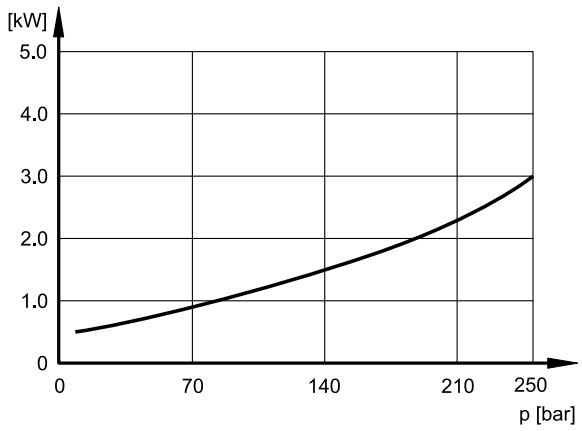
ABSORBED POWER



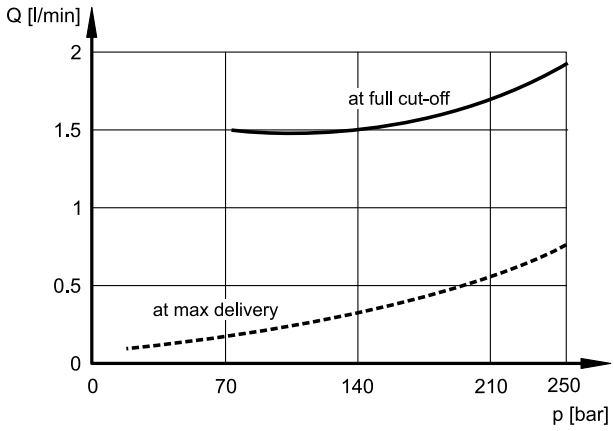
NOISE LEVEL
(detection at 1 m from the pump)



INPUT POWER AT FULL CUT-OFF

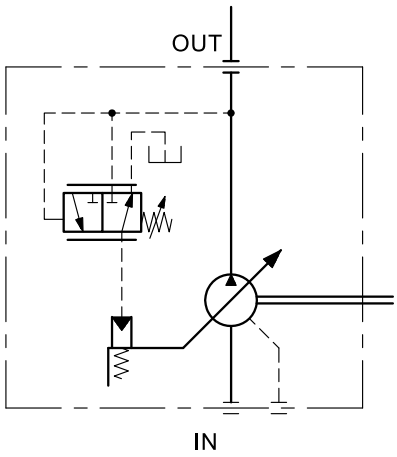


DRAIN FLOW RATE



5 - CONTROLS

5.1 - PC* pressure compensator



The PC* pressure compensator keeps the pressure constant at the set level in the system, thus adjusting automatically the pump delivery according to the actual requirements from the system.

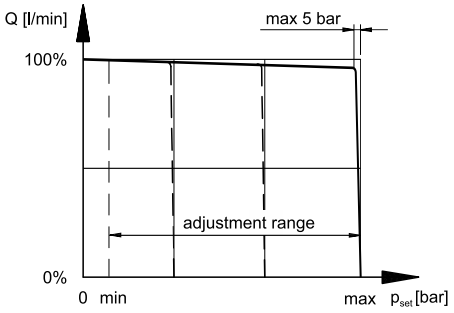
The delivery pressure can be set to the desired value by turning the pressure adjusting screw of the PC valve

Clockwise rotation increases the set pressure.

- pressure adjustment range:

  PC4 = 15 to 140 bar
  PC5 = 35 to 210 bar (for VPPD-*015 only)
  PC6 = 35 to 250 bar (for VPPD-*023 and VPPD-*038 only)

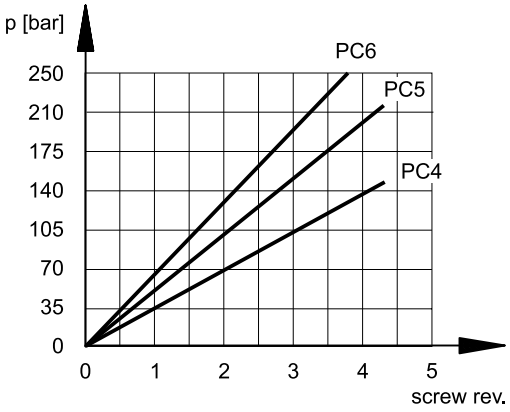
- default setting:
  highest value of the pressure range at max displacement.



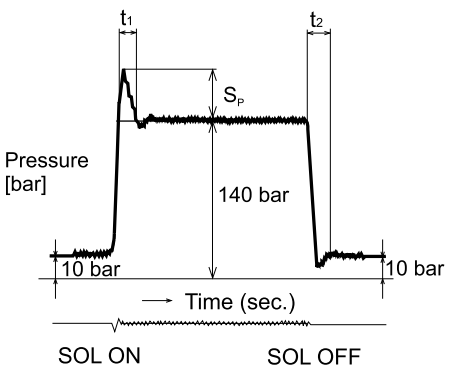
5.1.1 - Characteristic curves

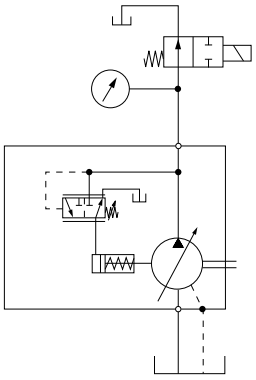
(values obtained with mineral oil with a viscosity of 36 cSt at 50 °C, 1500 rpm)

PRESSURE ADJUSTMENT BY TURNING SCREW



RESPONSE CHARACTERISTICS

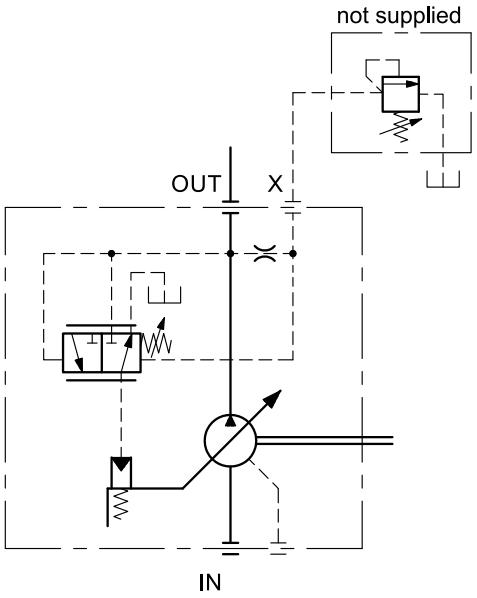




NOTE: Excessive loosening of the pressure adjusting screw may cause oil to leak from the threaded section or parts to fall out. Do not loosen the screw beyond the pressure adjustment range.

pump displacement	t1 [ms]	t2 [ms]	S_P surge pressure [bar]
015	40 ÷ 50	50 ÷ 70	25 ÷ 40
023	50 ÷ 60		35 ÷ 70
038	50 ÷ 90		55 ÷ 90

5.2 - PCR* remote-controlled pressure compensator



The PCR pressure compensator keeps the pressure constant at the set level in the system, thus adjusting automatically the pump delivery according to the actual system requirements, via a remote control (pressure relief valve) connected to the X port of the pump (typical application for immersed pumps).

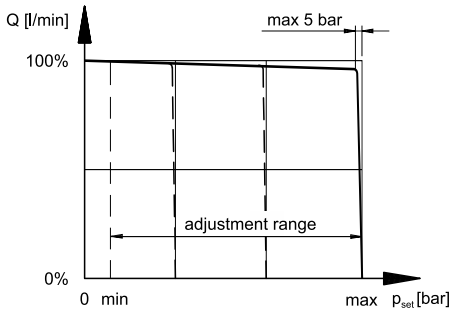
NOTE: The maximum flow rate of the remote valve should be max. 2 l/min.The maximum length of the piping between the valve and the X port of the pump must not exceed 2 m.

Clockwise rotation increases the set pressure.

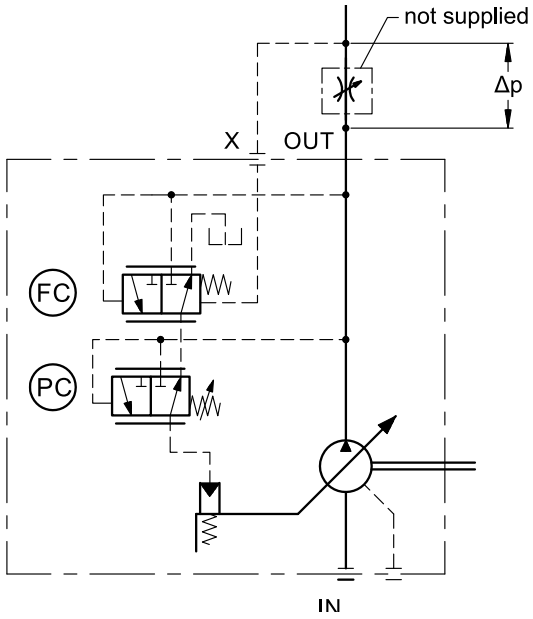
- pressure adjustment range:

  PCR5 = 15 to 210 bar (for VPPD-*015 only)
  PCR6 = 15 to 250 bar (for VPPD-*023 and VPPD-*038 only)

- differential pressure screw (PC valve): factory set
- required flow rate for pilot signal at X port = 1 l/min approx.



5.3 - PQC* flow and pressure compensator (Load Sensing):



Besides to the pressure adjustment (as for the PC* control), this compensator allows to control the pump delivery according to the pressure drop measured upstream and downstream a throttle valve installed in the working line.

Combining this control method with a proportional control valve achieves energy efficient control of the pump, where the minimum pressure and flow rate to operate the actuator are supplied.

Clockwise rotation on PC valve increases the set pressure.

NOTE: The piping between the X port and the delivery line downstream the restrictor (or valve) is in the Customer's charge

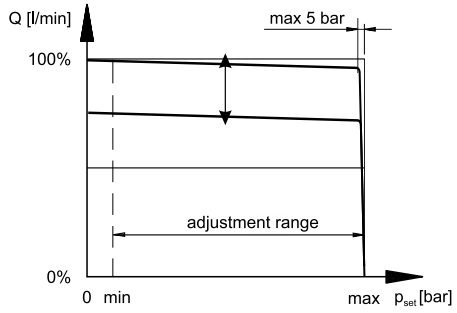
- pressure adjustment range (PC valve):

  PQC4 = 15 to 140 bar
  PQC5 = 35 to 210 bar (for VPPD-*015 only)
  PQC6 = 35 to 250 bar (for VPPD-*023 and VPPD-*038 only)

- default setting (PC valve):
  highest value of the pressure range at max displacement.

- differential pressure (FC valve, factory set): 14 bar

- minimum delivery pressure = 22 bar

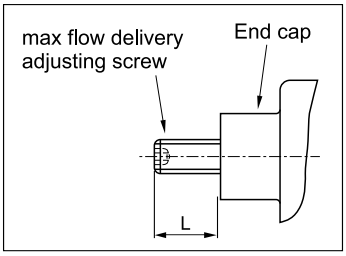


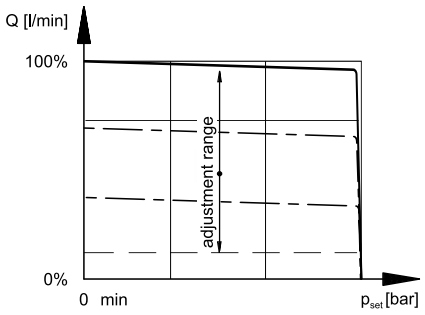
6 - MAXIMUM DISPLACEMENT ADJUSTMENT

The adjustment screw is placed on the pump back. Turn clockwise to decrease the pump displacement.

The delivery rate can be roughly judged from the protruding length of the adjusting screw (L).

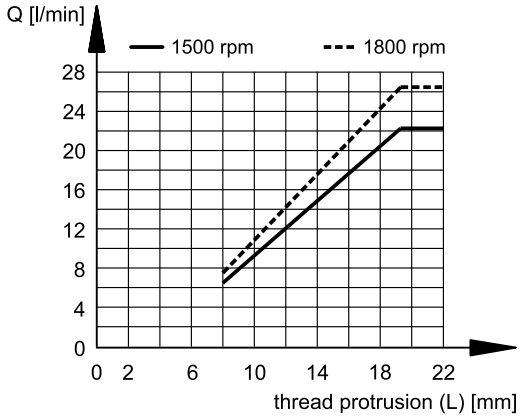
Overtightening of the adjusting screw may cause oil to leak from the threaded section. Do not tighten the screw beyond the adjustment range.



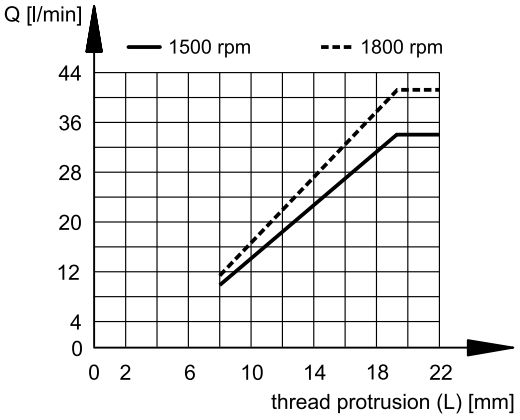


6.1 - Maximum delivery as a dependency of the thread protrusion

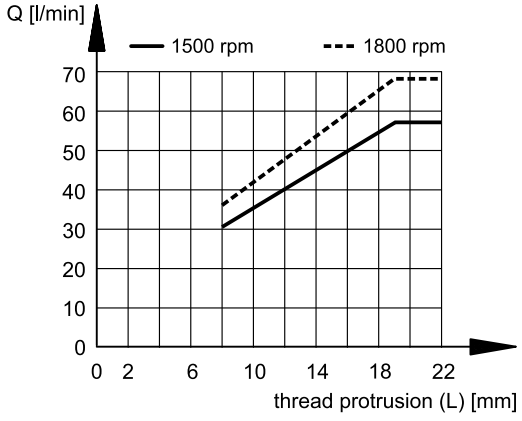
VPPD-*015



VPPD-*023



VPPD-*038

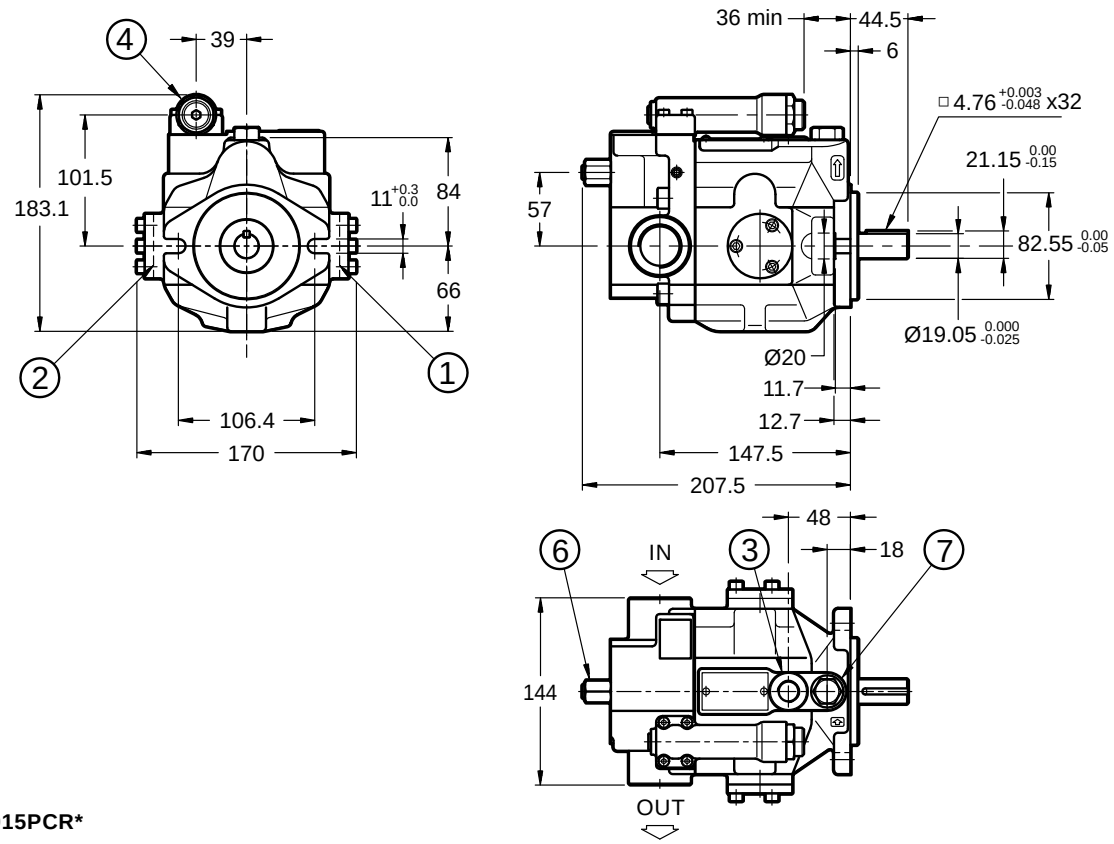


Min / max delivery at 1500 rpm		
	min	max
VPPD-*015	6.3	22.2
VPPD-*023	10.0	34.5
VPPD-*038	30.4	56.6

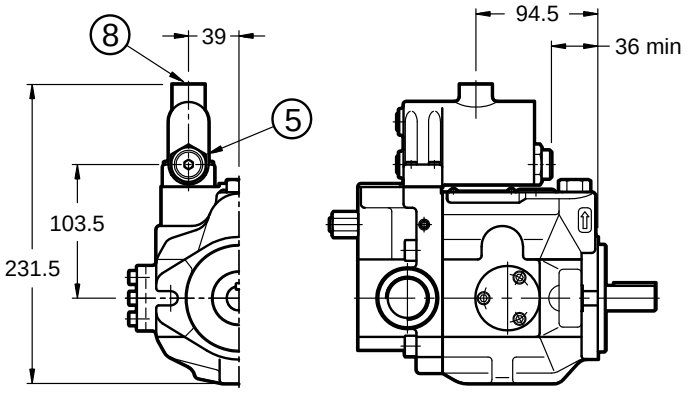
7 - VPPD-*015 PUMPS OVERALL AND MOUNTING DIMENSIONS

VPPD-*015PC*

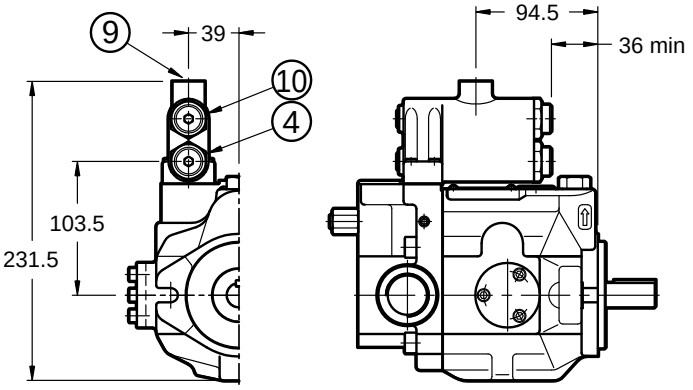
dimensions in mm



VPPD-*015PCR*



VPPD-*015PQC*



NOTE: Clockwise rotation is shown.

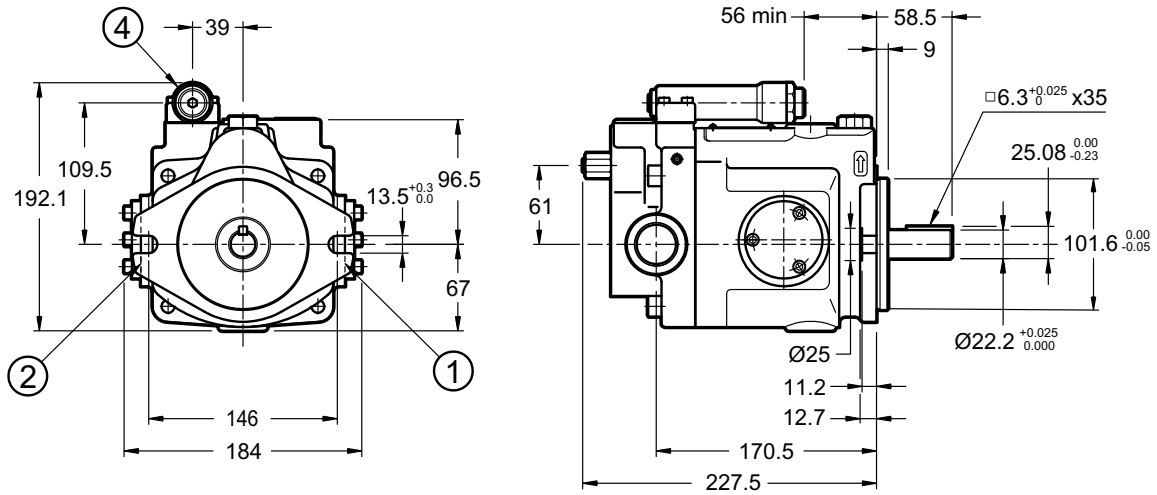
Suction and delivery are reversed in counterclockwise rotating pumps, and the controls are on the right side of the pump (shaft side view).

1	Suction port IN: 1” BSPP
2	Delivery port OUT: 1” BSPP
3	Drain port: 3/8” BSPP
4	Pressure adjusting screw PC: Allen key 6.5 Locking nut spanner 27 Turning clockwise increase the pressure
5	Differential pressure screw PC (factory-set)
6	Displacement set screw: Allen key 5 Locking nut spanner 17 Turning clockwise decrease the displacement See point 6
7	Oil filling port
8	Remote pressure control port: 1/4" BSPP
9	Load pressure port: 1/8" BSPP
10	Differential pressure screw FC (factory-set)

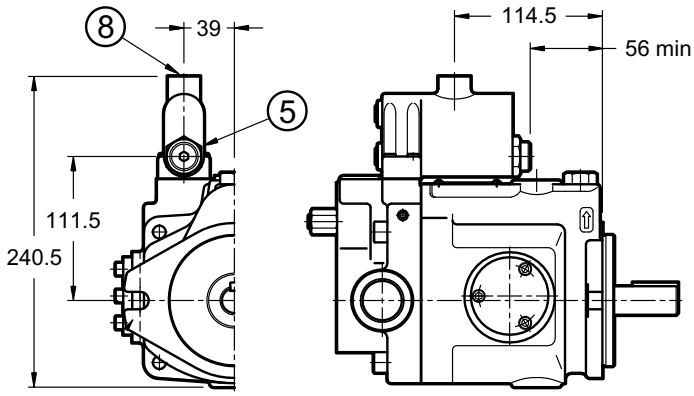
8 - VPPD-*023 PUMPS OVERALL AND MOUNTING DIMENSIONS

VPPD-*023PC*

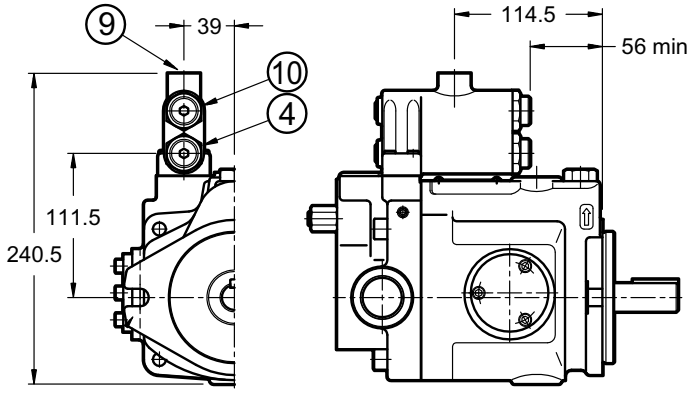
dimensions in mm



VPPD-*023PCR *



VPPD-*023PQC*



NOTE: Clockwise rotation is shown.

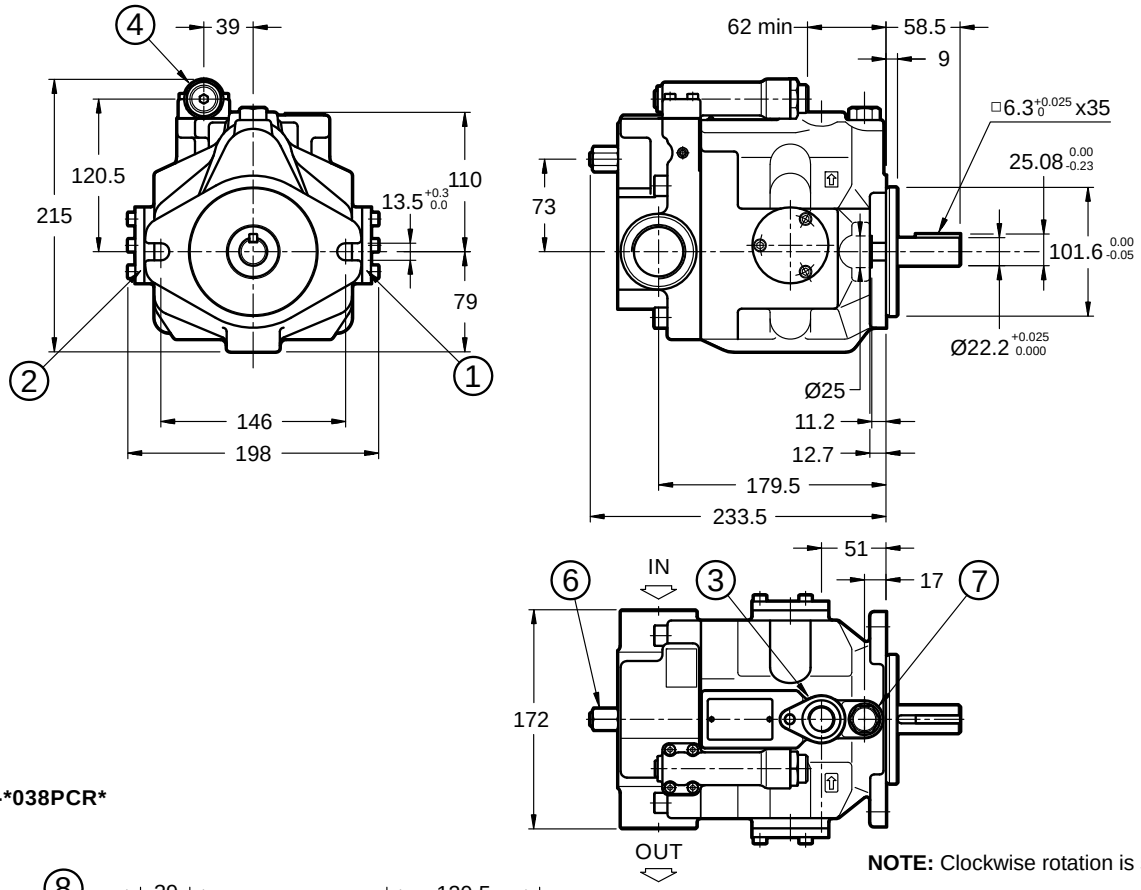
Suction and delivery are reversed in counterclockwise rotating pumps, and the controls are on the right side of the pump (shaft side view).

1	Suction port IN: 1” BSPP
2	Delivery port OUT: 1” BSPP
3	Drain port: 3/8” BSPP
4	Pressure adjusting screw PC: Allen key 6.5 Locking nut spanner 27 Turning clockwise increase the pressure
5	Differential pressure screw PC (factory-set)
6	Displacement set screw: Allen key 5 Locking nut spanner 17 Turning clockwise decrease the displacement See point 6
7	Oil filling port
8	Remote pressure control port: 1/4" BSPP
9	Load pressure port: 1/8" BSPP
10	Differential pressure screw FC (factory-set)

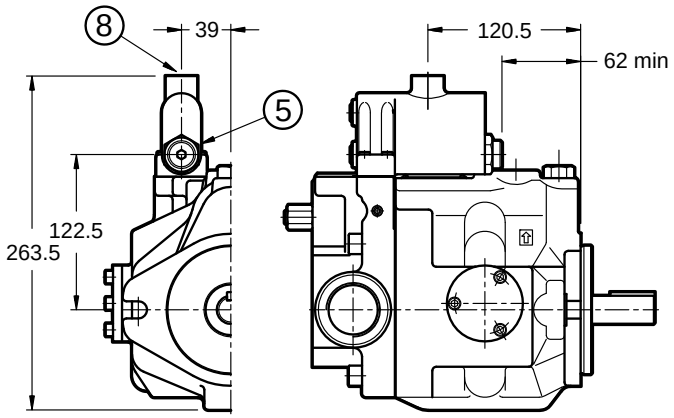
9 - VPPD-*038 PUMPS OVERALL AND MOUNTING DIMENSIONS

VPPD-*038PC5

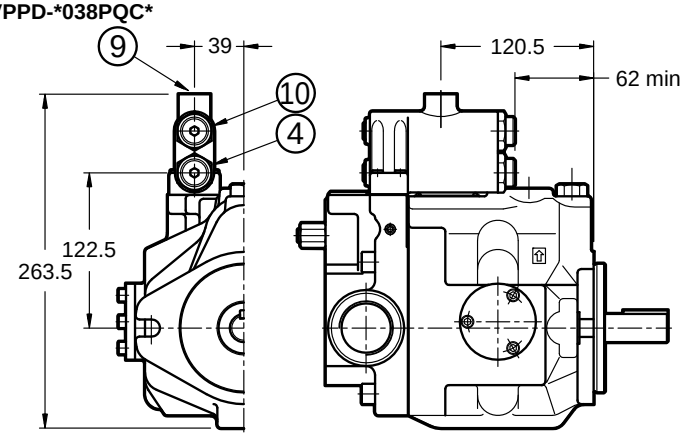
dimensions in mm



VPPD-*038PCR*



VPPD-*038PQC*



NOTE: Clockwise rotation is shown.

Suction and delivery are reversed in counterclockwise rotating pumps, and the controls are on the right side of the pump (shaft side view).

1	Suction port IN: 1 1/4” BSPP
2	Delivery port OUT: 1 1/4” BSPP
3	Drain port: 1/2” BSPP
4	Pressure adjusting screw PC: Allen key 6.5 Locking nut spanner 27 Turning clockwise increase the pressure
5	Differential pressure screw PC (factory-set)
6	Displacement set screw: Allen key 5 Locking nut spanner 17 Turning clockwise decrease the displacement See point 6
7	Oil filling port
8	Remote pressure control port: 1/4" BSPP
9	Load pressure port: 1/8" BSPP
10	Differential pressure screw FC (factory-set)

10 - INSTALLATION

VPPD pumps can be installed both in a horizontal and vertical position, with the shaft in an upward position. Using steel pipes for piping, take care not to force the pump off center. Forcing the pump off center with pipes may cause abnormal noise.

NOTE: The drainage port should be oriented so that the oil level inside the pump body never drops below 3/4 of the total volume required to fill the pump body.

- The motor-pump connection must be carried out directly with a flexible coupling, to reduce at the minimum the axial and radial loads on the pump shaft. The alignment tolerance between the two shafts must be within 0.05 mm.
- In the case of installation above the oil level, check that the minimal inlet pressure is not lower than -0.17 bar (relative). If a low noise emission level is required, the installation inside the tank is suggested.
- In case of an installation inside the tank with oil level which does not grant the complete pump submersion, arrange the drain line so that the higher pump bearing is always lubricated.
- Properly size the suction piping to comply with the minimum suction values given in Sections 2 and 3 of this document. Bends or restrictions or excessive pipe length could further reduce the suction pressure value resulting in increased noise emissions, cavitation issues and reduced pump life.
- Isolate the drain piping from other returning lines as it discharges direct inside the tank far from the suction area. Size the drainage line so that the pressure inside the pump casing is always less than 0.35 bar (relative), even during dynamic phases of flow rate variations.
  The drain piping size is minimum Ø12 mm for the VPPD-*015 and VPPD-*023, while it should be at least Ø15 mm for VPPD-*038. Maximum piping length 1 meter.
- Check that the pump direction of rotation is the same of that of the motor.
- Before starting, the pump body has to be filled with the fluid. Pump case filling volume is 500 cm^3 for VPPD-*015 and VPPD-*023, while is 900 cm^3 for VPPD-*038.
- The pump start up should occur with the system at minimum pressure, with no load, especially with low temperatures. When the pump is driven for the first time, turn the power switch to the motor on and off a few times to let the air out of the piping and then run it continuously at full speed. Noise may be observed until the air has been completely removed but this is not abnormal.

DUPLOMATIC MOTION SOLUTIONS
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02

S

20 catalogue documents | 80 original technical pages



PLK08

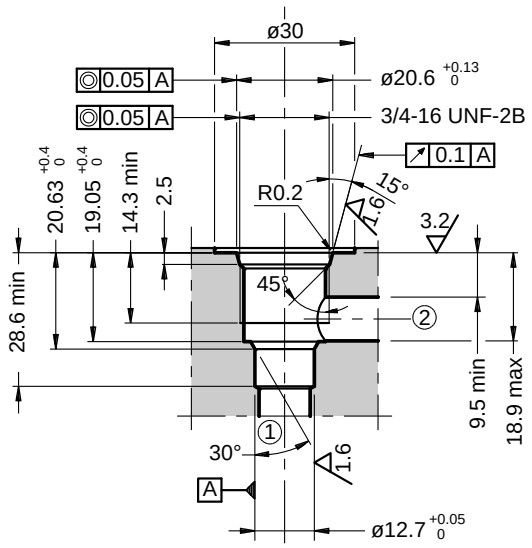
DIRECT OPERATED PRESSURE RELIEF VALVE

SERIES 10

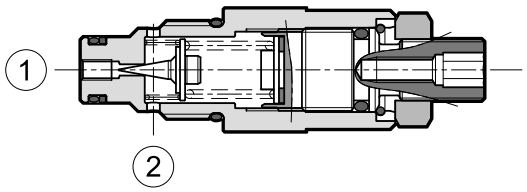
CARTRIDGE TYPE
seat 3/4-16 UNF-2B (SAE 08)

p max **400** bar
Q max **3** l/min

SEAT DIMENSIONS: 3/4 - 16 UNF- 2B (SAE 08)



OPERATING PRINCIPLE



— The PLK08 valve is a directly controlled pressure-relief valve, cartridge type, that can be used in blocks or panels with 3/4-16 UNF-2B (SAE 08) type seat.

— It controls the maximum pressure in the hydraulic circuits or acts as a limiting device for pressure peaks generated during hydraulic actuator movement variation.

— The circuit pressure acts on the shutter which is directly loaded by a spring on the opposite side. Once the set pressure is reached, the shutter opens, and discharges the excess flow in port 2 connected directly to the reservoir.

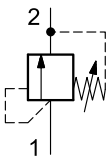
— Six pressure control ranges are available, from 35 bar to 350 bar.

— The pressure is adjustable by a socket set screw with locking nut, or by knob.

PERFORMANCES
(measured with mineral oil of viscosity 36 cSt at 50 °C)

Max working pressure	bar	400
Minimum controlled pressure	see diagrams	
Maximum flow rate	l/min	3
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass	kg	0.15
Surface treatment: electrolytic zinc covering	IS0 2081 - Fe/Zn12/A	

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

P	L	K	08	-		/	10		/	

Pressure relief valve, direct operated

Cartridge type

Size

Pressure adjustment range:
035 = up to 35 bar (6 bar/turn)
070 = up to 70 bar (14 bar/turn)
140 = up to 140 bar (34 bar/turn)
210 = up to 210 bar (53 bar/turn)
280 = up to 280 bar (75 bar/turn)
350 = up to 350 bar (94 bar/turn)

Series No.
(the overall and mounting dimensions remain unchanged from 10 to 19)

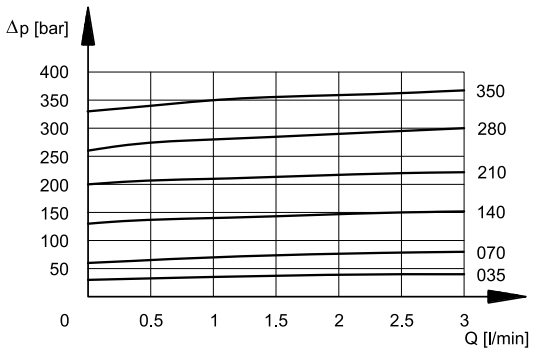
Seals:
N = NBR seals for mineral oils (**standard**)
V = FPM seals for special fluids

Option:
K = Adjustment knob.
(omit for adjustment with hex socket screw)

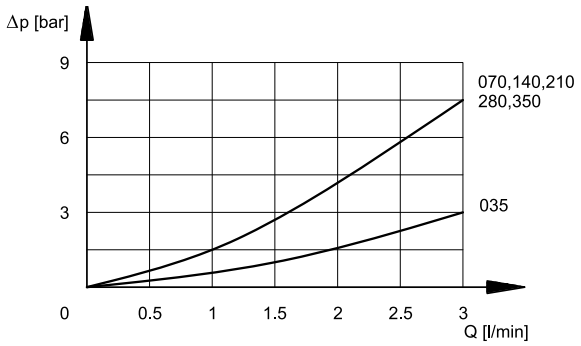
2 - CHARACTERISTIC CURVES

(values obtained with viscosity of 36 cSt at 50 °C)

ADJUSTMENT



MINIMUM CONTROLLED PRESSURE

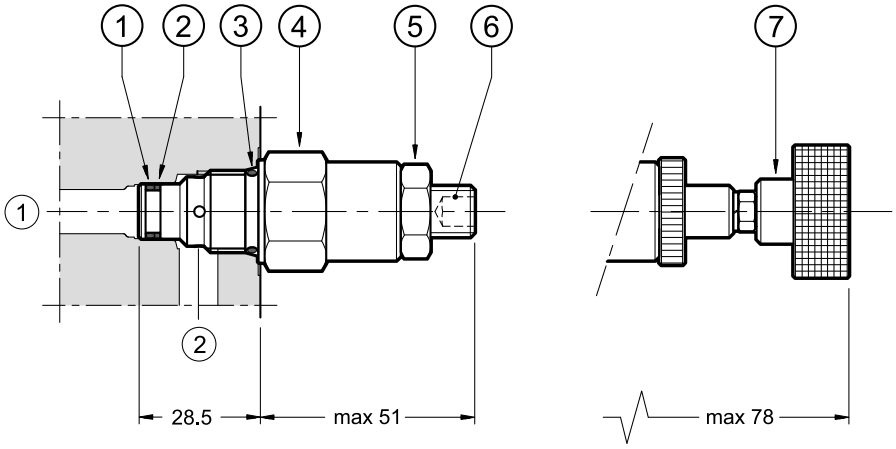


3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

4 - OVERALL AND MOUNTING DIMENSIONS



dimensions in mm

1	OR type 2037 (9.25x1.78) 70 Shore
2	Parbak 8-012 (9.96x1.14x1.35)
3	OR type 3.908 (16.36x2.2) 70 Shore
4	Cartridge tightening: spanner 24 Tightening torque 50 Nm
5	Locking nut: spanner 19
6	Socket hex adjustment screw: Hex key 6. Rotate clockwise to increase pressure
7	Adjustment knob: K

DUPLOMATIC MOTION SOLUTIONS

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CR

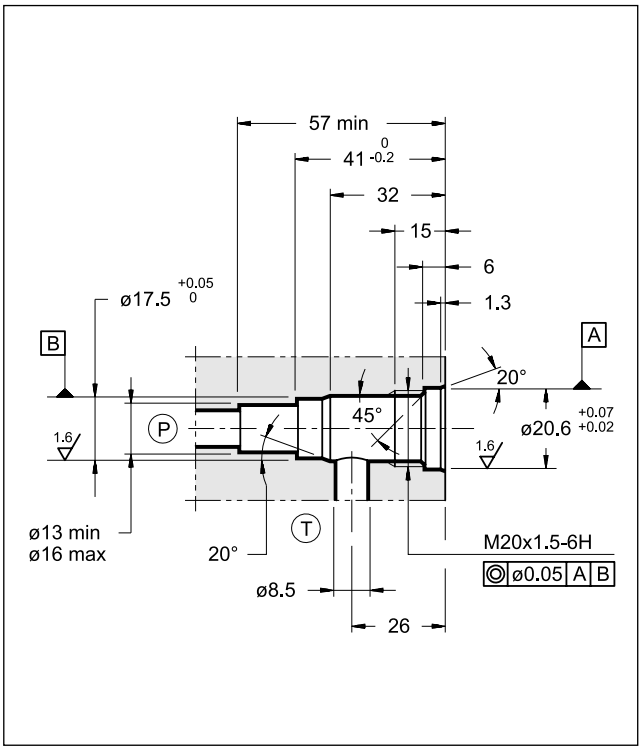
DIRECT OPERATED PRESSURE CONTROL VALVE

SERIES 22

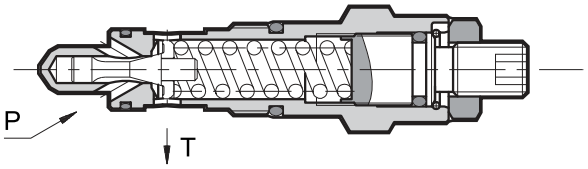
CARTRIDGE TYPE

p max **350** bar
Q max **50** l/min

SEAT DIMENSIONS: D-10B



OPERATING PRINCIPLE



— The CR valve is a direct operated pressure control valve cartridge type that can be used in blocks or panels with type D-10B seat.

— It is normally used to control the maximum pressure in the hydraulic circuits or as a limiting device for pressure peaks generated during hydraulic actuator movement variation.

— It is available in five different pressure control ranges up to 350 bar.

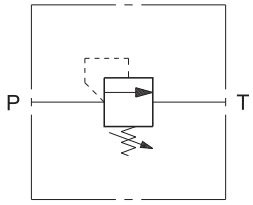
— The circuit pressure acts on the shutter which is directly loaded by a spring on the opposite side. Once the set pressure is reached, the shutter opens, and discharges the excess flow in port T connected directly to the reservoir.

— The pressure can be adjusted by a screw, usually supplied as the countersunk hex type, equipped with locking nut and maximum adjustment limiter.

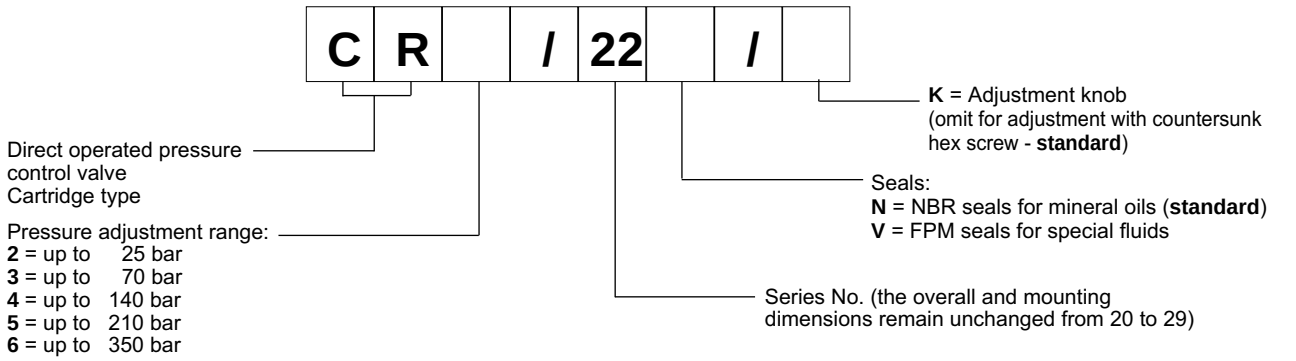
PERFORMANCES (measured with mineral oil of viscosity 36 cSt at 50°C)

Max working pressure	bar	350
Minimum controlled pressure and pressure drop	see diagram	
Maximum flow rate	l/min	50
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass	kg	0,16
Surface treatment: electrolytic zinc covering	Fe // Zn 8 // B EN 12329	

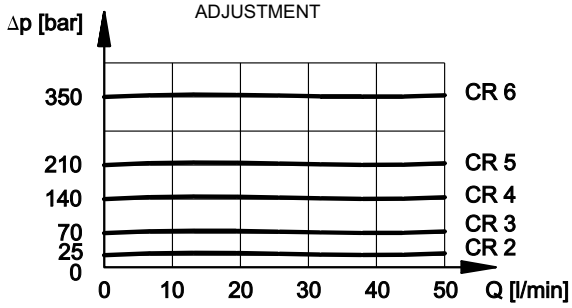
HYDRAULIC SYMBOL

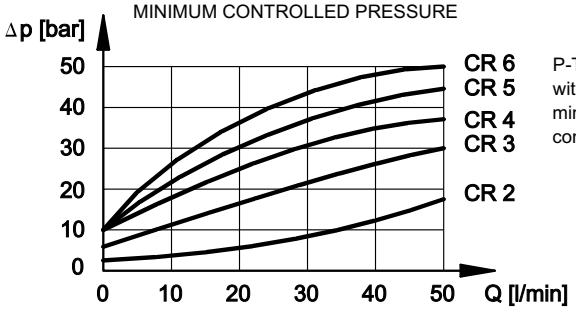


1 - IDENTIFICATION CODE



2 - CHARACTERISTIC CURVES (values obtained with viscosity of 36 cSt at 50°C)





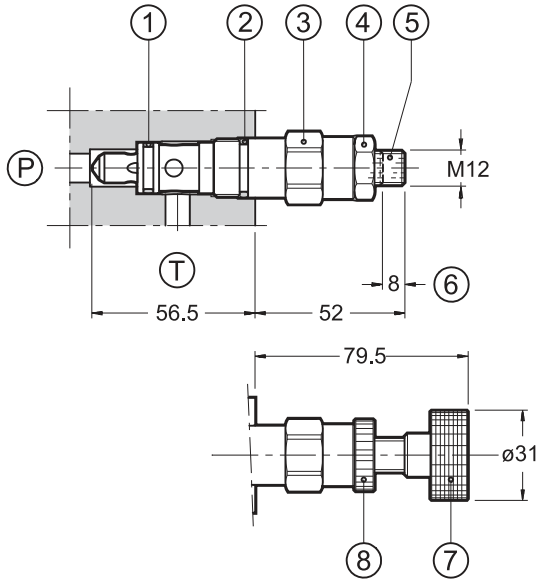
P-T pressure drops with screw set at minimum pressure control

3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

4 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	OR tipo 2056 (14.00x1.78) 90 Shore
2	OR tipo 3062 (15.54x2.62) 90 Shore
3	Hexagonal: spanner 22 Tightening torque 45 ÷ 50 Nm
4	Locking nut: spanner 19
5	Countersunk hex adjustment screw: spanner 6 (**standard**) Clockwise rotation to increase pressure
6	Maximum screw stroke
7	Adjustment knob: K
8	Locking ring

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CRQ

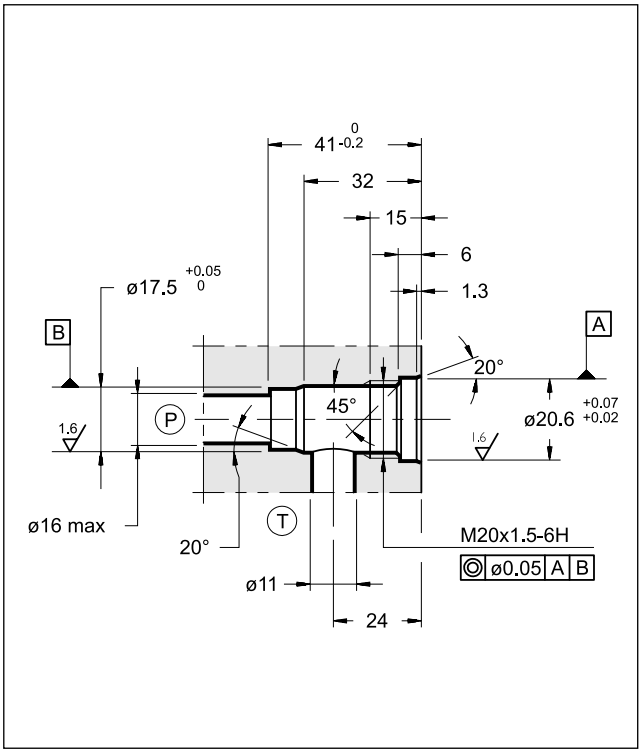
PILOT OPERATED PRESSURE CONTROL VALVE

SERIES 12

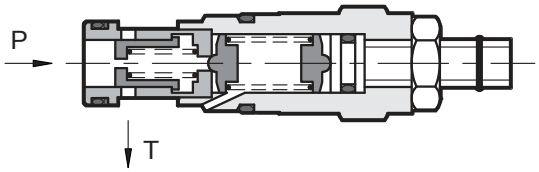
CARTRIDGE TYPE

p max **350** bar
Q max **100** l/min

SEAT DIMENSIONS: D-10C



OPERATING PRINCIPLE



— The CRQ valve is a pilot operated pressure control valve cartridge type that can be used in blocks or panels with D-10C type seat.

— It is normally used to control the hydraulic circuit pressure and allows use of the entire flow of the pump even at pressure values near the set value.

— It is available in four different pressure control ranges up to 350 bar.

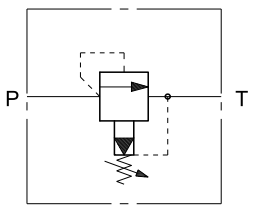
— It consists of a main balanced type spool and a pilot stage. The main spool, normally closed, opens when the circuit pressure exceeds the set value generated by the pilot stage, discharging the excess flow in port T, directly connected to the tank.

— The pressure is adjustable with a screw, usually supplied as the countersunk hex type, equipped with locking nut and with maximum adjustment limiter.

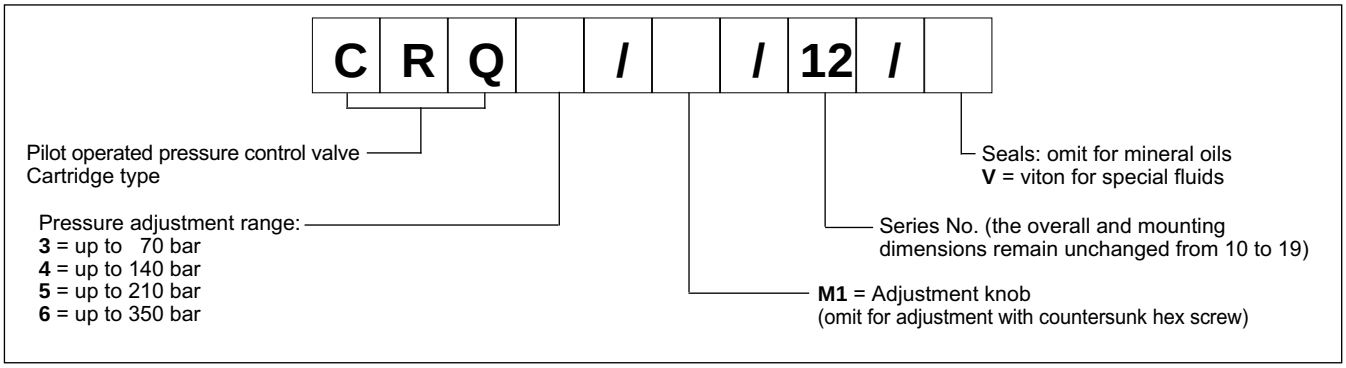
PERFORMANCES (measured with mineral oil of viscosity 36 cSt at 50°C)

Max working pressure	bar	350
Minimum controlled pressure and pressure drop	see diagram	
Maximum flow rate	l/min	100
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass	kg	0,16
Surface treatment:electrolytic zinc covering	Fe // Zn 8 // B EN 12329	

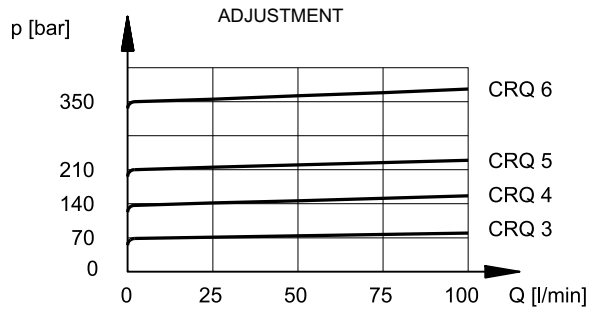
HYDRAULIC SYMBOL

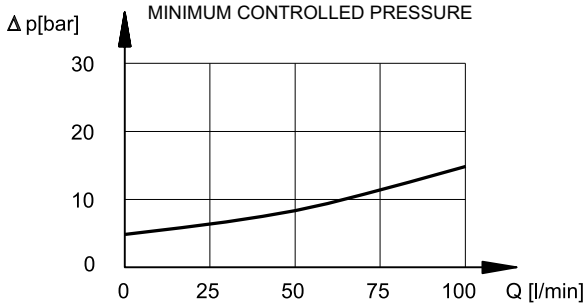


1 - IDENTIFICATION CODE



2 - CHARACTERISTIC CURVES (values obtained with viscosity of 36 cSt at 50°C)

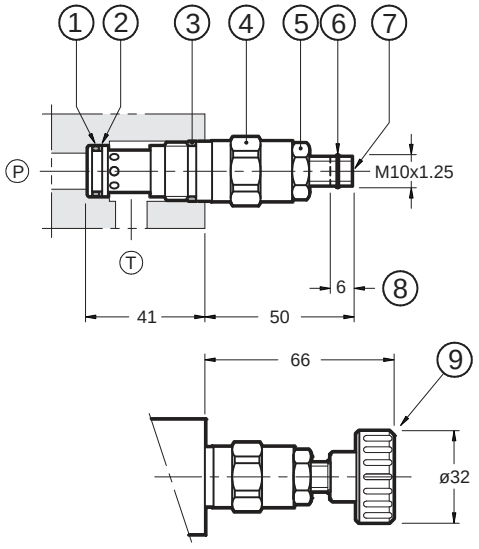




3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

4 - OVERALL AND MOUNTING DIMENSIONS



dimensions in mm

1	OR type 2056 (14.00x1.78) 90 Shore
2	Parbak 8-015 (14.81x1.14x1.35)
3	OR type 3062 (15.54x2.62) 90 Shore
4	Hexagonal: spanner 22 Tightening torque 45 ÷ 50 Nm
5	Locking nut: spanner 17
6	Maximum adjustment limiting device
7	Countersunk hex adjustment screw: spanner 5 Clockwise rotation to increase pressure
8	Maximum screw stroke
9	Adjustment knob: M1

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PRK10

PILOT OPERATED PRESSURE CONTROL VALVE

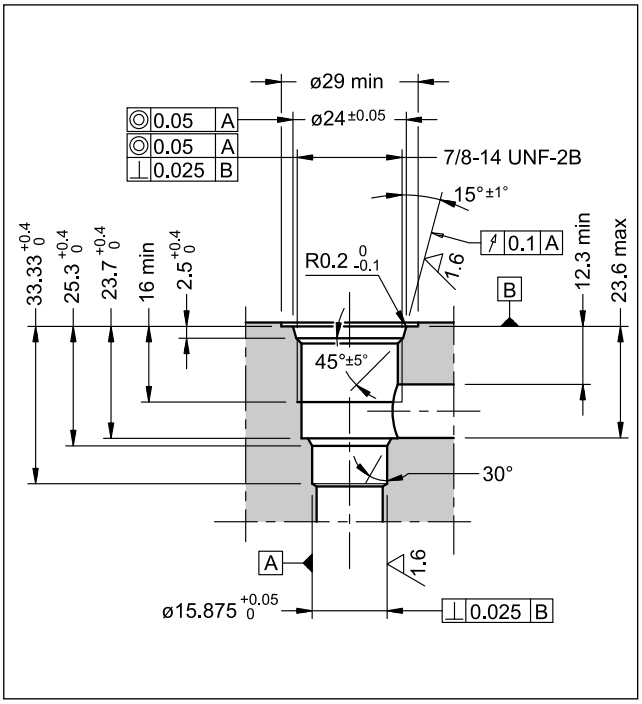
SERIES 13

CARTRIDGE TYPE

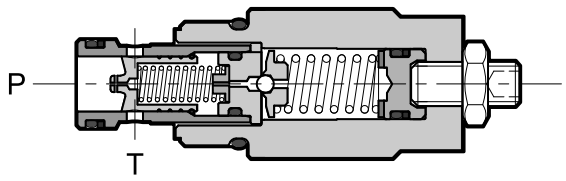
seat 7/8-14 UNF-2B (SAE - 10)

p max **350** bar
Q max **120** l/min

SEAT DIMENSIONS: 7/8 - 14 UNF- 2B (SAE - 10)



OPERATING PRINCIPLE



— The PRK10 valve is a pilot operated pressure control valve, cartridge type, that can be used in blocks or panels with 7/8-14 UNF-2B (SAE - 10) type seat.

— It is used to control the hydraulic circuit pressure and allows use of the entire flow of the pump even at pressure values near the set value.

— It consists of a main balanced type spool and a pilot stage. The main spool, normally closed, opens when the circuit pressure exceeds the set value generated by the pilot stage, discharging the excess flow in port T, directly connected to the tank.

— It's available in 4 pressure control ranges from 10 to 350 bar.

— The PRK10 are supplied with a finishing surface treatment (zinc-nickel) suitable to ensure a salt spray resistance up to 600 h (test according to UNI EN ISO 9227 standards and test evaluation according to UNI EN ISO 10289 standards)

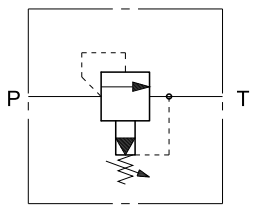
— The pressure is adjustable by a socket set screw with locking nut, or by knob.

PERFORMANCES

(measured with mineral oil of viscosity 36 cSt at 50°C)

Max working pressure	bar	350
Minimum controlled pressure and pressure drop	see diagram	
Maximum flow rate	l/min	120
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass	kg	0.2
Surface finishing: galvanic treatment	zinc-nickel	

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

P	R	K	10	-		/	13		/	

Pressure control valve, pilot operated

Cartridge type

Size

Pressure adjustment range:
070 = from 10 to 70 bar (17 bar/turn)
140 = from 10 to 140 bar (32 bar/turn)
210 = from 10 to 210 bar (47 bar/turn)
350 = from 10 to 350 bar (78 bar/turn)

Series No.
(the overall and mounting dimensions remain unchanged from 10 to 19)

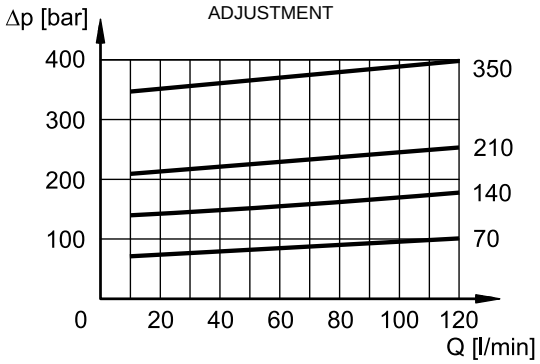
Seals:
N = NBR seals for mineral oils (**standard**)
V = FPM seals for special fluids

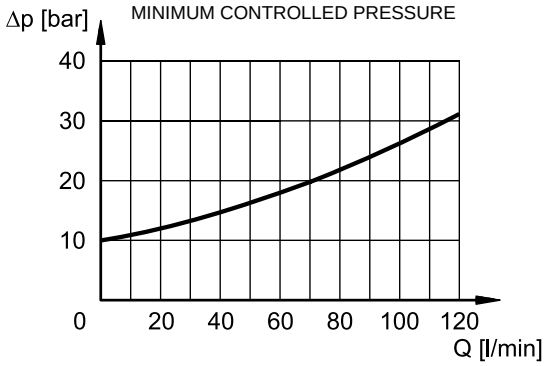
Option: **K** = Adjustment knob.
Omit for adjustment with hex socket screw (**standard**)

⚠ **NOTE:** the maximum regulated pressure value is reached when the screw is flush with the nut.
Screwing over this limit can damage the valve.

2 - CHARACTERISTIC CURVES

(values obtained with viscosity of 36 cSt at 50°C)





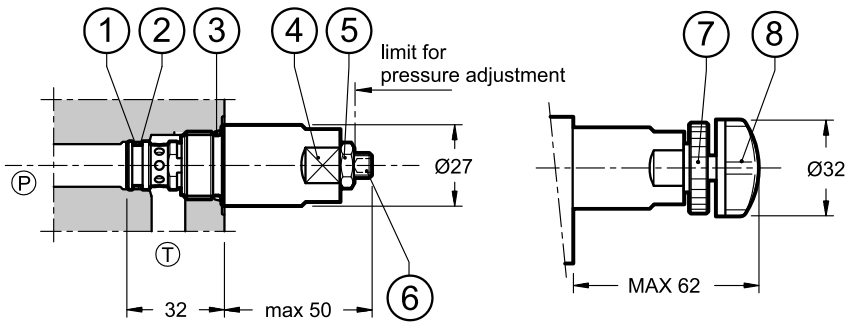
3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

4 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	OR type 2050 (12.42x1.78)
2	Parbak 8-014 (13.23x1.14x1.35)
3	OR type 3-910 (19.18x2.46)
4	Cartridge tightening: spanner 24 Tightening torque 38 Nm
5	Locking nut: spanner 13
6	Socket hex adjustment screw: Hex key 4. Rotate clockwise to increase pressure
7	Locking ring
8	Adjustment knob: K

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a member of DAIKIN group

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duplomaticmotionsolutions.com

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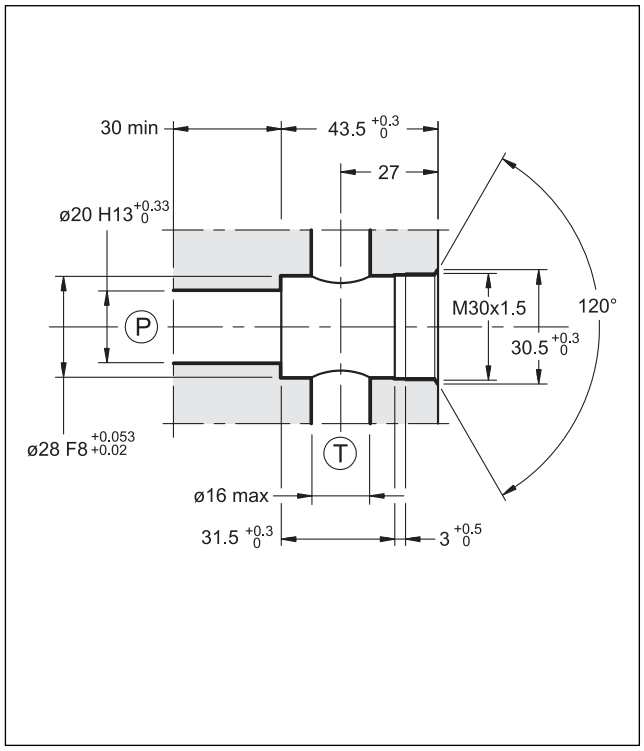


DBV
DIRECT OPERATED PRESSURE CONTROL VALVE
SERIES 10

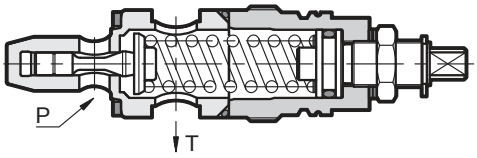
CARTRIDGE TYPE

p max **380** bar
Q max **120** l/min

SEAT DIMENSIONS: D-10E



OPERATING PRINCIPLE



— The DBV valve is a direct operated pressure control valve cartridge type that can be used in blocks or panels with seat.

— It is normally used to control the maximum pressure in the hydraulic circuits or as a limiting device for pressure peaks generated during hydraulic actuator movement variation.

— It is available in differents pressure control ranges up to 300 bar.

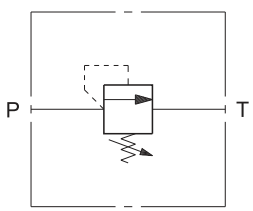
— The circuit pressure acts on the shutter which is directly loaded by a spring on the opposite side. Once the set pressure is reached, the shutter opens, and discharges the excess flow in port T connected directly to the reservoir.

— The pressure can be adjusted by a screw, equipped with locking nut and maximum adjustment limiter.

PERFORMANCES (measured with mineral oil of viscosity 36 cSt at 50°C)

Max working pressure	bar	380
Minimum controlled pressure and pressure drop	see diagram	
Maximum flow rate	l/min	120
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass	kg	0,25
Surface treatment:electrolytic zinc covering	Fe // Zn 8 // B EN 12329	

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

D	B	V	-		/	10		/	

Direct operated pressure control valve
Cartridge type

Pressure adjustment range:

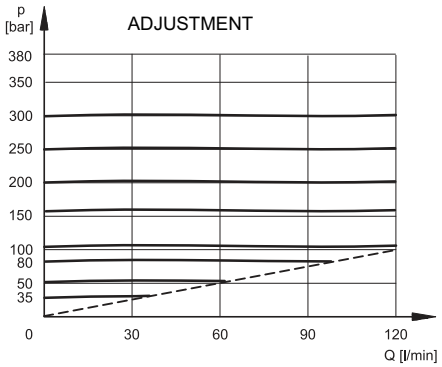
35 = up to 35 bar
50 = up to 50 bar
80 = up to 80 bar
100 = up to 100 bar
160 = up to 160 bar
200 = up to 200 bar
250 = up to 250 bar
300 = up to 300 bar

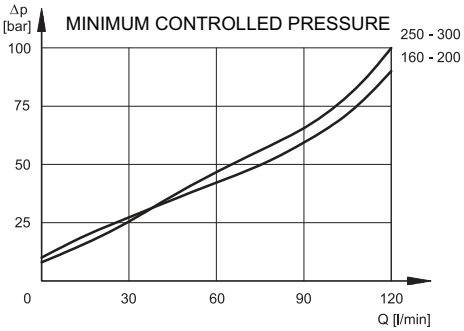
Series No. (the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
N = NBR seals for mineral oils (**standard**)
V = FPM seals for special fluids

K = Adjustment knob
(omit for adjustment with hex screw - **standard**)

2 - CHARACTERISTIC CURVES (values obtained with viscosity of 36 cSt at 50°C)





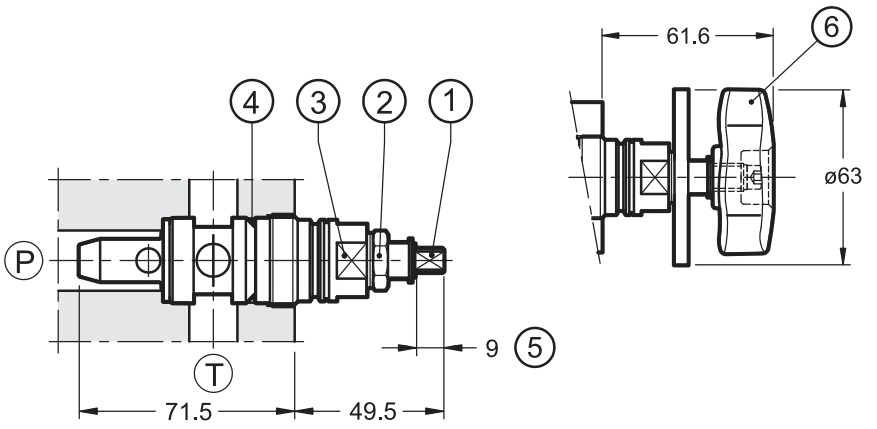
P-T pressure drops with screw set at minimum pressure control

3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

4 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	Countersunk hex adjustment screw: spanner 8 (**standard**) Clockwise rotation to increase pressure
2	Locking nut: spanner 17
3	Hexagonal spanner 24 Tightening torque 70 ÷ 100 Nm
4	OR type 130 (22.22x2.62) 90 Shore
5	Maximum screw stroke
6	Adjustment knob: **K**

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PCK06

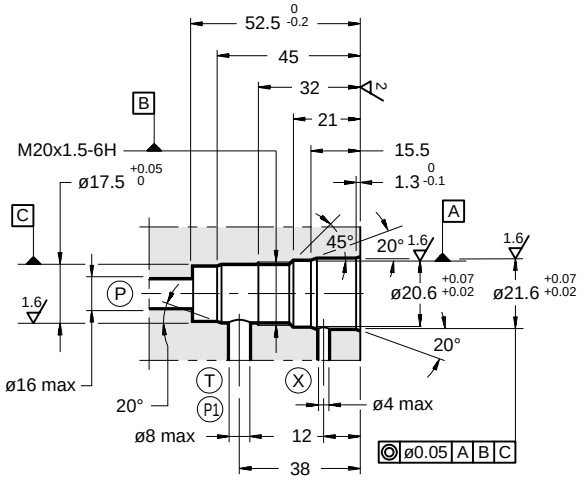
TWO- AND THREE-WAY PRESSURE COMPENSATOR WITH FIXED OR VARIABLE ADJUSTMENT

SERIES 10

CARTRIDGE TYPE

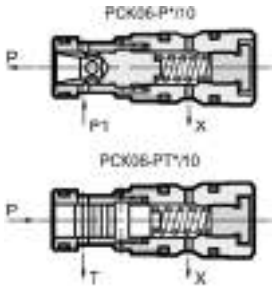
p max **350** bar
Q max **40** l/min

SEAT DIMENSIONS D-10D



(T): relevant to three-way compensator
(P1) : relevant to two-way compensator

OPERATING PRINCIPLE



— The PCK06 valve is a two or three-way pressure compensator, cartridge type, for block or manifold application.

— It keeps the pressure drop (characteristic Δp) between the P and the X pilot connections, at a constant level.

— It is normally used together with proportional directional valves, in order to control the flow rate independently of the pressure variations.

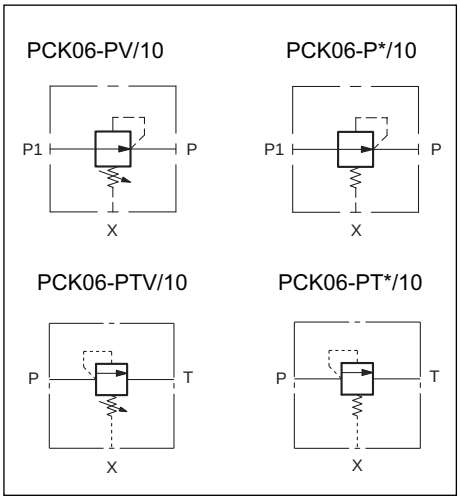
— The setting of the variable adjustment compensator can be varied from 7 to 33 bar; adjustment can be operated either via a countersunk hex adjustment screw, or via an adjustment knob.

— The fixed adjustment version can be supplied with a characteristic Δp setting of either 4 or 8 bar.

PERFORMANCES (working with mineral oil of viscosity of 36 cSt a 50°C)

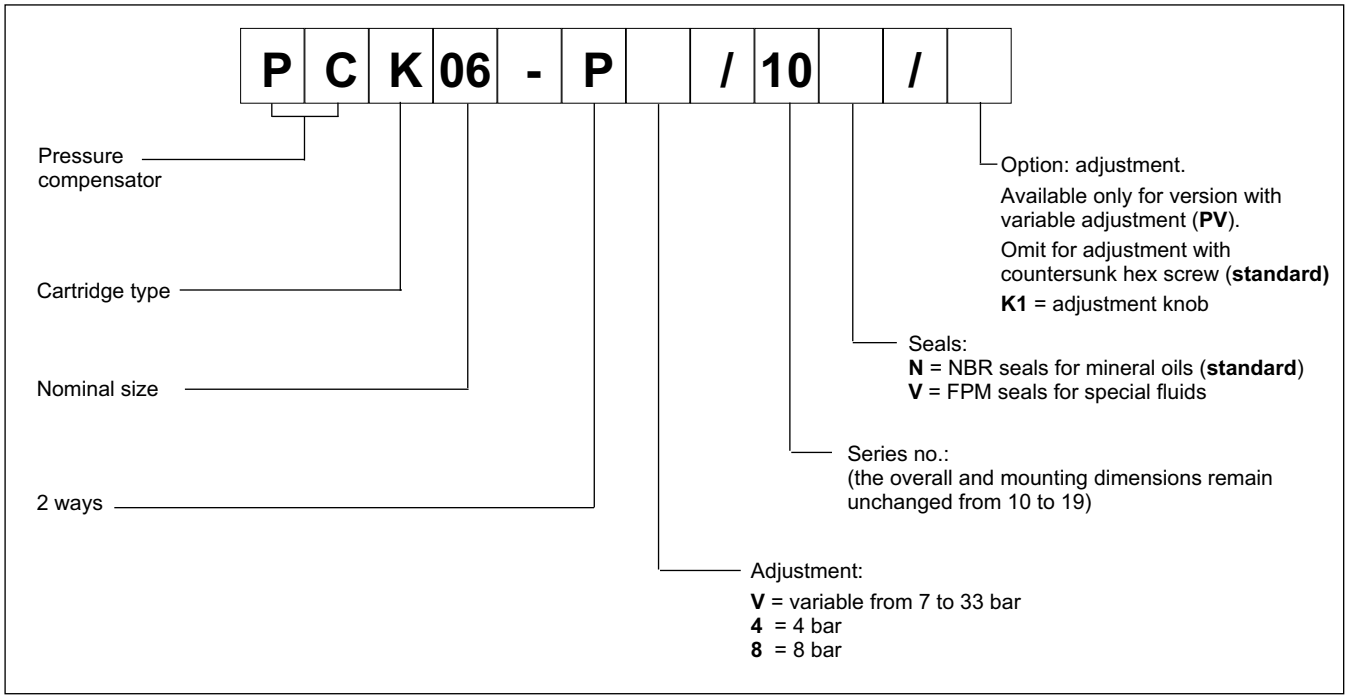
Maximum operating pressure	bar	350
Characteristic Δp: fixed adjustment variable adjustment	bar	4 - 8 7 ÷ 33
Maximum flow rate	l/min	40
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass:	kg	0,2
Surface treatment : electrolytic zinc covering	Fe // Zn 8 // B EN 12329	

HYDRAULIC SYMBOLS

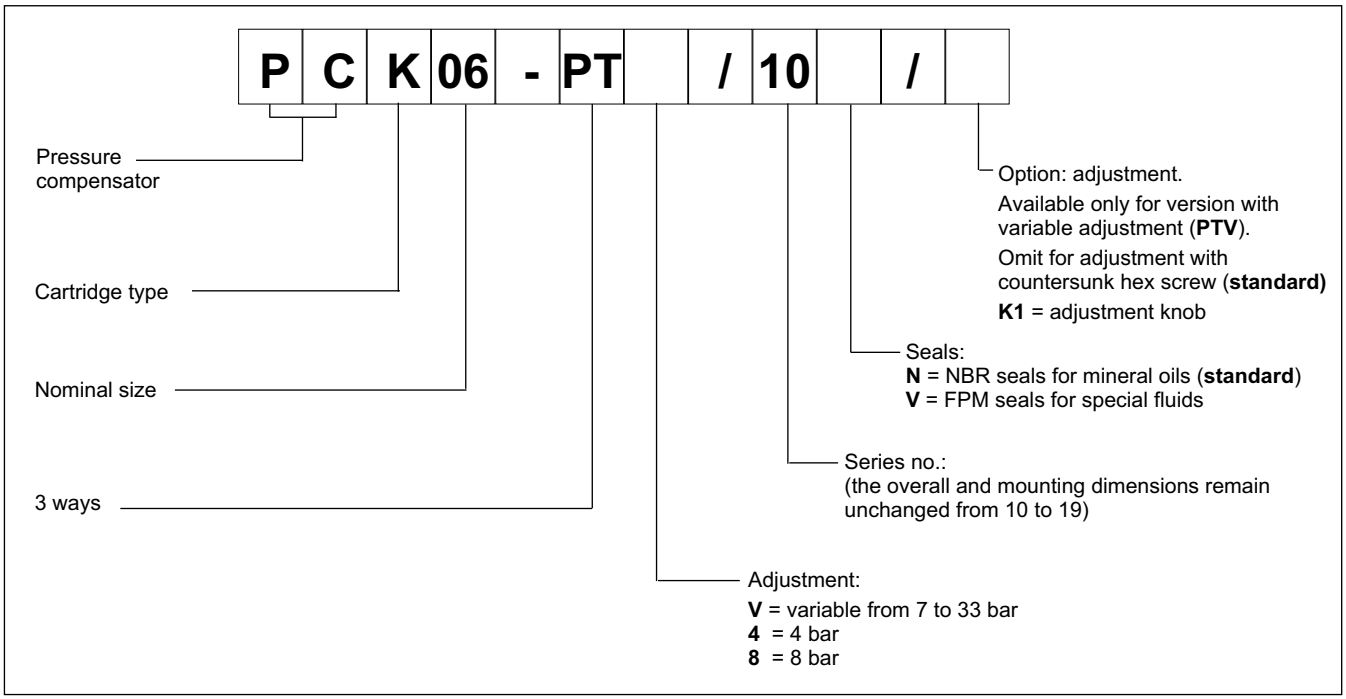


1 - IDENTIFICATION CODE

1.1 - Two-way compensator identification code



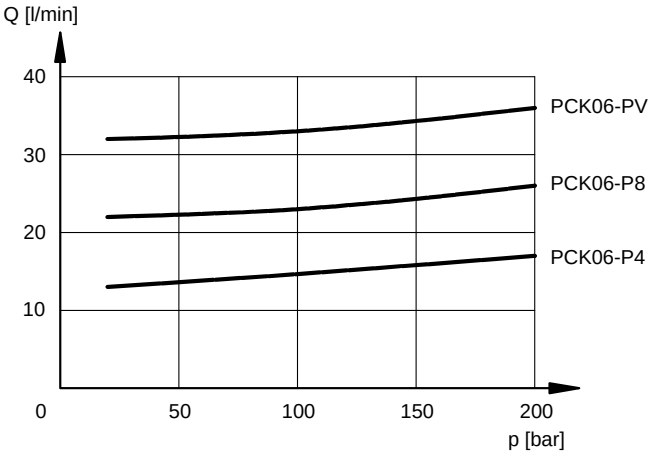
1.2 - Three-way compensator identification code



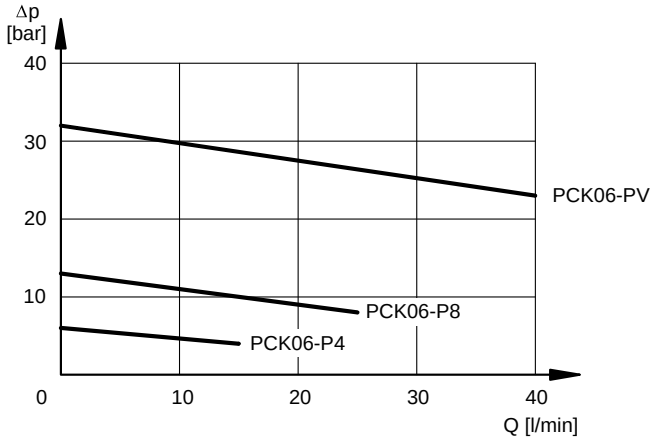
2 - CHARACTERISTIC CURVES (values obtained with viscosity of 36 cSt at 50°C)

2.1 - Two-way compensator characteristic curves

FLOW RATE - PRESSURE Q = f (p)

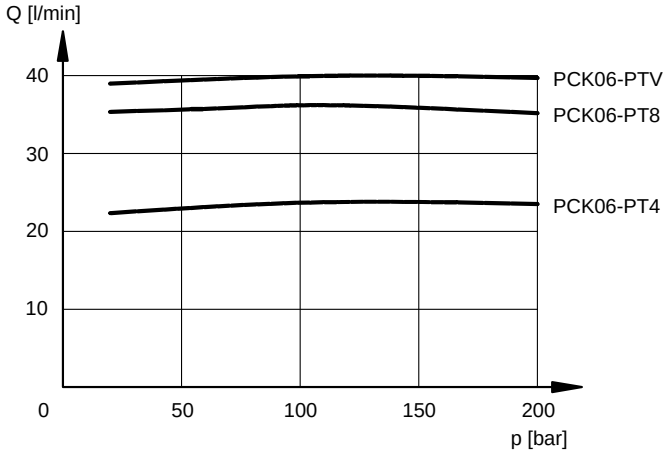


PRESSURE DROPS Δp = f (Q)

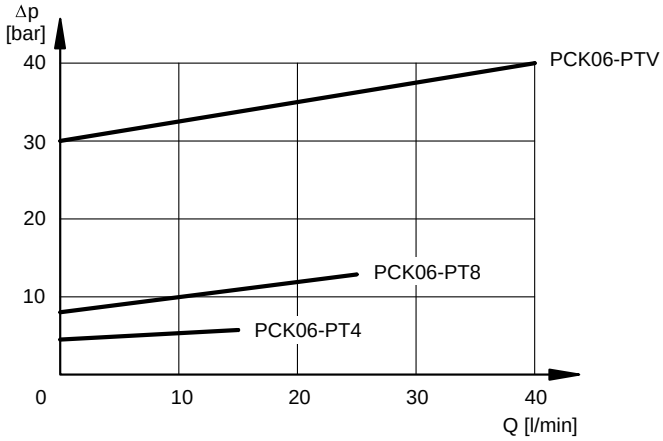


2.2 - Three-way compensator characteristic curves

FLOW RATE - PRESSURE Q = f (p)



PRESSURE DROPS Δp = f (Q)

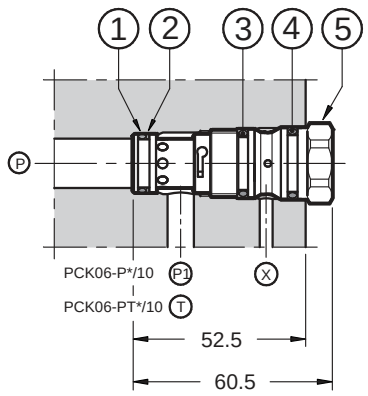


3 - HYDRAULIC FLUIDS

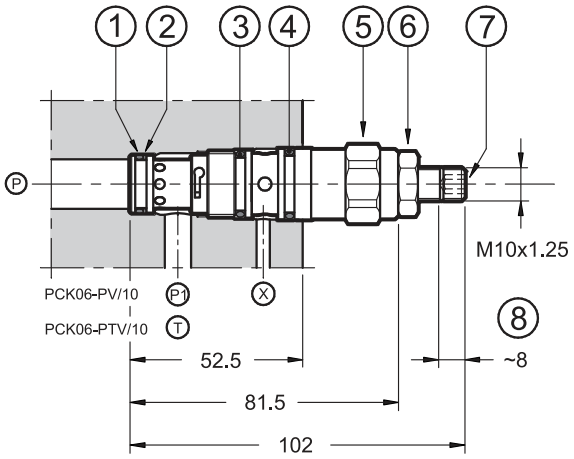
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

4 - OVERALL AND MOUNTING DIMENSIONS

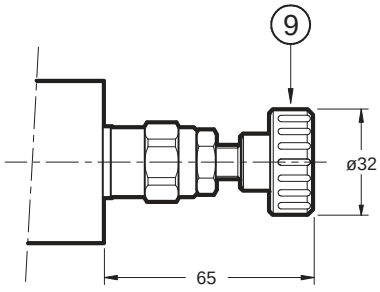
PCK06-P*/10
PCK06-PT*/10



PCK06-PV/10
PCK06-PTV/10



PCK06-PV/10*/K1
PCK06-PTV/10*/K1



dimensions in mm

1	OR type 2056 (14.00x1.78)
2	Parbak 8-015 (14.81x1.14x1.35)
3	OR type 3062 (15.54x2.62)
4	OR type 3062 (15.54x2.62)
5	Hexagonal: spanner 22 Tightening torque 45 ÷ 50 Nm
6	Locking nut: spanner 17
7	Countersunk hex adjustment screw: spanner 5 Clockwise rotation to increase pressure
8	Maximum screw stroke
9	Adjustment knob: **K1**

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CD1-W

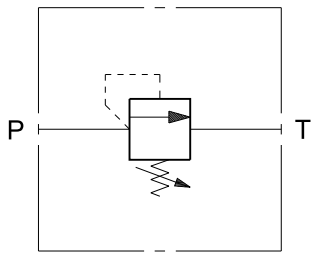
DIRECT OPERATED PRESSURE CONTROL VALVE

SERIES 10

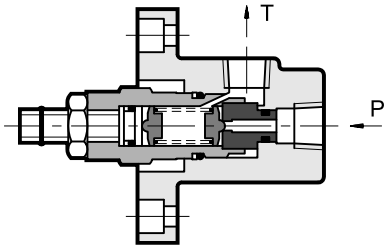
THREADED PORTS

p max **350** bar
Q max **3** l/min

HYDRAULIC SYMBOL



OPERATING PRINCIPLE



— The CD1-W valve is a direct operated pressure control valve with threaded ports and for flange mounting installation.

— It is used also for remote piloting of control valves and two-stage pressure reducers.

— It is available in four different pressure control ranges up to 350 bar.

— It is normally supplied with a countersunk hex adjustment screw, a locking nut and a maximum adjustment fastener.

PERFORMANCE RATINGS (measured with mineral oil of viscosity 36 cSt at 50°C)

Maximum operating pressure	bar	350
Minimum controlled pressure	see diagram	
Maximum flow rate	l/min	3
Ambient temperature range	°C	–20 / +50
Fluid temperature range	°C	–20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Recommended filtration		according to ISO4406:1999 class 20/18/15
Recommended viscosity	cSt	25
Mass	kg	1,2

CD1-W
SERIES 10

1 - IDENTIFICATION CODE

C	D	1	-	W		/		/	10	/	

Direct operated pressure control valve

Nominal dimension

Threaded ports: 1/4" NPT

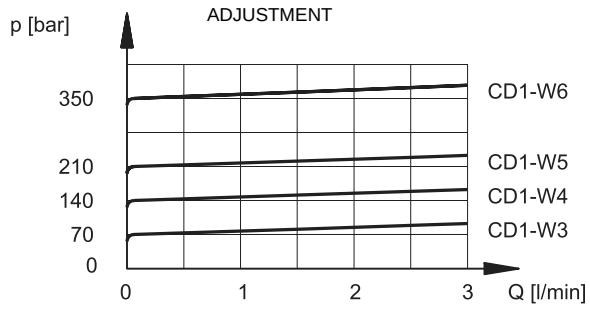
Pressure adjustment range:
3 = up to 70 bar **5** = up to 210 bar
4 = up to 140 bar **6** = up to 350 bar

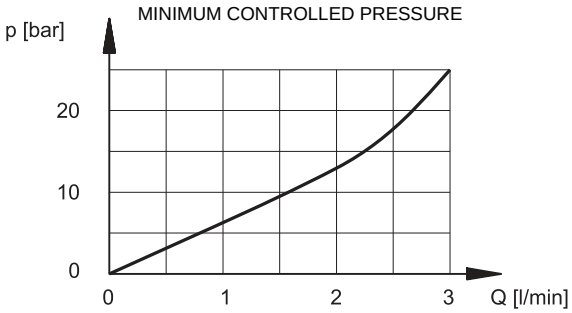
M1 = Adjustment knob
(omit for adjustment with countersunk hex screw)

Series No. (the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
omit for mineral oils
V = viton for special fluids

2 - CHARACTERISTIC CURVES (values obtained with viscosity of 36 cSt at 50°C)



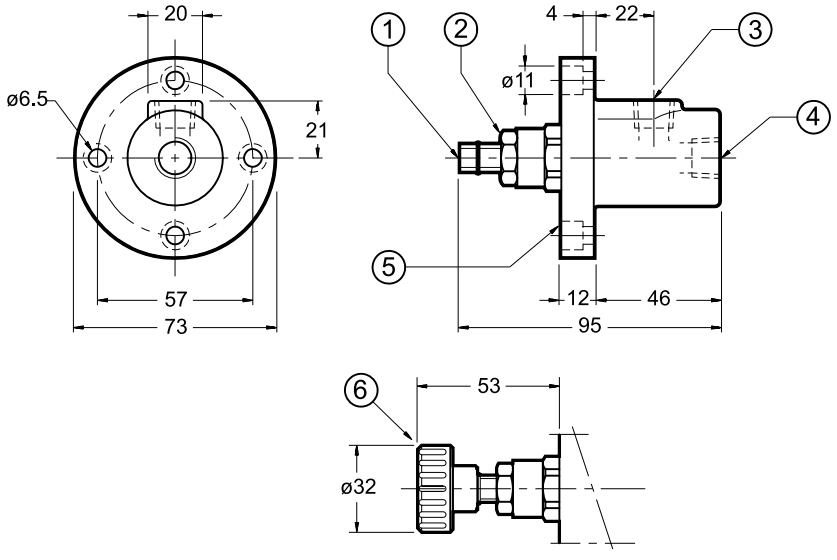


3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

4 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	Countersunk hex adjustment screw: spanner 5 Clockwise rotation to increase pressure
2	Locking nut: spanner 17
3	Outlet port T: 1/4" NPT
4	Pressure port P: 1/4" NPT
5	Identification label
6	Adjustment knob: M1

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RM*-W

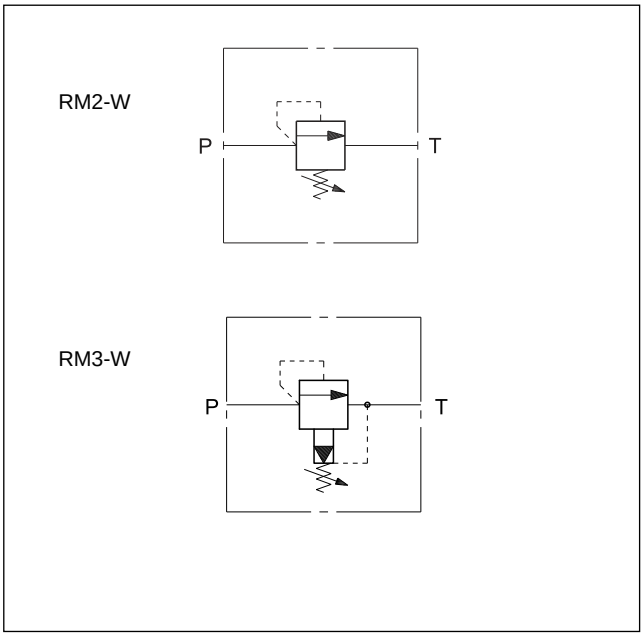
PRESSURE CONTROL VALVES

RM2-W SERIES 31
RM3-W SERIES 30

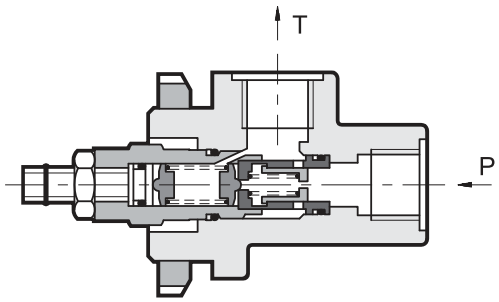
THREADED PORTS

p max **350** bar
Q max (see table of performances)

HYDRAULIC SYMBOLS



OPERATING PRINCIPLE



— The RM∗-W valves are pressure control valves with threaded ports for panel mounting with a ring-nut fastening.

— They are available in two different sizes: RM2-W direct operated for flows up to 50 l/min; RM3-W pilot operated for flows up to 75 l/min.

— They are normally supplied with a countersunk hex adjustment screw, a locking nut and a maximum adjustment fastener.

PERFORMANCES (measured with mineral oil of viscosity 36 cSt at 50°C)

		RM2-W	RM3-W
Maximum operating pressure	bar	350	
Minimum controlled pressure	see diagram		
Maximum flow rate	l/min	50	75
Ambient temperature range	°C	-20 / +50	
Fluid temperature range	°C	-20 / +80	
Fluid viscosity range	cSt	10 ÷ 400	
Fluid contamination degree	according to ISO 4406:1999 class 20/18/15		
Recommended viscosity	cSt	25	
Mass	kg	0,9	

1 - IDENTIFICATION CODE

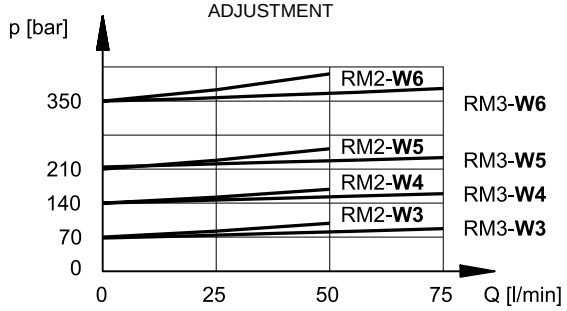
R	M		-	W		/					

Example: RM2-W3/31N/K
RM3-W3/M1/30/V

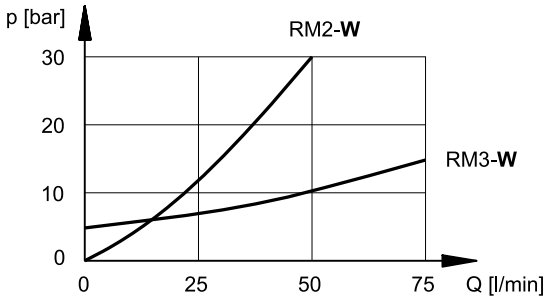
- Pressure control valve
- Nominal dimension: **2** = 3/8” **3** = 1/2”
- Threaded ports BSP
- Pressure adjustment range: **3** = up to 70 bar **5** = up to 210 bar **4** = up to 140 bar **6** = up to 350 bar
- only for RM3: **M1** = Adjustment knob (omit for adjustment with countersunk hex screw)
- only for RM2: Seals **N** = NBR seals for mineral oils (**standard**) **V** = FPM seals for special fluids
- Series no: **31** for RM2-W **30** for RM3-W
- only for RM3: Seals Omit for NBR seals for mineral oils (**standard**) **/V** = FPM seals for special fluids
- only for RM2: **/K** = Adjustment knob (omit for adjustment with countersunk hex screw)

2 - CHARACTERISTIC CURVES (values obtained with viscosity of 36 cSt at 50°C)

ADJUSTMENT



MINIMUM CONTROLLED PRESSURE

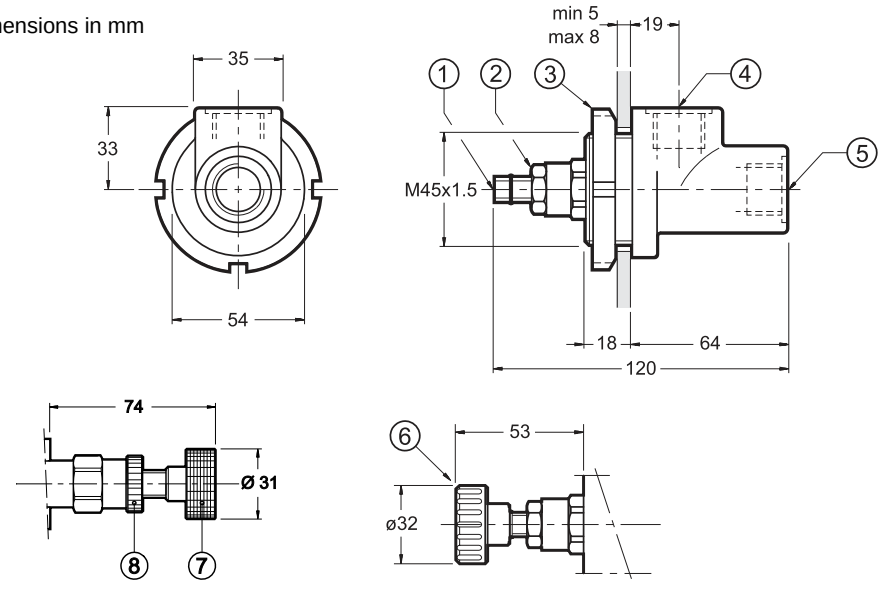


3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

4 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	Countersunk hex adjustment screw: **RM2-W**: spanner 6 **RM3-W**: spanner 5 Clockwise rotation to increase pressure
2	Locking nut: **RM2-W**: spanner 19 **RM3-W**:spanner 17
3	Ring-nut for flange mounting type SKF KM9
4	Outlet port 1/2” BSP
5	Pressure port: **RM2-W**: 3/8” BSP **RM3-W**: 1/2” BSP
6	Adjustment knob: **RM3-W**: **M1**
7	Adjustment knob: **RM2-W**: **K**
8	Locking ring

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RQ*-W

PRESSURE RELIEF VALVE

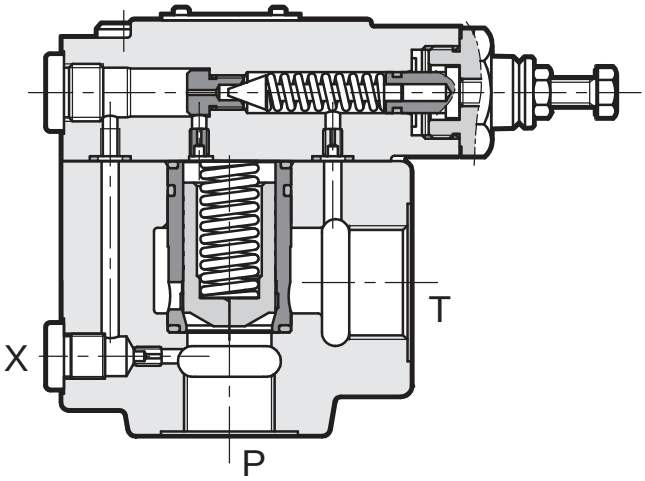
SERIES 41

THREADED PORTS

p max **350** bar

Q max (see table of performances)

OPERATING PRINCIPLE



— The RQ*-W valves are pilot operated pressure relief valves with threaded ports, available in two nominal sizes for a flow rate up to 400 l/min.

— Main stage with shutter and cone seal.

— Possibility of remote piloting using port X (see par. 4).

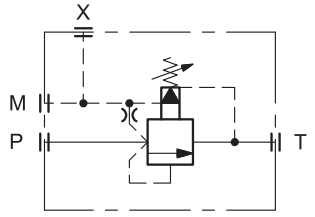
— The valves allow the use of the entire flow of the pump even with pressure values near the set value. The wide passages allow reduced pressure drops and fluid heating due to low pressure drop across the valve.

— They are normally supplied with a hexagonal head adjustment screw. Upon request, they can be equipped with a SICBLOC adjustment knob.

PERFORMANCES (measured with mineral oil of viscosity 36 cSt at 50°C)

		RQ5-W	RQ7-W
Maximum operating pressure	bar	350	
Maximum flow rate	l/min	250	400
Ambient temperature range	°C	-20 / +50	
Fluid temperature range	°C	-20 / +80	
Fluid viscosity range	cSt	10 ÷ 400	
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15		
Recommended viscosity	cSt	25	
Mass	kg	4,1	8

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

R	Q		-	W		/		/	41	/	

Pressure control valve

Nominal dimension **5** = DN 25
7 = DN 40

BSP threaded ports

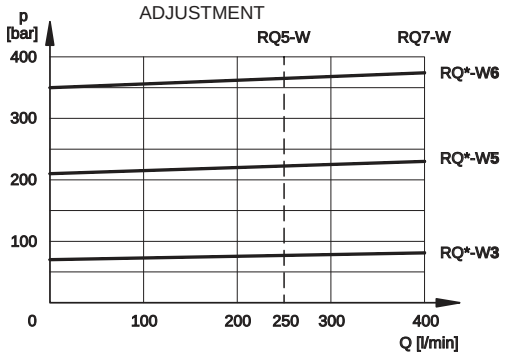
Pressure adjustment range:
3 = up to 70 bar
5 = up to 210 bar
6 = up to 350 bar

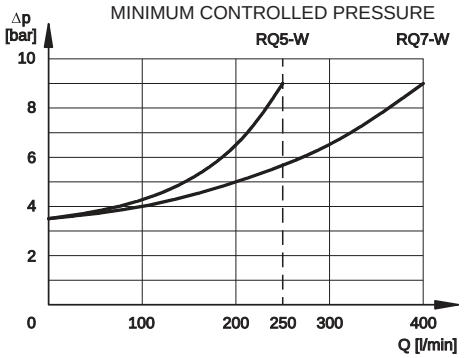
M = adjustment with SICBLOC knob
(omit for adjustment with hexagonal head screw)

Series No. (the overall and mounting dimensions remain unchanged from 40 to 49)

Seals:
omit for mineral oils
V = viton for special fluids

2 - CHARACTERISTIC CURVES (values obtained with viscosity of 36 cSt at 50°C)

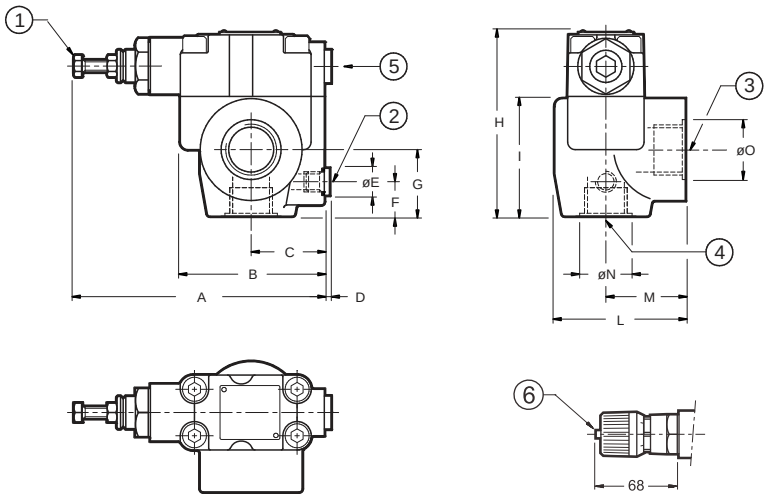




3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

4 - OVERALL AND MOUNTING DIMENSIONS



dimensions in mm

1	Hexagonal head adjustment screw. Spanner 13. Clockwise rotation to increase pressure
2	Remote piloting port X: 1/4" BSP
3	Outlet port T **RQ5-W**: 1" BSP **RQ7-W**: 1" 1/2 BSP
4	Pressure port P **RQ5-W**: 3/4" BSP **RQ7-W**: 1" 1/4 BSP
5	Pressure gauge port 3/8" BSP
6	SICBLOC adjustment knob. To operate, push and rotate at the same time.

	A	B	C	D	ØE	F	G	H	I	L	M	ØN	ØO
RQ5-W	168	98	49	4	22	21.5	44.5	123	80	87	53	35.5	46
RQ7-W	168	98	49	4	22	43	59.5	145	102	109	68	50	56

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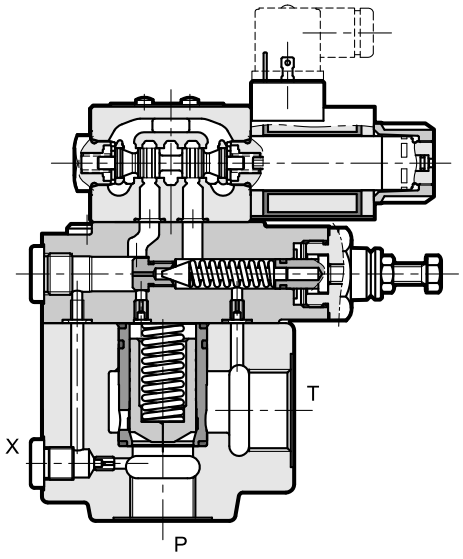
RQM*-W

SOLENOID OPERATED PRESSURE RELIEF VALVE WITH UNLOADING AND PRESSURE SELECTION

THREADED PORTS

p max **350** bar
Q max (see table of performances)

OPERATING PRINCIPLE



— The RQM*-W valves are pilot operated pressure relief valves with BSP threaded ports, for in-line mounting. They are available in two nominal sizes for a flow rates up to 400 l/min.

— They are available in five versions that, by means of a solenoid valve, allow unloading of the total flow and the selection of up to three pressure values (see table 2 for versions).

— The adjustment of both the second and the third pressure value is obtained by pressure relief valves placed between the main stage and the solenoid valve.

— The main pressure adjustment is supplied with a hexagonal head adjustment screw. Upon request, it can be equipped with a SICBLOC adjustment knob.

PERFORMANCES

(measured with mineral oil of viscosity 36 cSt at 50°C)

		RQM5-W	RQM7-W
Maximum operating pressure	bar	350	
Maximum flow rate	l/min	250	400
Ambient temperature range	°C	-20 / +50	
Fluid temperature range	°C	-20 / +80	
Fluid viscosity range	cSt	10 ÷ 400	
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15		
Recommended viscosity	cSt	25	

NOTE: for the solenoid valve DS3 characteristics see catalogue 41 150

1 - IDENTIFICATION CODE

R	Q	M		-	W		/		/		/			-		K1	/	

Pressure relief valve pilot operated

Solenoid valve for venting / pressure selection

Nominal dimension: **5** = ND 25
7 = ND 40

BSP threaded ports

Pressure adjustment range:
3 = up to 70 bar **6** = up to 350 bar
5 = up to 210 bar

Versions: **A**, **B**, **C**, **D**, **G** — see description in table 2: versions

M = adjustment with SICBLOC knob available on the main pressure control (omit for adjustment with hexagonal head screw)

Series No. (the overall and mounting dimensions remain unchanged from 60 to 69)
60 = for versions A and B
61 = for versions C, D and G

NOTE: The locking rings of the coils and the relevant O-Rings are supplied together with valves

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

DC power supply
D12 = 12 V
D24 = 24 V
D48 = 48 V
D110 = 110 V
D220 = 220 V

D00 = valve without coils (see **NOTE**)

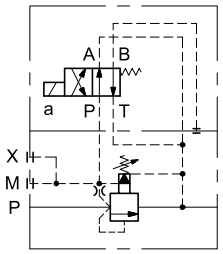
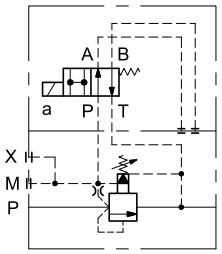
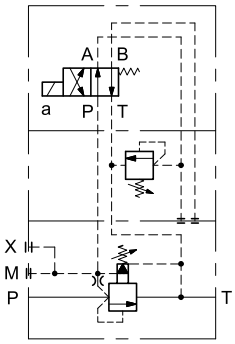
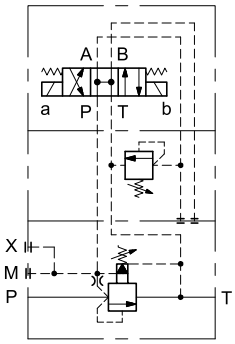
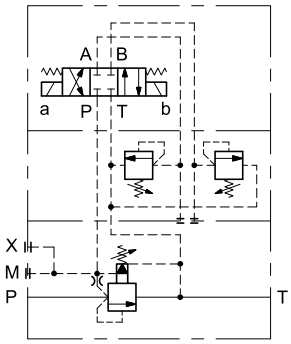
AC power supply
A24 = 24 V - 50 Hz
A48 = 48 V - 50 Hz
A110 = 110 V - 50 Hz / 120 V - 60 Hz
A230 = 230 V - 50 Hz / 240 V - 60 Hz
A00 = valve without coils (see **NOTE**)

F110 = 110 V - 60 Hz
F220 = 220 V - 60 Hz

Coil electrical connection: plug for connector type DIN 43650 (**standard**)

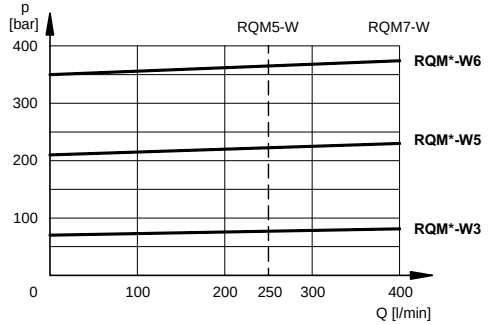
Manual override:
Omit for override integrated in the tube (**standard**)
CM = manual override, boot protected

2 - VERSIONS

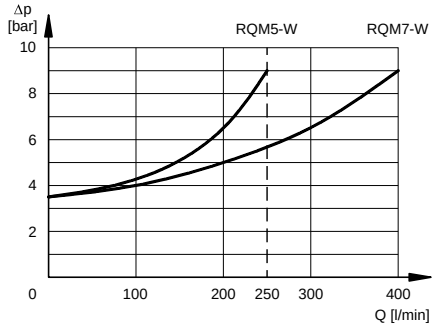
RQM*-W*/**A**	RQM*-W*/**B**	RQM*-W*/**C**	RQM*-W*/**D**	RQM*-W*/**G**
				
1 pressure setting and unloading with de-energized solenoid	**1 pressure setting and unloading with energized solenoid**	**2 pressure settings The highest setting is reached with energized solenoid**	**2 pressure settings and unloading with de-energized solenoids**	**3 pressure settings The highest setting is reached with de-energized solenoids**

3 - CHARACTERISTIC CURVES (values obtained with viscosity of 36 cSt at 50°C)

ADJUSTMENT



MINIMUM CONTROLLED PRESSURE



4 - HYDRAULIC FLUIDS

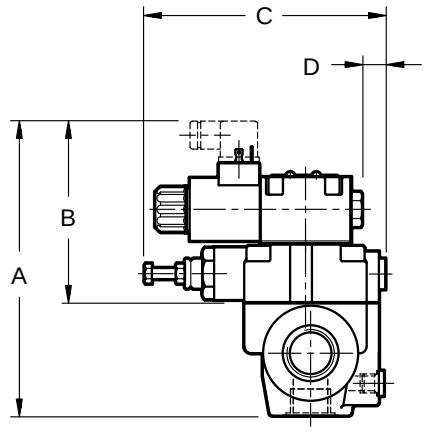
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

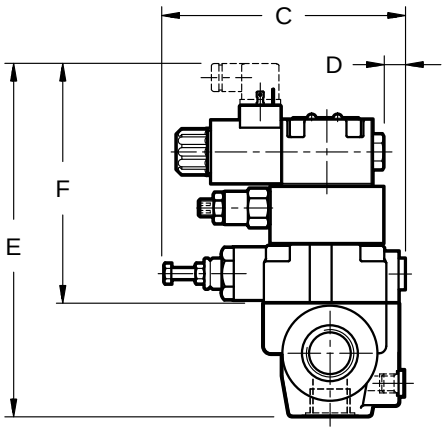
5 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

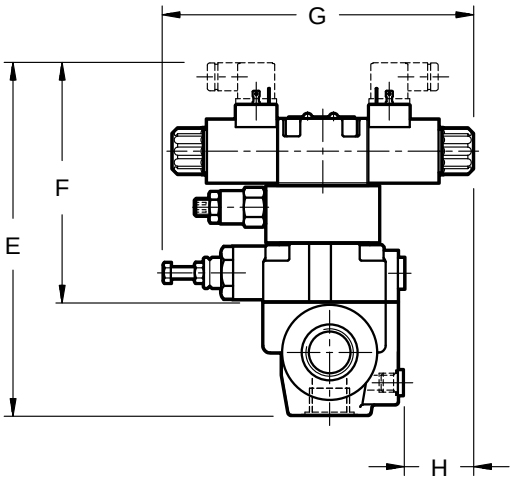
RQM*-W*/**A**
RQM*-W*/**B**



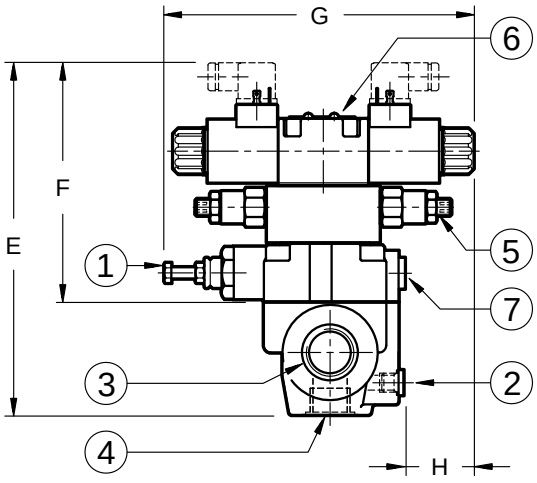
RQM*-W*/**C**



RQM*-W*/**D**



RQM*-W*/**G**

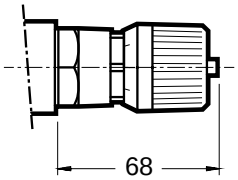


	A	B	C	D	E	F	G	H
RQM5-W	210	130	172	17	247	167	221.5	49.5
RQM7-W	232	130	172	17	269	167	221.5	49.5

1	Hexagonal head main pressure adjustment screw: Spanner 13 Clockwise rotation to increase pressure
2	Remote piloting port XX 1/4” BSP
3	Outlet port T **RQM5-W**: 1” BSP **RQM7-W**: 1” 1/2 BSP
4	Inlet port P **RQM5-W**: 3/4” BSP **RQM7-W**: 1” 1/4 BSP

5	Second value pressure adjustment valve. socket hex adjustment screw: hex key 6 locking nut: spanner 19 Clockwise rotation to increase pressure
6	ISO 4401-03 (CETOP 03) solenoid valve for pressure selection / unloading
7	Pressure gauge port 3/8” BSP

6 - ADJUSTMENT KNOB



The RQ valves can be equipped with a SICBLOC adjustment knob, only on the main pressure regulation. To actuate it, push and rotate at the same time.

Add **/M** to request this option (see point 1).

7 - ELECTRIC CONNECTORS

Solenoid operated valves are delivered without connectors. They must be ordered separately.

For the identification of the connector type to be ordered, please see catalogue 49 000.

8 - MANUAL OVERRIDE, BOOT PROTECTED: CM

Whenever the valve installation may involve exposure to atmospheric agents or utilization in tropical climates, the use of the boot protected manual override is recommended.

Add the suffix **CM** to request this device (see point 1).

For overall dimensions see catalogue 41 150.

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RQ*-P

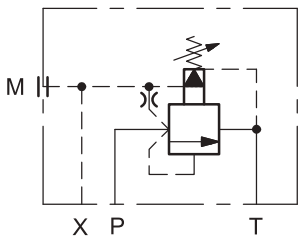
PRESSURE RELIEF VALVES

SERIES 41

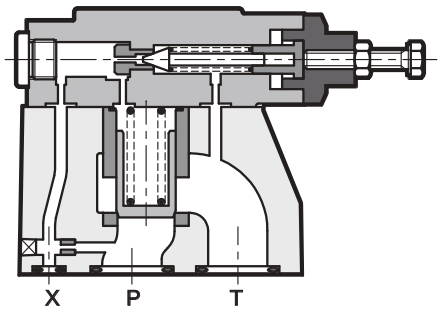
SUBPLATE MOUNTING

RQ3-P ISO 6264-06
RQ5-P ISO 6264-08
RQ7-P ISO 6264-10

HYDRAULIC SYMBOL



OPERATING PRINCIPLE



— Pilot operated pressure relief valve; main stage with shutter and cone seal.

— Subplate mounting in accordance with ISO 6264 standards.

— Possibility of remote piloting using port X (see Hydraulic symbol table).

— The RQ*-P valves allow use of the entire flow of the pump even with pressure values near the set value.

— The wide passages allow reduced pressure drops, improving the energy efficiency of the plant.

PERFORMANCES (measured with mineral oil of viscosity 36 cSt at 50°C)

		RQ3-P	RQ5-P	RQ7-P
Maximum operating pressure	bar	350		
Maximum flow rate	l/min	200	400	500
Ambient temperature range	°C	-20 / +60		
Fluid temperature range	°C	-20 / +80		
Fluid viscosity range	cSt	10 ÷ 400		
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15			
Recommended viscosity	cSt	25		
Mass	kg	3,5	4,3	6,5

1 - IDENTIFICATION CODE

R	Q		-	P		/		/	41	/	

Double stage pressure relief valve

Size: **3** = ISO 6264-06
5 = ISO 6264-08
7 = ISO 6264-10

Subplate mounting

Pressure adjustment range:
3 = up to 70 bar **6** = up to 350 bar
5 = up to 210 bar

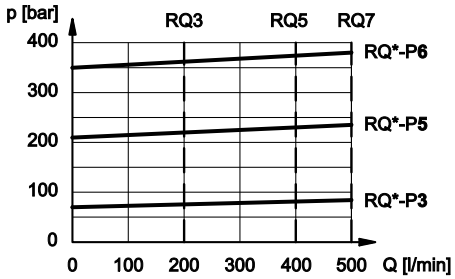
M = adjustment with SICBLOC knob
(omit for adjustment with hexagonal head screw)

Series No.
(the overall and mounting dimensions remain unchanged from 40 to 49)

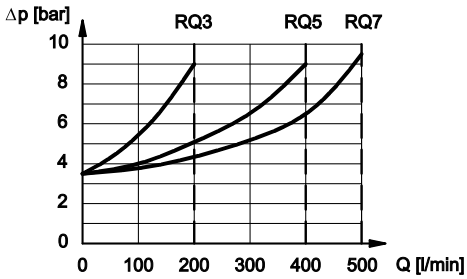
Seals: omit for mineral oils
V = viton for special fluids

2 - CHARACTERISTIC CURVES (values obtained with viscosity of 36 cSt at 50°C)

ADJUSTMENT



MINIMUM CONTROLLED PRESSURE

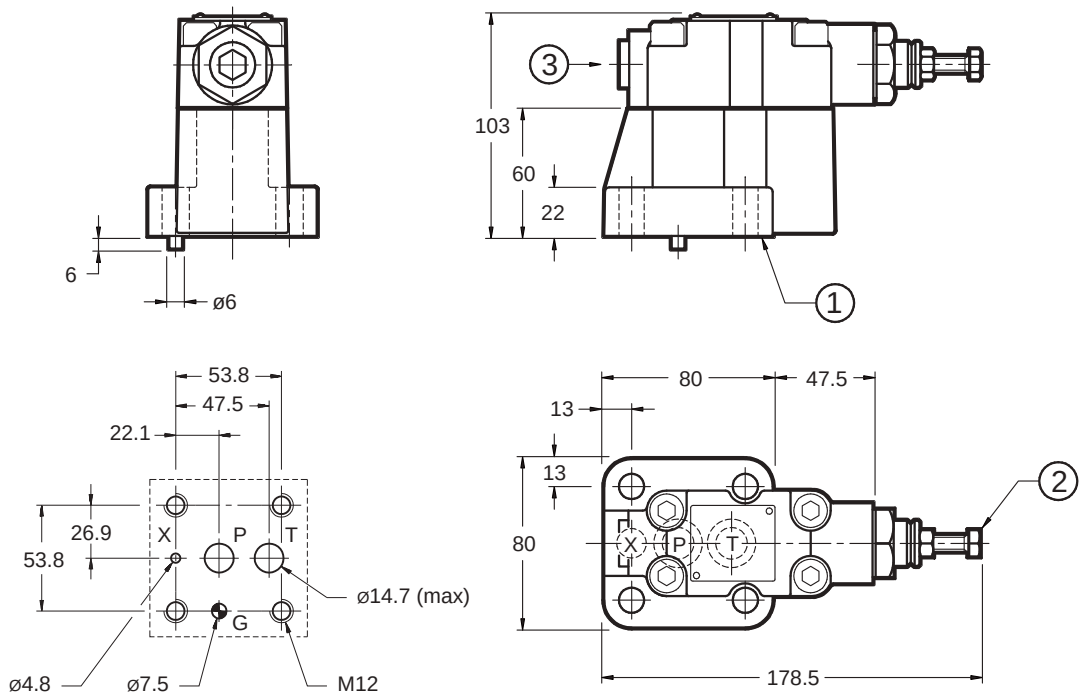


3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

4 - RQ3-P OVERALL AND MOUNTING DIMENSIONS



dimensions in mm

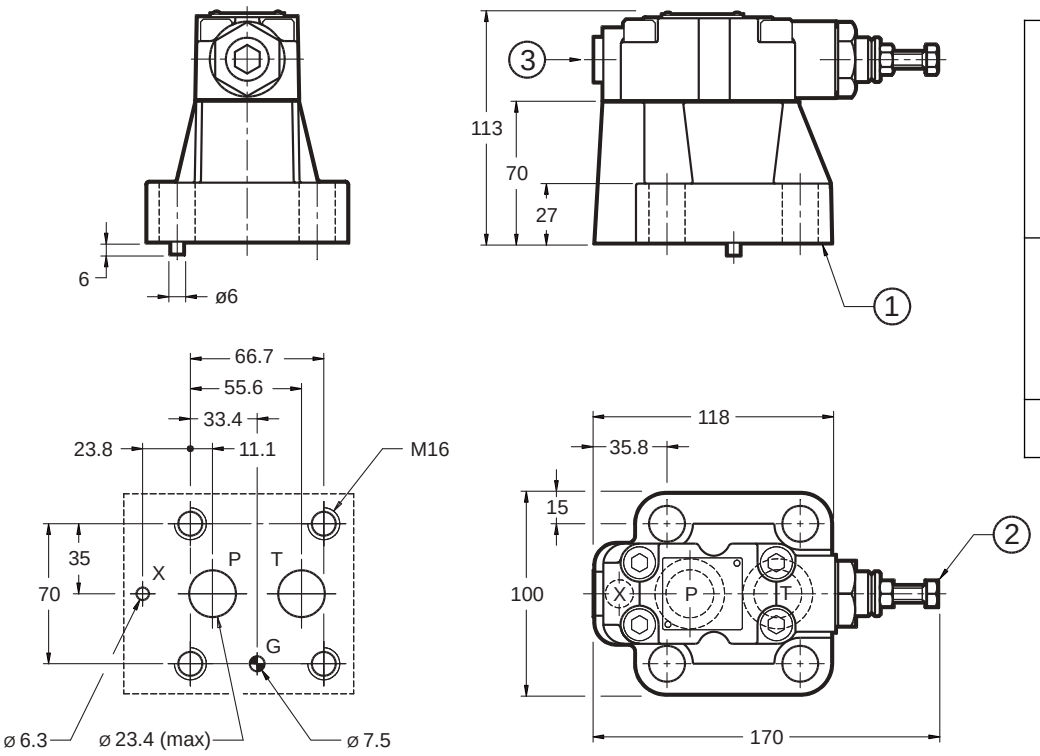
1	Mounting surface with sealing rings: 2 OR type 123 (17.86x2.62) 90 Shore 1 OR type 109 (9.13x2.62) 90 Shore
2	Hexagonal head adjustment screw. Spanner 13. Clockwise rotation to increase pressure.
3	Pressure gauge port Y 3/8" BSP

FASTENING BOLTS:
4 SHC bolts M12x40
Tightening torque: 69 Nm

MOUNTING SURFACE: ISO 6264-06-09-*-97 (CETOP 4.4.2-2-R06-350)

5 - RQ5-P OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



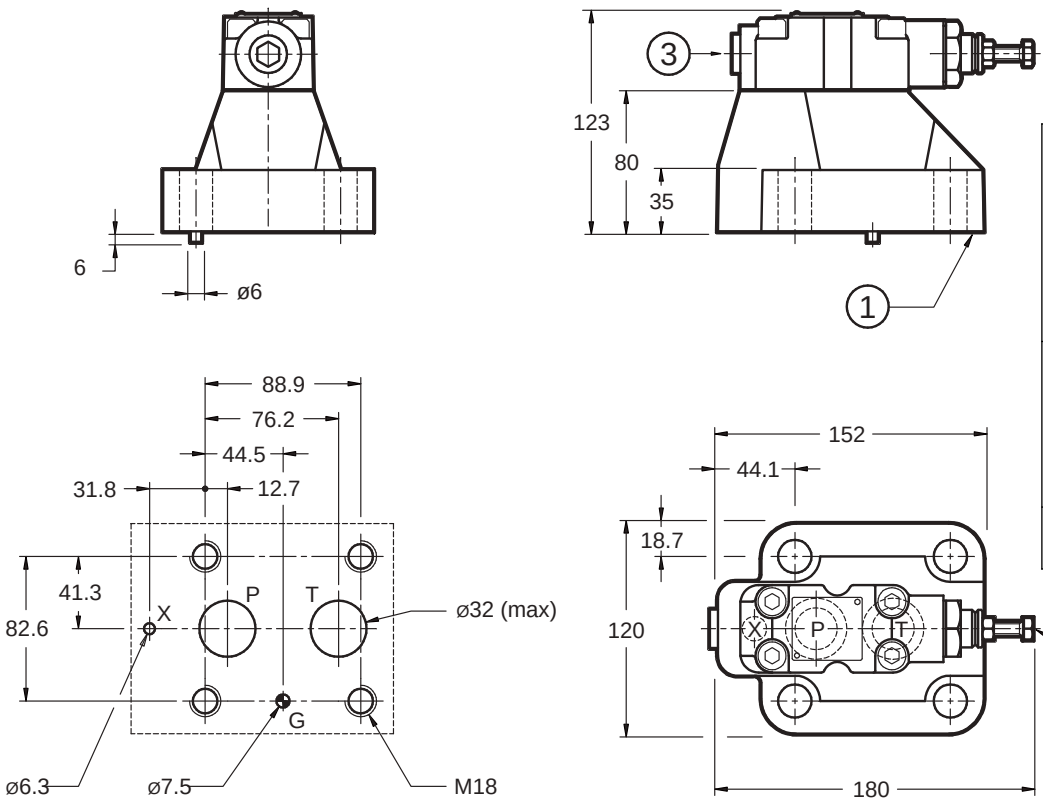
1	Mounting surface with sealing rings: N. 2 OR 3118 (29.82x2.62) 90 Shore N. 1 OR 109 (9.13x2.62) 90 Shore
2	Hexagonal head adjustment screw. Spanner 13. Clockwise rotation to increase pressure.
3	Pressure gauge port 3/8" BSP

FASTENING BOLTS:
4 SHC bolts M16x50
Tightening torque 170 Nm

MOUNTING SURFACE: ISO 6264-08-13-*-97 (CETOP 4.4.2-2-R08-350)

6 - RQ7-P OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	Mounting surface with sealing rings: N. 2 OR 4137 (34.52x3.53) 90 Shore N. 1 OR 109 (9.13x2.62) 90 Shore
2	Hexagonal head adjustment screw. Spanner 13. Clockwise rotation to increase pressure.
3	Pressure gauge port 3/8" BSP

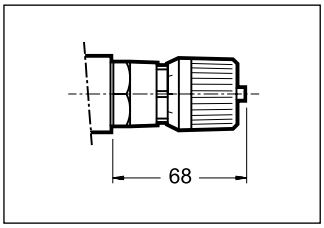
FASTENING BOLTS:
4 SHC bolts M18x60
Tightening torque: 235 Nm

MOUNTING SURFACE: ISO 6264-10-17-*-97 (CETOP 4.4.2-2-R10-350)

7 - ADJUSTMENT KNOB

The RQ valves can be equipped with a SICBLOC adjustment knob. To operate it, push and rotate at the same time.

To request this option, add: **/M** (see paragraph 1).



8 - SUBPLATES (see catalogue 51 000)

	RQ3-P	RQ5-P	RQ7-P
Type	PMRQ3-AI4G rear ports	PMRQ5-AI5G rear ports	PMRQ7-AI7G rear ports
P, T ports dimension	P: 1/2” BSP T: 3/4” BSP	1” BSP	1” 1/4 BSP
X port dimension	1/4” BSP	1/4” BSP	1/4” BSP

DUPLOMATIC MOTION SOLUTIONS

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DUPLOMATIC MOTION SOLUTIONS

WWW.SUMY.IR



RQM*-P

SOLENOID OPERATED PRESSURE RELIEF VALVES WITH UNLOADING AND PRESSURE SELECTION

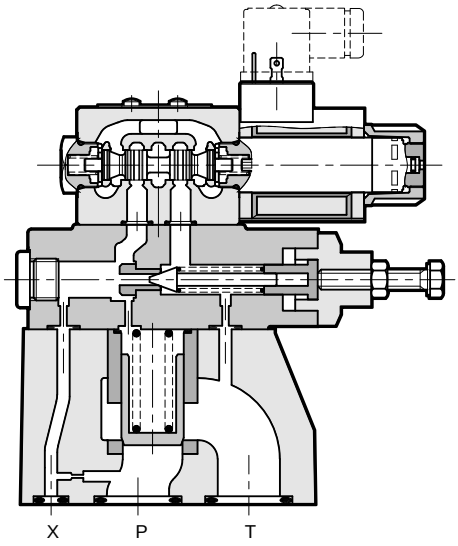
SUBPLATE MOUNTING

RQM3-P ISO 6264-06

RQM5-P ISO 6264-08

RQM7-P ISO 6264-10

OPERATING PRINCIPLE



— The RQM*-P valves are pilot operated pressure relief valves. They are available in three nominal sizes for flow up to 500 l/min.

— They are available in ISO 6264 subplate mounting version.

— They are available in five versions that, by means of a solenoid valve, allow unloading of the total flow and the selection of up to three pressure values (see table 2 for versions).

— The adjustment of both the second and the third pressure value is obtained by pressure relief valves placed between the main stage and the solenoid valve.

— The main pressure adjustment is supplied with a hexagonal head adjustment screw. Upon request, it can be equipped with a SICBLOC adjustment knob.

PERFORMANCES

(measured with mineral oil of viscosity 36 cSt at 50°C)

		RQM3-P	RQM5-P	RQM7-P
Maximum operating pressure	bar	350		
Maximum flow rate	l/min	200	400	500
Ambient temperature range	°C	-20 / +50		
Fluid temperature range	°C	-20 / +80		
Fluid viscosity range	cSt	10 ÷ 400		
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15			
Recommended viscosity	cSt	25		

NOTE: for the solenoid valve DS3 characteristics see catalogue 41 150

1 - IDENTIFICATION CODE

R	Q	M		-	P		/		/		/			-		K1	/	

Pilot operated pressure relief valve

Solenoid valve for unloading / pressure selection

Size: **3** = ISO 6264-06
5 = ISO 6264-08
7 = ISO 6264-10

Subplate mounting

Pressure adjustment range:
3 = up to 70 bar **6** = up to 350 bar
5 = up to 210 bar

Versions: **A**, **B**, **C**, **D**, **G** — see description at point 2: versions

M = adjustment with SICBLOC knob available only on the main pressure control (Omit for adjustment with hexagonal head screw)

Series No. (the overall and mounting dimensions remain unchanged from 60 to 69)
60 = for versions A and B
61 = for versions C, D and G

NOTE: The locking rings of the coils and the relevant O-Rings are supplied together with valves

Manual override: omit for override integrated in the tube (**standard**)
CM = manual override, boot protected

Coil electrical connection: plug for connector type EN 175301-803 (ex DIN 43650) (**standard**)

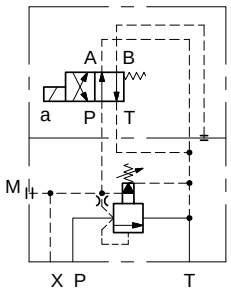
DC power supply
D12 = 12 V
D24 = 24 V
D48 = 48 V
D110 = 110 V
D220 = 220 V
D00 = valve without coils (see **NOTE**)

AC power supply
A24 = 24 V - 50 Hz
A48 = 48 V - 50 Hz
A110 = 110 V - 50 Hz / 120 V - 60 Hz
A230 = 230 V - 50 Hz / 240 V - 60 Hz
A00 = valve without coils (see **NOTE**)
F110 = 110 V - 60 Hz
F220 = 220 V - 60 Hz

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

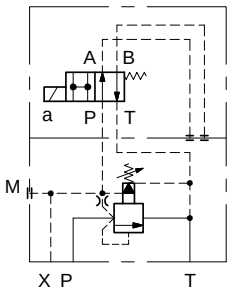
2 - VERSIONS

RQM*-P*/**A**



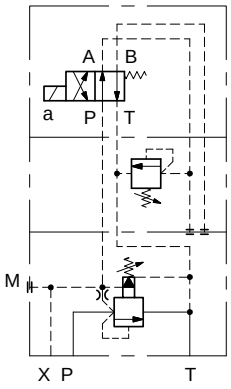
1 pressure setting and unloading with de-energized solenoid

RQM*-P*/**B**



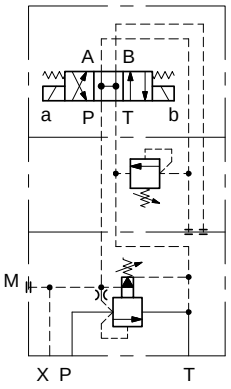
1 pressure setting and unloading with energized solenoid

RQM*-P*/**C**



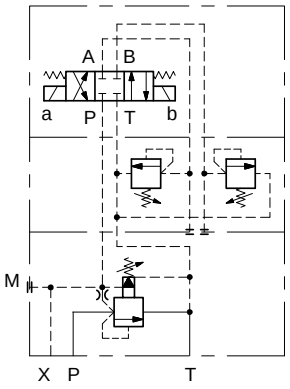
2 pressure settings The highest setting is reached with energized solenoid

RQM*-P*/**D**



2 pressure settings and unloading with de-energized solenoids

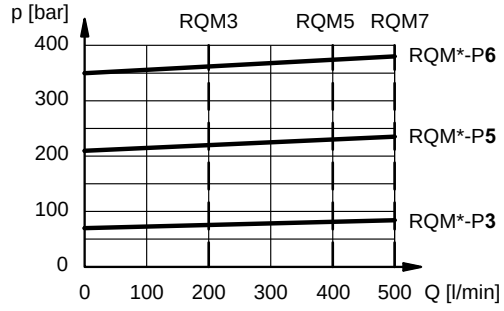
RQM*-P*/**G**



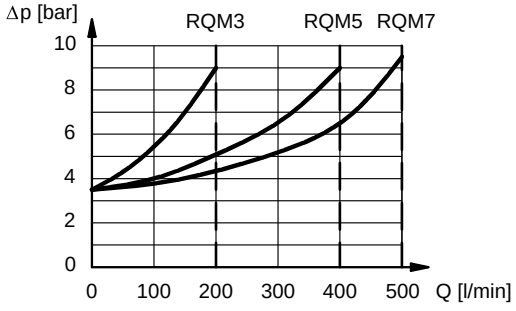
3 pressure settings The highest setting is reached with de-energized solenoids

3 - CHARACTERISTIC CURVES (values obtained with viscosity of 36 cSt at 50°C)

ADJUSTMENT



MINIMUM CONTROLLED PRESSURE



4 - HYDRAULIC FLUIDS

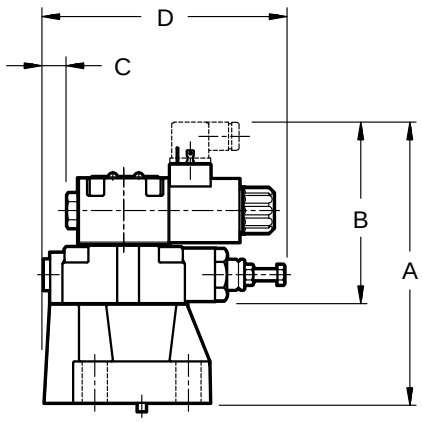
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

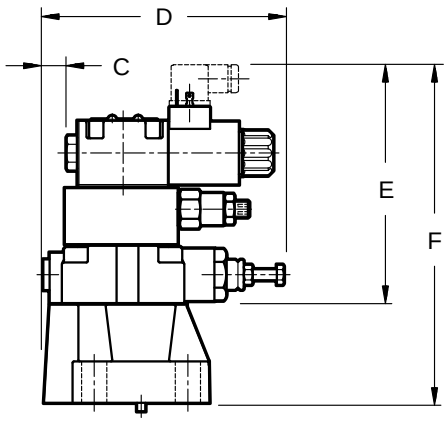
5 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

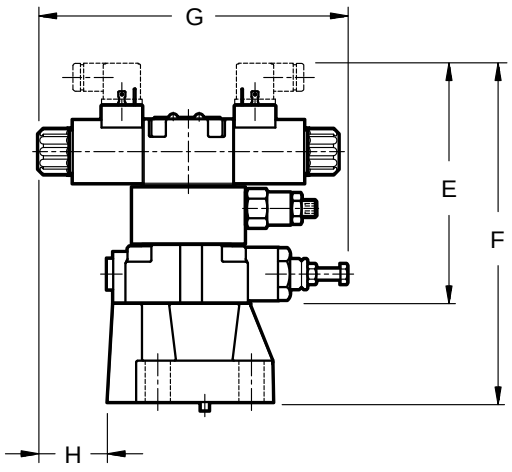
RQM*-P/**A**
RQM*-P/**B**



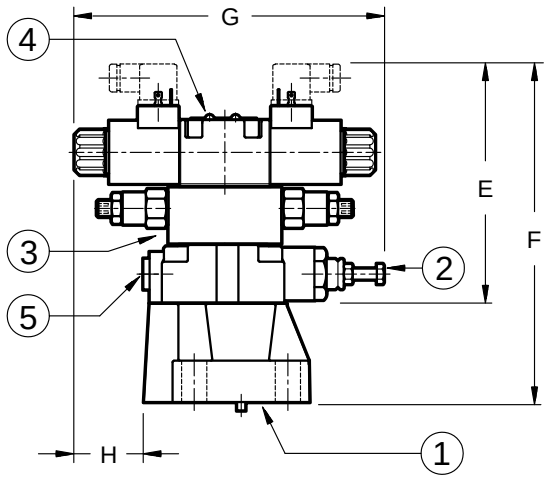
RQM*-P/**C**



RQM*-P/**D**



RQM*-P/**G**

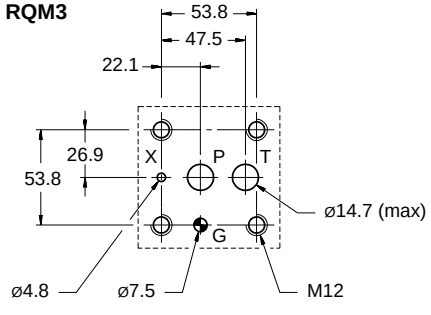


	A	B	C	D	E	F	G	H
RQM3-P	186	126	22	179	164	226	223	44
RQM5-P	196	126	14	170	164	236	222	52
RQM7-P	206	126	25	180	164	246	221	41

1	Mounting surface For fastening bolts and sealing rings see point 10
2	Hexagonal head main pressure adjustment screw: Spanner 13 Clockwise rotation to increase pressure
3	Second value pressure adjustment valve. socket hex adjustment screw: hex key 6 locking nut: spanner 19 Clockwise rotation to increase pressure
4	ISO 4401-03 (CETOP 03) solenoid valve for pressure selection / unloading
5	Pressure gauge port 3/8” BSP

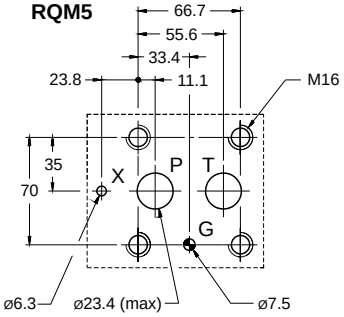
6 - MOUNTING SURFACES

RQM3



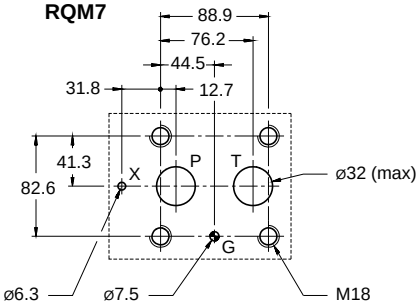
ISO 6264-06-09-*-97 (CETOP 4.4.2-2-R06-350)

RQM5



ISO 6264-08-13-*-97 (CETOP 4.4.2-2-R08-350)

RQM7

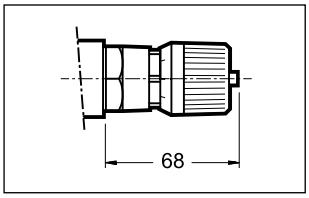


ISO 6264-10-17-*-97 (CETOP 4.4.2-2-R10-350)

7 - ADJUSTMENT KNOB

The valves can be equipped with a SICBLOC adjustment knob, only on the main pressure regulation. To operate it, push and rotate at the same time.

To request this option, add: **/M** (see point 1).



8 - ELECTRIC CONNECTORS

Solenoid operated valves are delivered without connectors. Connectors type EN 175301-803 (ex DIN 43650) for K1 connections can be ordered separately. See catalogue 49 000.

9 - MANUAL OVERRIDE, BOOT PROTECTED: CM

Whenever the solenoid valve installation may involve exposure to atmospheric agents or utilization in tropical climates, the use of the boot protected manual override is recommended.

Add the **CM** suffix to request this device (see point 1). For overall dimensions see catalogue 41 150.

10 - FASTENING BOLTS AND SEALING RINGS

	RQM3-P	RQM5-P	RQM7-P
Fastening (4 SHC bolts ISO 4762)	M12 x 40	M16 x 50	M18 x 60
Torque	69 Nm	170 Nm	235 Nm
Sealing rings	N. 2 OR type 123 (17.86x2.62) 90 Shore N. 1 OR type 109 (9.13x2.62) 90 Shore	N. 2 OR type 3118 (29.82x2.62) 90 Shore N. 1 OR type 109 (9.13x2.62) 90 Shore	N. 2 OR type 4137 (34.52x3.53) 90 Shore N. 1 OR type 109 (9.13x2.62) 90 Shore

11 - SUBPLATES

(see catalogue 51 000)

	RQM3-P	RQM5-P	RQR7-P
Type	PMRQ3-AI4G rear ports	PMRQ5-AI5G rear ports	PMRQ7-AI7G rear ports
P, T ports dimension	P: 1/2" BSP T: 3/4" BSP	1" BSP	1" 1/4 BSP
X port dimension	1/4" BSP	1/4" BSP	1/4" BSP

DUPLOMATIC MOTION SOLUTIONS
a member of DAIKIN group

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duplomaticmotionsolutions.com

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MRQA

UNLOADING VALVE

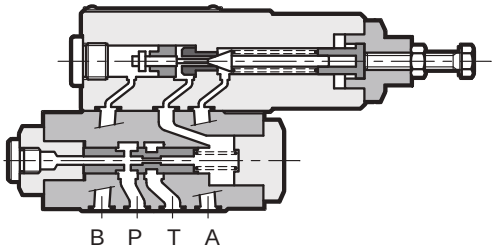
(FOR CIRCUITS WITH ACCUMULATOR)

SERIES 42

SUBPLATE MOUNTING
ISO 4401-03 (CETOP 03)

p max **350** bar
Q max **40** l/min

OPERATING PRINCIPLE



— MRQA is a pressure relief and safety valve with automatic unloading. Upon reaching the set value, the valve freely unloads the pump and puts it under pressure again when the pressure values descend in the circuit to correspond to 63% or 75% of the set value.

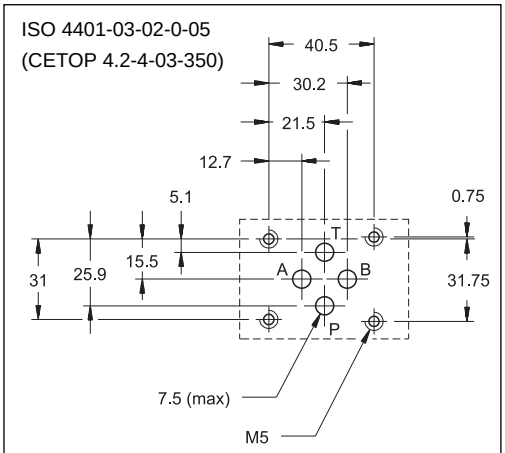
In order to assure this operation, it is necessary to use an accumulator (see hydraulic diagram) that guarantees pressure maintenance in the circuit. A check valve, incorporated in the panel or available as a plate under the valve MRQA/C, prevents the accumulator unloading through the open valve.

This system maintains the pressure in the hydraulic circuit, avoiding heating of the oil and reducing energy consumption.

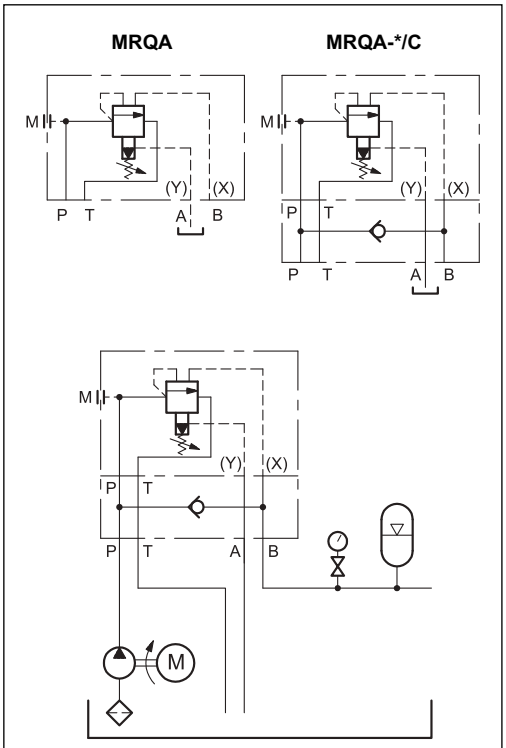
It is recommended to place the accumulator as close as possible to the MRQA, without reducing the connection size.

— The cycle time depends on the pump flow rate, the accumulator capacity and pre-charge, and the flow requirement of the system.

MOUNTING SURFACE



HYDRAULIC SYMBOLS & DIAGRAM



PERFORMANCE RATINGS (measured with mineral oil of viscosity 36 cSt at 50°C)

Maximum operating pressure	bar	350
Maximum flow rate	l/min	40
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 21/19/16	
Recommended viscosity	cSt	25
Mass: MRQA MRQA*/C	kg	3,3 4,2

1 - IDENTIFICATION CODE

M	R	Q	A	-		/		/		/		/	42	/	

Size ISO 4401-03 (CETOP 03)

Unloading valve

Automatic unloading for circuits with accumulator

Pressure adjustment range:
3 = 25 ÷ 70 bar
5 = 50 ÷ 210 bar
6 = 100 ÷ 280 bar

Differential pressure (values ± 2.5%)
1 = pump switch on at 75% of adjustment value
2 = pump switch on at 63% of adjustment value

Seals: omit for mineral oils
V = viton for special fluids

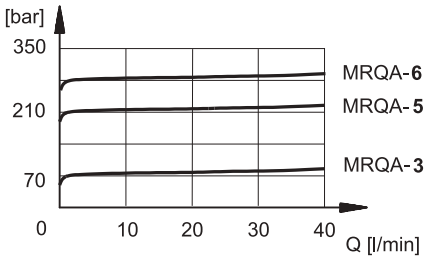
Series No. (the overall and mounting dimensions remain unchanged from 40 to 49)

C = Check valve (omit if not required)

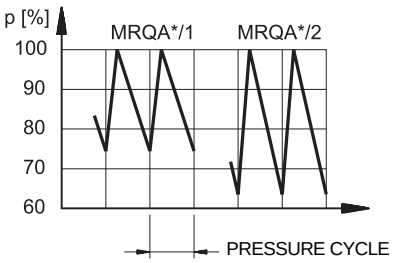
M = Adjustment with SICBLOC knob (omit for adjustment with hexagonal head screw)

2 - CHARACTERISTIC CURVES (values obtained with viscosity of 36 cSt at 50°C)

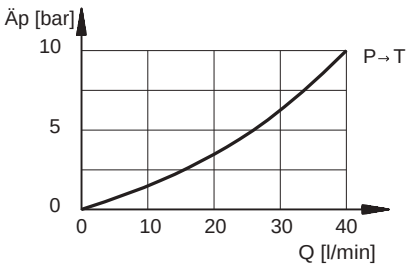
ADJUSTMENT



RESETTING PRESSURES



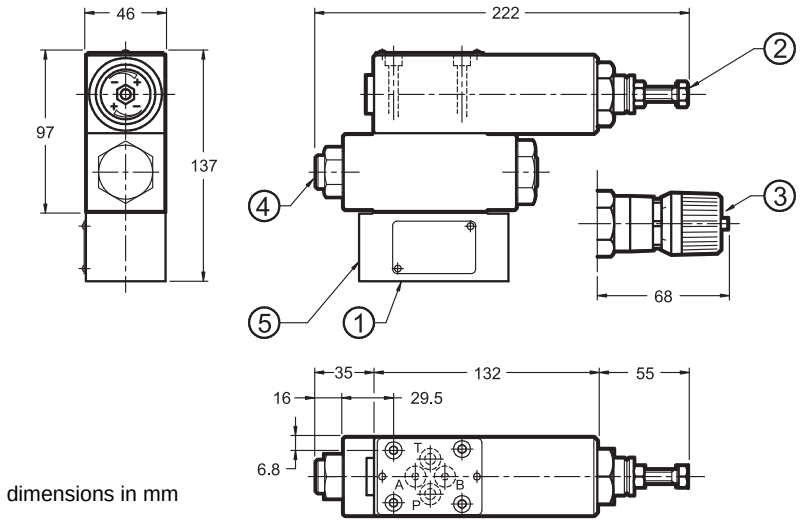
PRESSURE DROPS Δp-Q



3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

4 - OVERALL AND MOUNTING DIMENSIONS



dimensions in mm

FASTENING SCREWS:
MRQA
4 SHC screws ISO 4762 M5x95
MRQA/C
4 SHC screws ISO 4762 M5x135
Tightening torque: 5 Nm

1	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) - 90 Shore
2	Hexagonal head adjustment screw. Spanner 13. Clockwise rotation to increase pressure
3	SICBLOC adjustment knob. To operate, push and rotate at the same time.
4	Pressure gauge port 1/4” BSP
5	Check valve for version /C

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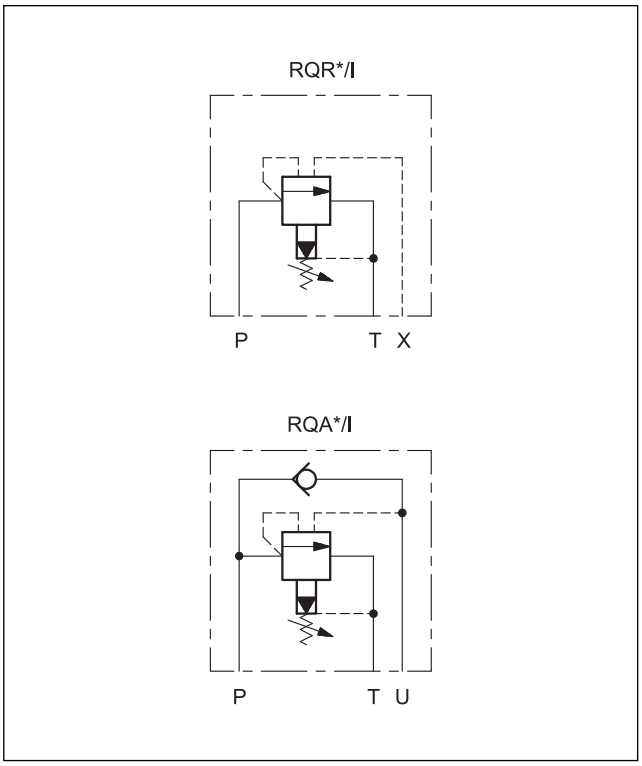
RQ**-P
UNLOADING VALVE
(FOR CIRCUITS WITH ACCUMULATOR)
SERIES 42

RQR*-P
FOR REMOTE PILOTING

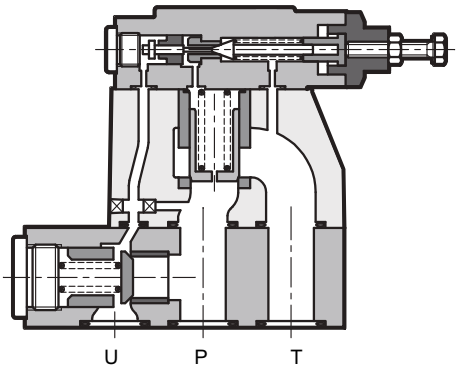
RQA*-P
WITH INCORPORATED CHECK VALVE

SUBPLATE MOUNTING

HYDRAULIC SYMBOLS



OPERATING PRINCIPLE



— The RQR*-P and RQR*-A valves have not only the normal function of relief valves or safety valves but also the characteristic of freely discharging the pump flow when the set pressure value is reached.

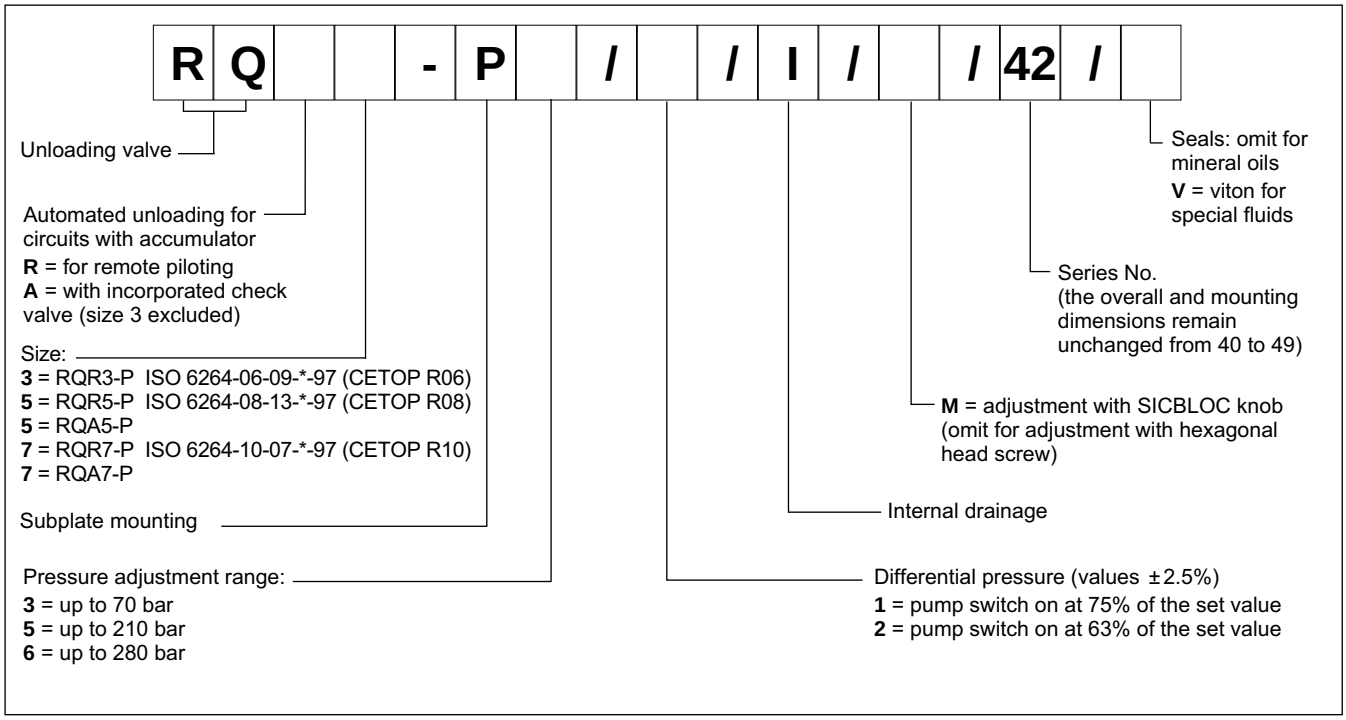
In order to assure this condition, the use of an accumulator that guarantees pressure in the circuit is required. The use of a check valve prevents the accumulator from discharging through the valve in the open position.

— Those valves are made with a balanced shutter main stage that has wide passages for big flows and reduced pressure drops.

PERFORMANCES
(measured with mineral oil of viscosity 36 cSt at 50°C)

		RQR3-P	RQR5-P	RQR7-P	RQA5-P	RQA7-P
Maximum operating pressure	bar	350				
Maximum flow rate	l/min	200	400	500	400	500
Ambient temperature range	°C	-20 / +50				
Fluid temperature range	°C	-20 / +80				
Fluid viscosity range	cSt	10 ÷ 400				
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15					
Recommended viscosity	cSt	25				
Mass	Kg	3,5	4,3	6,5	10	17

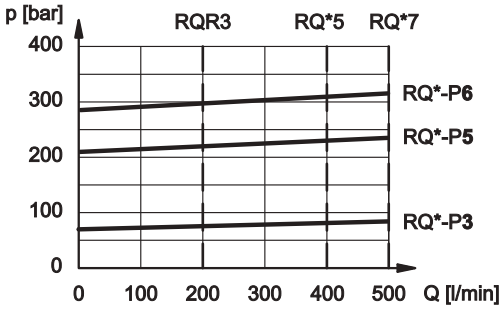
1 - IDENTIFICATION CODE



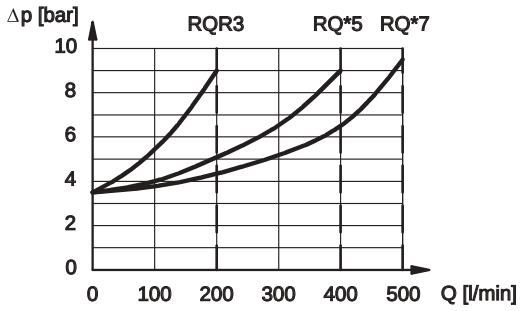
2 - CHARACTERISTIC CURVES

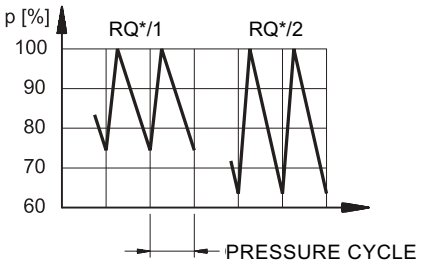
(values obtained with viscosity of 36 cSt at 50°C)

ADJUSTMENT



MINIMUM CONTROLLED PRESSURE





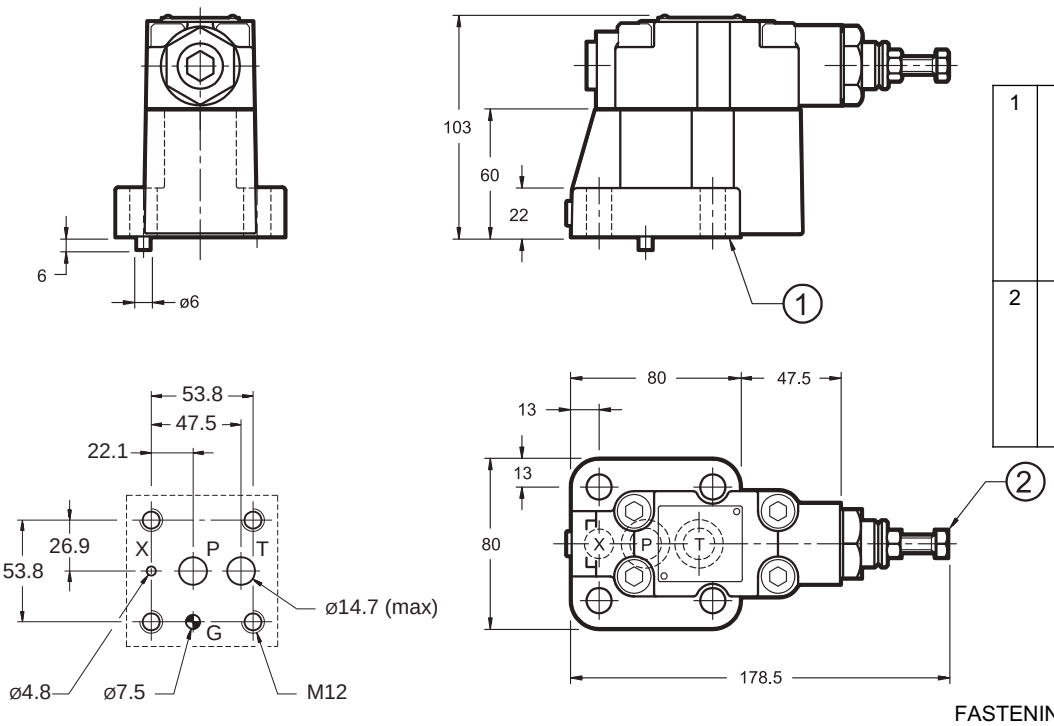
3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

4 - RQR3-P OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



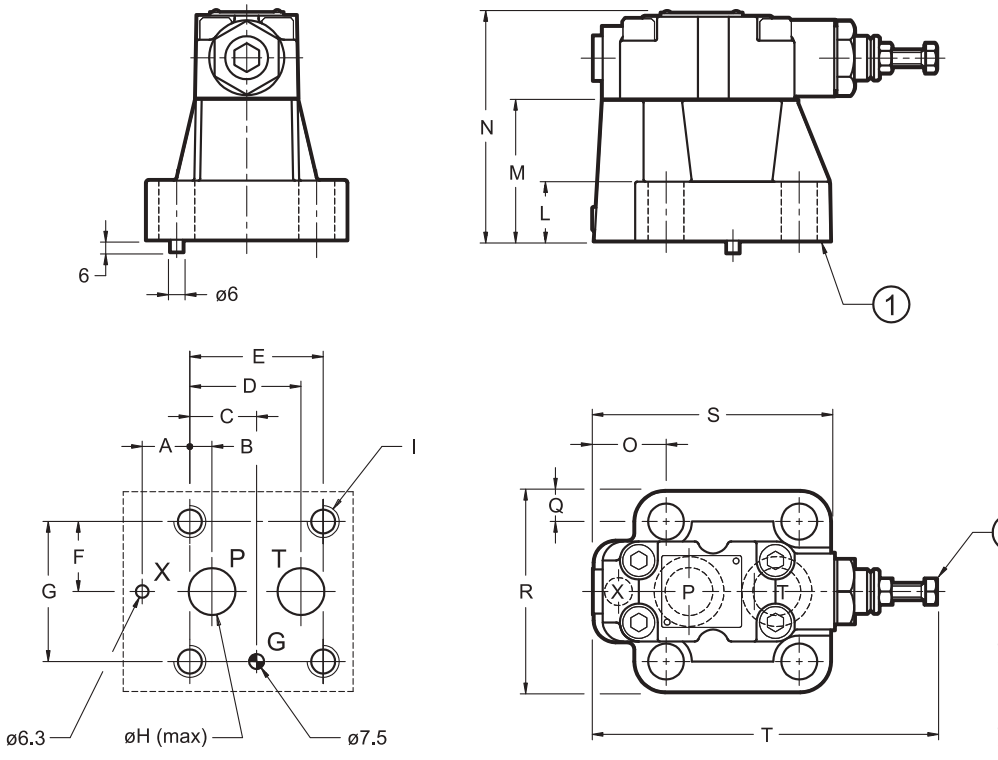
1	Mounting surface with sealing rings: N. 2 OR type 123 (17.86x2.62) N. 1 OR type 109 (9.13x2.62) 90 Shore
2	Hexagonal head adjustment screw. Spanner 13. Clockwise rotation to increase pressure.

MOUNTING SURFACE: ISO 6264-06-09-*-97 (CETOP 4.4.2-2-R06-350)

FASTENING BOLTS (included):
4 SHC bolts ISO 4762 M12x40
Tightening torque: 69 Nm

5 - RQR5-P AND RQR7-P OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



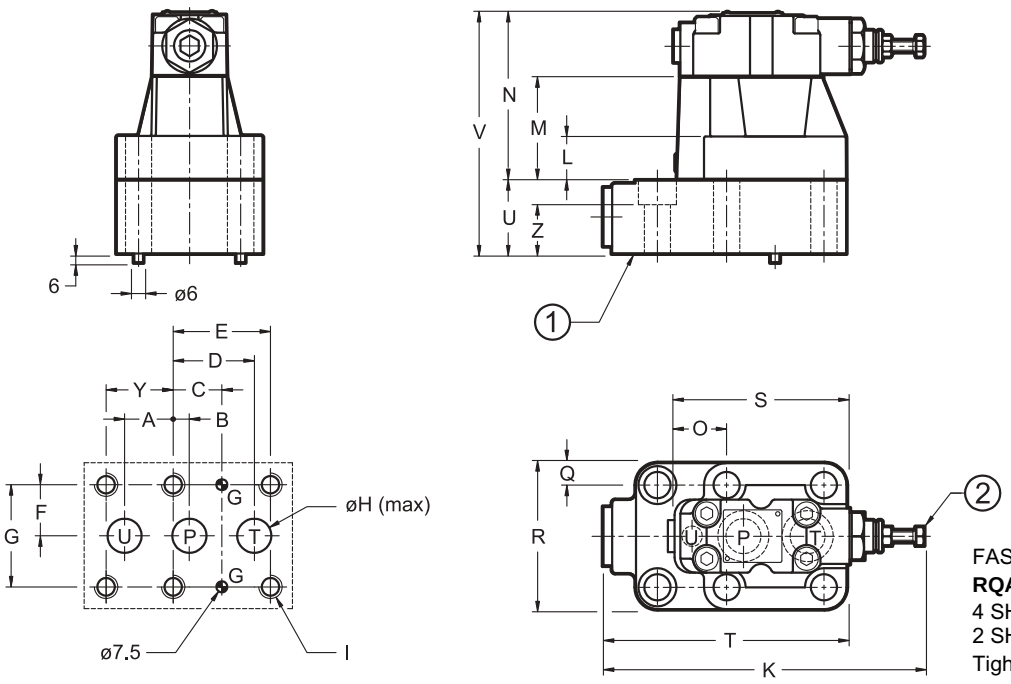
1	Mounting surface with sealing rings: **RQR5** N. 2 OR type 3118 (29.82x2.62) N. 1 OR type 109 (9.13x2.62) - 90 Shore **RQR7** N. 2 OR type 4137 (34.52x3.53) N. 1 OR type 109 (9.13x2.62) - 90 Shore
2	Hexagonal head adjustment screw. Spanner 13.

FASTENING BOLTS (included):
RQR5
4 SHC bolts ISO 4762 M16x50
Tightening torque: 170 Nm
RQR7
4 SHC bolts ISO 4762 M18x60
Tightening torque: 235 Nm

	MOUNTING SURFACE	A	B	C	D	E	F	G	ØH	I	L	M	N	O	Q	R	S	T
RQR5-P	ISO 6264-08-13-*-97 (CETOP 4.4.2-2-R08-350)	23.8	11.1	33.4	55.6	66.7	35	70	23.4	M16	27	70	113	35.8	15	100	118	170
RQR7-P	ISO 6264-10-17-*-97 (CETOP 4.4.2-2-R10-350)	31.8	12.7	44.5	76.2	88.9	41.3	82.6	32	M18	35	80	123	44.1	18.7	120	152	180

6 - RQA5-P AND RQA7P OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	Mounting surface with sealing rings: **RQA5** N. 3 OR type 3118 (29.82x2.62) 90 Shore **RQR7** N. 2 OR type 4137 (34.52x3.53) 90 Shore
2	Hexagonal head adjustment screw. Spanner 13.

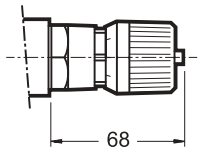
FASTENING BOLTS (included):
RQA5
4 SHC bolts ISO 4762 M16x100
2 SHC bolts ISO 4762 M16x55
Tightening torque:170 Nm
RQA7
4 SHC bolts ISO 4762 M18x130
2 SHC bolts ISO 4762 M18x70
Tightening torque: 235 Nm

	A	B	C	D	E	F	G	ØH	I	K	L	M	N	O	Q	R	S	T	U	V	Y	Z
RQA5-P	33.3	11.1	33.4	55.6	66.7	35	70	23.4	M16	213	27	70	113	35.8	15	100	118	167	50	163	46	33.5
RQA7-P	38	12.7	44.5	76.2	88.9	41.3	82.6	32	M18	245	35	80	123	44.1	18.7	120	152	222	66	189	50.8	48

7 - ADJUSTMENT KNOB

The valves can be equipped with a SICBLOC adjustment knob. To operate it, push and rotate at the same time.

To request this option, add **M** (see paragraph 1) in the proper square.



8 - SUBPLATES

(see catalogue 51 000)

	RQR3-P	RQR5-P	RQR7-P	RQA5-P	RQA7-P
Type	PMRQ3-AI4G rear ports	PMRQ5-AI5G rear ports	PMRQ7-AI7G rear ports	PMRQA5-AI5G rear ports	PMRQA7-AI7G rear ports
P, T, U ports dimensions	P: 1/2” BSP T: 3/4” BSP	1” BSP	1” 1/4 BSP	3/4” BSP	1” 1/4 BSP
X port dimension	1/4” BSP	1/4” BSP	1/4” BSP	-	-

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RQ*M*-P

UNLOADING VALVE WITH AUTOMATIC OR SOLENOID OPERATED VENTING

(FOR CIRCUITS WITH ACCUMULATOR)

SERIES 51

RQRM*-P

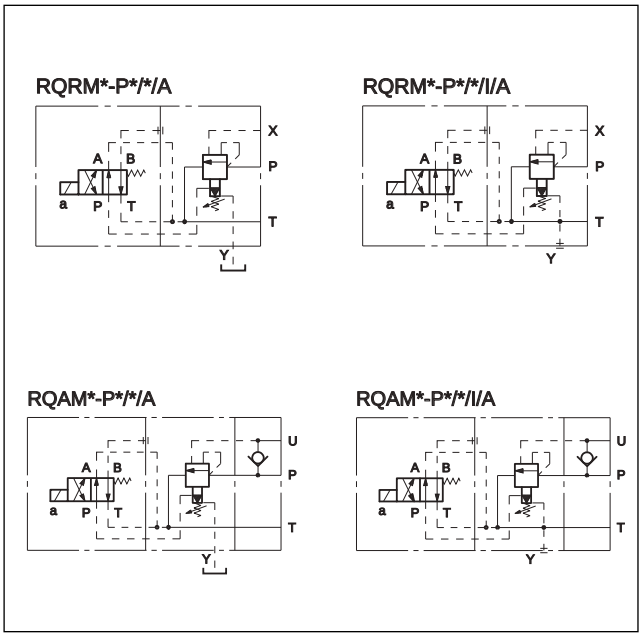
FOR REMOTE PILOTING

RQAM*-P

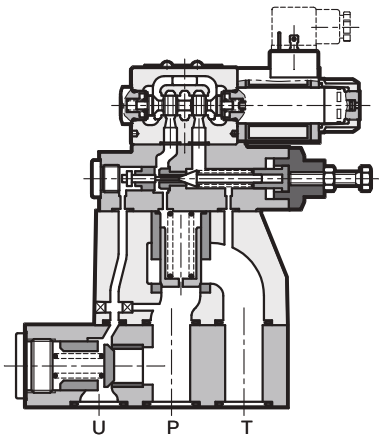
WITH INCORPORATED CHECK VALVE

SUBPLATE MOUNTING

HYDRAULIC SYMBOLS



OPERATING PRINCIPLE



— The RQ*M*-P valves have not only the normal function of relief valves or safety valves but also the characteristic of freely discharging the pump flow either when the set pressure value is reached, or when the solenoid valve is de-energized. In order to assure this condition, the use of an accumulator that guarantees pressure in the circuit is required. The use of a check valve prevents the accumulator from discharging through the valve in the open position.

— They are made with a balanced shutter main stage that has wide passages for large flows, with reduced pressure drops.

PERFORMANCES

(measured with mineral oil of viscosity 36 cSt at 50°C)

		RQRM3-P	RQRM5-P	RQRM7-P	RQAM5-P	RQAM7-P
Maximum operating pressure	bar	350				
Maximum flow rate	l/min	200	400	500	400	500
Ambient temperature range	°C	-20 / +50				
Fluid temperature range	°C	-20 / +80				
Fluid viscosity range	cSt	10 ÷ 400				
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15					
Recommended viscosity	cSt	25				
Mass	Kg	5	5,8	8	12	19

NOTE: for the solenoid valve DS3 characteristics see catalogue 41 150

1 - IDENTIFICATION CODE

R	Q		M		-	P		/		/	A	/		/		/	51		-		K1	/	

Unloading valve

Automatic venting for circuits with accumulator

R = for remote piloting
A = with embedded check valve (unavailable on size 3)

Solenoid valve for electrical unloading

Size:
3 = (RQRM3-P) ISO 6264-06-09-*-97 (CETOP R06)
5 = (RQRM5-P) ISO 6264-08-13-*-97 (CETOP R08)
5 = (RQAM5-P)
7 = (RQRM7-P) ISO 6264-10-17-*-97 (CETOP R10)
7 = (RQAM7-P)

Subplate mounting

Pressure adjustment range:
3 = up to 70 bar **6** = up to 280 bar
5 = up to 210 bar

Differential pressure (values ± 2.5%)
1 = pump switch on at 75% of the set value
2 = pump switch on at 63% of the set value

Unloading with de-energized solenoid

I = internal drainage (not possible when the backpressure on the return line is greater than 2 bar). Omit for external drainage.

CM = manual override, boot protected.
Omit for override integrated in the tube (**standard**)

Coil electrical connection: plug for connector type DIN 43650 (**standard**)

DC power supply
D12 = 12 V
D24 = 24 V
D48 = 48 V
D110 = 110 V
D220 = 220 V
D00 = valve without coils (see **NOTE**)

AC power supply
A24 = 24 V - 50 Hz
A48 = 48 V - 50 Hz
A110 = 110 V - 50 Hz / 120 V - 60 Hz
A230 = 230 V - 50 Hz / 240 V - 60 Hz
A00 = valve without coils (see **NOTE**)
F110 = 110 V - 60 Hz
F220 = 220 V - 60 Hz

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Series No. (the overall and mounting dimensions remain unchanged from 50 to 59)

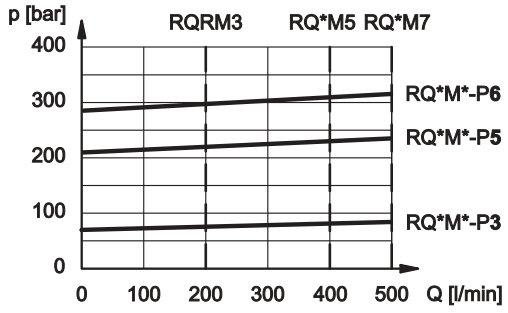
M = adjustment with SICBLOC knob (omit for adjustment with hexagonal head screw)

NOTE: The locking rings of the coils and the relevant O-Rings are supplied together with valves

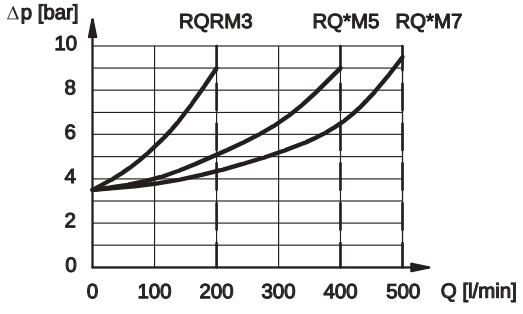
2 - CHARACTERISTIC CURVES

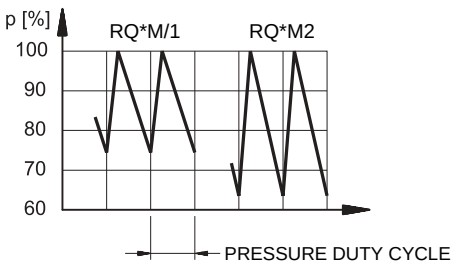
(values obtained with viscosity of 36 cSt at 50°C)

ADJUSTMENT



MINIMUM CONTROLLED PRESSURE





3 - HYDRAULIC FLUIDS

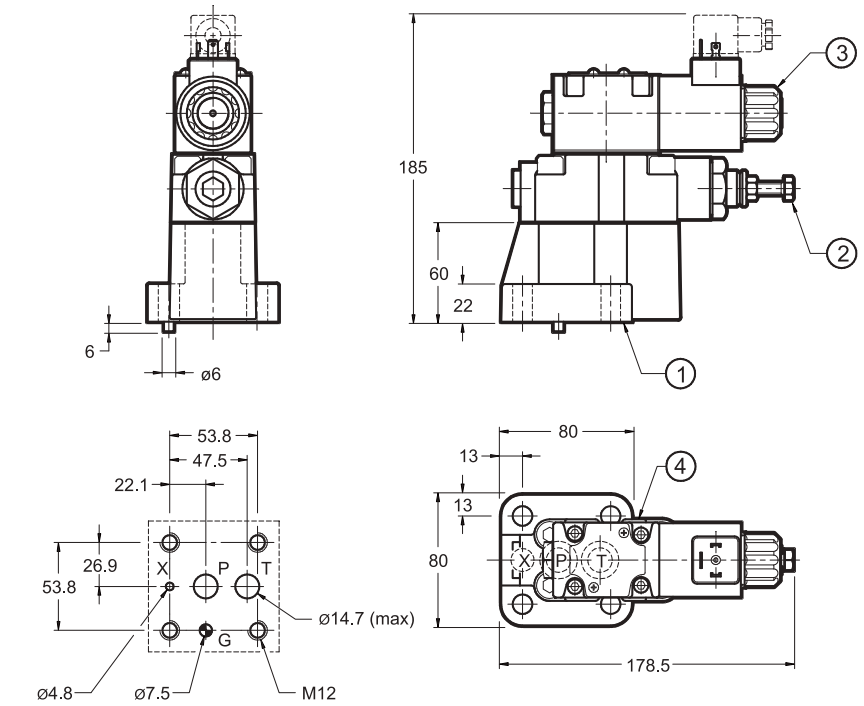
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

4 - RQRM3-P OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



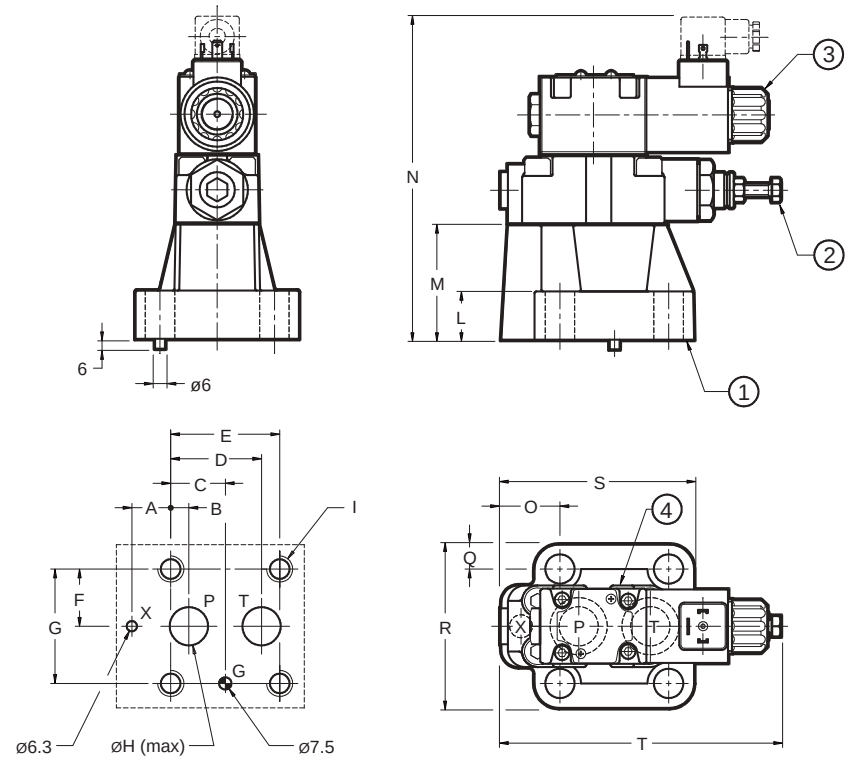
1	Mounting surface with sealing rings: N. 2 OR type 123 (17.86x2.62) 90 Shore N. 1 OR type 109 (9.13x2.62) 90 Shore
2	Hexagonal head main pressure adjustment screw. Spanner 13. Clockwise rotation to increase pressure.
3	ISO 4401-03 (CETOP 03) solenoid valve for unloading
4	External drainage port Y 1/8" NPT

MOUNTING SURFACE: ISO 6264-06-09-*-97 (CETOP 4.4.2-2-R06-350)

FASTENING BOLTS:
4 bolts M12x40 Torque: 69 Nm

5 - RQRM5-P AND RQRM7-P OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



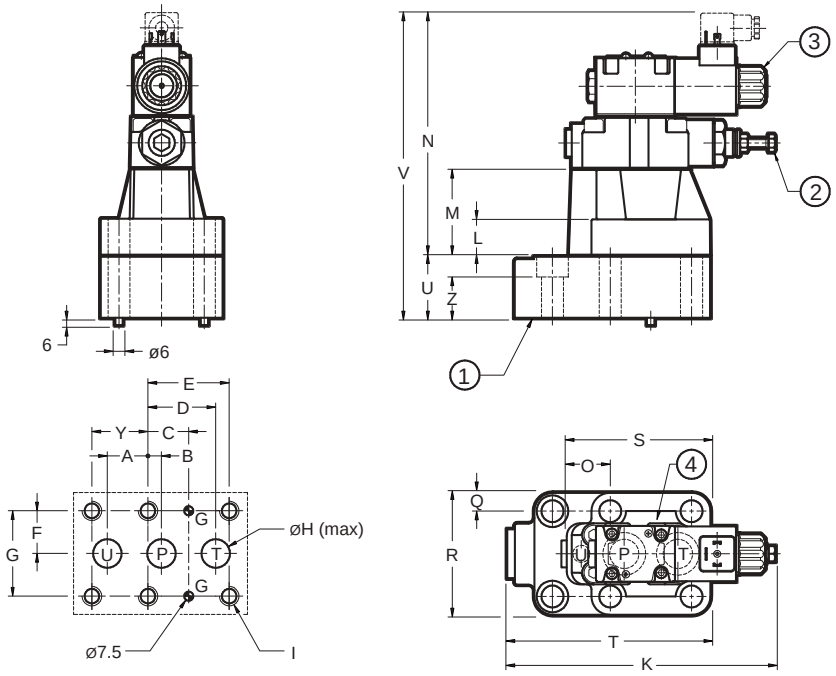
1	Mounting surface with sealing rings: **RQRM5** N. 2 OR type 3118 (29.82x2.62) - 90 Shore N. 1 OR type 109 (9.13x2.62) - 90 Shore **RQRM7** N. 2 OR type 4137 (34.52x3.53) - 90 Shore N. 1 OR type 109 (9.13x2.62) - 90 Shore
2	Hexagonal head main pressure adjustment screw. Spanner 13. Clockwise rotation to increase pressure.
3	ISO 4401-03 (CETOP 03) solenoid valve for unloading
4	External drainage port Y 1/8" NPT

FASTENING BOLTS:
RQRM5
4 bolts M16x50 Torque: 170 Nm
RQRM7
4 bolts M18x60 Torque: 235 Nm

	MOUNTING SURFACE	A	B	C	D	E	F	G	ØH	I	L	M	N	O	Q	R	S	T
RQRM5-P	ISO 6264-08-13-*-97 (CETOP 4.4.2-2-R08-350)	23.8	11.1	33.4	55.6	66.7	35	70	23.4	M16	27	70	194	35.8	15	100	118	170
RQRM7-P	ISO 6264-10-17-*-97 (CETOP 4.4.2-2-R10-350)	31.8	12.7	44.5	76.2	88.9	41.3	82.6	32	M18	35	80	204	44.1	18.7	120	152	180

6 - RQAM5-P AND RQAM7-P OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	Mounting surface with sealing rings: **RQAM5** N. 2 OR type 3118 (29.82x2.62) - 90 Shore **RQAM7** N. 2 OR type 4137 (34.52x3.53) - 90 Shore
2	Hexagonal head main pressure adjustment screw. Spanner 13. Clockwise rotation to increase pressure.
3	ISO 4401-03 (CETOP 03) solenoid valve for unloading
4	External drainage port Y 1/8" NPT

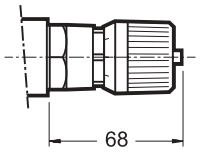
FASTENING BOLTS:

RQAM5	**RQAM7**
4 bolts M16x100	4 bolts M18x130
2 bolts M16x55	2 bolts M18x70
Torque:170 Nm	Torque: 235 Nm

	A	B	C	D	E	F	G	ØH	I	K	L	M	N	O	Q	R	S	T	U	V	Y	Z
RQAM5-P	33.3	11.1	33.4	55.6	66.7	35	70	23.4	M16	212	27	70	194	35.8	15	100	118	160	50	244	46	33.5
RQAM7-P	38	12.7	44.5	76.2	88.9	41.3	82.6	32	M18	242	35	80	204	44.1	18.7	120	152	218	66	270	50.8	48

7 - ADJUSTMENT KNOB

The RQ*M*-P valves can be equipped with a SICBLOC adjustment knob. To operate it, push and rotate at the same time. To request this option, add: /**M** (see paragraph 1).



8 - ELECTRIC CONNECTORS

The solenoid valves are never supplied with connectors. Connectors must be ordered separately, please see catalogue 49 000.

9 - MANUAL OVERRIDE, BOOT PROTECTED: CM

Whenever the solenoid valve installation may involve exposure to atmospheric agents or utilization in tropical climates, use of the manual override, boot protected is recommended. Add the suffix **CM** to request this device (see paragraph 1).

For overall dimensions see catalogue 41 150.

10 - SUBPLATES

(see catalogue 51 000)

	RQRM3-P	**RQRM5-P**	**RQRM7-P**	**RQAM5-P**	**RQAM7-P**
Type	PMRQ3-AI4G rear ports	PMRQ5-AI5G rear ports	PMRQ7-AI7G rear ports	PMRQA5-AI5G rear ports	PMRQA7-AI7G rear ports
P, T, U ports dimensions	P: 1/2" BSP T: 3/4" BSP	1" BSP	1" 1/4 BSP	3/4" BSP	1" 1/4 BSP
X port dimensions	1/4" BSP	1/4" BSP	1/4" BSP	-	-

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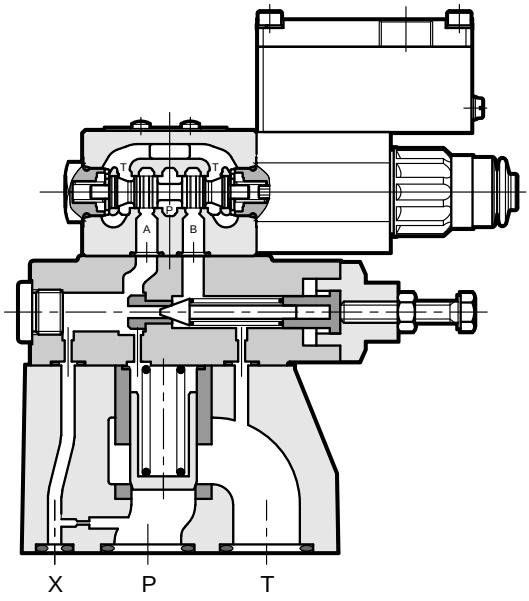
RQM*K*- P

EXPLOSION-PROOF SOLENOID OPERATED PRESSURE RELIEF VALVES WITH UNLOADING AND PRESSURE SELECTION ATEX, IECEx, PESO

SUBPLATE MOUNTING

RQM3K*-P ISO 6264-06
RQM5K*-P ISO 6264-08
RQM7K*-P ISO 6264-10

OPERATING PRINCIPLE



— The RQM*K*-P are explosion-proof pressure relief valves for subplate mounting ISO 6264. They are available in three nominal sizes for flows up to 500 l/min.

— They are compliant with ATEX, IECEx or PESO requirements and are suitable for use in potentially explosive atmospheres, for surface plants or mines.

— A low temperature version (up to -40 °C) is also available.

— They are available in five versions that allow the unloading of the total flow or the selection of up to three pressure values (see point 2 - Versions) by means of a solenoid valve.

— They are supplied with a hexagonal head adjustment screw. Upon request, it can be equipped with a SICBLOC adjustment knob on the main pressure control.

— The adjustment of the second and third pressure values is obtained by a pressure relief valve placed between the main stage and the solenoid valve.

— The valves are supplied with standard surface treatment of phosphating black for the main body and zinc-nickel for the pilot body. Upon request we can supply these valves completely with zinc-nickel surface treatment, suitable to ensure a salt spray resistance up to 600 h.

— Details for classification, operating temperatures and electrical characteristics are in the technical data sheet 02 500 ‘Explosion proof classification’.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C)

		RQM3K*-P	RQM5K*-P	RQM7K*-P
Maximum operating pressure	bar	350		
Maximum flow rate	l/min	200	400	500
Temperature range (ambient and fluid)		see data sheet 02 500		
Fluid viscosity range	cSt	10 ÷ 400		
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15			
Recommended viscosity	cSt	25		

1 - IDENTIFICATION CODE



Pilot operated pressure relief valve

Solenoid valve for unloading / pressure selection

Size:
3 = ISO 6264-06
5 = ISO 6264-08
7 = ISO 6264-10

Explosion-proof certification:
See table 1.1

Subplate mounting

Pressure adjustment range:
3 = up to 70 bar
5 = up to 210 bar
6 = up to 350 bar

Versions: **A**, **B**, **C**, **D**, **G** — see description in the table 2 - versions

M = adjustment with SICBLOC knob
available only on the main pressure control
Omit for adjustment with hexagonal head screw

Series No.
(the overall and mounting dimensions remain unchanged from 10 to 19)
10 = for versions A and B
11 = for versions C, D and G

Seals:
For temperature range -20 / +80 °C
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids
For temperature range - 40 / +80 °C
NL = seal for low temperatures (for mineral oil)

Power supply:
Direct current (DC)
D12 = 12 V
D24 = 24 V
D48 = 48 V
D110 = 110 V
Alternate current with built-in rectifier bridge (RAC)
R120 = 120 V
R240 = 240 V

Coil electrical connection:
junction box

Connection type for cable gland
upper connection:
T01 = M20x1.5 - ISO 261
T02 = Gk 1/2 - UNI EN 10226-2
T03 = 1/2" NPT - ANSI B1.20.1 (ex ANSI B2.1)
side connection:
S01 = M20x1.5 - ISO 261
S02 = Gk 1/2 - UNI EN 10226-2
S03 = 1/2" NPT - ANSI B1.20.1 (ex ANSI B2.1)
S04 = M16x1.5 - ISO 261

Manual override:
CM = boot protected
standard for both N and V seals
not available for NL seals
CB = blind ring nut
standard for NL seals
available upon request for both N and V seals
see at p. 12

Option: **/T5**
version in T5 temperature class.
Omit if not required.

Option: surface treatment not standard. Omit if not required (see **NOTE**)

NOTE: Valves are supplied with standard surface treatment of phosphating black for the main body and zinc-nickel for the pilot body.

The full zinc-nickel surface treatment is available upon request. It is suitable to ensure a salt spray resistance up to 600 h (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

For full zinc-nickel surface treatment add the suffix **/W7** at the end of the identification code.

Version with monobloc steel coil

Standard coils are made of zinc-nickel steel, with anodized aluminium junction box on it.

Monobloc coils **MD24K9S01** completely made of steel are available upon request. They have zinc-nickel treatment, power supply voltage D24 and cable gland connection type S01. Other variants for voltage and cable gland connection are available, always on request.

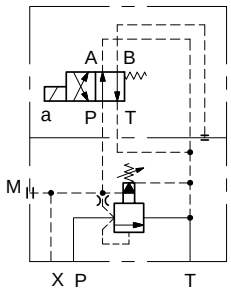
1.1 - Names of valves per certification

	ATEX		IECEx		PESO	
for gases for dusts	**KD2**	II 2GD	**KXD2**	IECEx Gb IECEx Db	**KPD2**	PESO Gb not applicable for dust
for mines	**KDM2**	I M2	**KXDM2**	IECEx Mb	not applicable for mines	

NOTE: Refer to the technical data sheet 02 500 for marking, operating temperatures and available versions.

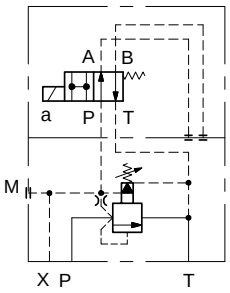
2 - VERSIONS

RQM*K*-P*/**A**



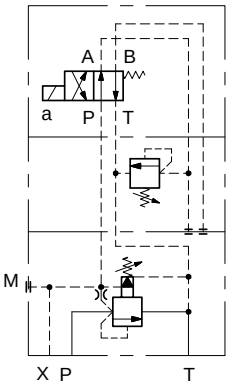
1 pressure setting and unloading with de-energized solenoid

RQM*K*-P*/**B**



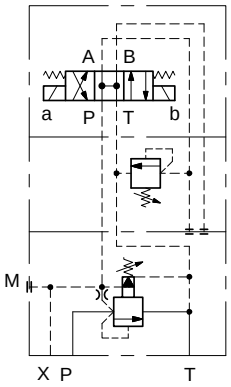
1 pressure setting and unloading with energized solenoid

RQM*K*-P*/**C**



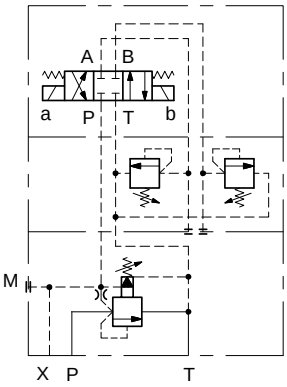
2 pressure settings The highest setting is reached with energized solenoid

RQM*K*-P*/**D**



2 pressure settings and unloading with de-energized solenoids

RQM*K*-P*/**G**

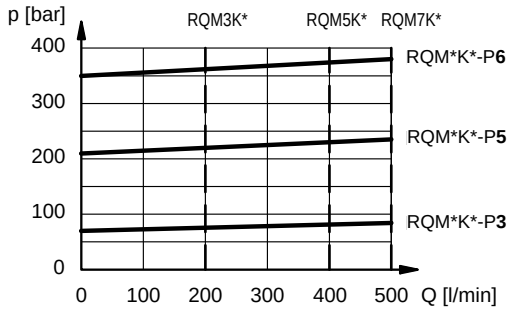


3 pressure settings The highest setting is reached with de-energized solenoids

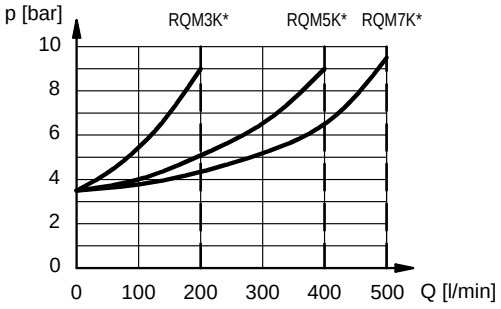
3 - CHARACTERISTIC CURVES

(values obtained with viscosity of 36 cSt at 50°C)

ADJUSTMENT



MINIMUM CONTROLLED PRESSURE



4 - ELECTRICAL CHARACTERISTICS

(values ± 5%)

Coil type	Nominal voltage [V]	Resistance at 20°C [Ω]	Current consumpt. [A]	Power consumpt. [W]
D12	12	7,2	1,7	20
D24	24	28,7	0,83	20
D48	48	115	0,42	20
D110	110	549	0,2	22

Coil type (**NOTE**)	Nominal voltage [V]	Freq. [Hz]	Resistance at 20°C [Ω]	Current consumpt. [A]	Power consumpt. [VA]
R120	110V-50Hz 120V-60Hz	50/60	489,6	0,19	21
				0,21	25
R240	230V-50Hz 240V-60Hz		2067,7	0,098	22,5
				0,1	24

NOTE: type R* coils are for alternating current supply for both 50 or 60 Hz. For R* coils the resistance can not be measured in the usual way because of the presence of diodes bridge inside the coil.

VOLTAGE SUPPLY FLUCTUATION (ripple included)	± 10% Vnom
MAX SWITCH ON FREQUENCY	6.000 ins/hour
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2014/30/EU
CLASS OF PROTECTION: Atmospheric agents Coil insulation (VDE 0580)	 IP66 / IP68 class H

4.1 - Wiring

In order to realise the electrical connection of the coil, it is necessary to access the terminal block (1) unscrewing the 4 screws (2) that fasten the cover (3) with the box (4) that contains the terminal block.

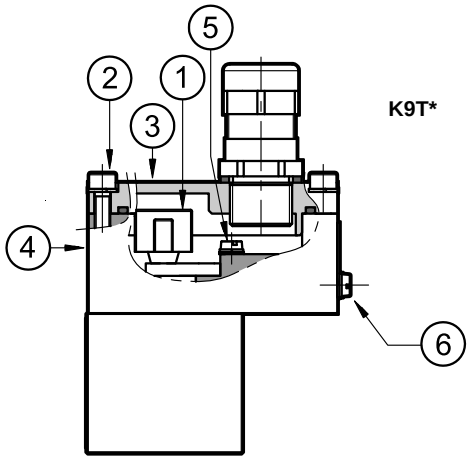
The electrical connection is polarity-independent.

By doing electrical connection it is important to connect also the grounding point (5) in the terminal block box (M4 screws), through suitable conductors with the general grounding line of the system.

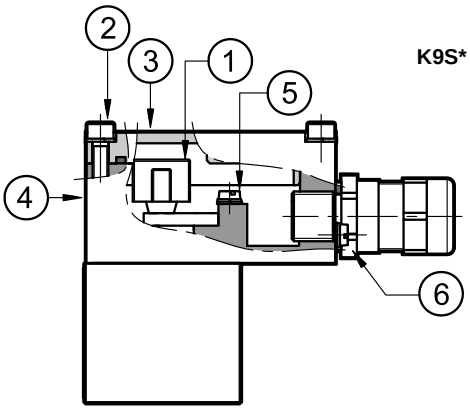
On the external body of the coil there is a grounding point (6) (M4 screw) that allows to ensure equipotentiality between the valve and the general grounding line of the system; connecting this point, the regulation of the EN 13463-1 standard, that imposes to verify the equipotentiality of the elements included in a potentially explosive environment (the maximum resistance between the elements must be 100 Ω), is guaranteed.

At the end of the electrical wiring, it is necessary to reassemble the cover (3) on the box (4), checking the correct positioning of the seal located in the cover seat and fastening the 4 M5 screws with a torque of 4.9÷6 Nm.

Electrical wiring must be done following in compliance with standards about protection against explosion hazards.



K9T*



K9S*

Characteristics of the cables connectable for wiring are indicated in the table below:

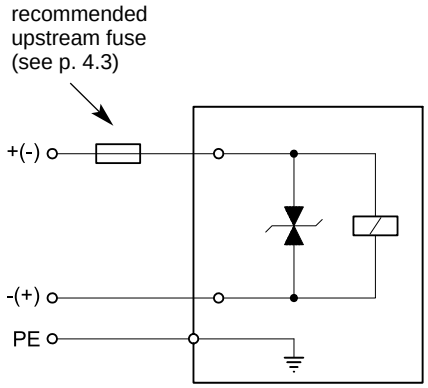
Function	Cable section
Operating voltage cables connection	max 2.5 mm²
Connection for internal grounding point	max 2.5 mm²
Connection for external equipotential grounding point	max 6 mm²

Cables for wiring must be non-armoured cables, with external covering sheath and must be suitable for use in environments with temperatures from - 20 °C to +110 °C (for valves either with N or V seals) or from - 40 °C to +110 °C (for valves with NL seals).

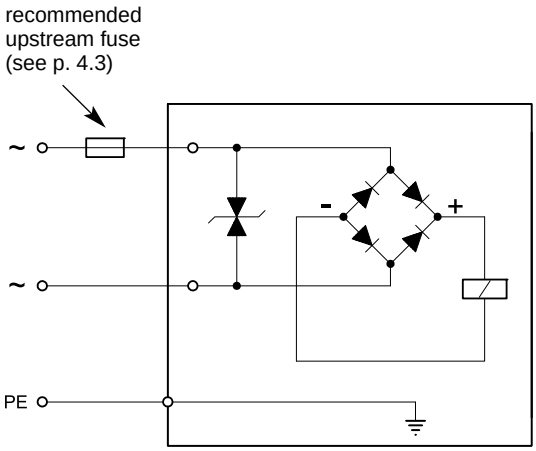
Cable glands (which must be ordered separately, see point 14) allow to use cables with external diameter between 8 and 10 mm.

4.2 - Electrical diagrams

DC coil



RAC coil



4.3 - Overcurrent fuse and switch-off voltage peak

Upstream of each valve, an appropriate fuse (max 3 x In according to IEC 60127) or a protective motor switch with short-circuit and thermal instantaneous tripping, as short-circuit protection, must be connected. The cut-off power of the fuse must correspond or exceed the short circuit current of the supply source. The breaking capacity of the fuse link shall be the same as or higher than the maximum short-circuit current expected to occur at the place of installation (normally 1500 A).

The fuse or the protective motor must be placed outside the dangerous area or they must be protected with an explosion-proof covering.

In order to safeguard the electronic device to which the valve is connected, there is a protection circuit in the coil, that reduces voltage peaks, which can occur when inductances are switched off.

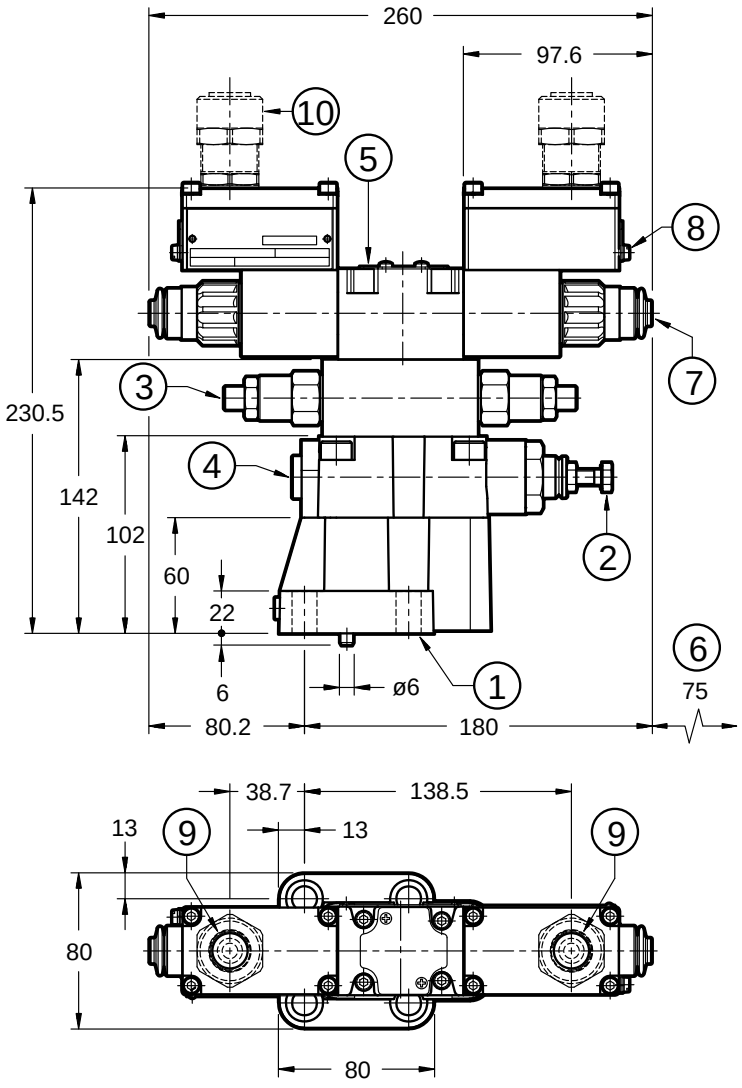
The table shows the type of fuse recommended according to the nominal voltage of the valve and to the value of the voltage peaks reduction.

Coil type	Nominal voltage [V]	Rated current [A]	**Recommended pre-fuse characteristics medium time-lag according to DIN 41571 [A]**	Maximum voltage value upon switch off [V]	Suppressor circuit
D12	12	1,7	2,5	- 49	Transient voltage suppressor bidirectional
D24	24	0,83	1,25	- 49	
D48	48	0,42	0,6	- 81	
D110	110	0,2	0,3	- 309	
R120	120	0,21	0,3	- 3	
R240	240	0,1	0,15	- 3	

5 - RQM3K*-P WITH UPPER CONNECTION - OVERALL AND MOUNTING DIMENSIONS

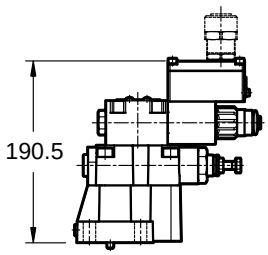
dimensions in mm

RQM3K*-P*/G/10*-*K9T*

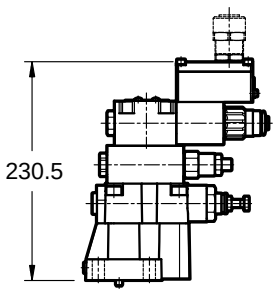


NOTE: for side connection cable gland see point 8.

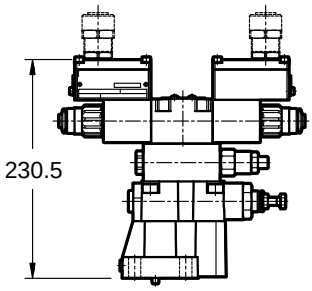
RQM3K*-P*/A/10*-*K9T*
RQM3K*-P*/B/10*-*K9T*



RQM3K*-P*/C/10*-*K9T*



RQM3K*-P*/D/10*-*K9T*



1	Mounting surface with sealing rings: 2 OR type 123 (17.86x2.62) 90 Shore 1 OR type 109 (9.13x2.62) 90 Shore
2	Hexagonal head adjustment screw for main pressure value: spanner 13 Clockwise rotation to increase pressure
3	Second value pressure adjustment valve. socket hex adjustment screw: hex key 6 locking nut: spanner 19 Clockwise rotation to increase pressure
4	Pressure gauge port 3/8” BSP

5	ISO 4401-03 solenoid valve for pressure selection / unloading with explosion-proof coils
6	Minimum clear space required
7	Manual override, boot protected (standard for both N and V seals) For blind ring nut dimensions (standard for NL seals) see point 12
8	Terminal for supplementary earth connection
9	Upper port for cable gland
10	Cable gland . To be ordered separately, see point 14

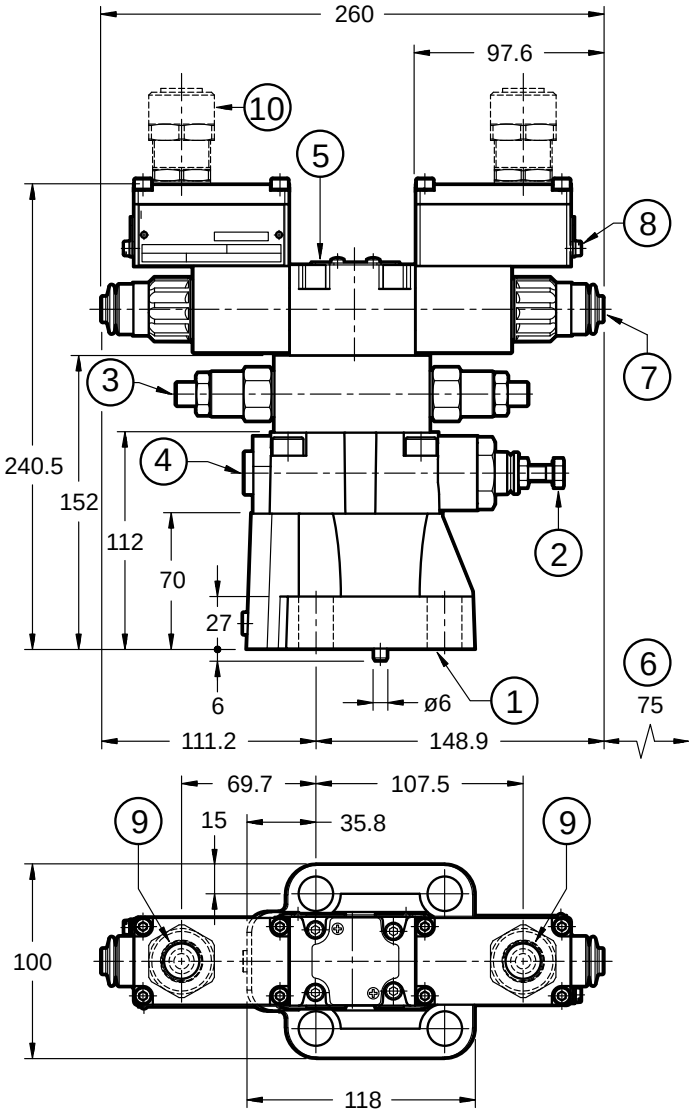
Valve	Mass
RQM3K*-P*/A and RQM3K*-P*/B	5,3
RQM3K*-P*/C	6,4
RQM3K*-P*/D	7,3
RQM3K*-P*/G	7,4

Valve fastening: N. 4 SHC screws M12x40 ISO 4762
Tightening torque: 69 Nm (A8.8 screws)
Threads of mounting holes: M12x20

6 - RQM5K*-P WITH UPPER CONNECTION - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

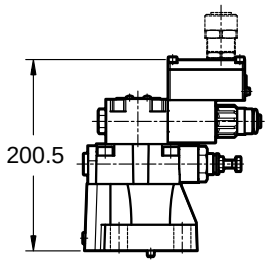
RQM5K*-P*/G/10*-*K9T*



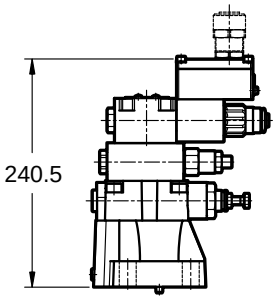
NOTE: for side connection cable gland see point 8.

RQM5K*-P*/A/10*-*K9T*

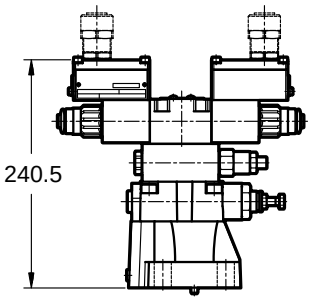
RQM5K*-P*/B/10*-*K9T*



RQM5K*-P*/C/10*-*K9T*



RQM5K*-P*/D/10*-*K9T*



1	Mounting surface with sealing rings: 2 OR type 3118 (29.82x2.62) 90 Shore 1 OR type 109 (9.13x2.62) 90 Shore
2	Hexagonal head adjustment screw for main pressure value: spanner 13 Clockwise rotation to increase pressure
3	Second value pressure adjustment valve. socket hex adjustment screw: hex key 6 locking nut: spanner 19 Clockwise rotation to increase pressure
4	Pressure gauge port 3/8" BSP

5	ISO 4401-03 solenoid valve for pressure selection / unloading with explosion-proof coils
6	Minimum clear space required
7	Manual override, boot protected (standard for both N and V seals) For blind ring nut dimensions (standard for NL seals) see point 12
8	Terminal for supplementary earth connection
9	Upper port for cable gland
10	Cable gland. To be ordered separately, see point 14

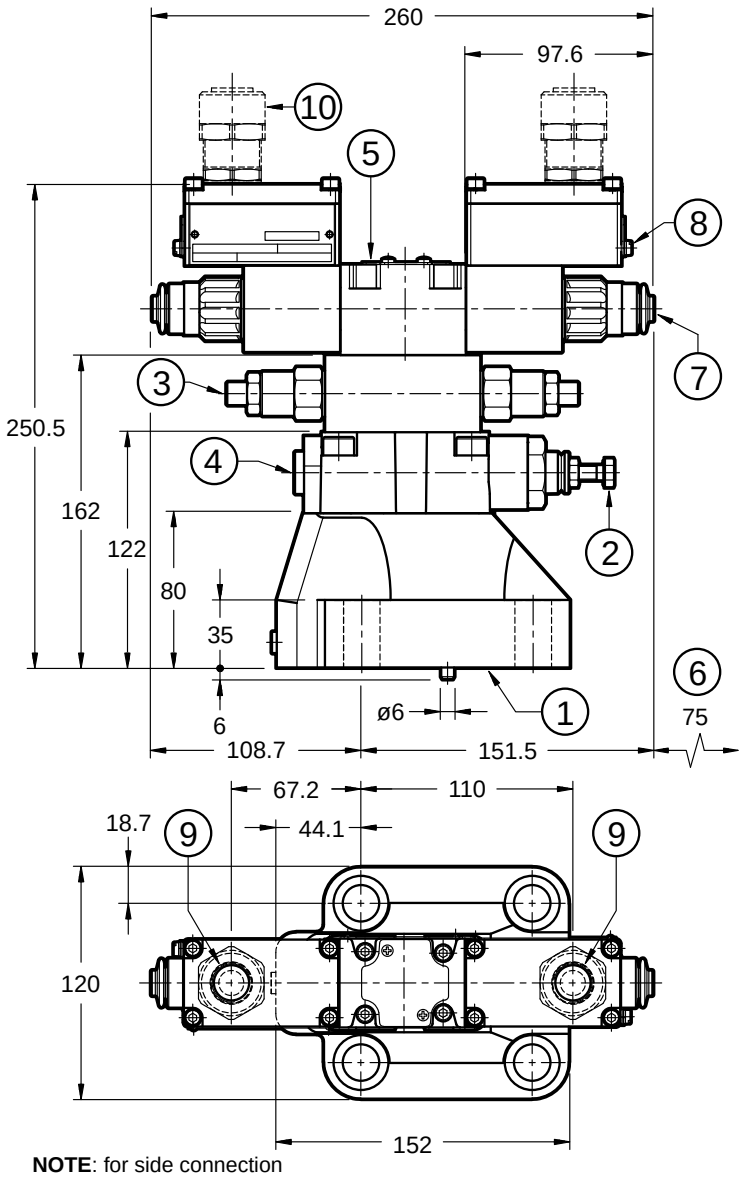
Valve	Mass
RQM5K*-P*/A and RQM5K*-P*/B	6,3
RQM5K*-P*/C	7,4
RQM5K*-P*/D	8,3
RQM5K*-P*/G	8,4

Valve fastening: N. 4 SHC screws M16x50 ISO 4762
Tightening torque: 170 Nm (A8.8 screws)
Threads of mounting holes: M16x25

7 - RQM7K*-P WITH UPPER CONNECTION - OVERALL AND MOUNTING DIMENSIONS

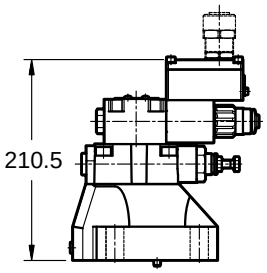
RQM7K*-P*/G/10*-*K9T*

dimensions in mm

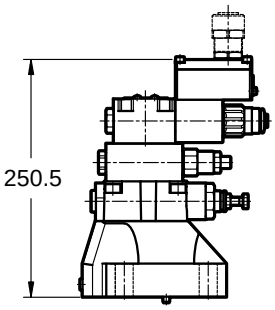


NOTE: for side connection cable gland see point 8.

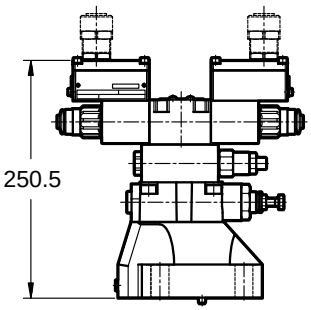
RQM7K*-P*/A/10*-*K9T*
RQM7K*-P*/B/10*-*K9T*



RQM7K*-P*/C/10*-*K9T*



RQM7K*-P*/D/10*-*K9T*



1	Mounting surface with sealing rings: 2 OR type 4137 (34.52x3.53) 90 Shore 1 OR type 109 (9.13x2.62) 90 Shore
2	Hexagonal head adjustment screw for main pressure value: spanner 13 Clockwise rotation to increase pressure
3	Second value pressure adjustment valve. socket hex adjustment screw: hex key 6 locking nut: spanner 19 Clockwise rotation to increase pressure
4	Pressure gauge port 3/8” BSP

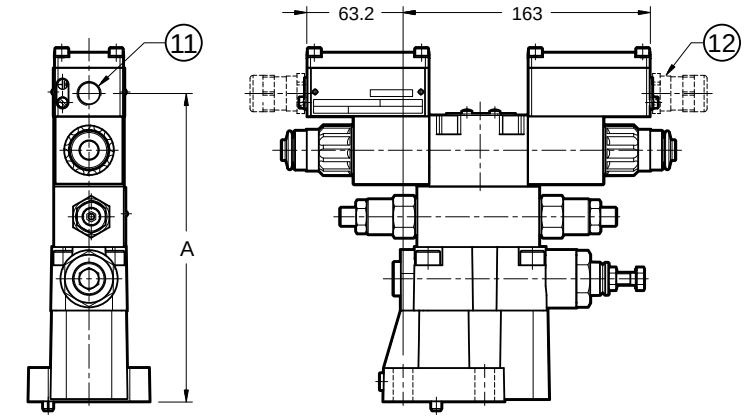
5	ISO 4401-03 solenoid valve for pressure selection / unloading with explosion-proof coils
6	Minimum clear space required
7	Manual override, boot protected (standard for both N and V seals) For blind ring nut dimensions (standard for NL seals) see point 12
8	Terminal for supplementary earth connection
9	Upper port for cable gland
10	Cable gland . To be ordered separately, see point 14

Valve	Mass
RQM7K*-P*/A and **RQM7K*-P*/B**	8,5
RQM7K*-P*/C	9,6
RQM7K*-P*/D	10,5
RQM7K*-P*/G	10,6

Valve fastening: N. 4 SHC screws M18x60 ISO 4762
Tightening torque: 235 Nm (A8.8 screws)
Threads of mounting holes: M18x27

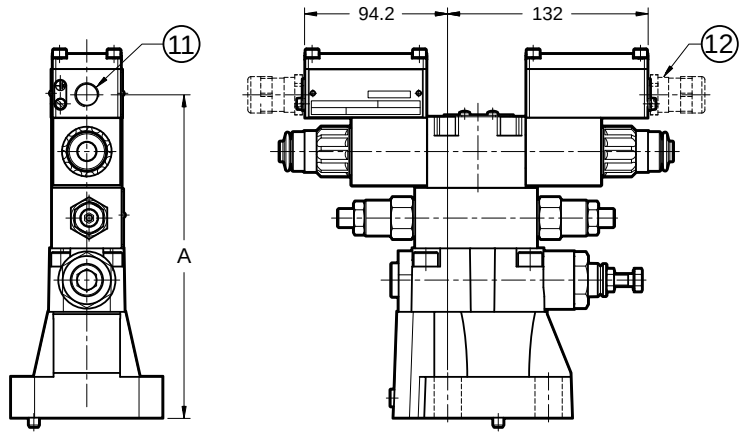
8 - RQM*K*- P* SIDE CONNECTION OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



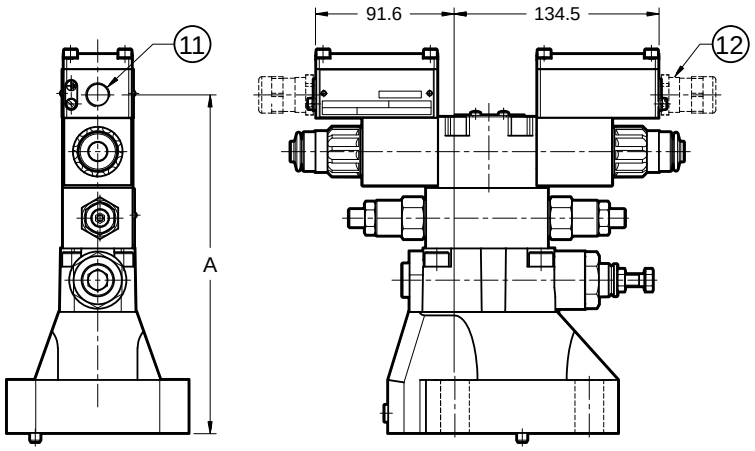
RQM3K*-P*/*/10*-*K9S*

Side port type	Dimension A	
	RQM3K*-P*/A RQM3K*-P*/B	RQM3K*-P*/C RQM3K*-P*/D RQM3K*-P*/G
S01, S04	162.5	202.5
S02, S03	162	202



RQM5K*- P*/*/10*-*K9S*

Side port type	Dimension A	
	RQM5K*-P*/A RQM5K*-P*/B	RQM5K*-P*/C RQM5K*-P*/D RQM5K*-P*/G
S01, S04	172.5	212.5
S02, S03	172	212



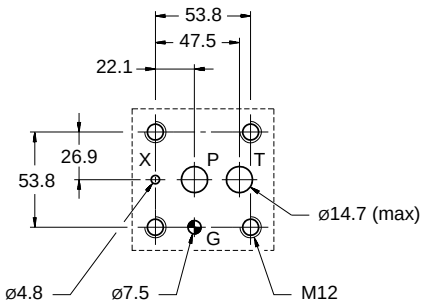
RQM7K*-P*/*/10*-*K9S*

Side port type	Dimension A	
	RQM7K*-P*/A RQM7K*-P*/B	RQM7K*-P*/C RQM7K*-P*/D RQM7K*-P*/G
S01, S04	182.5	222.5
S02, S03	182	222

11	Side port
12	Cable gland To be ordered separately, see point 14

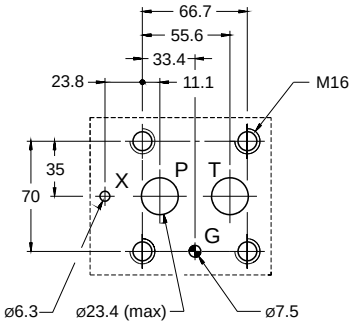
9 - MOUNTING SURFACES

RQM3K*-P



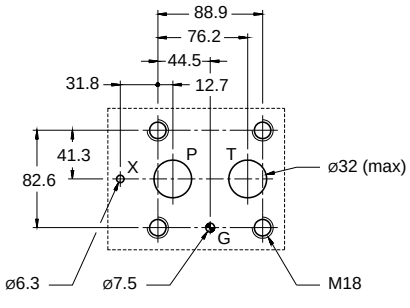
ISO 6264-06-09-*-97
(CETOP 4.4.2-2-R06-350)

RQM5K*-P



ISO 6264-08-13-*-97
(CETOP 4.4.2-2-R08-350)

RQM7K*-P



ISO 6264-10-17-*-97
(CETOP 4.4.2-2-R10-350)

10 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

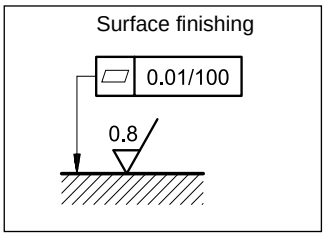
11 - INSTALLATION

Installation must adheres to instructions reported in the *Use and Maintenance manual*, always supplied with the valve. Unauthorized interventions can be harmful to people and goods because of the explosion hazards present in potentially explosive atmospheres.

The valves can be installed in any position without impairing correct operation.

Valve fastening takes place by means of screws or tie rods, laying the valve on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing.

If the minimum values of planarity or smoothness are not met, fluid leakages between valve and mounting surface can easily occur.



12 - MANUAL OVERRIDE CB

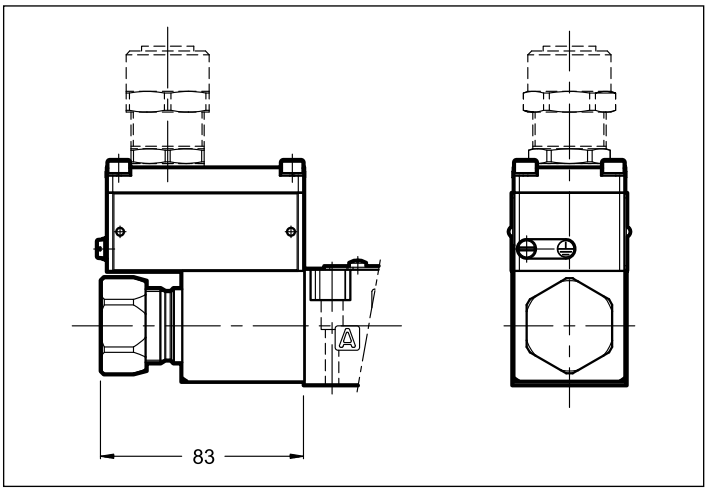
CB - Blind ring nut

The metal ring nut protects the solenoid tube from atmospheric agents and isolates the manual override from accidental operations. The ring nut is tightened on a threaded fastener that keeps the coil in its position even without the ring nut.

To access the manual override loosen the ring nut and remove it; then reassemble hand tightening, until it stops.

Activate the manual override always and only with non-sparking tools suitable for use in potentially explosive atmospheres.

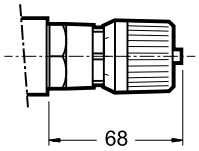
More information on safe use of explosion-proof components are provided in the instruction manual, always supplied with the valve.



13 - ADJUSTMENT KNOB

The valves can be equipped with a SICBLOC adjustment knob, only on the main pressure regulation. To operate it, push and rotate at the same time.

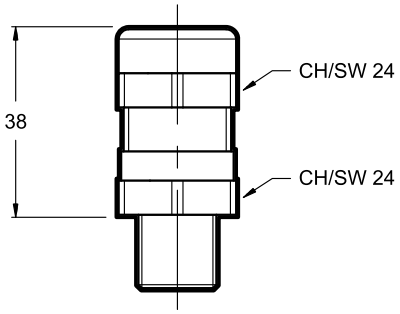
To request this option, add: **/M** (see point 1).



14 - CABLE GLANDS

Cable glands must be ordered separately; Duplomatic offers some types of cable glands with the following features:

- version for non-armoured cable, external seal on the cable (suitable for Ø 8÷10 mm cables);
- ATEX II 2GD, I M2; IECEx Gb, Db, Mb;
- cable gland material: nickel brass
- internal rubber tip material: silicone
- ambient temperature range: -65 ºC ÷ +220 ºC
- protection degree: IP66/IP68



To order the desired cable glands, specify description, code and quantity.

Description: CGK2/NB-01/10

Code: 3908108001

M20x1.5 - ISO 261 male thread, suitable for coils with T01 and S01 connections. It is supplied equipped with copper washer, that must be assembled between the cable gland and the coil, so as to ensure IP66/IP68 protection degree.

Tightening torque: 45 ÷ 50 Nm

Description: CGK2/NB-02/10

Code: 3908108002

Gk 1/2 - UNI EN 10226-2 male thread, suitable for coils with T02 and S02 connections. The customer must apply LOCTITE® 243™ threadlocker or similar between the cable gland connection thread and the coil in order to ensure IP66/IP68 protection degree.

Tightening torque: 20 ÷ 25 Nm

Description: CGK2/NB-03/10

Code: 3908108003

1/2” NPT - ANSI B1.20.1 (ex ANSI B2.1), suitable for coils with T03 and S03 connections. The customer must apply LOCTITE® 243™ threadlocker or similar between the cable gland connection thread and the coil in order to ensure IP66/IP68 protection degree.

Tightening torque: 20 ÷ 25 Nm

Description: CGK2/NB-04/10

Code: 3908108004

M16x1.5 - ISO 261 male thread, suitable for coils with S04 connection. It is supplied equipped with copper washer, that must be assembled between the cable gland and the coil, so as to ensure IP66/IP68 protection degree.

Tightening torque: 45 ÷ 50 Nm

15 - SUBPLATES

(see catalogue 51 000)

	RQM3K*-P	RQM5K*-P	RQR7K*-P
Type	PMRQ3-AI4G rear ports	PMRQ5-AI5G rear ports	PMRQ7-AI7G rear ports
P, T ports dimension	P: 1/2” BSP T: 3/4” BSP	1” BSP	1” 1/4 BSP
X port dimension	1/4” BSP	1/4” BSP	1/4” BSP

NOTE: Subplates (to be ordered separately) contain neither aluminium nor magnesium at a rate higher than the value allowed by norms according to ATEX directive for category II 2GD and I M2.

The user will bear to do the complete assessment of the ignition risk that can occur from the relative use in potentially explosive environments.

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duplomaticmotionsolutions.com

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EXPLOSION-PROOF CLASSIFICATION for

SOLENOID AND PROPORTIONAL VALVES

ref. catalogues:

pressure control valves

RQM*K*-P	**21 515**
P*E*K*	**81 316**
ZDE3K*	**81 515**
DZCE*K*	**81 606**

flow control valves

QDE3K*	**82 225**

directional valves

D*K*	**41 515**
DT3K*	**42 215**
DS(P)E*K*	**83 510**

GENERAL INFO

This informative technical datasheet displays information about **classification and marking** of Duplomatic explosion-proof valves range.

Duplomatic MS offers valves with the following certifications:

ATEX	**II 2G**	**II 2D**	**I M2**
IECEx	**Gb**	**Db**	**Mb**
PESO	**Gb**		

Instructions for use and maintenance can be found in the related manuals, always supplied toghether with valves.

1 - ATEX CLASSIFICATION AND TEMPERATURES

Duplomatic certificates the combination valve-coil for the valves suitable for application and installation in potentially explosive atmospheres, according to ATEX directive; the supply always includes the declaration of conformity to the directive and the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environments.

Coils assembled on these valves have been separately certified according to ATEX directive and so they are suitable for use in potentially explosive atmospheres.

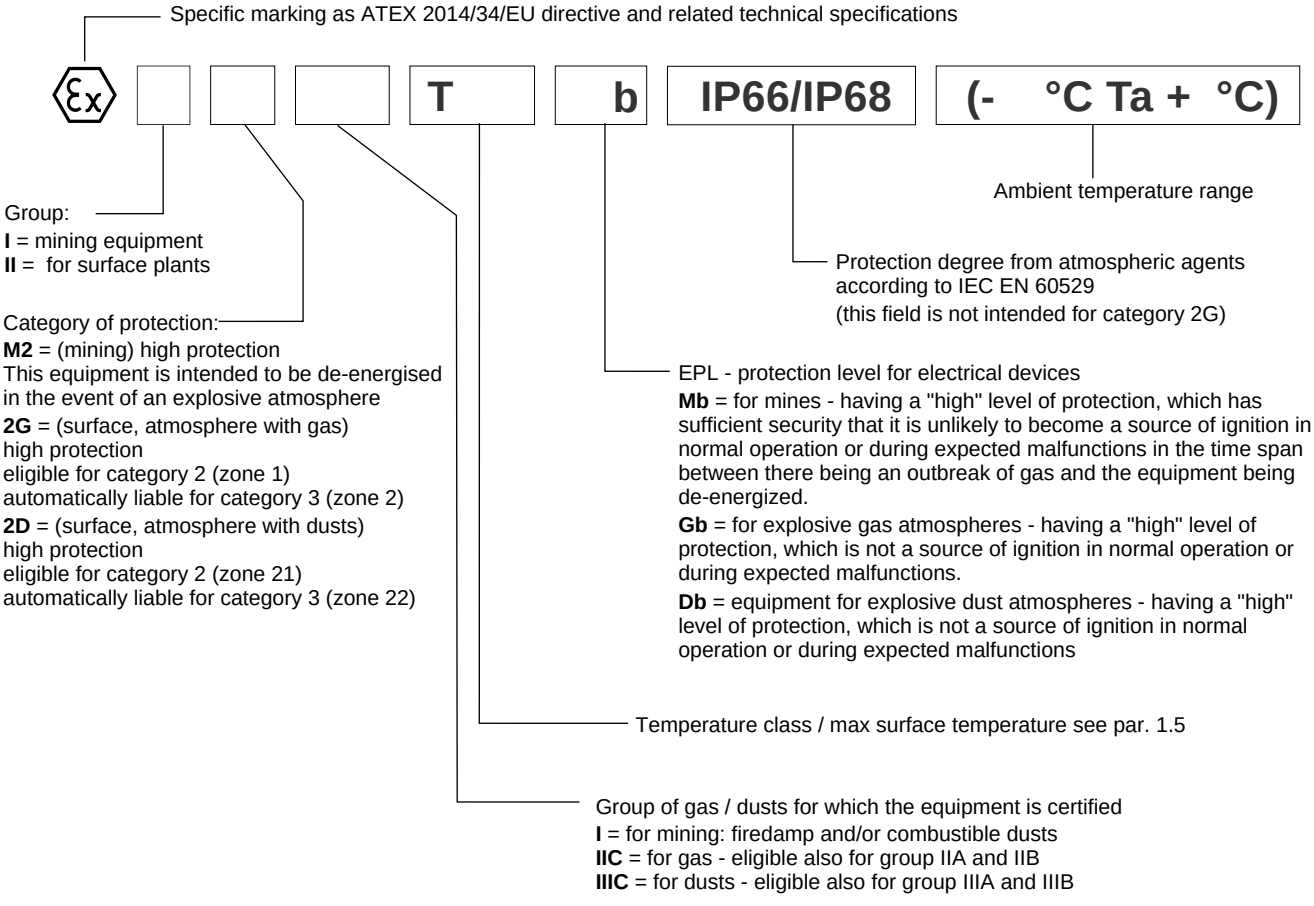
1.1 - ATEX classification for valves

Type examination certificate: AR18ATEX055
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

ATEX II 2G ATEX II 2D	***KD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur occasionally.The means of protection relating to equipment in this category ensure the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account.
ATEX I M2	***KDM2**	equipment intended for use in underground parts of mines as well as those parts of surface installations of such mines likely to be endangered by firedamp and/or combustible dust. This equipment is intended to be de-energised in the event of an explosive atmosphere.

1.2 - ATEX marking for valves

valve code		N and V seals	NL seals
***KD2**	for gas	Ex II 2G IIC T4 Gb (-20°C Ta +80°C)	Ex II 2G IIC T4 Gb (-40°C Ta +80°C)
	for dusts	Ex II 2D IIIC T154°C Db IP66/IP68 (-20°C Ta +80°C)	Ex II 2D IIIC T154°C Db IP66/IP68 (-40°C Ta +80°C)
***KD2 /T5**	for gas	Ex II 2G IIC T5 Gb (-20°C Ta +55°C)	Ex II 2G IIC T5 Gb (-40°C Ta +55°C)
	for dusts	Ex II 2D IIIC T129°C Db IP66/IP68 (-20°C Ta +55°C)	Ex II 2D IIIC T129°C Db IP66/IP68 (-40°C Ta +55°C)
***KDM2**	mining	Ex I M2 I T150°C Mb IP66/68 (-20°C Ta +75°C)	Ex I M2 I T150°C Mb IP66/68 (-40°C Ta +75°C)



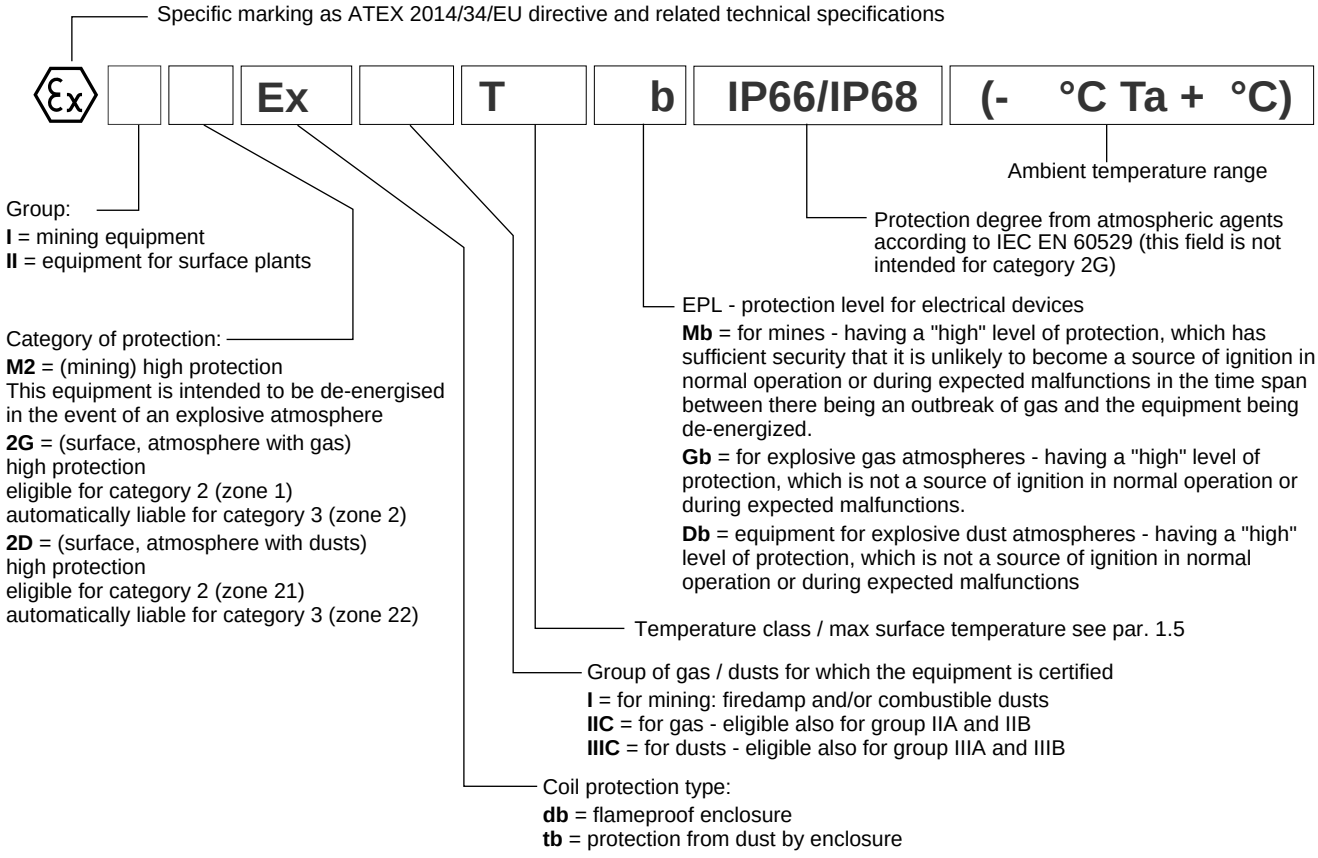
1.3 - ATEX classification of the coils

The coil of the explosion-proof valves is ATEX certified itself and, as such, is identified with its own tag, carries the relative ATEX marking. The mechanical construction of the coil housing is made in order to ensure its resistance to possible internal explosion and to avoid any explosion propagation to the outside environment, matching an “Ex db” type protection (explosion-proof coil).

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

1.4 - ATEX marking on coils

for valve type ***KD2**	for gas	II 2G Ex db IIC T4 Gb (-40°C Ta +80°C)
	for dusts	II 2D Ex tb IIIC T154°C Db IP66/IP68 (-40°C Ta +80°C)
for valve type ***KD2 /T5**	for gas	II 2G Ex db IIC T5 Gb (-40°C Ta +55°C)
	for dusts	II 2D Ex tb IIIC T129°C Db IP66/IP68 (-40°C Ta +55°C)
for valve type ***KDM2**	mining	I M2 Ex db I T150°C Mb IP66/IP68 (-40°C Ta +75°C)



1.5 - Operating temperatures

These valves are classified according to their maximum surface temperature (EN 13463-1), which must be lower than the ignition temperature of the gases, vapors and dusts for which the area in which they will be used is classified.

The valves in group II can also be used for less limiting temperature classes (surface temperature allowed higher).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
ATEX II 2G ATEX II 2D	***KD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas) T154°C (dusts)	T3, T2, T1 T200°C and higher
		of fluid				
	***KD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas) T129°C (dusts)	T4, T3, T2, T1 T135°C and higher
		of fluid	-20 / +60 °C	-40 / +60 °C		
ATEX I M2	***KDM2**	of ambient	-20 / +75 °C	-40 / +75 °C	T150°C	-
		of fluid				

2 - IECEX CLASSIFICATION AND TEMPERATURES

The IECEx certification requires the classification of the electrical equipment only.

Duplomatic supplies valves with IECEx certified coils, suitable for application and installation in potentially explosive atmospheres. The mechanical construction of the coil housing is made in order to ensure its resistance to possible internal explosion and to avoid any explosion propagation to the outside environment, matching an “Ex db” type protection (explosion-proof coil).

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

The supply always includes the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environment.

2.1 - IECEx classification

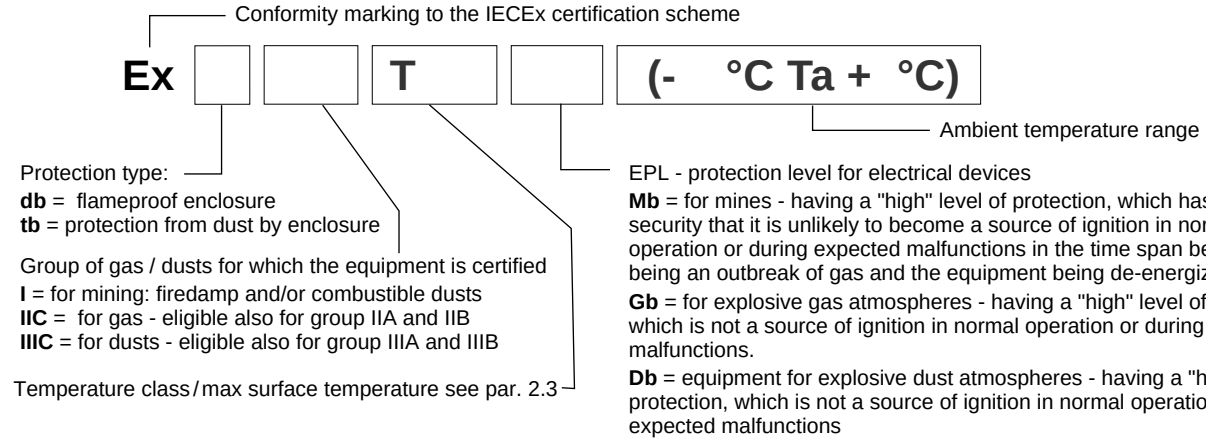
Certificate of conformity (CoC): IECEx TUN 15.0028X
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

IECEx Gb IECEx Db	***KXD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur occasionally.The means of protection relating to equipment in this category ensure the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account.
IECEx Mb	***KXDM2**	equipment intended for use in underground parts of mines as well as those parts of surface installations of such mines likely to be endangered by firedamp and/or combustible dust. This equipment is intended to be de-energised in the event of an explosive atmosphere.

2.2 - IECEx marking

There is a plate with the IECEx mark on each coil.

***KXD2** valves	for gas for dusts	Ex db IIC T4 Gb (-40°C Ta +80°C) Ex tb IIIC T135°C Db (-40°C Ta +80°C)
***KXD2 /T5** valves	for gas for dusts	Ex db IIC T5 Gb (-40°C Ta +55°C) Ex tb IIIC T100°C Db (-40°C Ta +55°C)
***KDM2** valves	mining	Ex db I Mb (-40°C Ta +80°C)



2.3 - Operating temperatures

These valves are classified according to their maximum surface temperature (EN 13463-1), which must be lower than the ignition temperature of the gases, vapors and dusts for which the area in which they will be used is classified.

Valves for surface plants can also be used for less limiting temperature classes (higher surface temperature allowed).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
IECEx Gb IECEx Db	***KXD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas) T135°C (dusts)	T3, T2, T1 T200°C and higher
		of fluid				
	***KXD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas) T100°C (dusts)	T4, T3, T2, T1 T135°C and higher
		of fluid	-20 / +60 °C	-40 / +60 °C		
IECEx Mb	***KXDM2**	of ambient	-20 / +80 °C	-40 / +80 °C	-	-
		of fluid				

2.4 - Protection degree from atmospheric agents (IEC EN 60529)

Protection degree from atmospheric agents according to IEC EN 60529 is IP66/IP68.

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3 - PESO CLASSIFICATION AND TEMPERATURES

The PESO certification requires the classification of the electrical equipment only.

Duplomatic supplies valves with PESO certified coils, suitable for application and installation in potentially explosive atmospheres. The mechanical construction of the coil housing is made in order to ensure its resistance to possible internal explosion and to avoid any explosion propagation to the outside environment, matching an “Ex db” type protection (explosion-proof coil).

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

The supply always includes the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environment.

3.1 - PESO classification

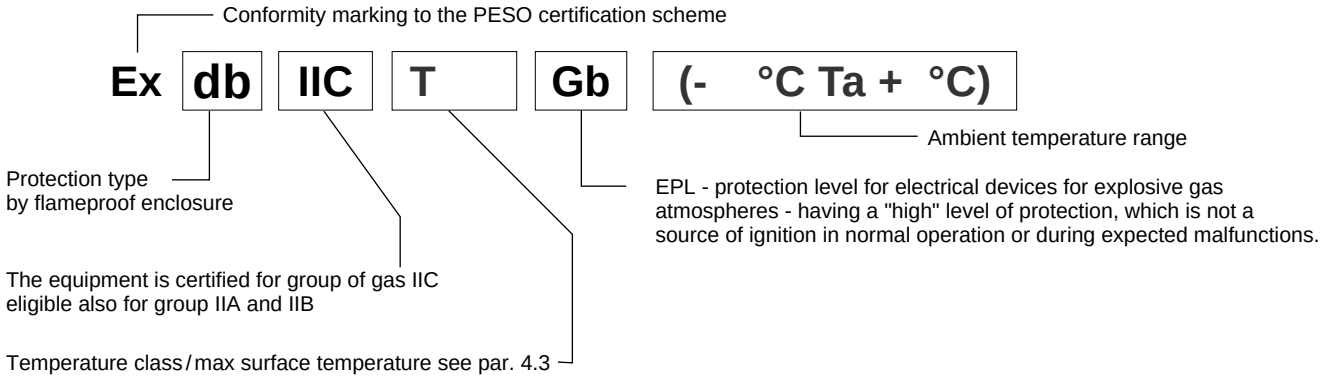
Certificate of conformity: P480801
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

PESO Gb	***KPD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists are likely to occur occasionally.The means of protection relating to equipment in this category ensure the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account.

3.2 - PESO marking

There is a plate with the PESO mark on each coil.

***KPD2** valves	for gas	Ex db IIC T4 Gb (-40°C Ta +80°C)
***KPD2 /T5** valves	for gas	Ex db IIC T5 Gb (-40°C Ta +55°C)



3.3 - Operating temperatures

These valves are classified according to their maximum surface temperature (EN 13463-1), which must be lower than the ignition temperature of the gases, vapors and dusts for which the area in which they will be used is classified.

Valves for surface plants can also be used for less limiting temperature classes (higher surface temperature allowed).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
PESO Gb	***KPD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas)	T3, T2, T1
		of fluid				
	***KPD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas)	T4, T3, T2, T1
		of fluid	-20 / +60 °C	-40 / +60 °C		

3.4 - Protection degree from atmospheric agents (IEC EN 60529)

Protection degree from atmospheric agents according to IEC EN 60529 is IP66/IP68.

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duplomaticmotionsolutions.com

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Z*-P

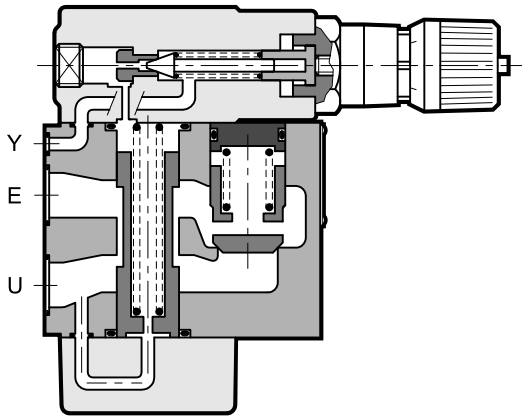
PRESSURE REDUCING VALVES

SERIES 22

SUBPLATE MOUNTING

Z3-P ISO 5781-06 (CETOP 06)
Z5-P ISO 5781-08 (CETOP 08)

OPERATING PRINCIPLE



— The Z*-P type valves are used when a branch with a lower pressure than the main one is desired in the hydraulic circuits.

Being normally open, they allow passage of oil up to the point when the outlet pressure is less than that set on the valve; the valve closes and keeps the outlet pressure constant when it reaches the set value. The intake pressure fluctuation, for values greater than the set values, does not affect the reduced outlet pressure, and furthermore the particular design of the valve prevents exceeding the set value even in transients.

The drainage, to be connected directly to the tank, discharges about 0,8 l/min. The valves are available, upon request, with reduced drainage (0,4 l/min).

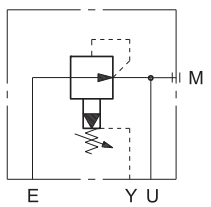
— Available even with incorporated check valve upon request, with cracking pressure of 0,5 bar.

PERFORMANCES (measured with mineral oil of viscosity 36 cSt at 50°C)

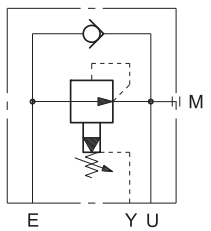
		Z3-P	Z5-P
Maximum operating pressure	bar	250	
Maximum flow rate	l/min	40	110
Drain flow rate: for Z*-P for Z*-P*R	l/min	0,8 0,4	
Ambient temperature range	°C	-20 / +50	
Fluid temperature range	°C	-20 / +80	
Fluid viscosity range	cSt	10 ÷ 400	
Fluid contamination degree	According to ISO 4406:1999 classe 20/18/15		
Recommended viscosity	cSt	25	
Mass	kg	3,9	6,1

HYDRAULIC SYMBOLS

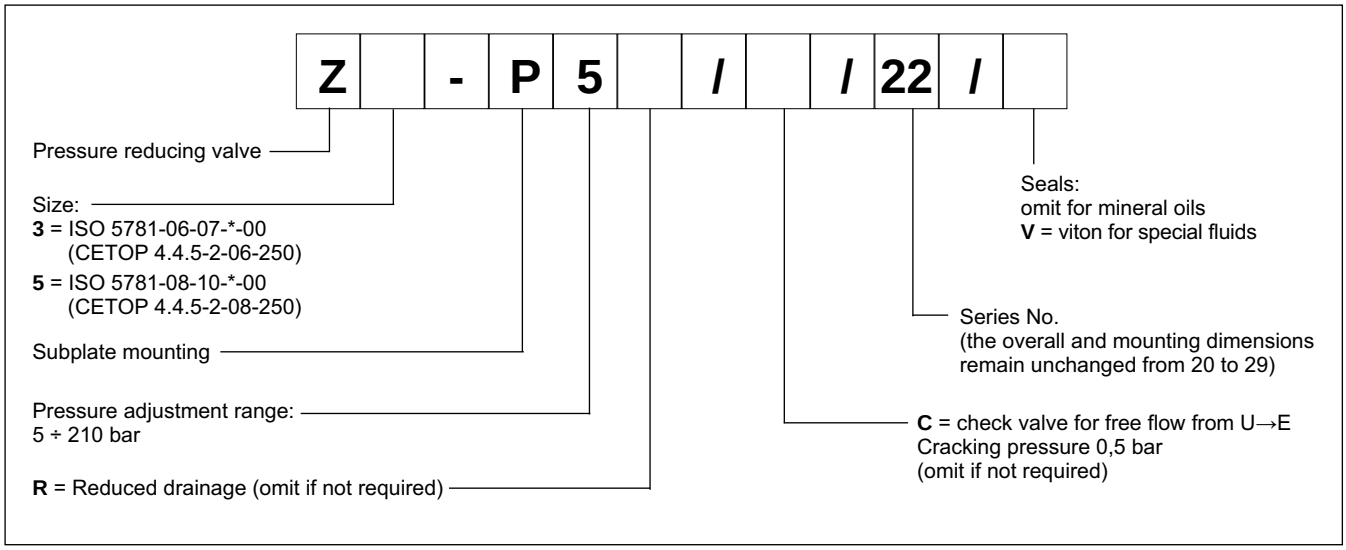
Z*-P



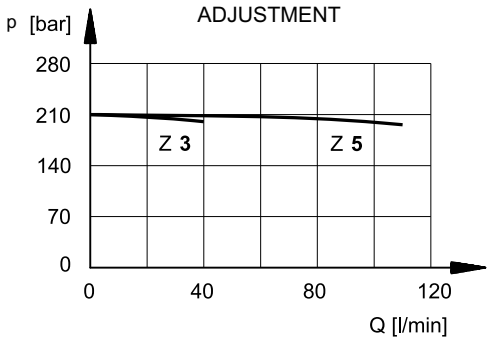
Z*-P/C

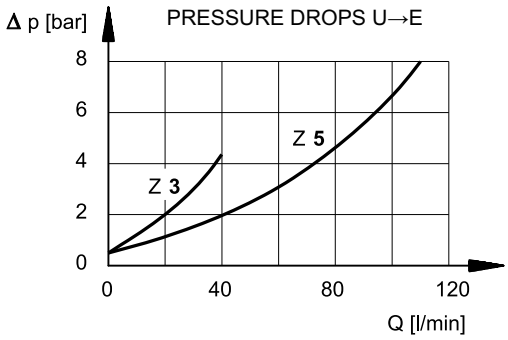


1 - IDENTIFICATION CODE



2 - CHARACTERISTIC CURVES (values obtained with viscosity of 36 cSt at 50°C)





3 - HYDRAULIC FLUIDS

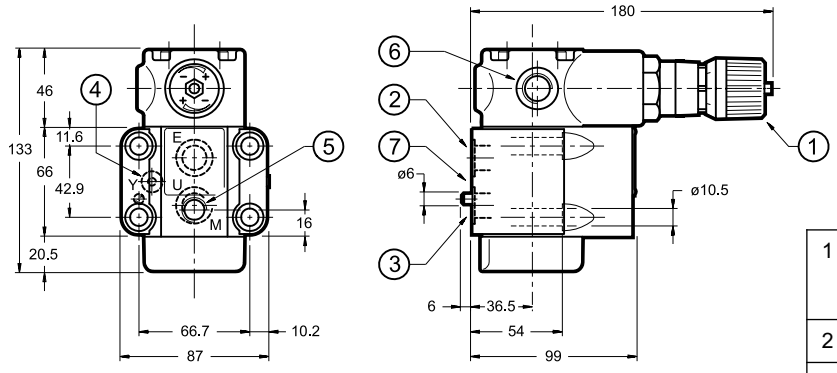
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V).

For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

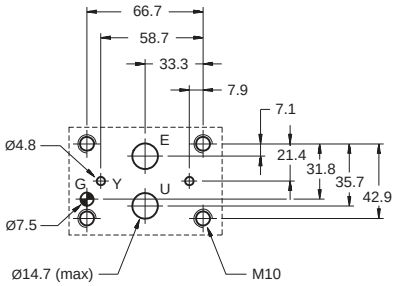
The fluid must be preserved in its physical and chemical characteristics.

4 - Z3-P OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



MOUNTING SURFACE:
ISO 5781-06-07-*-00 (CETOP 4.4.5-2-06-250)



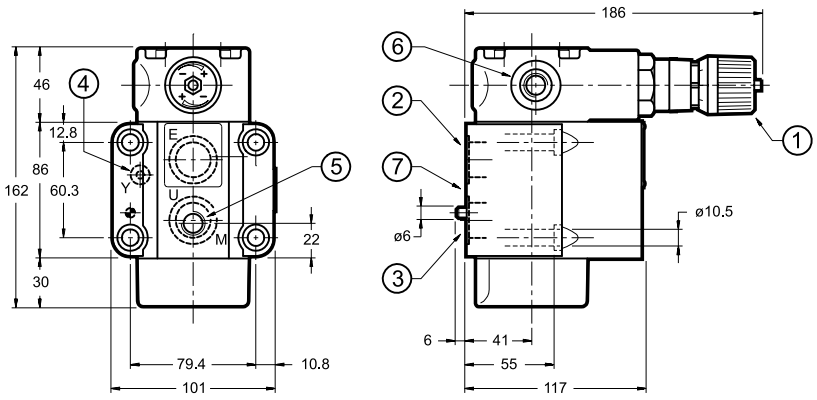
NOTE: the position of the Y port corresponds to the position of the X port provided for by the ISO Standard

1	SICBLOC adjustment knob. To operate, push and rotate at the same time.
2	Intake
3	Outlet port
4	Drainage port
5	Pressure gauge port 1/4” NPT
6	Supplementary tube port for drainage 1/4” BSP
7	Mounting surface with sealing rings: N. 2 OR type 3068 (17.13x2.62) N. 2 OR type 2021 (5.28x1.78) 90 Shore

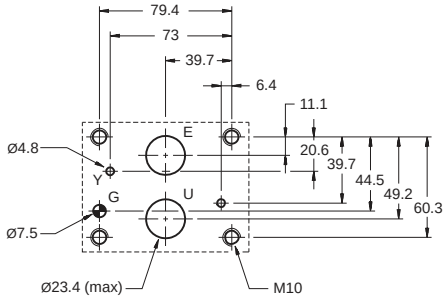
FASTENING BOLTS:
4 bolts M10x70
Tightening torque: 40 Nm

5 - Z5-P OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



MOUNTING SURFACE:
ISO 5781-08-10-*-00 (CETOP 4.4.5-2-08-250)



NOTE: the position of the Y port corresponds to the position of the X port provided for by the ISO Standard

1	SICBLOC adjustment knob. To operate, push and rotate at the same time.
2	Intake
3	Outlet port
4	Drainage port
5	Pressure gauge port 1/4” NPT
6	Supplementary plug for drainage 1/4” BSP
7	Mounting surface with sealing rings: N. 2 OR type 3100 (25.07x2.62) 90 Shore N. 2 OR type 2021 (5.28x1.78) 90 Shore

FASTENING BOLTS:
4 bolts M10x70
Tightening torque: 40 Nm

6 - SUBPLATES (see catalogue 51 000)

	Z3-P	Z5-P
Type	PMSZ3-AI4G with rear ports	PMSZ5-AI6G with rear ports
Port dimensions: - E, U - X, Y	 1/2” BSP 1/4” BSP	 1” BSP 1/4” BSP

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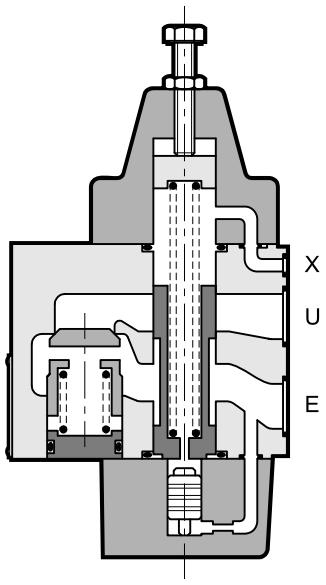
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S*-P
SEQUENCE VALVE
U*-P
UNLOADING VALVE
T*-P
BACKPRESSURE VALVE
X*-P
BALANCING VALVE

SERIES 20

OPERATING PRINCIPLE



— The S U T X sequence valves are used for pressure control. They are direct-acting and normally closed.

— They are available in two nominal sizes for flows up to 150 l/min and in four pressure adjustment ranges.

— Opening takes place by means of a pilot pressure that, acting on a small piston, resists the force of the adjustment spring.

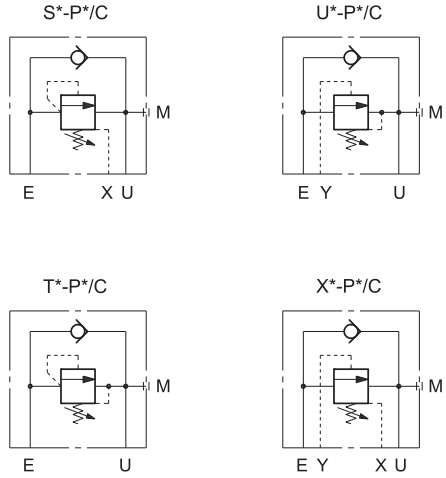
— The valve can be easily modified to get any one of the four versions **S**, **U**, **T**, **X**, turning the upper and the bottom covers in order to obtain the X and Y internal connections, as indicated in par. 7.

The figure represents the section of a type S valve.

PERFORMANCES (measured with mineral oil of viscosity 36 cSt at 50°C)

		size 3	size 5
Maximum operating pressure	bar	320	250
Maximum flow rate	l/min	4060	150
Ambient temperature range	°C	-20 / +50	
Fluid temperature range	°C	-20 / +80	
Fluid viscosity range	cSt	10 ÷ 400	
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15		
Recommended viscosity	cSt	25	
Mass	kg	5,8	6,7

HYDRAULIC SYMBOLS



1 - IDENTIFICATION CODE

		-	P		/		/	20	/	

Valve type:
S = sequence valve
U = unloading valve
T = backpressure valve
X = balancing valve

Size:
3 = ISO 5781-06 (CETOP 06)
5 = ISO 5781-08 (CETOP 08)

Subplate mounting

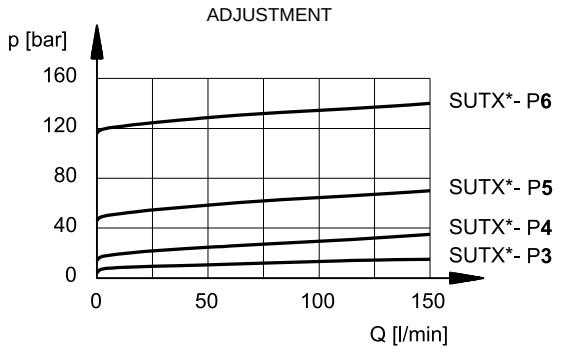
Pressure adjustment range:
3 = 5 ÷ 20 bar
4 = 10 ÷ 35 bar
5 = 15 ÷ 70 bar
6 = 35 ÷ 140 bar

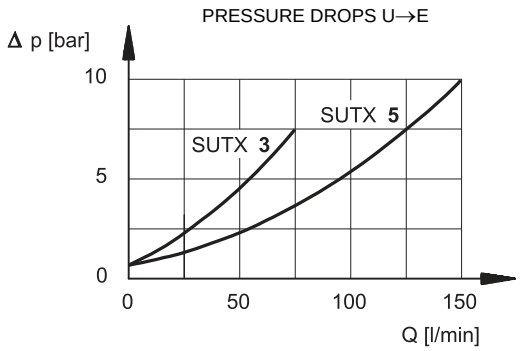
C = check valve for free flow from U to E.
Cracking pressure 0,5 bar.
(omit for version without check valve)

Series No. (the overall and mounting dimensions remain unchanged from 20 to 29)

Seals:
omit for mineral oils
V = viton for special fluids

2 - CHARACTERISTIC CURVES (values obtained with viscosity of 36 cSt at 50°C)

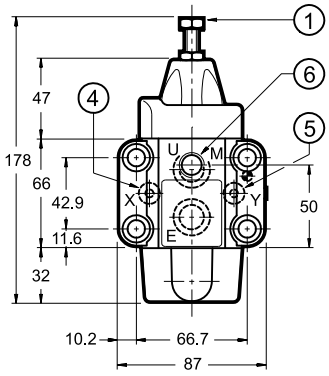


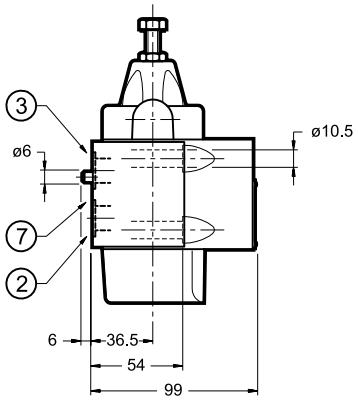


3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

4 - S U T X 3-P OVERALL AND MOUNTING DIMENSIONS

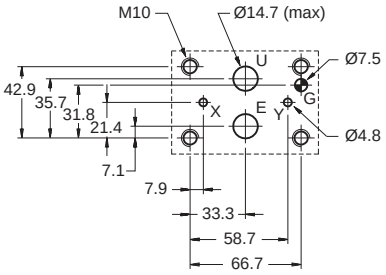




FASTENING BOLTS:
4 bolts M10x70
Tightening torque: 40 Nm

dimensions in mm

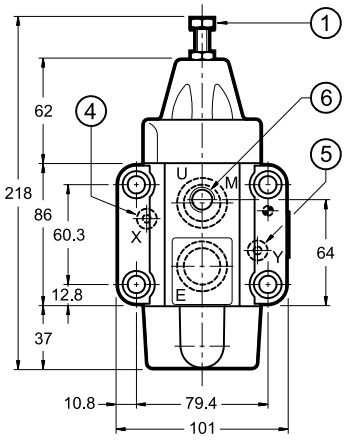
MOUNTING SURFACE:
ISO 5781-06-07-*-00 (CETOP 4.4.4-2-06-320)

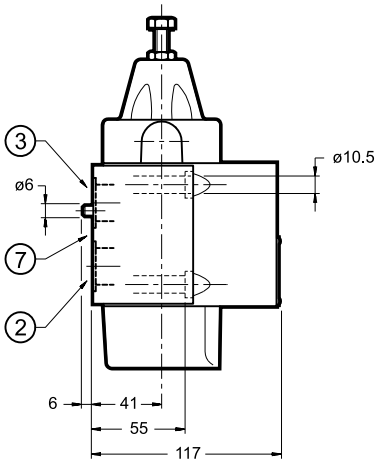


NOTE: the positions of the X and Y ports are reversed from the requirements of the ISO Standard

1	Hexagonal head adjustment screw. Spanner 13.
2	Intake port
3	Outlet port
4	External drainage port
5	External piloting port
6	Pressure gauge port 1/4” NPT
7	Mounting surface with sealing rings: N. 2 OR type 3068 (17.13x2.62)- 90 Shore N. 2 OR type 2021 (5.28x1.78) - 90 Shore

5 - S U T X 5-P OVERALL AND MOUNTING DIMENSIONS

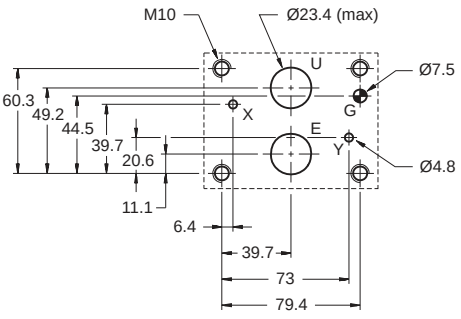




FASTENING BOLTS:
4 bolts M10x70
Tightening torque: 40 Nm

dimensions in mm

MOUNTING SURFACE:
ISO 5781-08-10-*-00 (CETOP 4.4.5-2-08-320)



NOTE: the positions of the X and Y ports are reversed from the requirements of the ISO Standard

1	Hexagonal head adjustment screw. Spanner 13.
2	Intake port
3	Outlet port
4	External drainage port
5	External piloting port
6	Pressure gauge port 1/4” NPT
7	Mounting surface with sealing rings: N. 2 OR type 3100 (25.07x2.62) - 90 Shore N. 2 OR type 2021 (5.28x1.78) - 90 Shore

6 - APPLICATIONS

"S" The type "S" sequence valve is normally used to successively command two or more actuators: when the pressure in the primary circuit reaches the set value on the valve, it opens and allows the fluid to feed the second circuit branch, keeping the pressure in the first branch.

The valve remains open until the pressure at the intake falls below the set value; under these conditions, the maximum pressure setting on the first circuit branch will be achieved also at the outlet.

It is also used to keep a circuit under pressure when simultaneous supply of various users, requiring the total delivery of the pump, would make the pressure value decrease.

"U" This is normally used in automatic circuits (high-low pressure) for unloading the low pressure pump; this occurs when the pressure in the circuit reaches the set value of the valve.

In this manner it is possible to utilize the total flow of the two pumps for fast movements at low pressure, with electric power saving, using high pressure only for working movements.

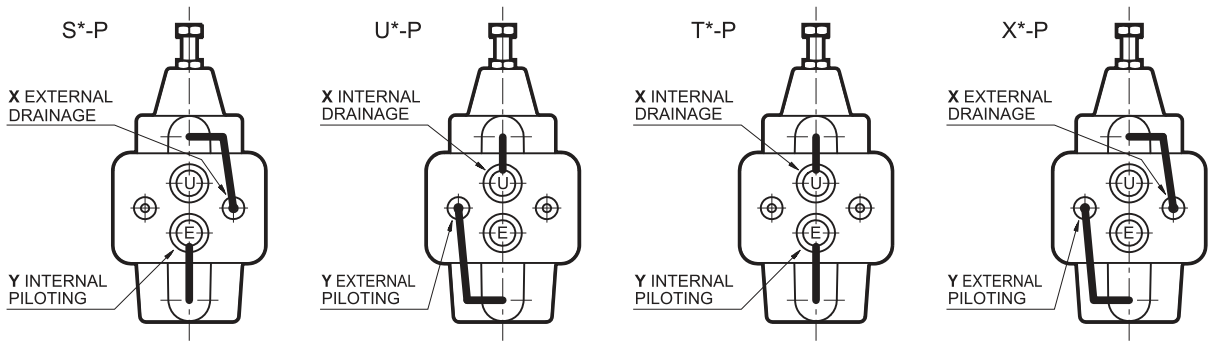
Furthermore, it is used to allow quick discharge of the large chamber of a high differential cylinder which the directional valve would not be able to drain; in this case the valve piloting is connected to the small chamber of the cylinder.

"T" Normally this is used to create hydraulic resistance (back pressure) to prevent uncontrolled movements, especially in the case of suspended loads.

The valve, normally closed, opens only when the set pressure is reached, and thus the descent of the load occurs in a controlled manner and the descending speed depends on the delivery of the pump.

"X" This is mainly used for load balancing. The piloting pressure can be taken from any point in the plant. The valve stays closed until the pilot pressure reaches the set value.

7 - COVER ORIENTATION FOR ALL THE VERSIONS S, U, T, X



NOTE: in this kind of valves Y is the piloting port while X is the drainage port

7 - SUBPLATES (see catalogue 51 000)

		SIZE 3	SIZE 5
Type with rear ports		PMSZ3-AI4G	PMSZ5-AI5G
Ports dimensions:	E, U X, Y	1/2" BSP 1/4" BSP	1" BSP 1/4" BSP

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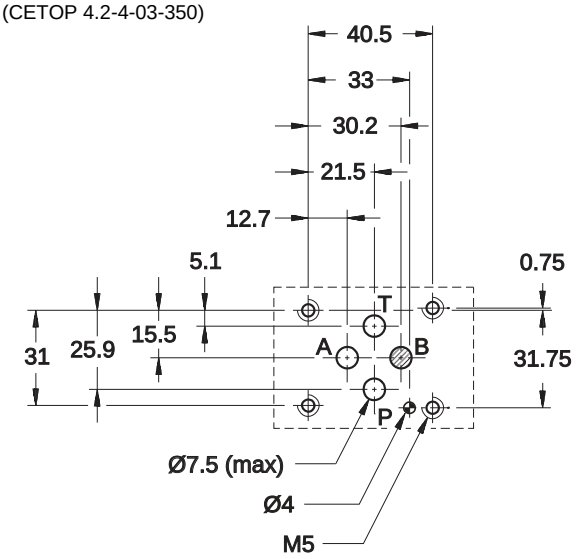
ZC2
BALANCING VALVES
SERIES 51

SUBPLATE MOUNTING
ISO 4401-03 (CETOP 03)

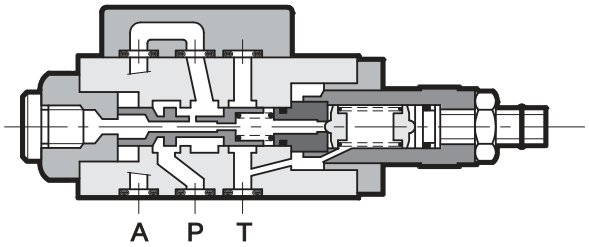
p max **350** bar
Q max **25** l/min

MOUNTING INTERFACES

ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)



OPERATING PRINCIPLE



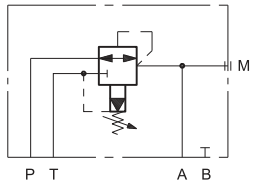
— The type ZC2 balancing valves act as pressure reducing valves that, besides reducing the pressure from line P to user A, allow the flow to return from user A to discharge T when a pressure greater than the set value is generated in the downstream circuit (user A). (A typical case of hydraulic counterweight or load balancing)

— They have a mounting surface in accordance with ISO 4401 (CETOP RP121H) standards. Port B is never used.

PERFORMANCES (measured with mineral oil of viscosity 36 cSt at 50°C)

Maximum operating pressure	bar	350
Maximum flow rate	l/min	25
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass:	kg	1,3

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

Z	C	2	-	P		/		/	51	/	

Balancing valve

Size: ISO 4401-03 (CETOP 03)

Subplate mounting

Pressure adjustment range:
3 = 10 ÷ 70 bar **4** = 30 ÷ 140 bar **5** = 50 ÷ 210 bar

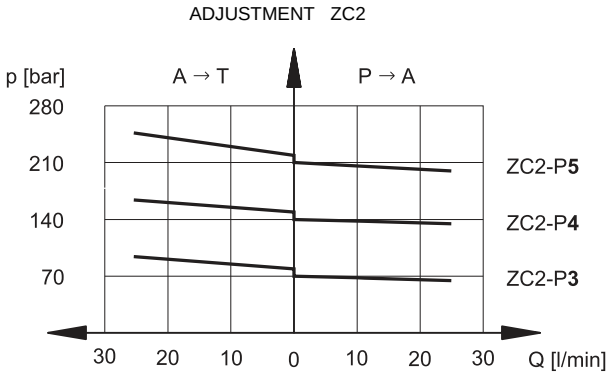
M1= Adjustment knob
(omit for adjustment with countersunk hex screw)

Series No.
(the overall and mounting dimensions remain unchanged from 50 to 59)

Seals:
omit for mineral oils
V = viton for special fluids

2 - CHARACTERISTIC CURVES

(values obtained with viscosity of 36 cSt at 50°C)



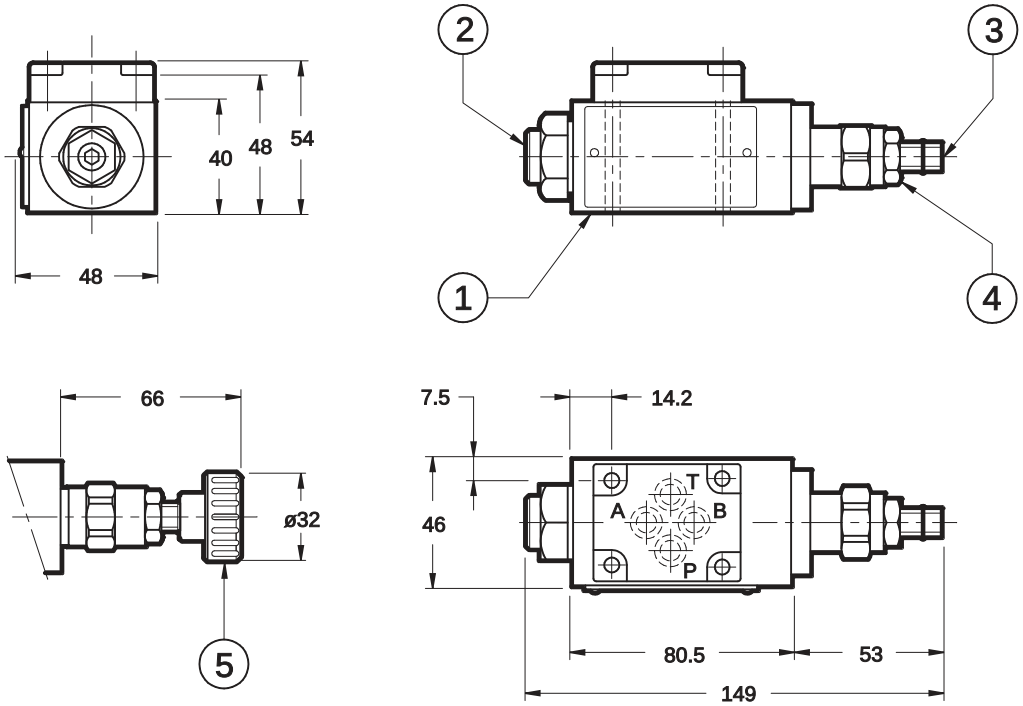
3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

4 - ZC2 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

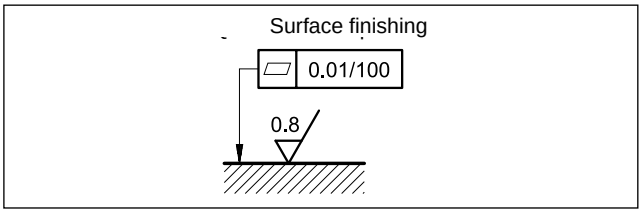


1	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) 90 Shore
2	Pressure gauge port 1/4” BSP
3	Countersunk hex adjustment screw: Spanner 5. Clockwise rotation to increase pressure
4	Locking nut: spanner 17
5	Adjustment knob: M1

9 - INSTALLATION

The ZC2 valves can be installed in any position without impairing correct operation.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.



6 - FASTENING BOLTS

N. 4 bolts M5x55
Tightening torque: 5Nm (A screws 8.8)

7 - SUBPLATES (see cat. 51 000)

Type PMMD-AI3G ports on rear 3/8” BSP
Type PMMD-AL3G side ports3/8” BSP

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DZC*

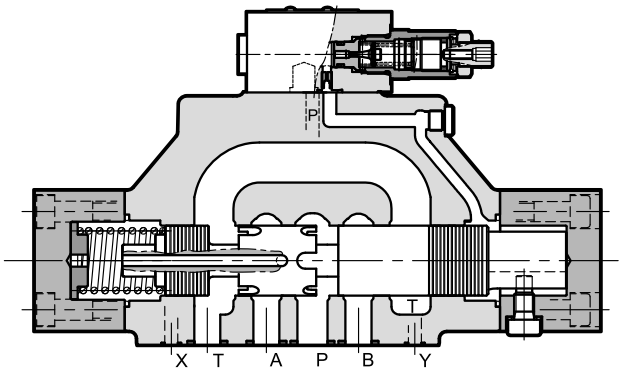
THREE-PORT PRESSURE REDUCING VALVES

SERIES 20

DZC5	**CETOP P05**
DZC5R	**ISO 4401-05**
DZC7	**ISO 4401-07**
DZC8	**ISO 4401-08**

p max **350** bar
Q max (see table of performances)

OPERATING PRINCIPLE



— The DZC* valves, besides reducing the pressure from line P to working line A, allow the flow to return from the line A to the return line T when a pressure greater than the set value is generated in the downstream circuit (flow path A): a typical example of hydraulic counterweight or load balancing.

— They have a mounting surface according to ISO 4401 standards. Port B is never used.

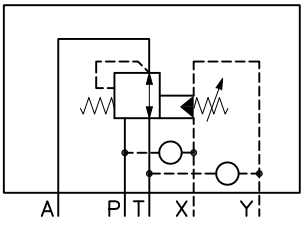
— They are available in three different sizes for flow rates up to 500 l/min.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C)

		DZC5 DZC5R	DZC7	DZC8
Maximum operating pressure	bar	350		
Maximum flow	l/min	150	300	500
Pilot flow rate	l/min	1.1		
Ambient temperature range	°C	-20 / +60		
Fluid temperature range	°C	-20 / +80		
Fluid viscosity range	cSt	10 ÷ 400		
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15			
Recommended viscosity	cSt	25		
Mass	kg	5.6	7.3	14.1

HYDRAULIC SYMBOL (typical)



1 - IDENTIFICATION CODE

D	Z	C		-		/	20		-			/	

Three-port pressure reducing valve

Nominal size:
5 = CETOP P05 (**NOTE**)
5R = ISO 4401-05
7 = ISO 4401-07
8 = ISO 4401-08

Pressure adjustment range:
070 = 2 ÷ 70 bar
140 = 2 ÷ 140 bar
210 = 2 ÷ 210 bar
280 = 2 ÷ 280 bar

Series No. (the overall and mounting dimensions remain unchanged from 20 to 29)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

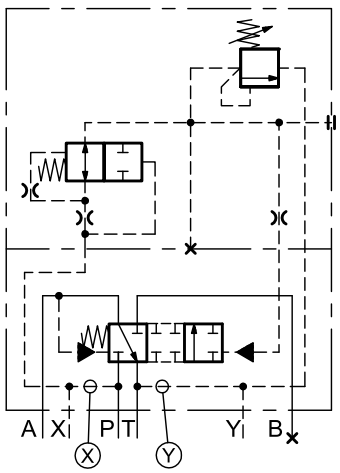
Piloting: **I** = internal
E = external

Drainage: **I** = internal
E = external

Omit for adjustment with socket hex screw (**standard**)
K1 = adjustment knob

NOTE: This version is interchangeable with the previous model ZC4 Duplomatic

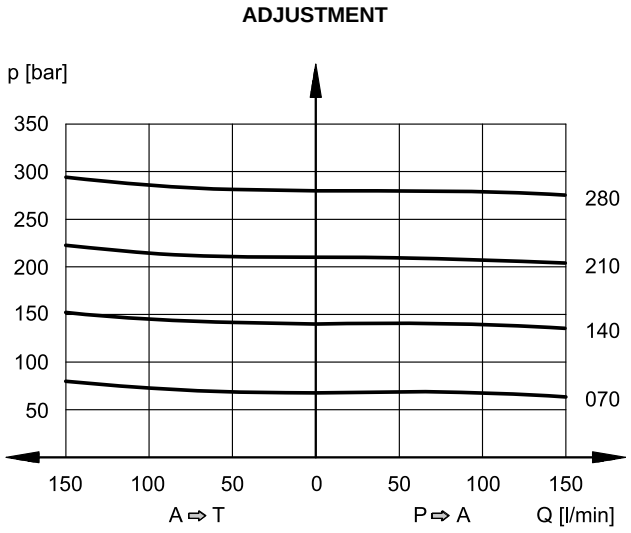
2 - DETAILED SYMBOL



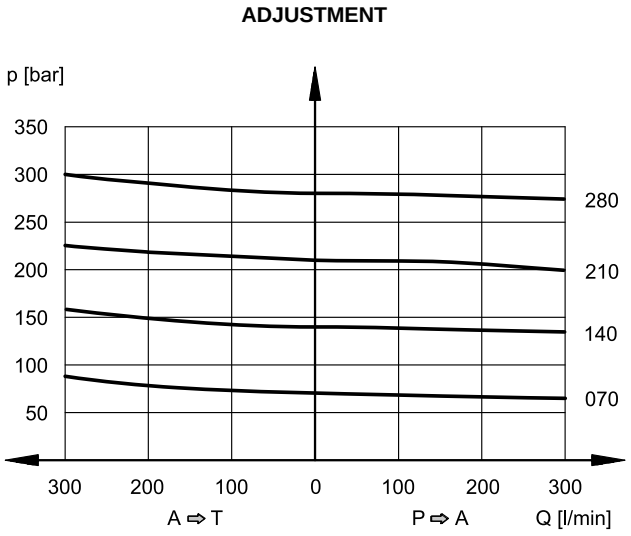
3 - CHARACTERISTIC CURVES

(obtained with mineral oil with viscosity of 36 cSt at 50 °C)

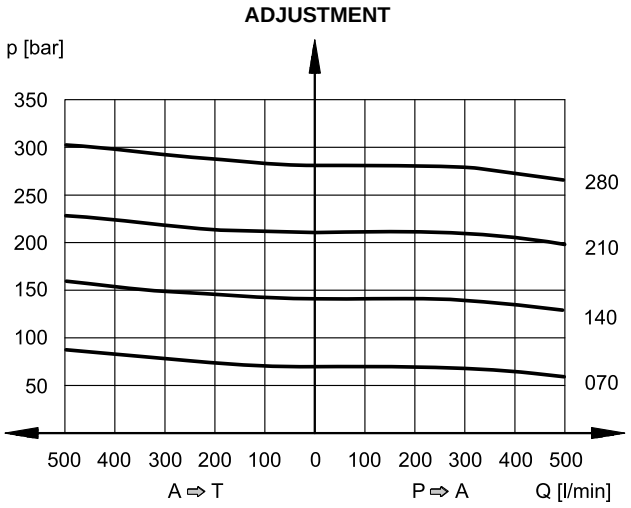
3.1 - Characteristic curves DZC5 and DZC5R



3.2 - Characteristic curves DZC7



3.3 - Characteristic curves DZC8



4 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

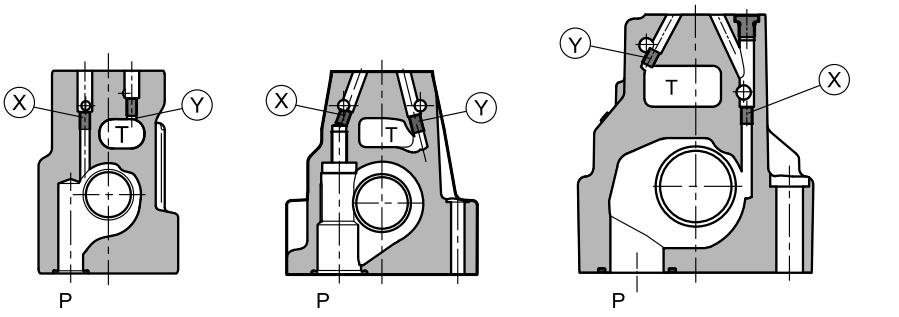
5 - PILOTING AND DRAINAGE

The DZC* valves are available with pilot and drain both internal and external. The version with external drain allows a higher back pressure on the discharge line.

NOTE: The configuration of pilots and drains must be chosen when ordering. Subsequent modifications are allowed only to specialized operators with authorization and in factory.

TYPE OF VALVE		Plug assembly	
		X	Y
IE	internal pilot and and external drain	NO	YES
II	internal pilot and internal drain	NO	NO
EE	external pilot and external drain	YES	YES
EI	external pilot and internal drain	YES	NO

DZC5 and DZC5R **DZC7** **DZC8**



X: M5x6 plug for external pilot
Y: M5x6 plug for external drain

X: M6x8 plug for external pilot
Y: M6x8 plug for external drain

PRESSURES (bar)

Pressure	MAX
Piloting pressure on external X port	350 (**NOTE**)
Pressure on T port with internal drain	2
Pressure on T port with external drain	250

NOTE: Pilot pressure must be 10% higher than the set value for the reduced pressure, in order to let the valve work properly.

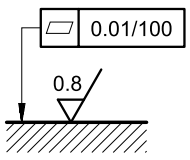
6 - INSTALLATION

The DZC* valves can be installed in any position without impairing correct operation. Connect the valve T port directly to the tank. Add any backpressure value detected in the T line to the controlled pressure value.

Maximum admissible backpressure in the T line, in operating conditions, is 2 bar.

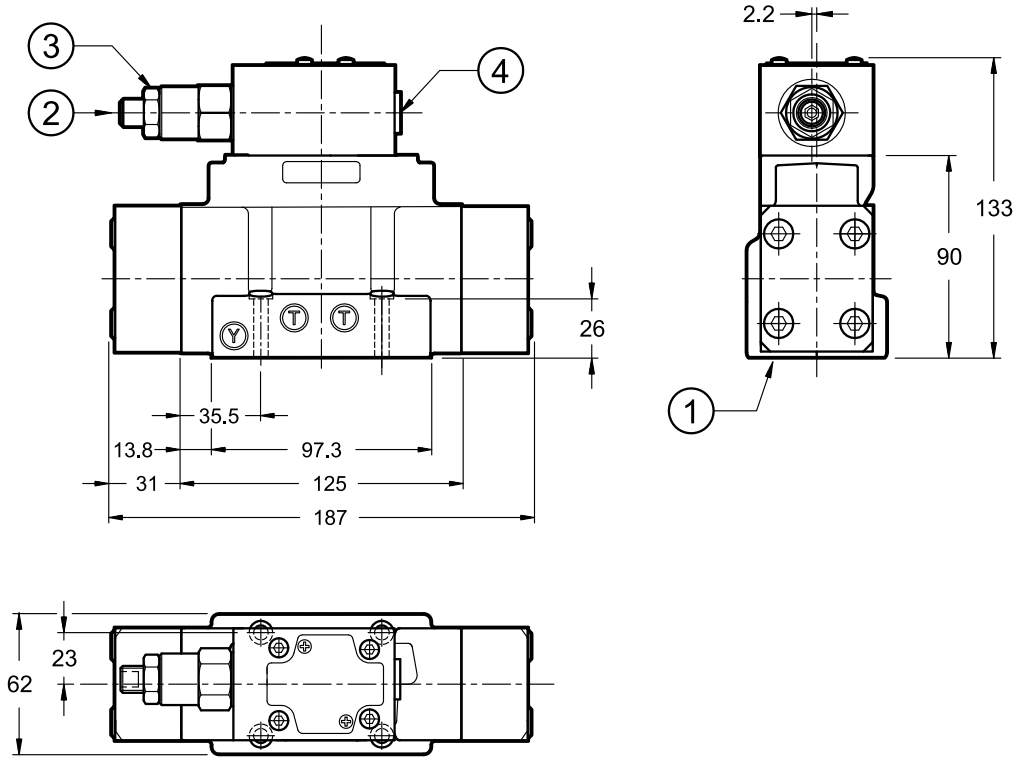
Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.

surface finishing

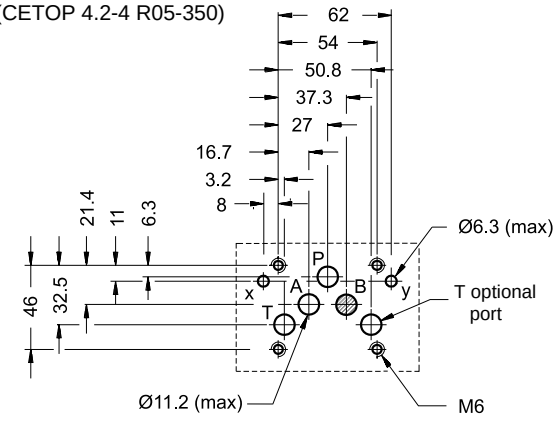


7 - DZC5 AND DZC5R OVERALL AND MOUNTING DIMENSIONS

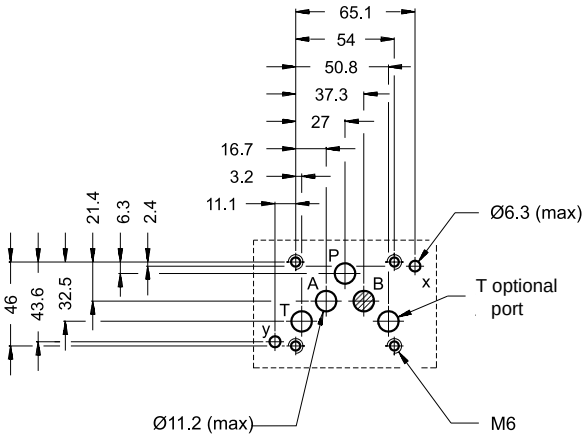
dimensions in mm



DZC5R MOUNTING INTERFACE
ISO 4401-05-05-0-05
(CETOP 4.2-4 R05-350)



DZC5 MOUNTING INTERFACE
CETOP 4.2-4 P05-350

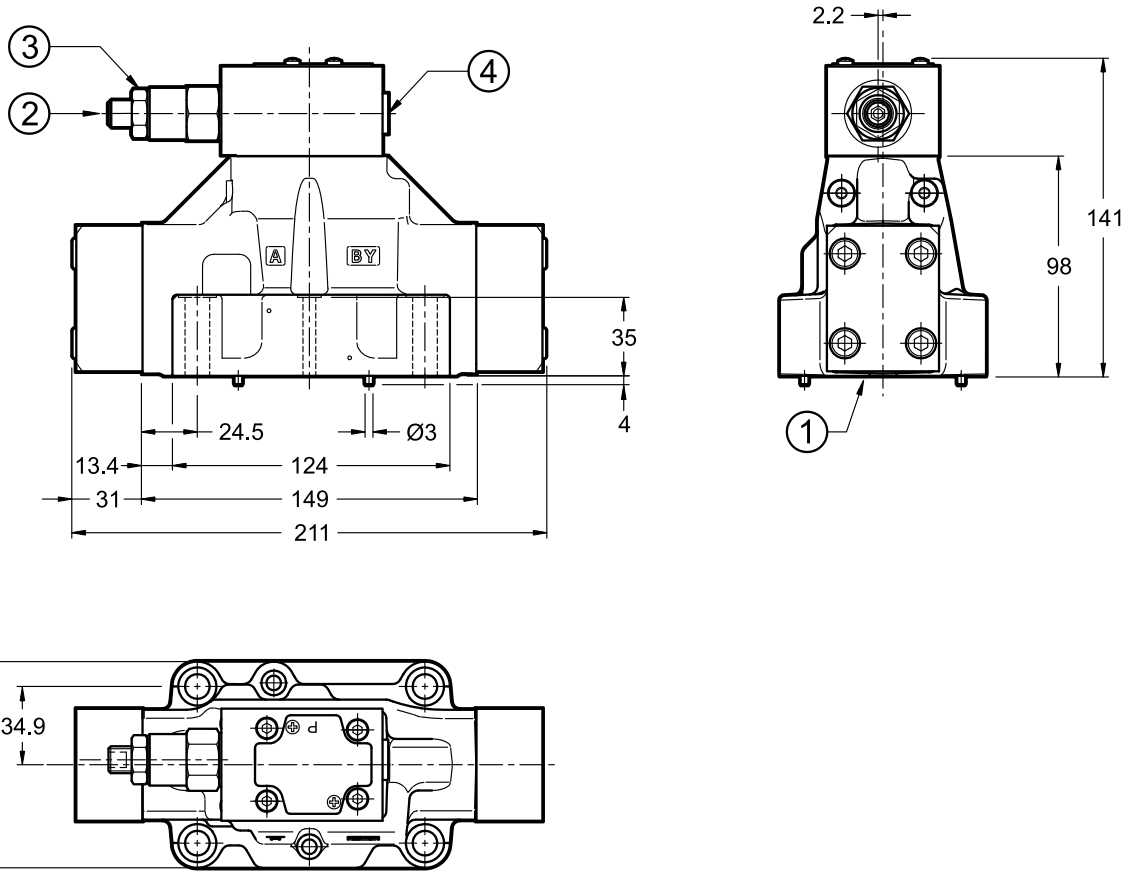


Valve fastening: N. 4 bolts SHC ISO 4762 M6x35
Tightening torque: 8 Nm (A 8.8 bolts)
Thread of mounting holes: M6x10

1	Mounting surface with sealing rings: N. 5 OR type 2050 (12.42x1.78) - 90 Shore N. 2 OR type 2037 (9.25x1.78) - 90 Shore
2	Socket hex adjustment screw: Allen key 6. Clockwise rotation to increase pressure
3	Locking nut: spanner 19
4	Pressure gauge port 1/4” BSPP

8 - DZC7 OVERALL AND MOUNTING DIMENSIONS

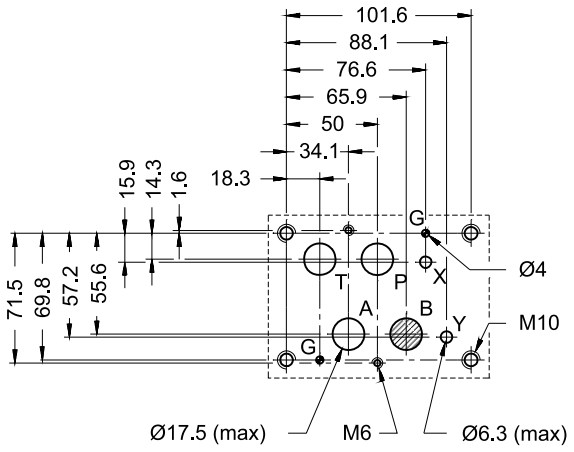
dimensions in mm



1	Mounting surface with sealing rings: N. 4 OR type 130 (22.22x2.62) - 90 Shore N. 2 OR type 2043 (10.82x1.78) - 90 Shore
2	Socket hex adjustment screw: Allen key 6. Clockwise rotation to increase pressure
3	Locking nut: spanner 19
4	Pressure gauge port 1/4” BSPP

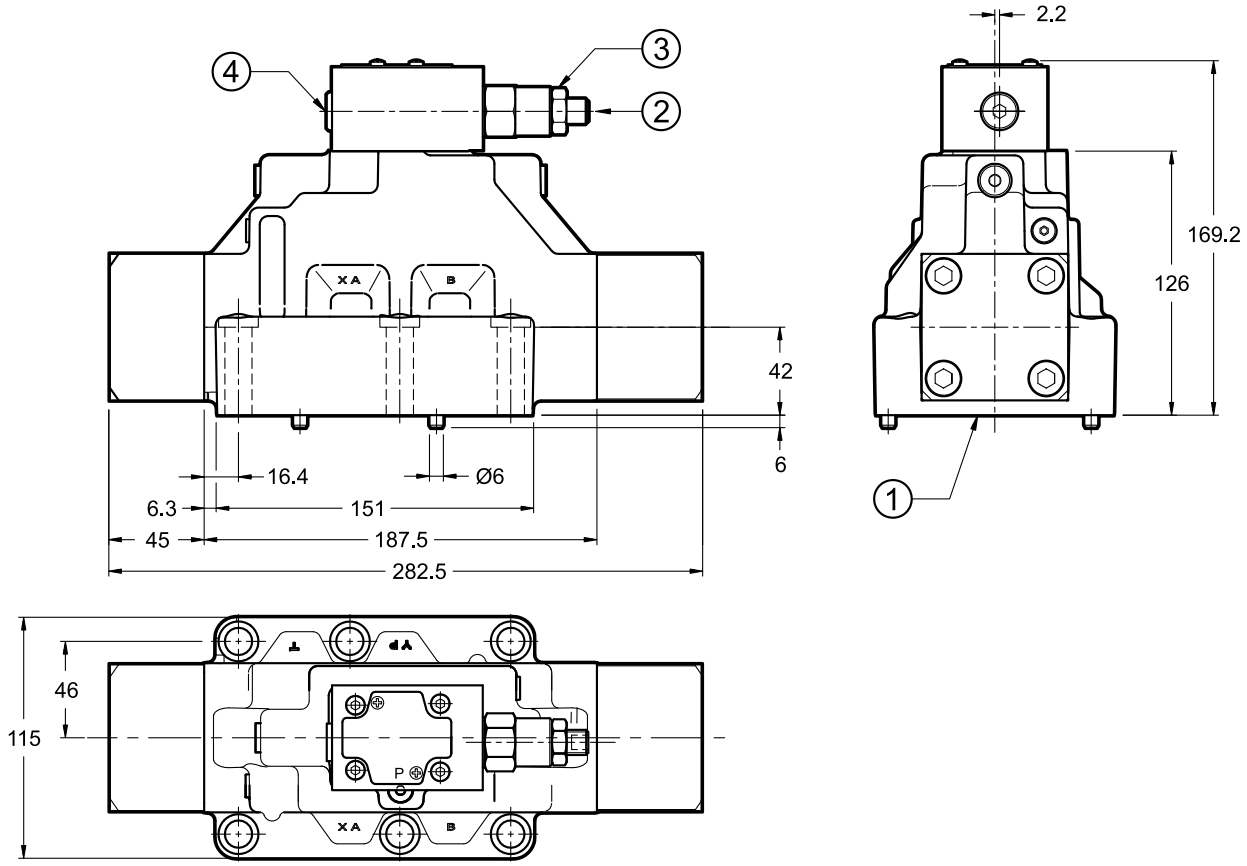
Single valve fastening:	N. 4 SHC bolts ISO 4762 M10x50 N. 2 SHC bolts ISO 4762 M6x50
Tightening torque	M10x60: 40 Nm (A 8.8 bolts) M6x60: 8 Nm (A 8.8 bolts)
Thread of mounting holes:	M6x18; M10x18

MOUNTING INTERFACE
ISO 4401-07-07-0-05
(CETOP 4.2-4-07-350)

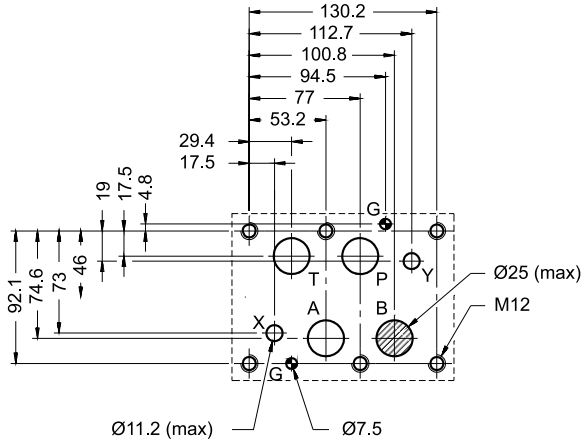


9 - DZC8 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



MOUNTING INTERFACE
ISO 4401-08-08-0-05
(CETOP 4.2-4-08-350)



1	Mounting surface with sealing rings: N. 4 OR type 3131 (32.99x2.62) - 90 Shore N. 2 OR type 3087 (21.89x2.62) - 90 Shore
2	Socket hex adjustment screw: Allen key 6. Clockwise rotation to increase pressure
3	Locking nut: spanner 19
5	Pressure gauge port 1/4” BSPP

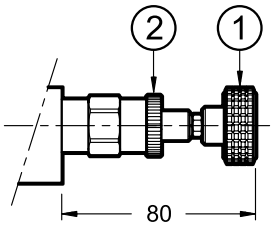
Valve fastening: N. 6 SHC bolts ISO 4762 M12x60
Tightening torque: 69 Nm (A 8.8 bolts)
Thread of mounting holes: M12x20

10 - OPTIONS

The valves can be equipped with adjustment knob instead of the standard socket head screw.

Add **K1** in the identification code to order this version (see point 1)

dimensions in mm



1	Adjustment knob: K1
2	Locking ring

11 - SUBPLATES

(See catalogue 51 000)

		DZC5	DZC7	DZC8
Model with rear ports		PME4-AI5G	PME07-AI6G	-
Model with side ports		PME4-AL5G	PME07-AL6G	PME5-AL8G
Thread of ports:	P - T - A - B X - Y	3/4” BSPP 1/4” BSPP	1” BSPP 1/4” BSPP	1½” BSPP 1/4” BSPP

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03

8 catalogue documents | 24 original technical pages



RS*

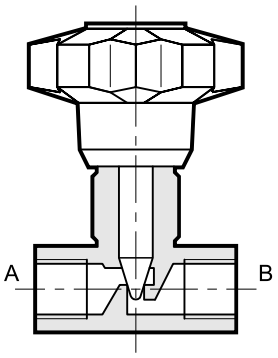
DOUBLE-ACTING THROTTLE FLOW CONTROL VALVE

SERIES 30

THREADED PORTS
CARTRIDGE TYPE

p max (see table of performances)
Q max (see table of performances)

OPERATING PRINCIPLE



— The RS* and RS*-I valves are throttle flow control valves for in-line mounting, directly in the line or as a cartridge complete with threading for in-block mounting.

— Adjustment is obtained with a conical throttle that operates in a cylindrical seat and allows a good linearity of the adjusted flow.

— They are also used as flow shut-off valves since they guarantee good sealing when completely closed.

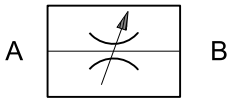
— The valves are always supplied with an adjustment knob that can be locked in any position with a transverse positioned grub screw, as may be required.

PERFORMANCES (obtained with mineral oil with viscosity of 36 cSt at 50°C)

Valve code	Port dimensions BSP	Nominal flow rate [l/min]	Mass [kg]	Max. operating pressure [bar]
RS2	1/4”	15	0,2	400
RS3	3/8”	30	0,4	
RS4	1/2”	50	0,6	
RS5	3/4”	80	1,3	
RS6	1”	150	2,6	320
RS7	1 ¼”	200	3,0	
RS8	1 ½”	220	4,2	
RS2-I	_	15	0,15	320
RS3-I	_	30	0,2	
RS4-I	_	50	0,3	
RS5-I	_	80	0,6	
RS6-I	_	150	1,2	

Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

R	S		-		/	30	/	

Throttle flow control valve

Nominal dimension:
2 = 1/4” **5** = 3/4”
3 = 3/8” **6** = 1”
4 = 1/2” **7** = 1¼”
8 = 1½”

I = In-block cartidge version, available only in dimensions 2-3-4-5-6
Omit for version with threaded ports

Series No. (the overall and mounting dimensions remain unchanged from 30 to 39)

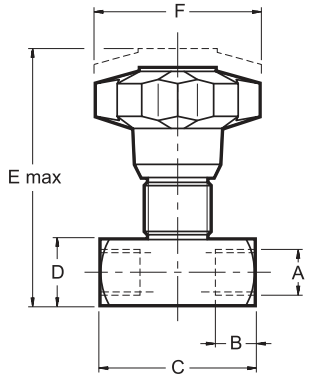
Seals:
omit for mineral oils
V = viton for special fluids

3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

3 - OVERALL AND MOUNTING DIMENSIONS RS*

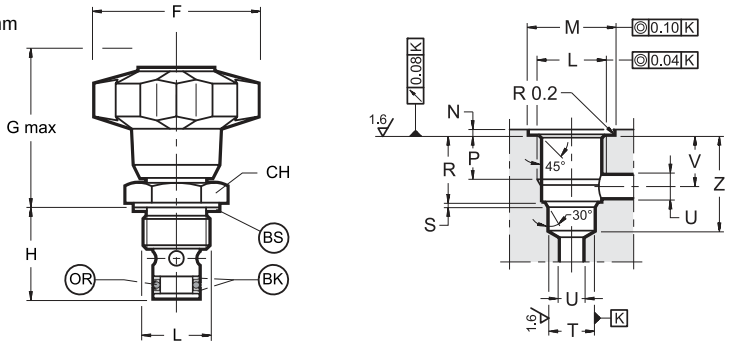
dimensioni in mm



Valve	A BSP	B	C	⌀ D	E max	Ø F
RS2	1/4”	12,5	49	20	78	50
RS3	3/8”	12,5	59	25	93	70
RS4	1/2”	15,5	68	30	107	80
RS5	3/4”	17	86	40	132,5	100
RS6	1”	20	105	50	167,5	120
RS7	1 ¼”	22	120	55	172,5	120
RS8	1 ½”	24	134	65	181	120

4 - OVERALL AND MOUNTING DIMENSIONS RS*-I

dimensioni in mm



* *“BONDED SEAL”*
seal excluded from the supply

sigla valvola	ØF	G max	H	L 6H	ØM +0.2 0	N	P min	R ±0.2	S +0.2 0	ØT H8	ØU max	V ±0.2	Z min	CH	OR type	BK type	BS* type
RS2-I	50	49.5	26.5	M20x1.5	27	1	12	16.5	1	14	5	13.3	27	27	2043	2043	400-513
RS3-I	70	57.5	30.5	M20x1.5	27	1	12	20	1.2	16	8	15.2	32	27	2050	2050	400-513
RS4-I	80	66.5	40	M27x2	33	1.3	18	28	1.2	19	10	22	41	32	2062	2062	400-520
RS5-I	100	76.5	44	M33x2	40	1.3	18	30.5	1.2	27	12	23	45.5	41	130	130	400-515
RS6-I	120	102	52.5	M42x2	50	1.3	21.5	36.5	1.5	35	16	28.5	55	50	3118	3118	400-516

DUPLOMATIC OLEODINAMICA

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RSN*

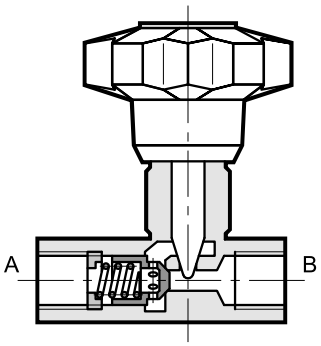
SINGLE-ACTING THROTTLE FLOW CONTROL VALVE

SERIES 30

THREADED PORTS CARTRIDGE TYPE

p max (see table of performances)
Q max (see table of performances)

OPERATING PRINCIPLE



— The RSN* and RSN*-I valves are single-acting throttle flow control valves for in-line mounting, directly in the line or as a cartridge complete with threading for in-block mounting.

— Adjustment is obtained with a conical throttle that operates in a cylindrical seat and allows a good linearity of the adjusted flow.

— They are also used as single direction flow shut-off valves since they guarantee good sealing when completely closed. They also allow a free return in the opposite direction.

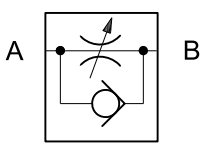
— The valves are always supplied with an adjustment knob that can be locked in any position with a transverse positioned grub screw, as may be required.

PERFORMANCES (obtained with mineral oil with viscosity of 36 cSt at 50°C)

Valve Code	Port dimensions BSP	Nominal flow rate [l/min]	Max. flow with open flow [l/min]	Mass [kg]	Max. operating pressure [bar]
RSN2	1/4"	15	35	0,25	400
RSN3	3/8"	30	80	0,5	
RSN4	1/2"	50	150	0,75	
RSN5	3/4"	80	200	1,6	
RSN6	1"	150	300	3,05	320
RSN7	1 ¼"	200	400	3,75	
RSN8	1 ½"	220	500	5,75	
RSN2-I	_	15	35	0,13	320
RSN3-I	_	30	80	0,25	
RSN4-I	_	50	150	0,34	
RSN5-I	_	80	200	0,62	

Direct check valve opening pressure	bar	0,35
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

R	S	N		-		/	30	/	

Single-acting throttle flow control valve

Nominal dimension:
2 = 1/4” **5** = 3/4”
3 = 3/8” **6** = 1”
4 = 1/2” **7** = 1¼”
8 = 1½”

I = in-block cartridge version, available only in dimensions 2-3-4-5
Omit for version with threaded ports

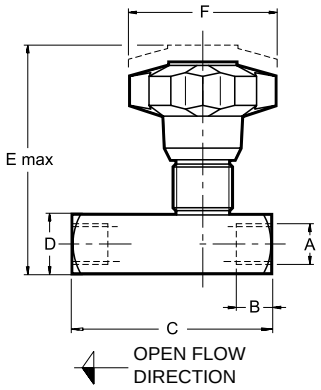
Series No. (the overall and mounting dimensions remain unchanged from 30 to 39)

Seals:
omit for mineral oils
V = viton for special fluids

2 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

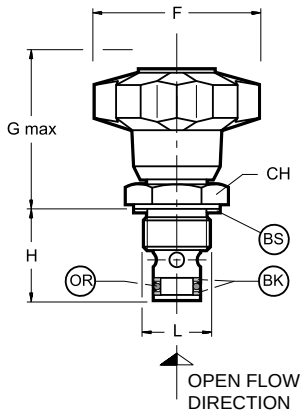
3 - OVERALL AND MOUNTING DIMENSIONS RSN*

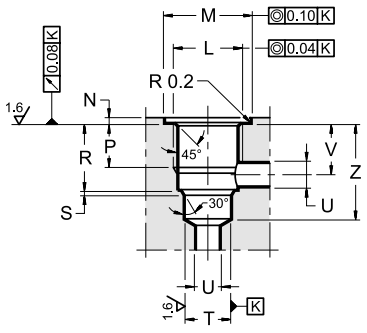


dimensions in mm

Valve	A BSP	B	C	⌀ D	E max	Ø F
RSN2	1/4”	12,5	66	20	78	50
RSN3	3/8”	12,5	79	25	93	70
RSN4	1/2”	15,5	94,5	30	107	80
RSN5	3/4”	17	115	40	132,5	100
RSN6	1”	20	138,5	50	167,5	120
RSN7	1¼”	22	157	55	172,5	120
RSN8	1½”	24	190	65	181	120

4 - OVERALL AND MOUNTING DIMENSIONS RSN*-I





dimensions in mm

***“BONDED SEAL” seal excluded from the supply**

Valve	ØF	G max	H	L 6H	ØM +0.2 0	N	P min	R ±0.2	S +0.2 0	ØT H8	ØU max	V ±0.2	Z min	CH	OR type	BK type	BS* type
RSN2-I	50	49	30.5	M20x1.5	27	1	12	20	1.2	16	8	15.2	32	27	2050	2050	400-513
RSN3-I	70	56	40	M27x2	33	1.3	18	28	1.2	19	10	22	41	32	2062	2062	400-520
RSN4-I	80	70	44.5	M33x2	40	1.3	18	30.5	1.2	27	12	23	45.5	41	130	130	400-515
RSN5-I	100	80	52.5	M42x2	50	1.3	21.5	36.5	1.5	35	16	28.5	55	50	3118	3118	400-516

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MOTION SOLUTIONS
a member of DAIKIN group

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DUPLOMATIC MOTION SOLUTIONS

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RPC1

FLOW CONTROL VALVE PRESSURE AND TEMPERATURE COMPENSATED

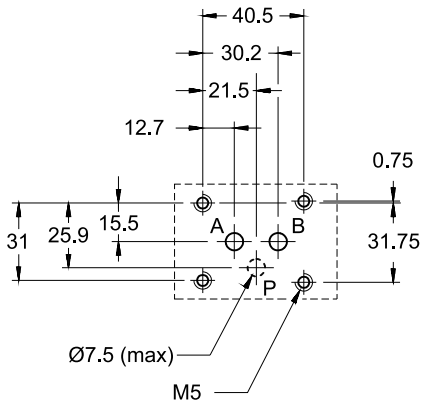
SERIES 43

SUBPLATE MOUNTING ISO 6263-03

p max **250** bar
Q max (see table of performances)

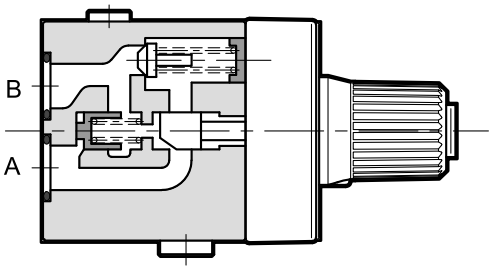
MOUNTING INTERFACE

ISO 6263-03-03-*-97
(CETOP 4.5.2-2-03-250)



NOTE: Port T must never be made. The port P must be made only for RPC1 - */CTX. Conversion plates are available.

OPERATING PRINCIPLE



— The RPC1 valve is a pressure and temperature compensated flow control valve.

— Valves are available with three-turn or single turn adjustment knob, with or without check valve for free reverse flow.

— The flow is adjusted by a calibrated knob that modulates the opening of the control gap and can be locked in any adjustment position.

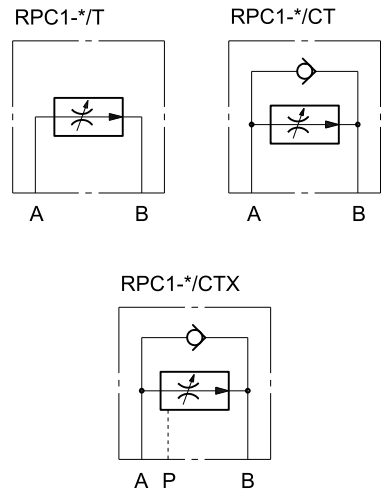
— They are available in seven different flow rate adjustment ranges from 0,5 l/min to 30 l/min.

PERFORMANCE RATINGS

(obtained with mineral oil with viscosity of 36 cSt at 50 °C)

Maximum operating pressure Minimum pressure difference between A and B Check valve cracking pressure	bar	250 10 0.5
Max. controlled flow rates Min. controlled flow rate (for 0.5, 1 and 4 l/min) Maximum flow rate in free flow direction	l/min	0.5 - 1 - 4 - 10 - 16 - 22 - 30 0.025 40
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree for controlled flow = 0,5 l/min for controlled flow > 0,5 l/min	according to ISO 4406:1999 class 20/18/15 class 18/16/13	
Recommended viscosity	cSt	25
Mass	kg	1.3
No. of turns of the adjustment knob	RPC1 RPC1-*/M	3 1

HYDRAULIC SYMBOLS



1 - IDENTIFICATION CODE

R	P	C	1	-		/		T		/		/	43	/	

Pressure compensated flow control valve

Size ISO 6263-03

Controlled flow
0,5 = 0,5 l/min
1 = 1 l/min **16** = 16 l/min
4 = 4 l/min **22** = 22 l/min
10 = 10 l/min **30** = 30 l/min

C = incorporated check valve
Omit if not required

Temperature compensation

X = with port P for anti-surge pilot signal (available for version with incorporated check valve only)
Omit if not required.

Adjustment knob:
Omit for three-turn adjustment
M = single-turn (**NOTE)**

Series No.:
(the overall and mounting dimensions remain unchanged from 40 to 49)

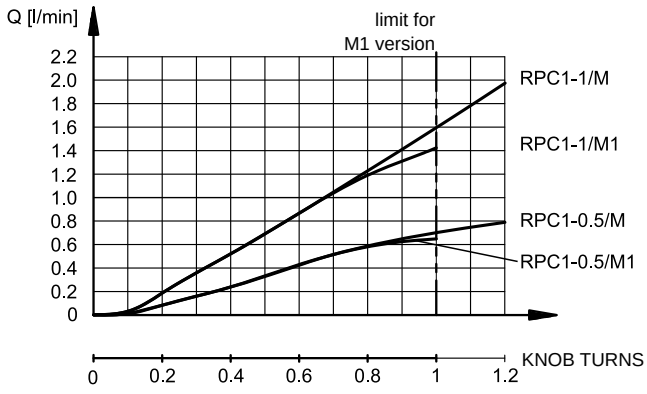
Seals:
Omit for mineral oils
V = viton for special fluids

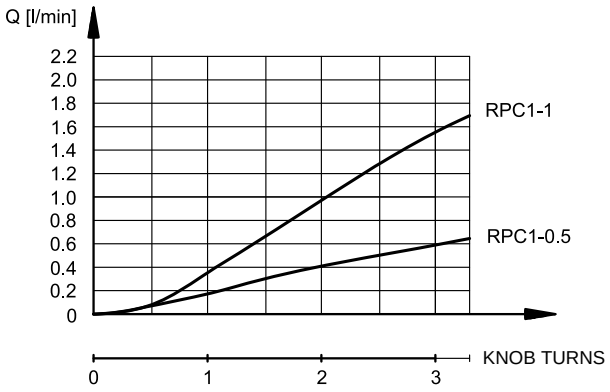
NOTE: Version **M1** with flowrate limitation is available on request for controlled flow 0.5 and 1 only. Refer to charachteristic curves diagrams for flow limits.

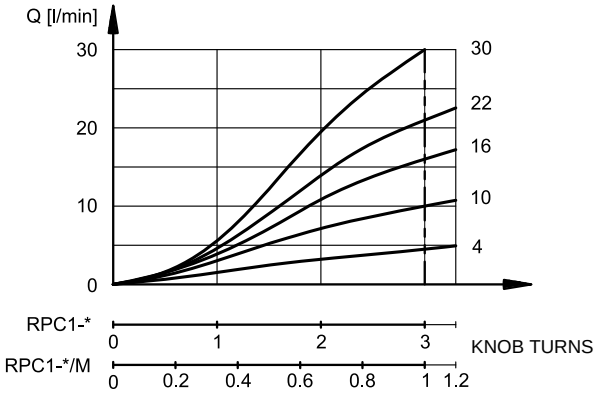
2 - CHARACTERISTIC CURVES

(values obtained with viscosity of 36 cSt at 50°C)

ADJUSTMENT







3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

4 - PRESSURE COMPENSATION

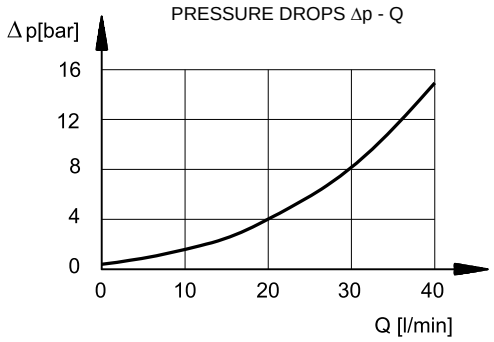
Two throttles in series are in the valve. The first is controlled by the knob mechanism; the second throttle assures a constant pressure drop, controlled by the pressure upstream and downstream the first throttle. In these conditions, the set flow rate value stays constant within a tolerance range of ± 2% of the maximum flow controlled by the valve for maximum pressure variation between the intlet and the outlet ports.

5 - TEMPERATURE COMPENSATION

Thermal compensation in the valve is obtained by adopting the principle of restricted fluid passage, so that the fluid is not influenced significantly by variations in oil viscosity. For controlled flows of less than 0,5 l/min and with a temperature difference of 50 °C, flow is increased by about 13% of the set flow value. For higher flow rates, and with the same temperature difference, the flow rise is about 4% of the maximum flow controlled by the valve.

6 - RPC1-*/CT: WITH REVERSE FREE FLOW

The RPC1-*/CT version is equipped with an incorporated check valve to allow free flow in the direction opposite to the controlled flow, B→A.



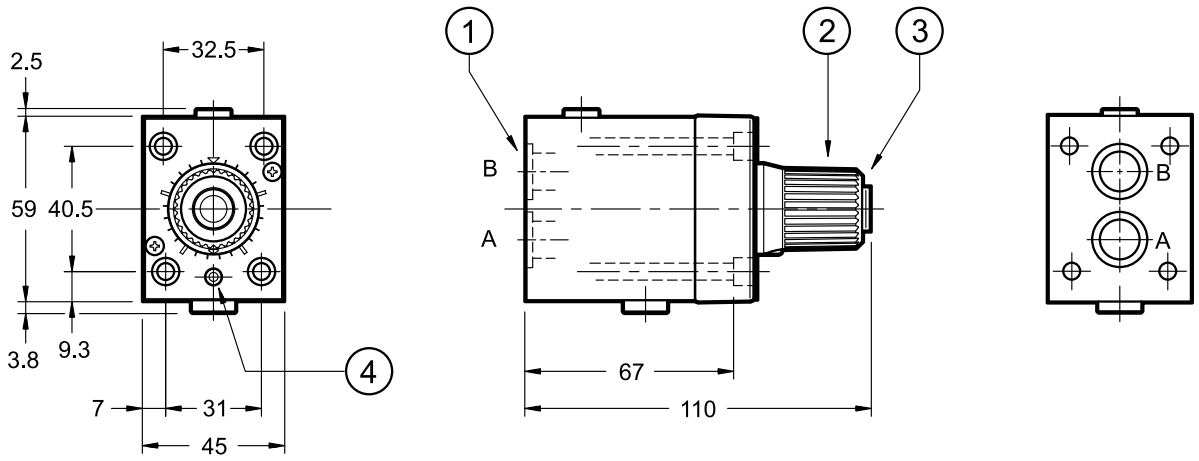
7 - RPC1-*/CTX: HYDRAULIC PILOT SIGNAL

This valve is used for meter-in control and is to be placed downstream of the directional valve.

The pilot signal coming in path P keeps the internal compensator closed thus avoiding the initial flow rate surge that occurs when the directional control valve downstream in the line connects the flow path and the fluid reaches the inlet port of the RPC1 (see the application diagram, point 11).

8 - RPC1-*/T AND RPC1-*/CT OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

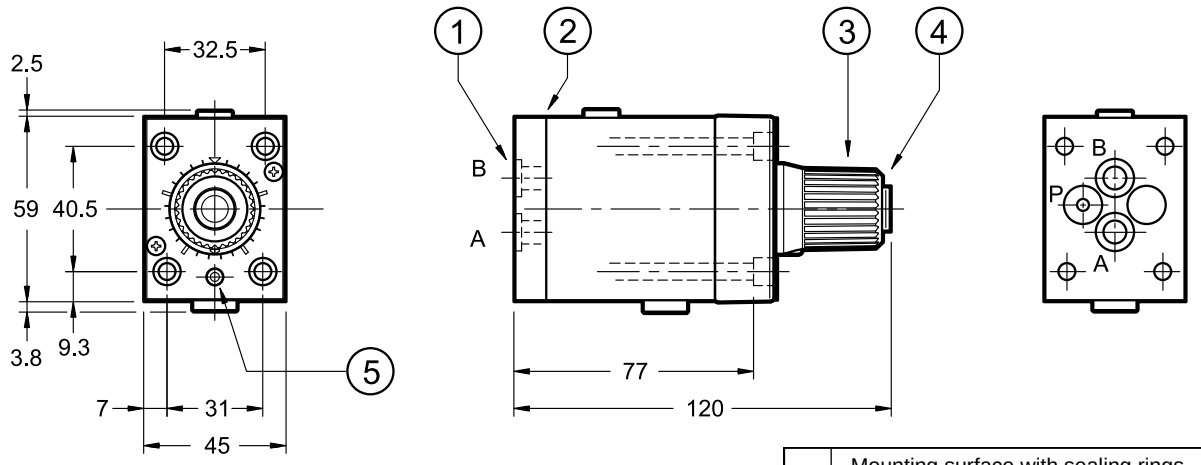


Valve fastening: 4 SHC screws ISO 4762 M5x75
Tightening torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

1	Mounting surface with sealing rings N. 2 ORM - 0140 - 20 (14x2)
2	Adjustment knob. Anticlockwise rotation to increase flow rate
3	Knob turns notch
4	Knob locking screw

9 - RPC1-*/CTX OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



Valve fastening: 4 SHC screws ISO 4762 M5x85
Tightening torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

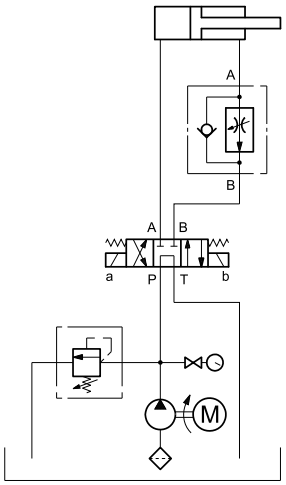
1	Mounting surface with sealing rings N. 4 OR type 2037 (9.25x1.78) - 90 Shore
2	Intermediate surface with sealing ring: N. 2 ORM - 0140 - 20 (14x2) - 70 Shore N. 1 OR type 106 (6.75x1.78) - 70 Shore
3	Adjustment knob. Anticlockwise rotation to increase flow rate.
4	Indicator of knob turns
5	Knob locking screw

10 - SUBPLATES (see catalogue 51 000)

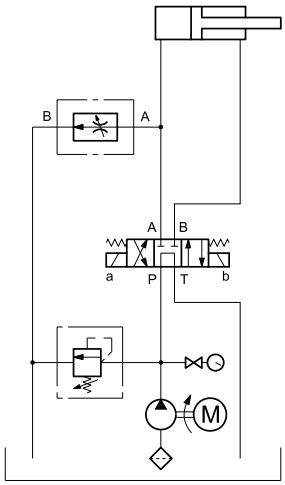
	rear ports 3/8" BSP	side ports 3/8" BSP	ISO 6263 subplate with P and T blind ports
RPC1-*/T, RPC1-*/CT	PMRPC1-AI3G	PMRPC1-AL3G	0113388 P port to be plug (M4)
RPC1-*/CTX	PMMD-AI3G T port to be plug	PMMD-AL3G T port to be plug	-

11 - APPLICATION EXAMPLES

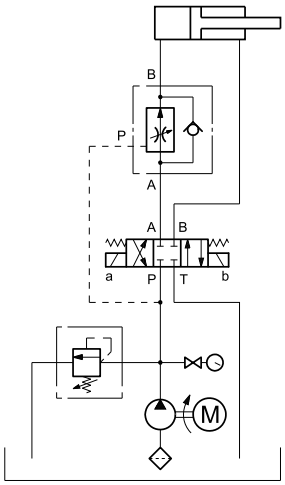
Meter-out control



Bleed-off control



Meter-in control with anti-surge device



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RPC1-T3

PRESSURE AND TEMPERATURE COMPENSATED THREE-WAY FLOW CONTROL VALVE

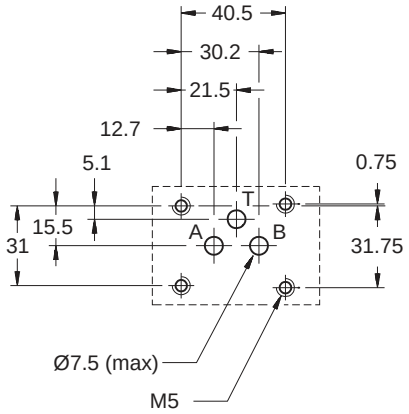
SERIES 41

SUBPLATE MOUNTING
ISO 6263-03 (CETOP 03)

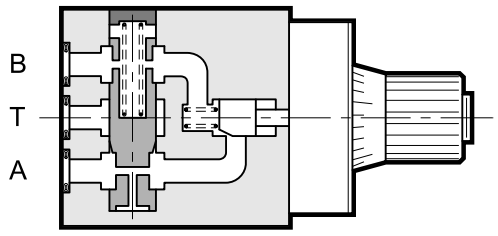
p max **250** bar
Q max (see table of performances)

MOUNTING INTERFACE

ISO 6263-03-03-*-97
(CETOP 4.5.2-3-03-250)



OPERATING PRINCIPLE



— The pressure and temperature compensated three-way flow control valves serve to control the flow sent to the actuator and to discharge it, which exceeds that required, back to tank at system pressure rather than at relief value pressure.

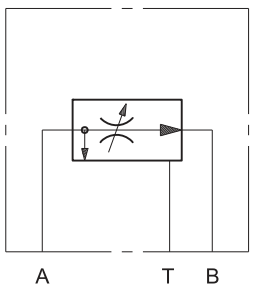
— The flow rate adjustment range is carried out with three turns of the knob and an indicator shows the number of turns made. A one-turn adjustment on the knob, RPC1*/M, is available upon request.

— The adjustment knob can be locked in any position in the adjustment range by a screw.

PERFORMANCES (obtained with mineral oil with viscosity of 36 cSt at 50°C)

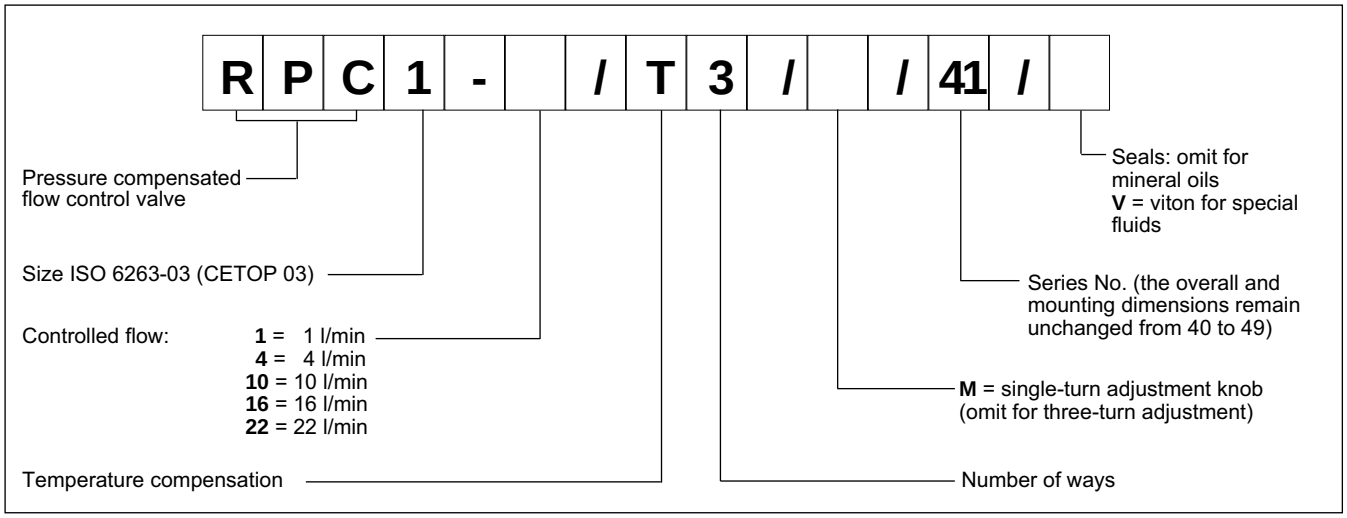
Maximum operating pressure Minimum pressure difference between A and B	bar	250 12
Maximum controlled flow rates Minimum controlled flow rate (for 1 and 4 l/min)	l/min	1-4-10-16-22 0,035
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree Fluid contamination degree for flows < 0,5 l/min	According to ISO 4406:1999 class 20/18/15 According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass	kg	1,5
Number of adjustment knob turns	RPC1/T3 RPC1-/T3/M	3 1

HYDRAULIC SYMBOL

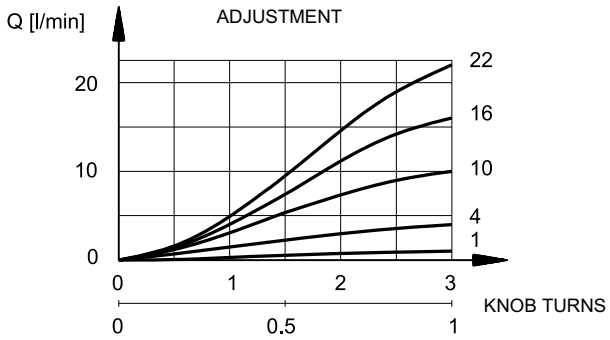


RPC1-T3
SERIES 41

1 - IDENTIFICATION CODE



2 - CHARACTERISTIC CURVES (values obtained with viscosity of 36 cSt at 50°C)



3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

4 - PRESSURE COMPENSATION

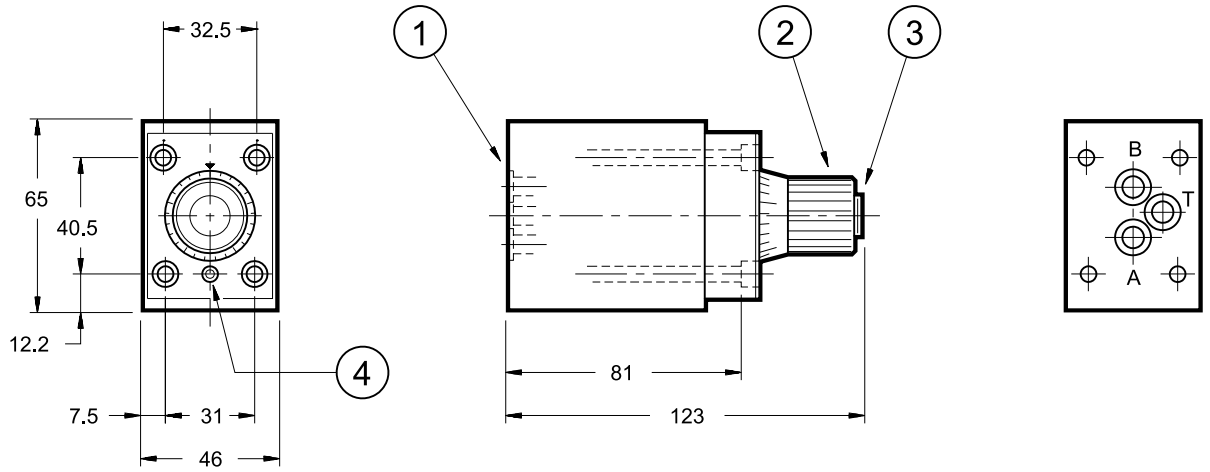
Two throttles in series are in the valve. The first is an opening regulated by the knob; the second, piloted by the pressure upstream and downstream of the first throttle, assures a constant pressure drop across the adjustable throttle. In these conditions, the set flow rate value stays constant within a tolerance range of ±2% of the maximum flow controlled by the valve for maximum pressure variation between the intake and outlet chambers of the valve.

5 - TEMPERATURE COMPENSATION

The valve temperature compensation is obtained with the principle of fluid passage across a thin wall orifice in which the flow rate is not subtantially influenced by the oil viscosity fluctuations. For controlled flows of less than 0,5 l/min and with a temperature difference of 50 °C, flow is increased by about 13% of the set flow value. For higher flow rates, and with the same temperature difference, the flow increase is about 4% of the maximum flow controlled by the valve.

6 - OVERALL AND MOUNTING DIMENSIONS

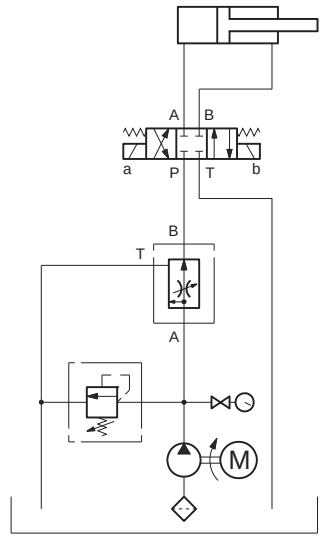
dimensions in mm



1	Mounting surface with sealing rings: 3 OR type 2037 (9.25x1.78) - Shore 90
2	Adjustment knob
3	Indicator of knob turns
4	Knob locking screw

FASTENING BOLTS
4 bolts M5x90
Tightening torque: 5 Nm

7 - APPLICATION EXAMPLE



8 - SUBPLATES (see datasheet 51 000)

Type	PMMD-AI3G with rear ports with user P plugged
Type	PMMD-AL3G with side ports with user P plugged
Port dimension	3/8” BSP

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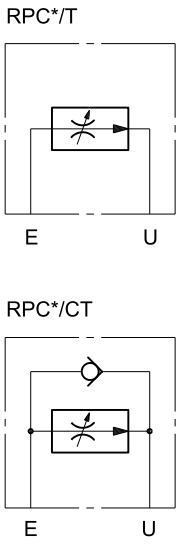
RPC*

PRESSURE AND TEMPERATURE COMPENSATED FLOW CONTROL VALVES

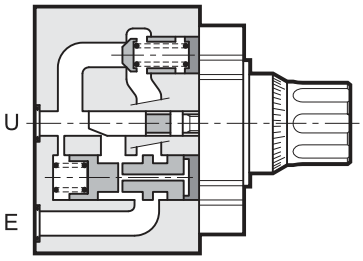
SUBPLATE MOUNTING

RPC2 **ISO 6263-06** (CETOP 06)
RPC3 **ISO 6263-07** (CETOP 07)

HYDRAULIC SYMBOL



OPERATING PRINCIPLE



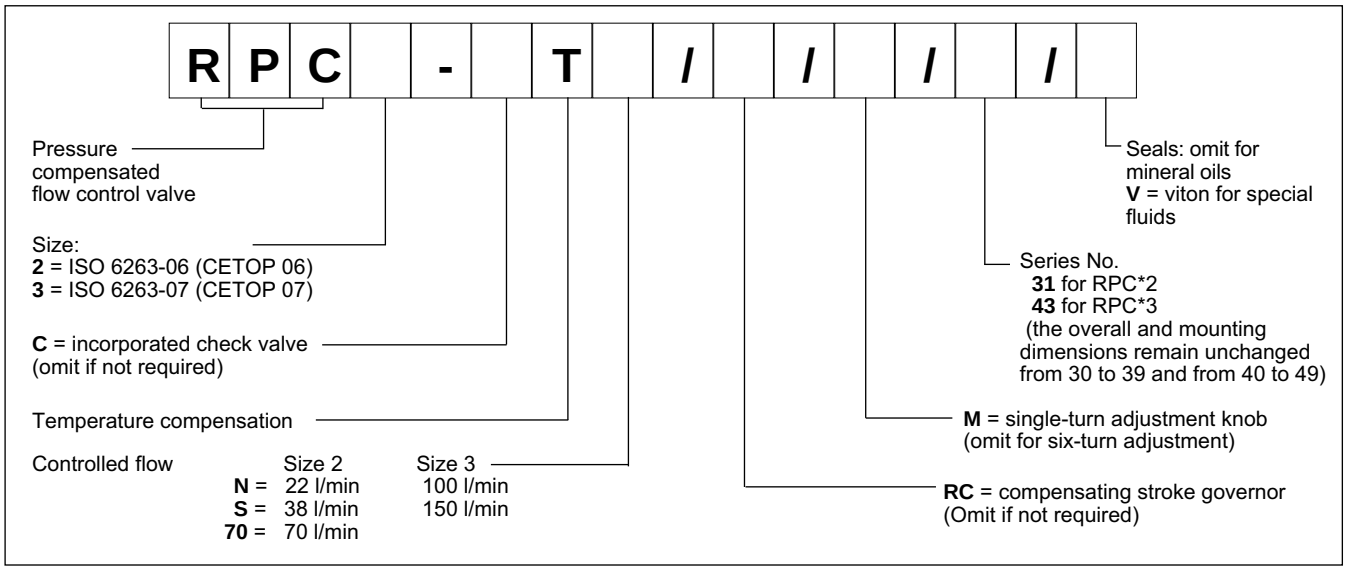
— The RPC* valve is a pressure and temperature compensated flow control valve.

— The flow rate is adjusted with a calibrated knob that modulates the opening of the control gap and can be locked in any adjustment position by a screw.

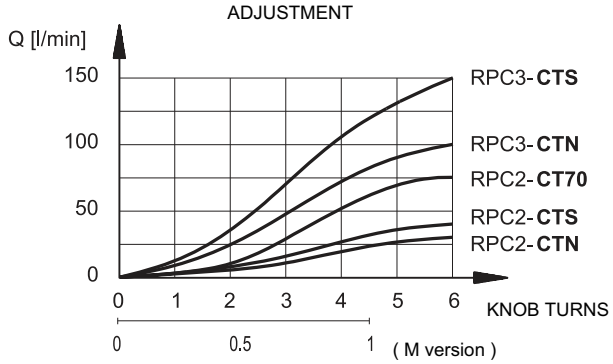
— The flow rate adjustment range is carried out with six turns of the knob, with indication of the number of turns made. A one-turn adjustment on the knob, RPC*/M, is available upon request.

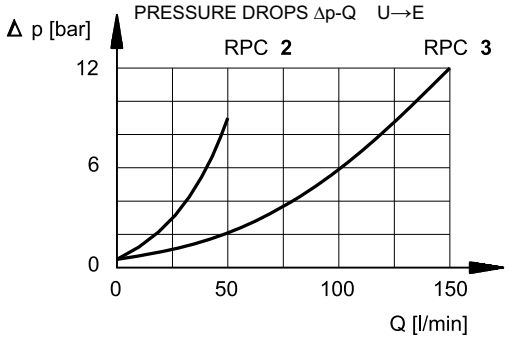
PERFORMANCES (obtained with mineral oil with viscosity of 36 cSt at 50°C)		**RPC2**	**RPC3**
Maximum operating pressure Check valve cracking pressure Minimum pressure difference between E and U	bar	320 0,5 10	250 0,5 12
Maximum controlled flow rates Minimum controlled flow rate	l/min	22 - 38 -70 0,050	100 - 150 0,120
Ambient temperature range	°C	-20 / +50	
Fluid temperature range	°C	-20 / +80	
Fluid viscosity range	cSt	10 ÷ 400	
Fluid contamination degree		According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25	
Mass	kg	3,6	7,8

1 - IDENTIFICATION CODE



2 - CHARACTERISTIC CURVES (values obtained with viscosity of 36 cSt at 50°C)





3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

4 - PRESSURE COMPENSATION

Two throttles in series are in the valve. The first is an opening regulated by the knob; the second, piloted by the pressure upstream and downstream of the first throttle, assures a constant pressure drop across the adjustable throttle. In these conditions, the set flow rate value stays constant within a tolerance range of ± 3% of the maximum flow controlled by the valve for the maximum pressure variation between inlet and outlet chambers of the valve.

5 - TEMPERATURE COMPENSATION

A device located on the first throttle which is sensitive to the temperature fluctuations corrects the position keeping the controlled flow more or less unaltered even should the oil viscosity change.

The fluctuation of the set flow rate stays within ± 2,5% of the maximum flow controlled by the valve.

6 - REVERSE FREE FLOW

The RPC* valves, upon request, are supplied with an incorporated check valve to allow free flow in the direction opposite of the controlled flow. In this case the valve code becomes RPC*-**CT**.

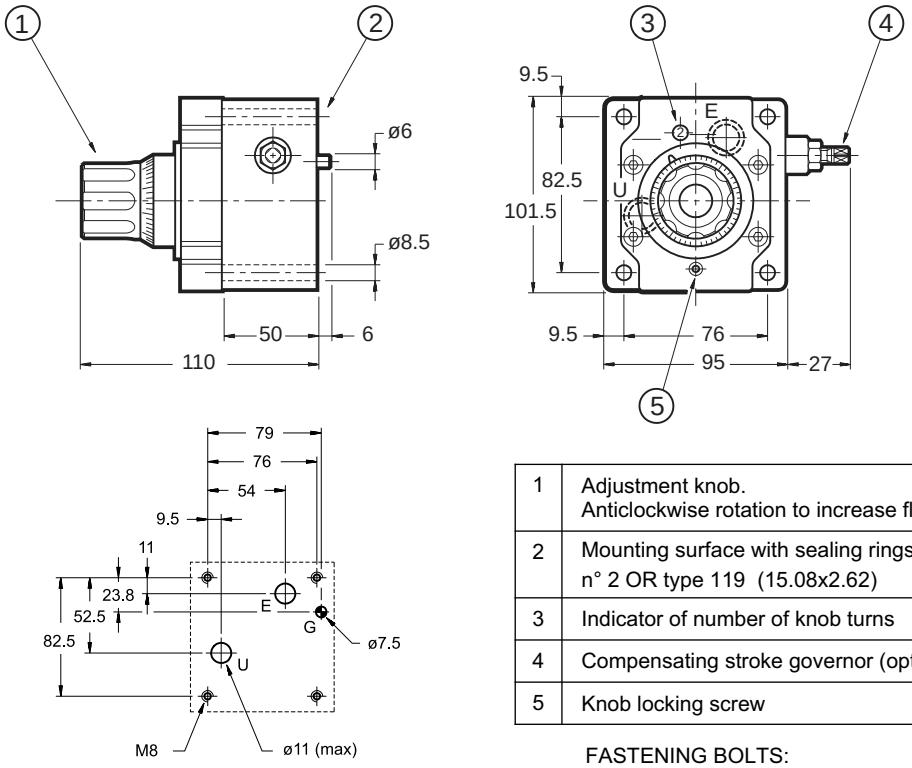
7 - COMPENSATING STROKE GOVERNOR

In order to avoid jumps in the actuator when it is started, the RPC valve can be equipped with a special accessory that controls the compensating stroke, thus preventing it from making uncontrolled movements.

Add the suffix **RC** to the identification code to request this governor. See paragraph 1.

8 - RPC2 SERIES 31 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



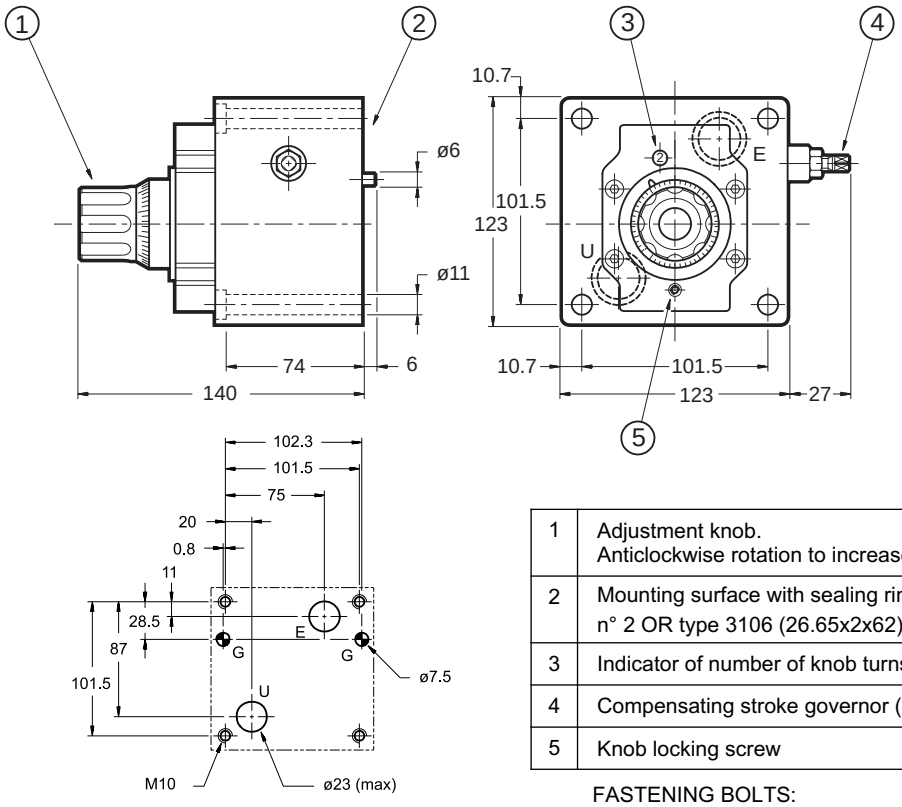
1	Adjustment knob. Anticlockwise rotation to increase flow rate
2	Mounting surface with sealing rings: n° 2 OR type 119 (15.08x2.62)
3	Indicator of number of knob turns
4	Compensating stroke governor (optional)
5	Knob locking screw

MOUNTING SURFACE: ISO 6263-06-05-*-97 (CETOP 4.5.2-2-06-320)

FASTENING BOLTS:
4 SHC bolts ISO 4762 M8x60
Tightening torque: 20 Nm

9 - RPC3 SERIES 43 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	Adjustment knob. Anticlockwise rotation to increase flow rate
2	Mounting surface with sealing rings: n° 2 OR type 3106 (26.65x2x62)
3	Indicator of number of knob turns
4	Compensating stroke governor (optional)
5	Knob locking screw

MOUNTING SURFACE: ISO 6263-07-09-*-97 (CETOP 4.5.2-2-07-250)

FASTENING BOLTS:
4 SHC bolts ISO 4762 M10x90
Tightening torque: 40 Nm

10 - SUBPLATES (see catalogue 51 000)

	RPC2	RPC3
Type	PMRPC2-AI4G rear ports	PMRPC3-AI6G rear ports
Port dimensions	1/2” BSP	1” BSP

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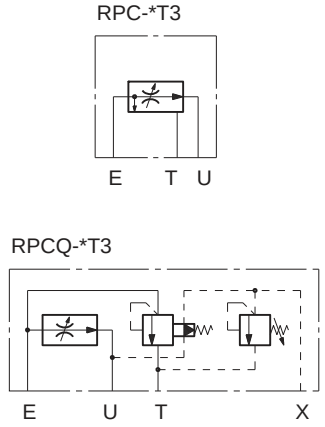
RPC*-*T3

PRESSURE AND TEMPERATURE COMPENSATED THREE-WAY FLOW CONTROL VALVES

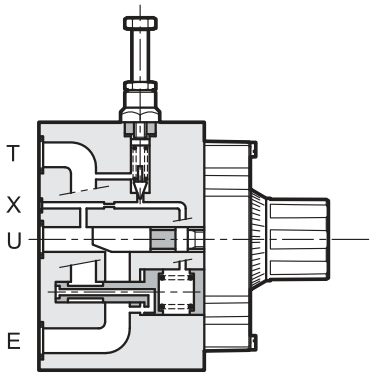
SUBPLATE MOUNTING

RPC-2T3 **ISO 6263-06** (CETOP 06)
RPC-3T3 **ISO 6263-07** (CETOP 07)

HYDRAULIC SYMBOLS



OPERATING PRINCIPLE



— The RPC*-*T3 valve is a pressure and temperature compensated three-way flow control valve.

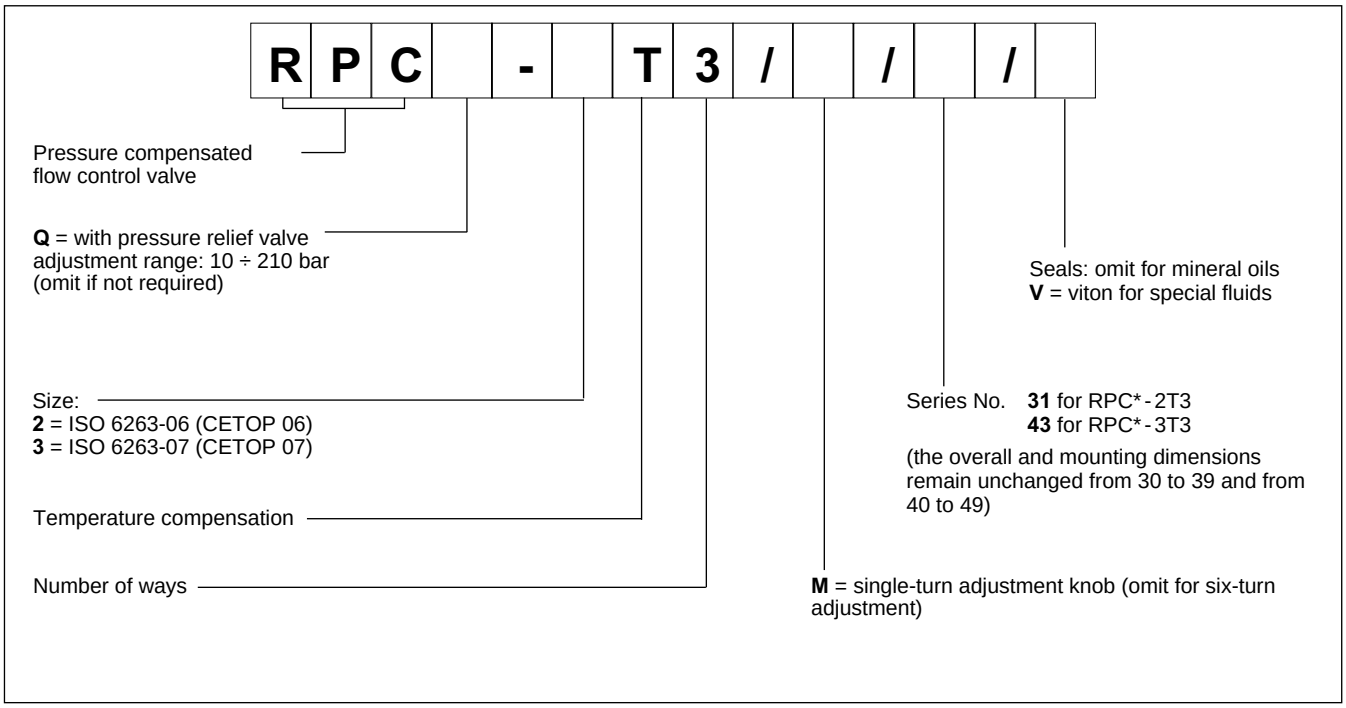
— It allows the control of flow rate to an actuator by discharging the flow exceeding that required by the plant at any one moment. As a consequence, energy consumption is reduced and appropriate at every instant throughout the cycle.

— Single-turn adjustment knob (RPC**/M) and built-in pressure relief valve (RPCQ*) are available upon request.

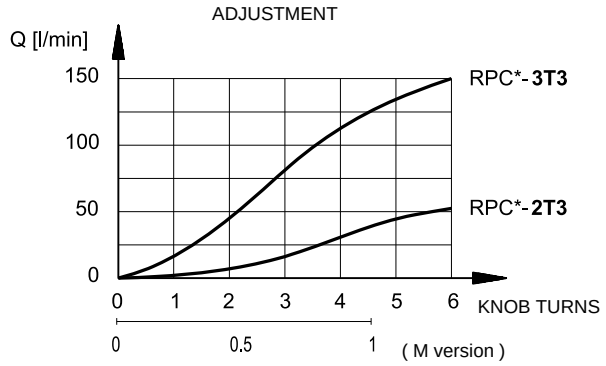
PERFORMANCE RATINGS (obtained with mineral oil with viscosity of 36 cSt at 50°C)

		RPC*-2T3	RPC*-3T3
Maximum operating pressure Minimum pressure difference between E and U	bar	320 10	250 12
Maximum controlled flow rate Minimum controlled flow rate	l/min	50 0,060	150 0,130
Ambient temperature range	°C	-20 / +50	
Fluid temperature range	°C	-20 / +80	
Fluid viscosity range	cSt	10 ÷ 400	
Fluid contamination degree Fluid contamination degree for flow rate <0,5 l/min		According to ISO 4406:1999 class 20/18/15 According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25	
Mass	kg	4,7	9

1 - IDENTIFICATION CODE



2 - CHARACTERISTIC CURVES (values obtained with viscosity of 36 cSt at 50°C)



3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

4 - PRESSURE COMPENSATION

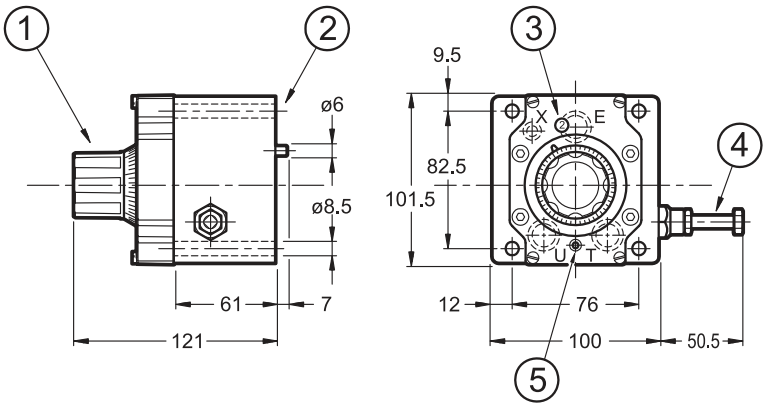
Two throttles in series are in the valve. The first is an opening regulated by the knob; the second, piloted by the pressure upstream and downstream of the first throttle, assures a constant pressure drop across the adjustable throttle. In these conditions, the set flow rate value stays constant within a tolerance range of ±3% of the maximum flow controlled by the valve for maximum pressure variation between the intake and outlet chambers of the valve.

5 - TEMPERATURE COMPENSATION

A device located on the first throttle which is sensitive to the temperature fluctuations corrects the position keeping the controlled flow more or less unaltered even should the oil viscosity change.
The fluctuation of the set flow rate stays within ±2,5% of the maximum flow controlled by the valve.

6 - RPC*-2T3 SERIES 31 OVERALL AND MOUNTING DIMENSIONS

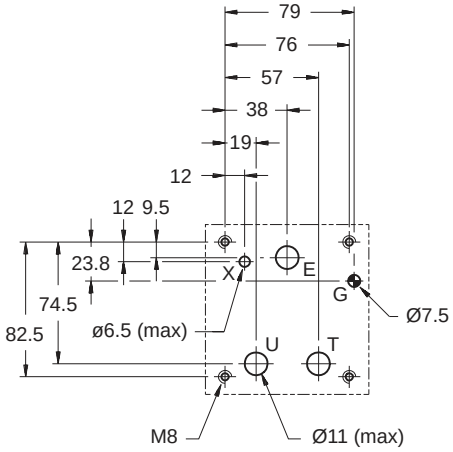
dimensions in mm



1	Adjustment knob with setting range in 6 turns. Anticlockwise rotation to increase flow rate
2	Mounting surface with sealing rings: N. 3 OR type 3068 (17.13x2.62) N. 1 OR type 109 (9.13x2.62)
3	Indicator of number of knob turns
4	Pressure adjustment screw RPCQ
5	Knob locking screw

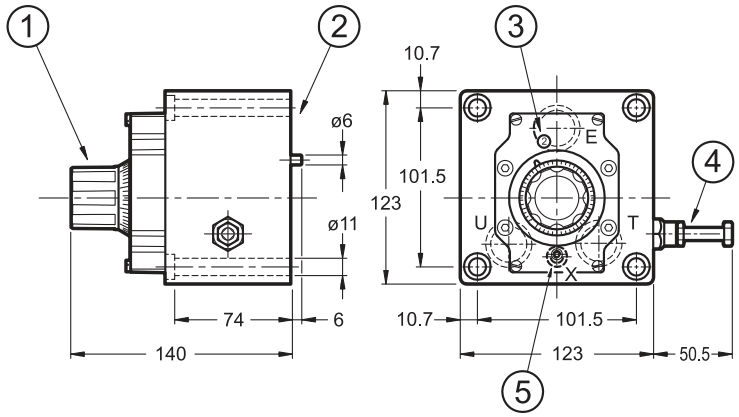
FASTENING BOLTS: 4 SHC bolts ISO 4762 M8x75
Tightening torque: 20 Nm

MOUNTING SURFACE:
ISO 6263-06-07-*-97
(CETOP 4.5.2-3-06-320)



7 - RPC*-3T3 SERIES 43 OVERALL AND MOUNTING DIMENSIONS

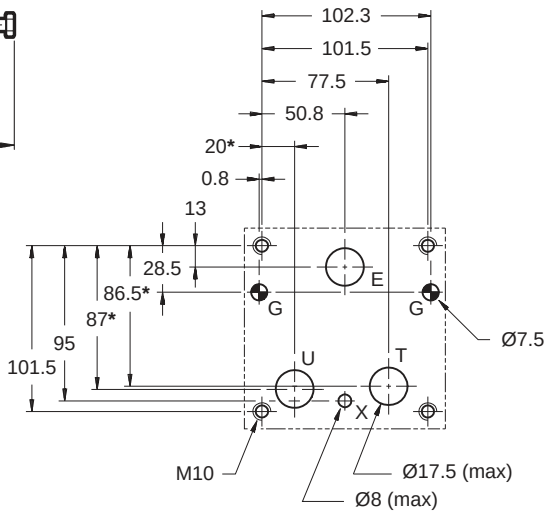
dimensions in mm



1	Adjustment knob with setting range in 6 turns. Anticlockwise rotation to increase flow rate
2	Mounting surface with sealing rings: N. 3 OR type 3106 (26.65x2.62) N. 1 OR type 3043 (10.78x2.62)
3	Indicator of number of knob turns
4	Pressure adjustment screw RPCQ
5	Knob locking screw

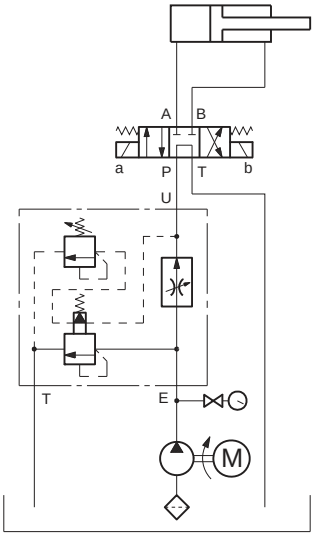
FASTENING BOLTS: 4 SHC bolts ISO 4762 M10x90
Tightening torque: 40 Nm

MOUNTING SURFACE:
ISO 6263-07-11-*-97
(CETOP 4.5.2-3-07-250)

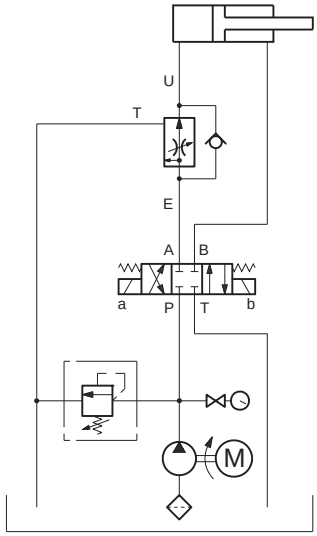


11 - APPLICATION EXAMPLES

RPCQ-*T3



RPC-*T3



12 - SUBPLATES (see catalogue 51 000)

	RPC*-2T3	RPC*-3T3
Type	PMRPCQ2-AI4G rear ports	PMRPCQ3-AI6G rear ports
E, U, T port dimensions	1/2” BSP	1” BSP
X port dimensions	1/4” BSP	1/4” BSP

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CP1R*-W

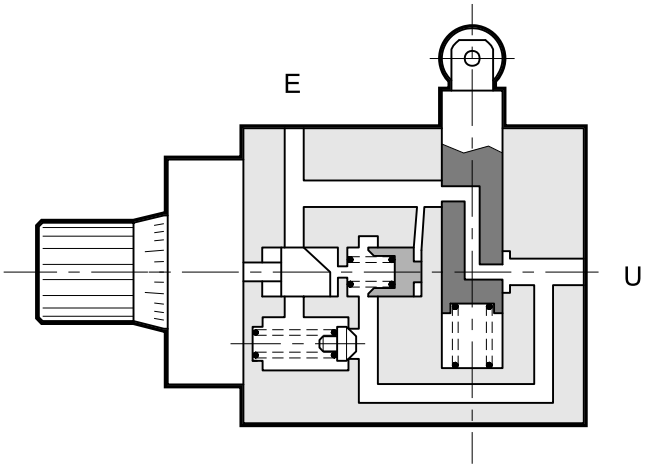
ROLLER OPERATED FAST/SLOW SPEED SELECTION VALVE

SERIES 21

THREADED PORTS

p max **70** bar
Q max **40** l/min

OPERATING PRINCIPLE



— The CP1R*-W valve is used for the selection and control of fast/slow speed of hydraulic axis by mechanical roller operation.

— The slow working speed adjustment is obtained by using a pressure compensated flow control valve.

The special shape of the control openings allows fine adjustment even with very low flow rates.

— Adjustment of the flow rate is carried out with three turns of the knob that can be locked in any position with a screw.

— It is available in two configurations:
normally open CP1RA,
normally closed CP1RC.

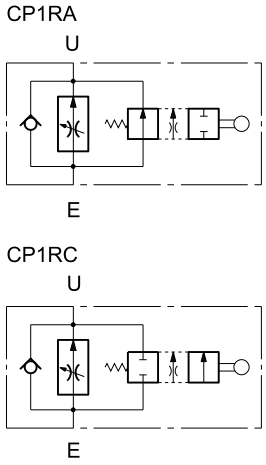
— It is supplied with an incorporated check valve that allows free passage of the reverse flow.

CONFIGURATIONS (see Hydraulic symbols table)
– CP1RA-W: normally open - fast movement with roller in rest position and controlled slow movement with roller in operation.
– CP1RC-W: normally closed - controlled slow movement with roller in rest position and fast movement with roller in operation.

PERFORMANCES (obtained with mineral oil with viscosity of 36 cSt at 50°C)

Maximum operating pressure		bar	70
Fast movement maximum flow rate		l/min	40
Controlled slow monement flow rate	max	l/min	4 - 10 - 16
	min	l/min	0,1
Roller working movement		mm	6
Ambient temperature range		°C	-20 / +50
Fluid temperature range		°C	-20 / +80
Fluid viscosity range		cSt	10 ÷ 400
Fluid contamination degree		According to ISO 4406:1999 class 20/18/15	
Recommended viscosity		cSt	25
Massa		kg	3,2

HYDRAULIC SYMBOLS



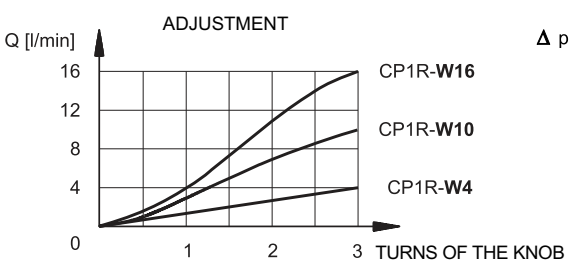
CP1R*-W
SERIES 21

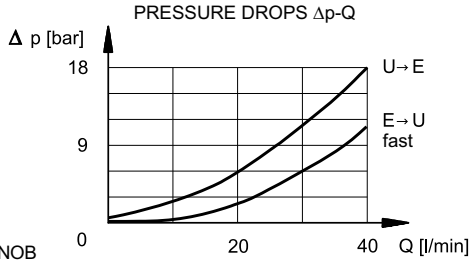
1 - IDENTIFICATION CODE

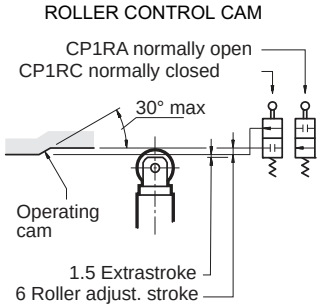
C	P	1	R		-	W			/	21	/	

- Fast/slow speed selection valve
- Nominal size
- Roller operated
- **A** = normally open - **C** = normally closed
- Threaded ports: 3/8" BSP
- Controlled slow movement : **4**=4 l/min - **10**=10 l/min - **16**=16 l/min
- **R** = roller operation perpendicular to the support surface (omit for parallel operation, as represented in par. 4)
- Series No. (the overall and mounting dimensions remain unchanged from 20 to 29)
- Seals: omit for mineral oils **V** = viton for special fluids

2 - CHARACTERISTIC CURVES (values obtained with viscosity of 36 cSt at 50°C)





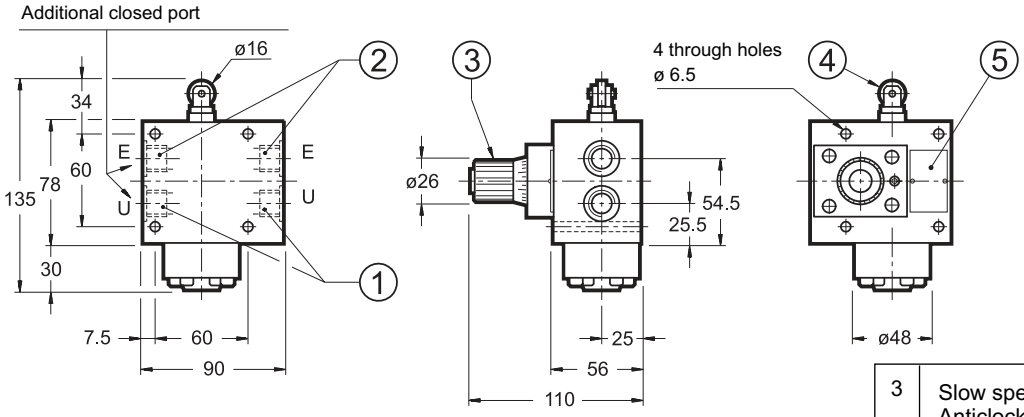


3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

4 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	Outlet port U 3/8" BSP
2	Intake port E 3/8" BSP

3	Slow speed adjustment knob. Anticlockwise rotation to increase flow rate
4	Control roller for fast/slow selection
5	Identification plate

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K4WA/C

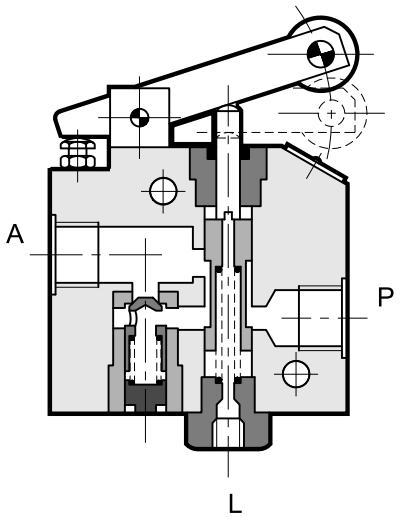
DECELERATION VALVE

SERIES 10

THREADED PORTS

p max **150** bar
Q max **40** l/min

OPERATING PRINCIPLE



— The K4WA/C valve is a mechanically operated decelerating valve with BSPP threaded ports for in-line mounting on hydraulic lines.

— It is normally used to change the movement speed of the hydraulic axis, such as changing from fast to slow, or for slow stops.

— The valve is normally open in the free condition and allows free flow passage from port P to port A.

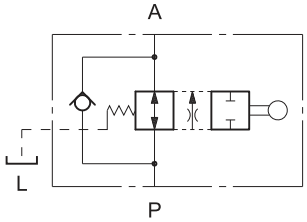
The flow is partially or completely shut off by operating the mechanical drive of the valve.

— It is always supplied with a built in check valve that allows reverse free flow from port A to port P.

PERFORMANCES (measured with mineral oil of viscosity 36 cSt at 50°C)

Maximum operating pressure	bar	150
Cracking pressure of the check valve	bar	0,5
Maximum flow rate	l/min	40
Needed force on the lever to operate: - at beginning - at end stroke	Kg	 6,8 12,0
Maximum leakage with closed valve (Δp 100 bar)	l/min	0,05
Stroke (from all open to completely closed)	mm	20
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass	kg	2,5

HYDRAULIC SYMBOL

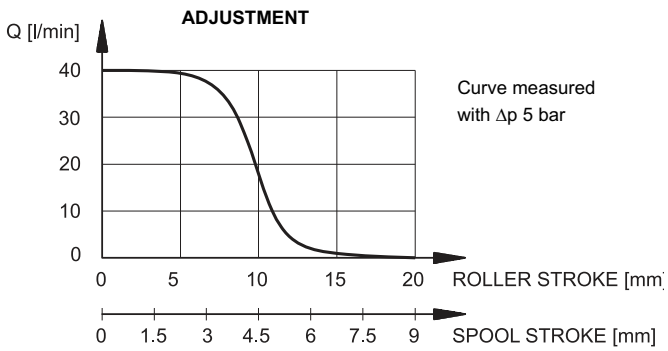


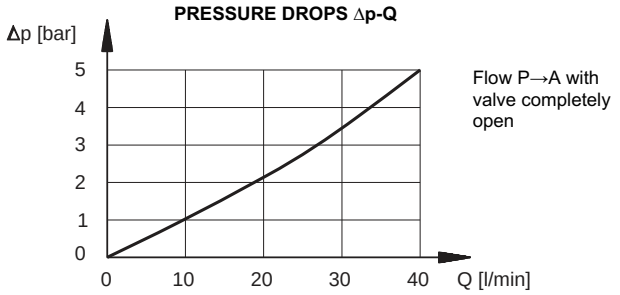
1 - IDENTIFICATION CODE

K	4	W	A	/	C	/	10	/	

- Deceleration valve
- Nominal size: 1/2”
- Threaded ports: 1/2” BSP
- Normally open
- Built in check valve
- Series No. (the overall and mounting dimensions remain unchanged from 10 to 19)
- Seals: omit for mineral oils; **V** = viton for special fluids

2 - CHARACTERISTIC CURVES (values obtained with viscosity of 36 cSt at 50°C)





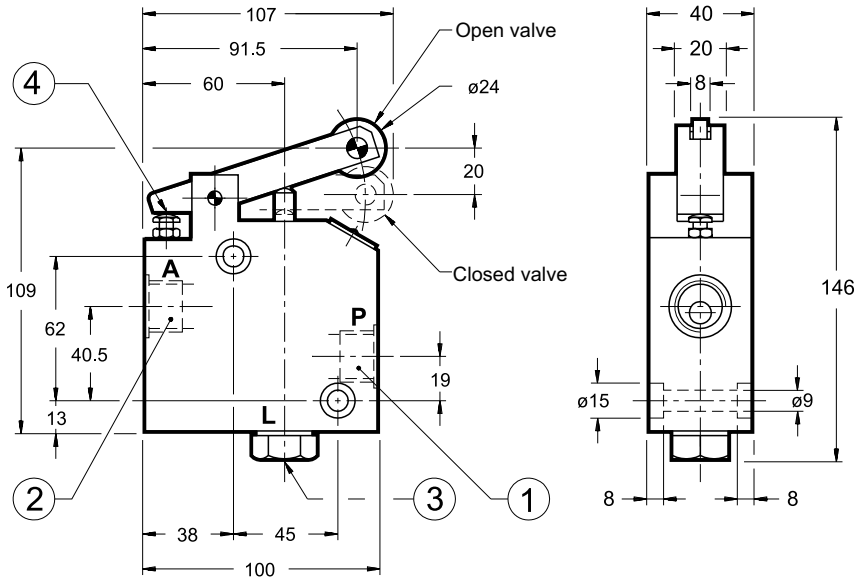
NOTE: For flow A→P, with valve closed, add the cracking pressure (0,5 bar) to the values shown in the diagram.

3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

4 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	Intake port P 1/2” BSP
2	Outlet port A 1/2” BSP
3	Port for drainage L 1/8” BSPP to connect to the reservoir
4	Hexagonal head screw for maximum opening adjustment: spanner 10

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04

DIRECTIONAL CONTROL VALVES

41 catalogue documents | 414 original technical pages



DS2

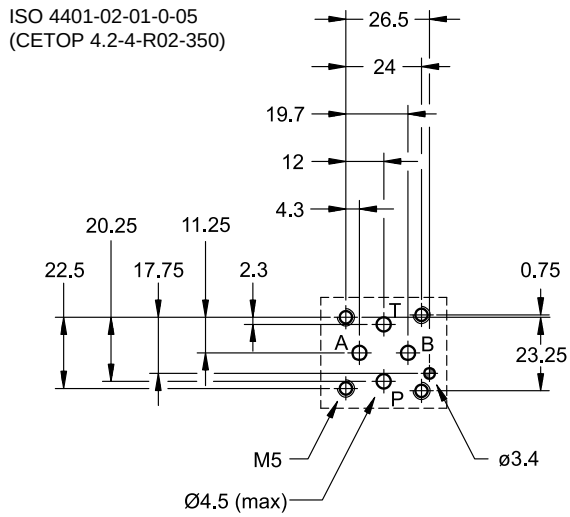
SOLENOID OPERATED DIRECTIONAL CONTROL VALVE

SERIES 10

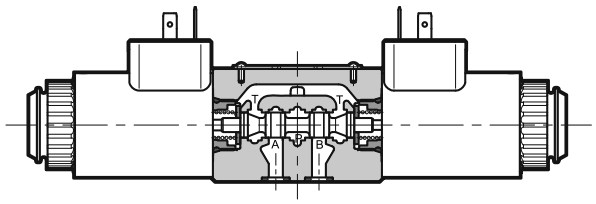
SUBPLATE MOUNTING ISO 4401-02

p max **350** bar
Q max **25** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



— Direct acting, subplate mounting directional control valve, with mounting surface according to ISO 4401 standards.

— Compact design with reduced solenoid dimensions, suitable for mini-power packs and mobile and agricultural applications.

— The valve body is made with high strenght cast iron provided with wide internal passages in order to minimize the flow pressure drop. Wet armature solenoids with interchangeable coils are used (for further information on solenoids see paragraph 7).

— The valve is supplied with 4 way designs, with 2 or 3 positions and with several spools with different porting arrangements.

— The valve is available with direct current solenoids.

— The valve is also available with zinc-nickel coating that ensures a salt spray resistance up to 240 hours.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C)

Maximum operating pressure: - ports P - A - B - port T	bar	 350 250
Maximum flow rate	l/min	25
Pressure drop Δp-Q	see paragraph 4	
Operating limits	see paragraph 5	
Electrical features	see paragraph 7	
Electrical connections	EN 175301-803 (ex DIN 43650)	
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass: single solenoid valve double solenoid valve	kg	0.9 1.3

1 - IDENTIFICATION CODE

D	S	2	-		/	10		-		K1	/		

Directional valve, solenoid operated

ISO 4401-02 size

Spool type (see paragraph 2)

S* **TA** **RK**
SA* **TB**
SB*

Series:
(the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Power supply
D12 = 12 V
D24 = 24 V
D00 = valve without coils (see **NOTE 1**)

Coil electrical connection (see par. 11):
K1 = plug for connector type EN 175301-803 (ex DIN 43650) (**standard**)
K2 = plug for connector type AMP JUNIOR
K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S

Manual override:
Omit for override integrated in the tube (**standard**)
CM = manual override, boot protected
CK1 = turning knob override

Option:
/ W7 = Zinc-nickel surface treatment (see **NOTE 2**)
Omit if not required

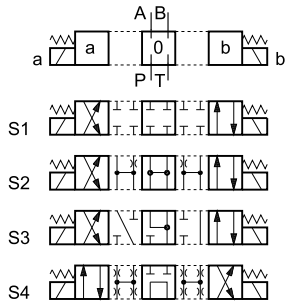
NOTE 2: The standard valve is supplied with surface treatment of phosphating black.

The zinc-nickel finishing on the valve body makes the valve suitable to ensure a salt spray resistance up to **240** hours (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

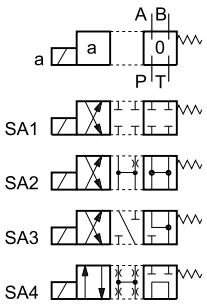
NOTE 1: coils locking ring and related OR are supplied together with valves.

2 - SPOOL TYPE

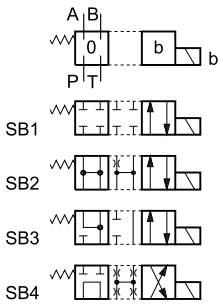
Type **S***:
2 solenoids - 3 positions
with spring centering



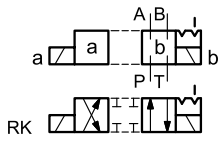
Type **SA***:
1 solenoid side A
2 positions (central + esternal)
with spring centering



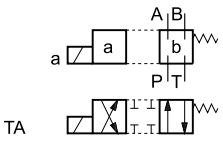
Type **SB***:
1 solenoid side B
2 positions (central + esternal)
with spring centering



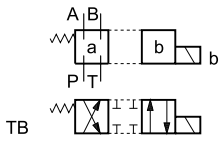
Type **RK**:
2 solenoids - 2 positions
with mechanical retention



Type **TA**:
1 solenoid side A
2 external positions
with spring return



Type **TB**:
1 solenoid side B
2 external positions
with spring return



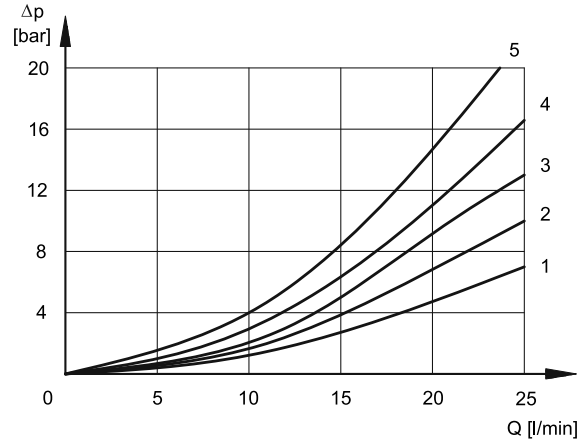
3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

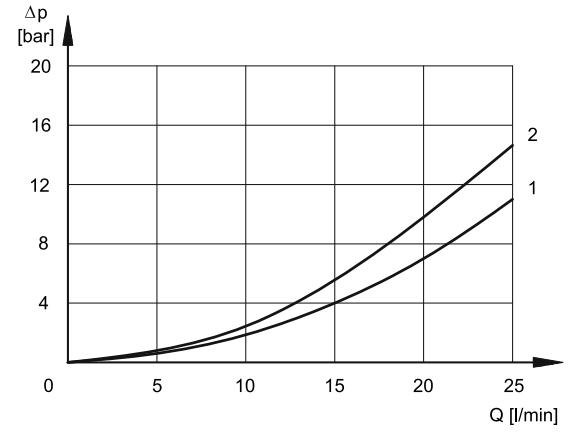
4 - PRESSURE DROPS ΔP-Q

(obtained with viscosity 36 cSt at 50 °C)



ENERGIZED VALVE

SPOOL	FLOW DIRECTIONS			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPHS			
S1, SA1, SB1	1	1	2	2
S2, SA2, SB2	1	1	2	2
S3, SA3, SB3	1	1	1	1
S4, SA4, SB4	4	4	5	5
TA	2	1	2	3
RK	1	1	2	2



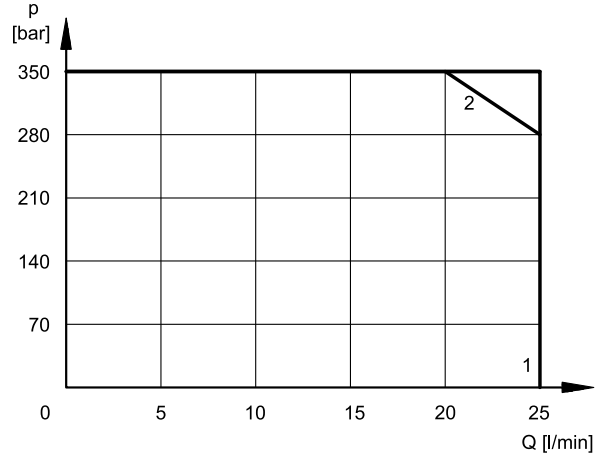
SOLENOID VALVE CENTRAL POSITION

SPOOL	FLOW DIRECTIONS				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPHS				
S2	-	-	-	-	1
S3	-	-	2	2	-
S4	-	-	-	-	2

5 - OPERATING LIMITS

The curves define the flow rate operating fields according to the valve pressure of the different versions. The operating limits can be considerably reduced if a 4-way valve is used as 3-way valve with port A or B plugged or without flow.

The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage. The value have been obtained with mineral oil, viscosity 36 cSt, temperature 50 °C and filtration according to ISO 4406:1999 class 18/16/13.



SPOOL	CURVE
S1, S2, S3, TA, TB, RK	1
S4	2

6 - SWITCHING TIMES

The values indicated are obtained according to ISO 6403 standard, with mineral oil viscosity 36 cSt at 50°C.

TIMES (±10%) [ms]	
ENERGIZING	DE-ENERGIZING
25 ÷ 75	15 ÷ 25

7 - ELECTRICAL FEATURES

7.1 - Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear.

The inner part, in contact with the oil in the return line, ensures heat dissipation. The interchangeability of coils of different voltages is allowed within the same type of supply current, alternating or direct.

The coil is fastened to the tube by a threaded ring, and can be rotated 360°, to suit the available space.

SUPPLY VOLTAGE FLUCTUATION	±10% Vnom
MAX SWITCH ON FREQUENCY	10.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC)(NOTE)	In compliance with 2014/30/EU
LOW VOLTAGE	In compliance with 2014/35/EU
CLASS OF PROTECTION: Coil insulation (VDE 0580) Impregnation	 class H class F

Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree, correctly connected and installed.

electric connection	electric connection protection	whole valve protection
K1 EN 175301-803 (ex DIN 43650)	IP65	IP65
K2 AMP JUNIOR	IP65/IP67	
K7 DEUTSCH DT04 male	IP65/IP67	

NOTE: In order to further reduce the emissions, use of type H connectors is recommended. These prevent voltage peaks on opening of the coil supply electrical circuit (see cat. 49 000).

7.2 - Current and power consumption

In direct current energizing, current consumption stays at fairly constant values, essentially determined by Ohm's law: V = R x I

The table shows current and power consumption values related to coil types.

(values ±10 %)

	Resistance at 20°C [Ω]	Current consumption [A]	Power consuption [W]	Coil code		
				K1	**K2**	**K7**
D12	4.98	2.41	28.9	1903560	1903640	1903650
D24	21	1.15	28	1903561	1903641	1903651

8 - ELECTRIC CONNECTORS

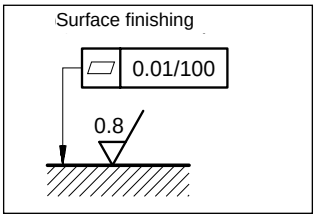
The solenoid valves are not supplied with connector. Connectors type EN 175301-803 (ex DIN 43650) for K1 connections can be ordered separately**.** For the identification of the connector type to be ordered, please see catalogue 49 000.

9 - INSTALLATION

The valves can be mounted in any position.

Valve fitting takes place by means of screws or tie rods, fixing the valve on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing.

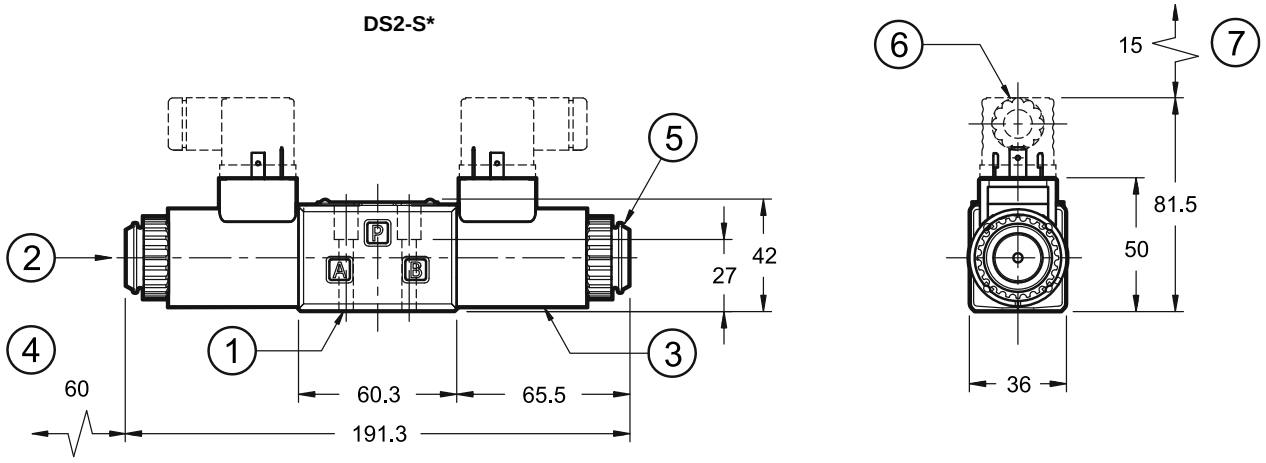
If the minimum values of planarity or smoothness are not met, fluid leakages between valve and mounting surface can easily occur.

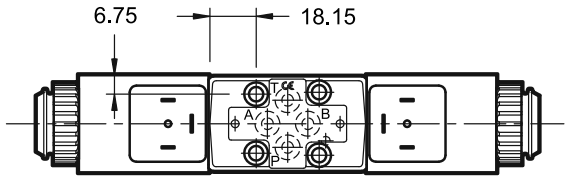


10 - OVERALL MOUNTING AND DIMENSIONS

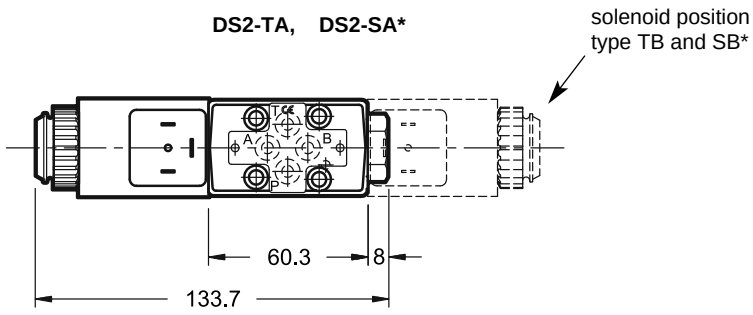
dimensions in mm

DS2-S*





DS2-TA, DS2-SA*



Single valve fastening: 4 SHC screws M5x35 - ISO 4762
Tightening torque: 5 Nm (bolts A 8.8)
Threads of mounting holes: M5x10

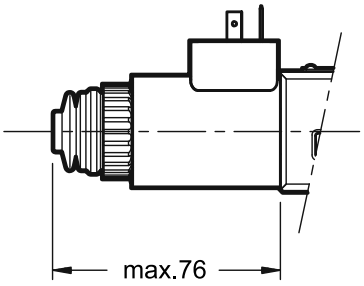
1	Mounting surface with sealing rings: N. 4 OR type 106 (6.75x1.78) - 90 Shore
2	Manual override, integrated in the tube
3	Coil (360° revolving)
4	Coil removal space
5	Locking ring: tightening torque: 5 Nm ± 0,5
6	EN 175301-803 (ex DIN 43650) electrical connector (to be ordered separately - see catalogue 49 000)
7	Connector removal space

11 - MANUAL OVERRIDES

11.1 - CM - boot protected manual override

The boot override can be ordered by entering the code **CM** in the identification code at par. 1, or is available as option to be ordered separately.

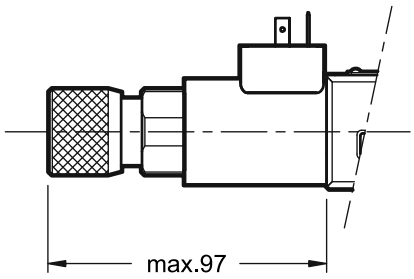
Code: **3404100043**



11.2 - Knob manual override

The knob override can be ordered by entering the code **CK1** in the identification code at par. 1, or is available as option to be ordered separately.

Code: **3404100041**



DUPLOMATIC MOTION SOLUTIONS
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duplomaticmotionsolutions.com

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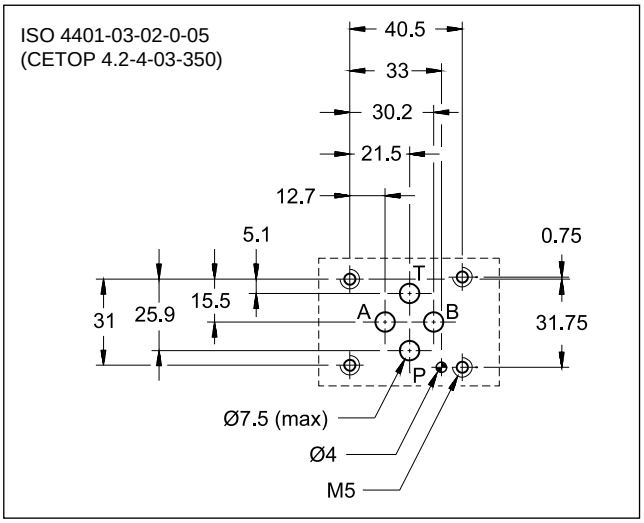
DS3

SOLENOID OPERATED DIRECTIONAL CONTROL VALVE

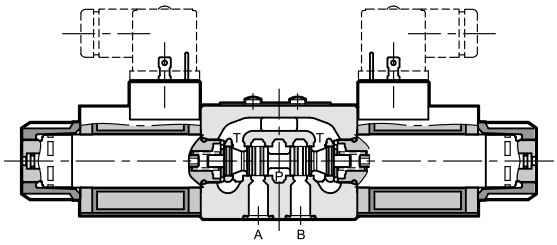
SUBPLATE MOUNTING ISO 4401-03

p max **350** bar
Q max **100** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



— Solenoid actuated directional control valve, direct operated, with mounting surface according to ISO 4401-03 standards.

— The valve is supplied with 3- or 4-port design, with 2 or 3 positions with a wide range of spools.

— The valve body is made with high strength iron castings provided with wide internal paths in order to minimize the flow pressure drop. Wet armature solenoids with interchangeable coils are used (for further information on solenoids see point 7).

— The valve is available with DC or AC solenoids. DC solenoids can also be fed with AC power supply, by using connectors with a built-in rectifier bridge (see points 6.3 and 7.3).

— Versions with UL/CSA Recognized DC coils are available for the North American market.

— The DC valve is also available in a soft-shifting version (see point 15).

— DC versions can be supplied with zinc-nickel surface treatment, suitable for salt spray resistance up to 600 hours.

— Alternative to the standard manual override there are lever, push button, knob, push and twist, boot and mechanical detent devices.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C)

		CC	CA
Maximum operating pressure: - P - A - B ports - T port	bar	350 210	160
Maximum flowrate	l/min	100	
Pressure drops Δp-Q	see point 4		
Operating limits	see point 6		
Electrical features	see point 7		
Electrical connections	see point 12		
Ambient temperature range	°C	-20 / +50	
Fluid temperature range	°C	-20 / +80	
Fluid viscosity range	cSt	10 ÷ 400	
Fluid contamination degree	according to ISO 4406:1999 class 20/18/15		
Recommended viscosity	cSt	25	
Mass: single solenoid valve double solenoid valve	kg	1,5 2	1,4 2

1 - IDENTIFICATION CODE

D	S	3	-		/	11		-				/		

Directional valve, solenoid operated

ISO 4401-03 size

Spool type (see point 3)

S*	**RSA***	**TA**	**RK**
SA*	**RSB***	**TB**	
SB*		**RTA**	
		RTB	
		TA*	
		TB*	

Series:
(the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

DC power supply

D12 = 12 V
D14 = 14 V
D24 = 24 V
D26 = 26.4 V
D48 = 48 V
D110 = 110 V
D125 = 125 V
D220 = 220 V
D00 = valve without coils, with locking rings and O-rings

AC power supply
A24 = 24 V - 50 Hz
A48 = 48 V - 50 Hz
A100 = 100 V - 50 Hz / 100 V - 60 Hz
A110 = 110 V - 50 Hz / 120 V - 60 Hz
A230 = 230 V - 50 Hz / 240 V - 60 Hz
A00 = valve without coils, with locking rings and O-rings
F110 = 110 V - 60 Hz
F220 = 220 V - 60 Hz

Coil version (see availability table):
Omit for standard zinc-plated version
W = corrosion-protected (point 8)
ULW = UL Recognized, corrosion-protected (points 7.2 and 8)

Coil electrical connection (see point 12):
K1 = plug for connector type EN 175301-803 (ex DIN 43650)
K2 = plug for connector type AMP JUNIOR
K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S
K7D = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S, with diode

For DC versions only, the following options are also available:
CH = lever manual override
Not available for RS*3 and RS*4.
CH1 = long lever manual override
Not available for RS*3 and RS*4.
CP = push manual override
CK1 = turning knob override
CK2 = push-and-twist override
CPK = push manual override with mechanical detent

Manual override:
(see point 14)
Omit for override integrated into the tube (**standard**)
CM = boot protected manual override

Option:
/ W7 = Zinc-nickel surface treatment (see **NOTE**)
Not available for AC valves.
Omit if not required (standard treatment: black phosphating)

AVAILABILITY

Voltage	conn.	coil version std	W	ULW
D12, D24	K1	■	■	■
	K7			■
	K7D		■	
	K2			■
D26	K1		■	■
	K7			■
D14, D48, D110, D125, D220	K1			■
A*, F*	K1	■		

NOTE: The valve protection level against atmospheric agents depends on the combination of the fitted components (configuration). See point 8 for further details.

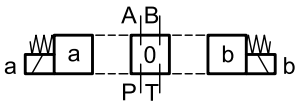
2 - HYDRAULIC FLUIDS

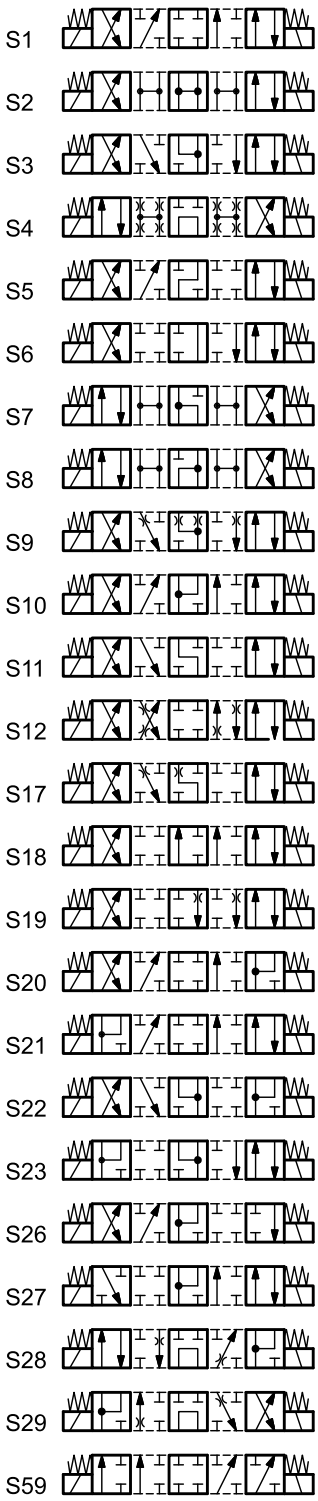
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

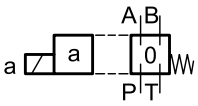
3 - SPOOL TYPES

Type **S***:
2 solenoids - 3 positions
with spring centering



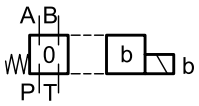


Type **SA***:
1 solenoid side A
2 positions (central + external)
with spring centering



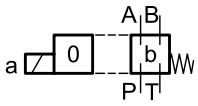


Type **SB***:
1 solenoid side B
2 positions (central + external)
with spring centering



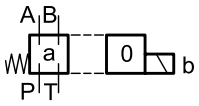


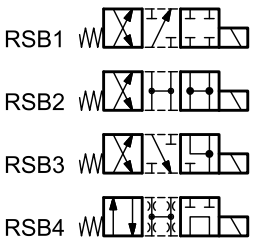
Type **RSA***:
1 solenoid side A
2 positions (external + central)
with return spring





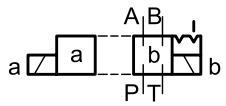
Type **RSB***:
1 solenoid side B
2 positions (external + central)
with return spring

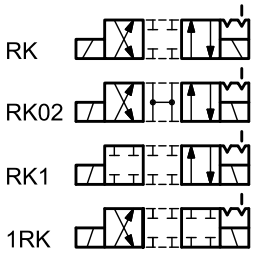




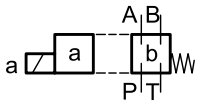
Besides the diagrams shown, which are the most frequently used, other special versions are available: consult our technical department for their identification, feasibility and operating limits.

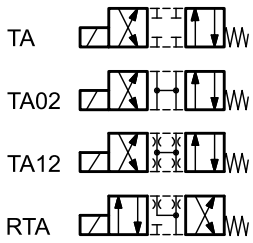
Type **RK**:
2 solenoids - 2 positions
with mechanical retention



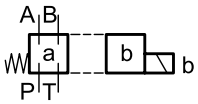


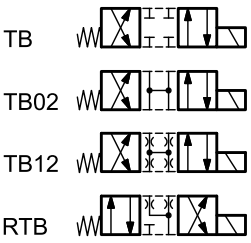
Type **TA**:
1 solenoid side A
2 external positions
with return spring



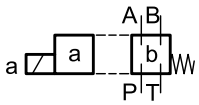


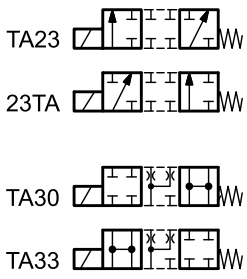
Type **TB**:
1 solenoid side B
2 external positions
with return spring



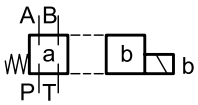


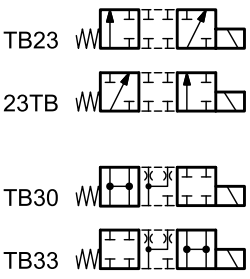
Type **TA***:
1 solenoid side A
2 positions with return spring





Type **TB***:
1 solenoid side B
2 positions with return spring

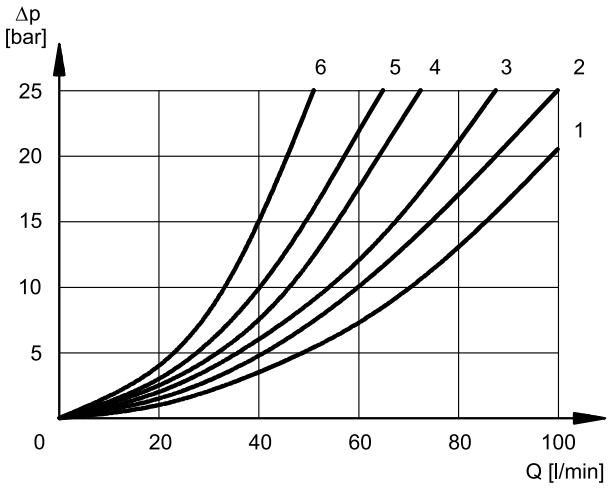




Besides the diagrams shown, which are the most frequently used, other special versions are available: consult our technical department for their identification, feasibility and operating limits.

4 - PRESSURE DROPS Δp-Q

(obtained with viscosity 36 cSt at 50 °C)



Refer to curve 5 for the pressure drops between working lines A and B of the spools S10, S20, S21, S22 and S23 used in regenerative schemes.

Refer to curve 3 for pressure drop P → T of the TA33 / TB33 spool.

ENERGIZED POSITION

SPOOL TYPE	FLOW DIRECTION			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPH			
S1, SA1, SB1	2	2	3	3
S2, SA2, SB2	1	1	3	3
S3, SA3, SB3, RSA3, RSB3	3	3	1	1
S4, SA4, SB4, RSA4, RSB4	5	5	5	5
S5	2	1	3	3
S6	2	2	3	1
S7, S8	4	5	5	5
S9	2	2	3	3
S10	1	3	1	3
S11	2	2	1	3
S12, S17, S19	2	2	3	3
S18	1	2	3	3
S20, S22	1	5	2	
S21, S23	5	1		2
S28	6	5	-	6
S29	5	6	6	-
S59	3	3	-	-
TA, TB	3	3	3	3
RTA	2	3	3	2
RTB	3	2	2	3
TA02, TB02	2	2	2	2
TA23, TB23	3	3		
TA33, TB33			3	2
RK, RK02, RK1, 1RK	2	2	2	2

DE-ENERGIZED POSITION

SPOOL TYPE	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S2, SA2, SB2					2
S3, SA3, SB3, RSA3, RSB3			3	3	
S4, SA4, SB4, RSA4, RSB4					3
S5		4			
S6				3	
S7, S8			6	6	3
S10	3	3			
S11			3		
S18	4				
S22, S23			3	3	
S28, S29				6	

5 - SWITCHING TIMES

The values indicated are obtained according to ISO 6403 standard, with mineral oil viscosity 36 cSt at 50°C.

SUPPLY	**TIMES [ms]**	
	ENERGIZING	DE-ENERGIZING
DC	25 ÷ 75	15 ÷ 25
AC	10 ÷ 25	15 ÷ 40

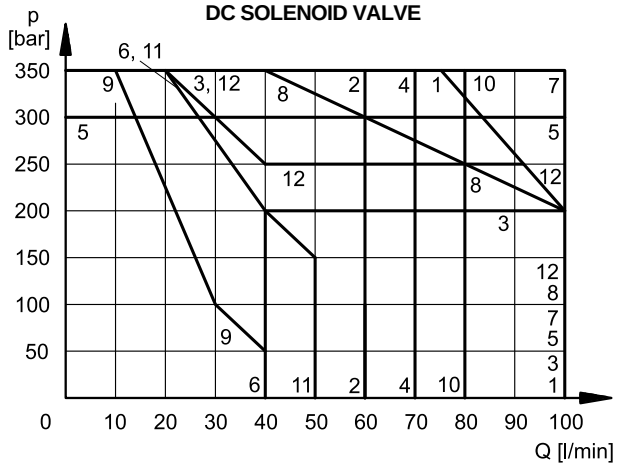
6 - OPERATING LIMITS

The curves define the flow rate operating fields according to the valve pressure of the different versions. The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage. The value have been obtained with mineral oil, viscosity 36 cSt, temperature 50 °C and filtration according to ISO 4406:1999 class 18/16/13.

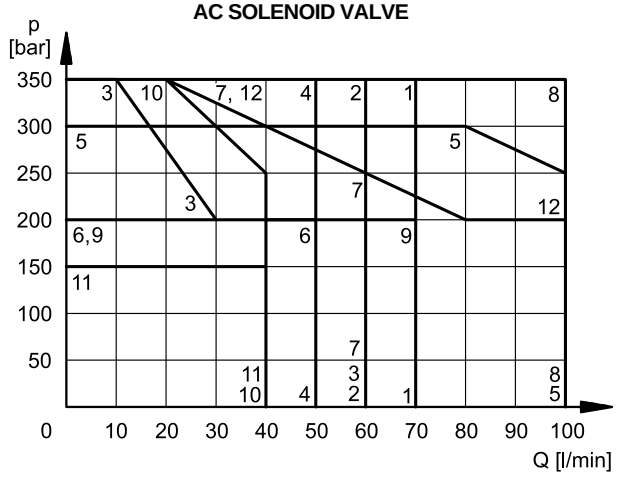
The limits for TA02 and TA spools refer to the 4-port operation. The operating limits of a 4-port valve in 3-port operation or with port A or B plugged or without flow are shown in the chart on the next page. The performance of the DC solenoid powered by AC with rectifier connectors are at point 6.4. The operating limits of the soft-shift valve are shown at point 14.

6.1 - Valves in standard operation

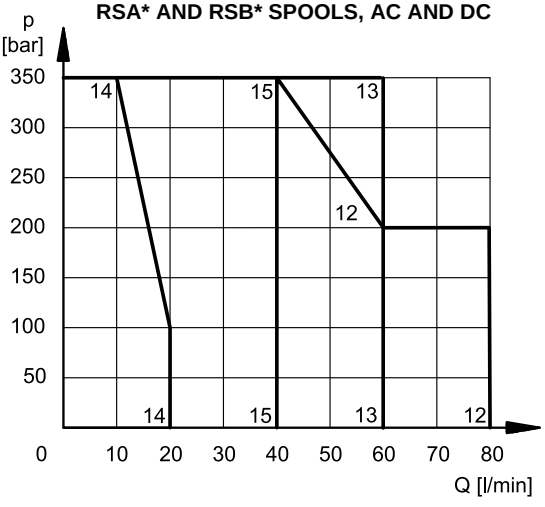
DC SOLENOID VALVE



AC SOLENOID VALVE



RSA* AND RSB* SPOOLS, AC AND DC



DC SOLENOID VALVE

SPOOL	CURVE	
	P→A	P→B
S1,SA1,SB1	1	1
S2, SA2, SB2	2	2
S3, SA3, SB3	3	3
S4, SA4, SB4	4	4
S5	5	5
S6	4	6
S7	4	4
S8	4	4
S9	7	7
S10	7	7
S11	4	6
S12	1	1
S17	4	4
S18	5	5
S19	4	4
S20	6*	6
S21	6	6*
S22	6	6
S23	6	6
S28	9*	9*
S29	9*	9*
S59	10	10
TA, TB	7	7
TA02, TB02	8	8
TA30	1	-
RTA, RTB	11	11
TA23, TB23	2	2
TA33, TB33	12	12
RK	7	7
RK02	8	8
RK1, 1RK	7	7

AC SOLENOID VALVE

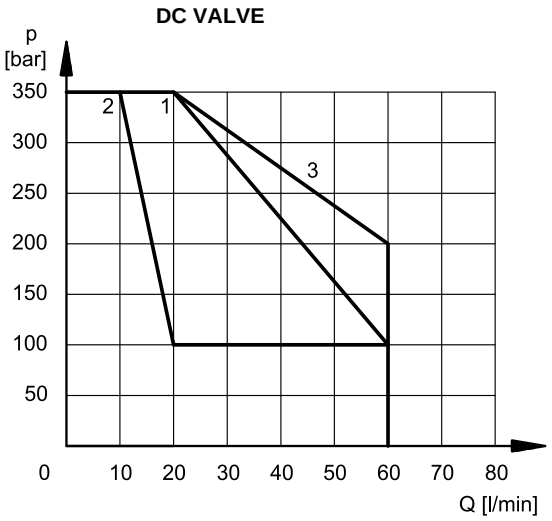
SPOOL	CURVE	
	P→A	P→B
S1,SA1,SB1	1	1
S2, SA2, SB2	2	2
S3, SA3, SB3	3	3
S4, SA4, SB4	2	2
S5	5	5
S6	6	6
S7	4	4
S8	4	4
S9	7	7
S10	8	8
S11	6	6
S12	2	2
S17	7	7
S18	5	5
S19	7	7
S20	10*	10
S21	10	10*
S22	10*	10
S23	10	11*
S28		
S29		
S59	2	2
TA, TB	1	1
TA02, TB02	1	1
TA30	5	-
RTA, RTB	11	11
TA23, TB23	2	2
TA33, TB33	12	12
RK	8	8
RK02	9	9
RK1, 1RK	8	8

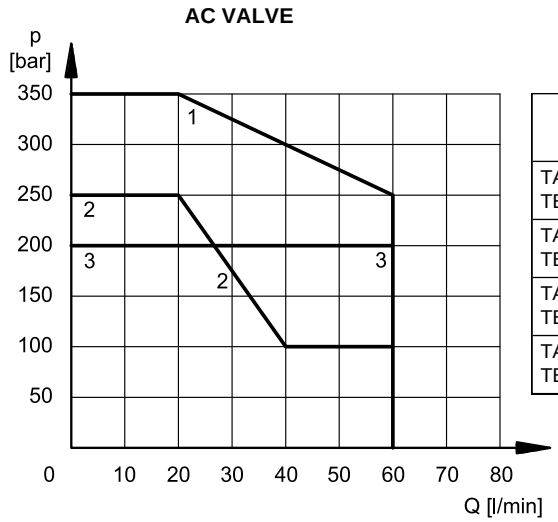
* Performance obtained for a valve with A and B lines connected the one to the piston-side chamber and the other to the rod-side chamber of a double-acting cylinder with area ratio 2:1.

SPOOL	CURVE
RSA1, RSB1	12
RSA2, RSB2	13
RSA3, RSB3	14
RSA4, RSB4	15

6.2 - 4-port valve in 3-port operation

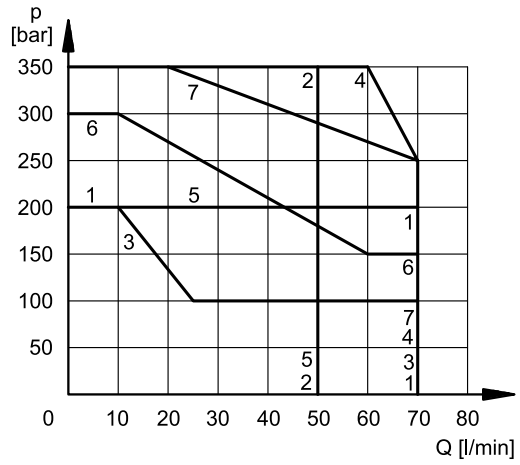
Operating limits of a 4-port valve in 3-port operation or with port A or B plugged or without flow.





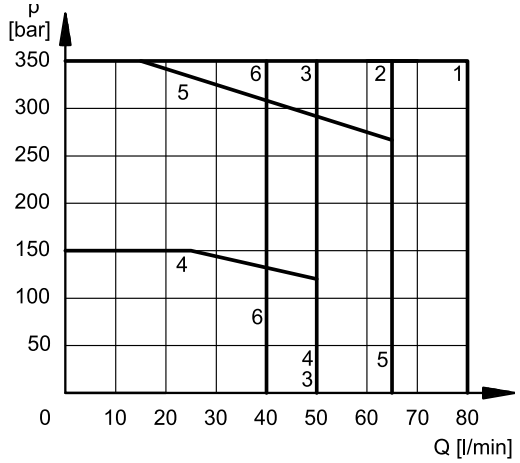
SPOOL	CURVE	
	DC	AC
TA backpr. A TB backpr. B	1	1
TA02 backpr. A TB02 backpr. B	1	1
TA backpr. B TB backpr. A	2	1
TA02 backpr. B TB02 backpr. A	3	3

6.3 - AC solenoid valve with coil A110 fed with 110V - 60 Hz



SPOOL	CURVE	
	P→A	P→B
S1,SA1, SB1	1	1
S2, SA2, SB2	2	2
S3, SA3, SB3	3	3
S4, SA4, SB4	4	4
S9	5	5
TA, TB	2	2
RK	6	6

6.4 - Operating limits for DC solenoid valves fed with AC with rectifier connectors



SPOOL	CURVE	
	P→A	P→B
S1, SA1, SB1	2	2
S2, SA2, SB2	3	3
S3, SA3, SB3	4	4
S4, SA4, SB4	2	2
S9	5	5
TA, TB	6	6
RK	1	1

7 - ELECTRICAL FEATURES

7.1 - Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation. The coil is fastened to the tube by a threaded ring, and can be rotated 360°, to suit the available space.

7.2 - UL Recognized coils

ULW type coils are UL Recognized Components (cUR@us marking) intended for installation within end-use equipment that is subject to evaluation in accordance with the applicable UL and CSA standards.

SUPPLY VOLTAGE FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY	18.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC) (NOTE)	In compliance with 2014/30/EU
LOW VOLTAGE	In compliance with 2014/35/EU
CLASS OF PROTECTION Coil insulation (VDE 0580) Impregnation: DC valve AC valve	 class H class F class H

NOTE: To further reduce emissions, when using a DC power supply, type H connectors are recommended. These prevent overvoltage peaks when the coil supply circuit is opened (see catalogue 49 000).

7.3. - DC solenoid valve - current and power consumption

The table shows current and power consumption values of the DC coils.

Using connectors type ‘D’ or ‘D1’(see cat. 49 000) with embedded bridge rectifier it is possible to feed DC coils with alternating current (50 or 60 Hz), considering a reduction of the operating limits (see diagram at point 6.4).

(values ± 10%)

	nominal voltage [V]	resistance at 20°C [Ω]	current consumpt [A]	power consumpt[W]
D12	12	4.4	2.72	32.7
D14	14	7.2	1.93	27
D24 (std, W)	24	18.6	1.29	31
D24 (ULW)	24	16.6	1.44	34.7
D26	26.4	21.8	1.21	32
D48	48	78.6	0.61	29.5
D110	110	436	0.26	28.2
D125	125	550	0.23	28.6
D220	220	1758	0.13	28.2

7.3.1 - DC coils with diode

K7D coils incorporate a suppression diode providing protection against voltage peaks. During switching, the diode limits the voltage generated by the coil winding to 31.4 V for the D12 coil and 58.9 V for the D24 coil.

7.4 - AC solenoid valve - current and power consumption

The table shows current and power consumption values at inrush and at holding, for AC coils.

(values ± 5%)

Suffix	Nominal Voltage [V]	Freq. [Hz]	Resistance at 20°C [Ω]	Current consumption at inrush [A]	Current consumption at holding [A]	Power consumption at inrush [VA]	Power consumption at holding [VA]
A24	24	50	1,69	5,81	1,32	139	32
A48	48		6,02	3,78	0,86	182	41
A100	100V-50Hz 100V-60Hz	50/60	23,3	2,11	0,48	211	48
				1,63	0,37	163	37
A110	110V-50Hz 120V-60Hz		33	1,76	0,40	194	44
				1,54	0,35	185	42
A230	230V-50Hz 240V-60Hz		135	0,92	0,21	213	48
				0,79	0,18	190	43
F110	110	60	28,5	1,45	0,33	160	36
F220	220		103	0,92	0,21	203	46

8 - PROTECTION AGAINST ENVIRONMENTAL CONDITIONS (DC SOLENOID VALVES)

The valve protection against environmental conditions depends on the combination of its individual components (valve body, coils, electrical connection and manual override). This determines both the corrosion resistance level and the IP degree of protection.

8.1 - IP degree of protection

The IP degree of protection is defined according to IEC 60529 and indicates the level of protection against the ingress of solid objects and liquids.

The actual IP degree of protection of the valve depends on the type of electrical connection, the solenoid tube protection and the design solutions adopted. The stated IP degree of protection is guaranteed only when a connector with an equivalent degree of protection is correctly wired and installed.

coil type	electrical connection type	IP rating	
		electrical conn.	valve
standard	**K1**	IP65	IP65
	K7	IP65/IP67	
W, ULW	**K1**	IP65	IP65
	K2	IP65/IP67	
	K7	IP65/IP67	
	K7D	IP65/IP67	
W, ULW + manual override type C*	**K1**	IP66	IP66
	K2	IP65/IP67	IP65/IP67
	K7	IP66/IP68/IP69 IP69K*	IP66/IP68/IP69 IP69K*
	K7D	IP66/IP68/IP69 IP69K*	IP66/IP68/IP69 IP69K*

(*) The IP69K degree of protection is not covered by IEC 60529 but is defined in ISO 20653.

IP Ratings: Selection Guide

The IP rating indicates protection against solid objects (first digit) and liquids (second digit). For solid objects, rating 6 is the highest level and provides complete dust protection. Our solenoid valves fall into this category.

For liquids, three types are distinguished:

- degree 1 to 6: protection against water jets;
- degree 7 and 8: protection against immersion;
- degree 9: protection against high-pressure, high-temperature water jets.

IP ratings are neither equivalent nor cumulative: IP66 covers lower ratings; IP68 covers IP67 only, not IP66, IP65 or lower ratings; IP69 does not cover any other rating.

Where a component complies with more than one type of protection, all applicable IP ratings shall be stated.

Example: equipment protected against powerful water jets and continuous immersion is marked IP66/IP68.

8.2 - Corrosion resistance

The valve body in the standard version is treated with a black phosphate coating, providing basic corrosion protection.

For applications requiring higher corrosion resistance, a zinc-nickel finish is available for the valve body (option /W7, point 1). When combined with standard coils, the zinc-nickel plated valve body provides corrosion resistance of up to 240 h in salt spray testing.

Complete valve configurations with a zinc-nickel finish on valve body, type W or ULW coils, and a type C* manual override providing solenoid tube protection provide corrosion resistance of up to 600 h in salt spray testing.

Salt spray tests are carried out in accordance with UNI EN ISO 9227, with results evaluated according to UNI EN ISO 10289.

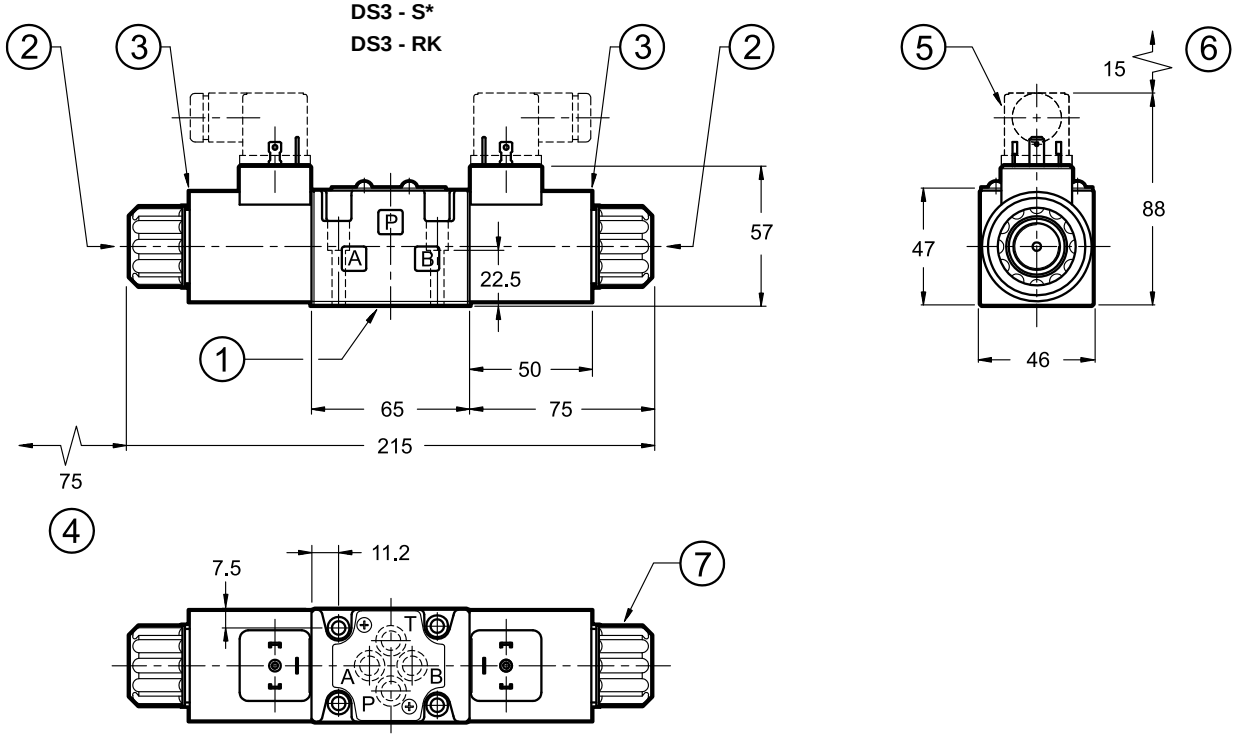
The availability of the various protection levels depends on the combination of design options selected and may vary according to supply voltage, electrical connection type and manual override selected (see availability table, point 1).

body type	**configurations**	**resistance**
standard (black phosphated)	Any configuration	-
W7 (zinc-nickel finish)	+ standard coil (zinc-plated)	240 h
	+ W or ULW coil	240 h
	+ W or ULW coil + type C* manual override	600 h

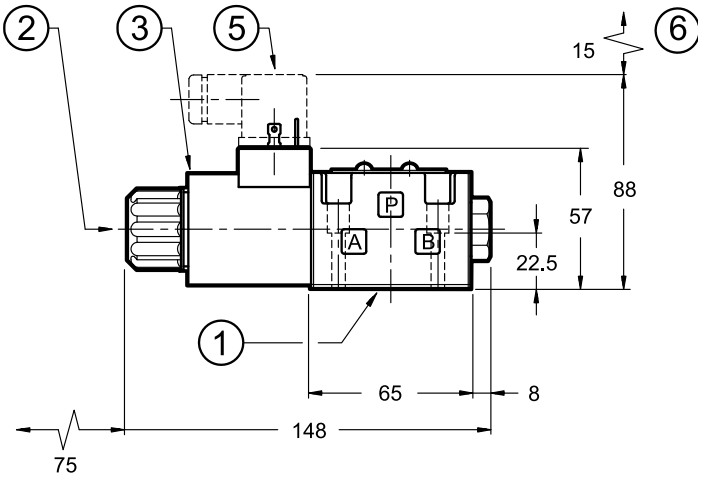
9 - OVERALL AND MOUNTING DIMENSIONS FOR DC SOLENOID VALVES

dimensions in mm

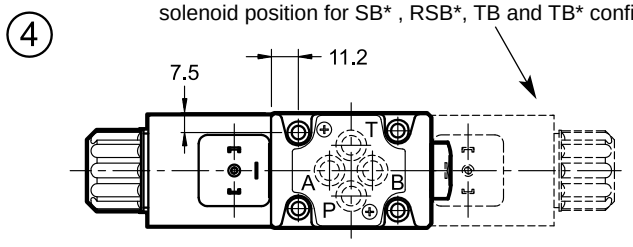
DS3 - S*
DS3 - RK



DS3-SA*, DS3-RSA*
DS3-TA, DS3-TA*



solenoid position for SB* , RSB*, TB and TB* configurations



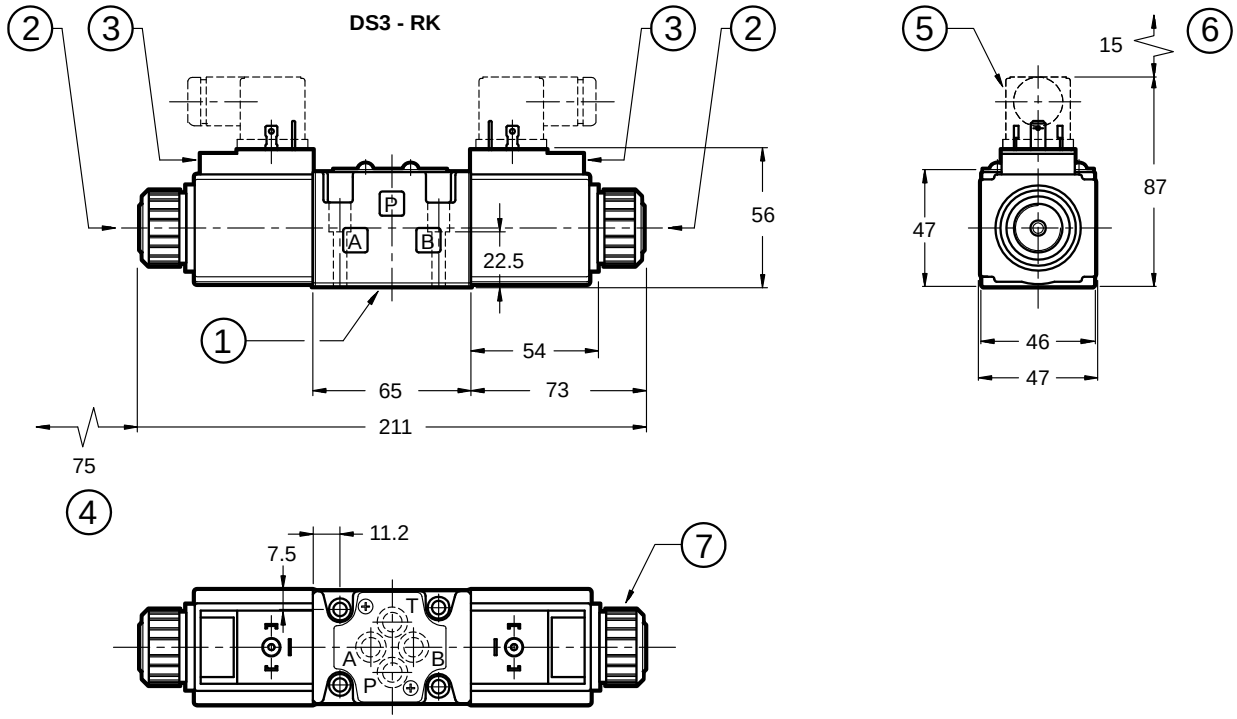
Valve fastening: 4 SHC screws ISO 4762 M5x30
Tightening torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

1	Mounting surface with sealing rings: 4 OR 2037 (9.25x1.78) - 90 shore
2	Standard manual override included in the solenoid tube
3	Coil (360° revolving)
4	Coil removal space
5	EN 175301-803 (ex DIN 43650) connector To be ordered separately. See cat. 49 000
6	Connector removal space
7	Locking ring: tightening torque 5 ±0.5 Nm

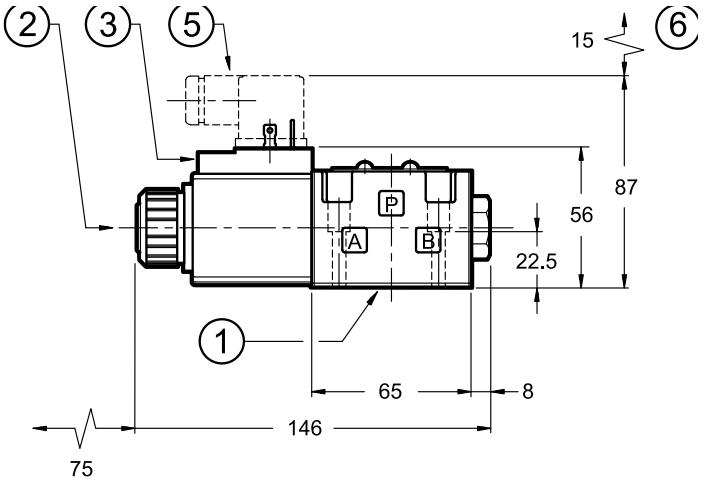
10 - OVERALL AND MOUNTING DIMENSIONS FOR AC SOLENOID VALVES

dimensions in mm

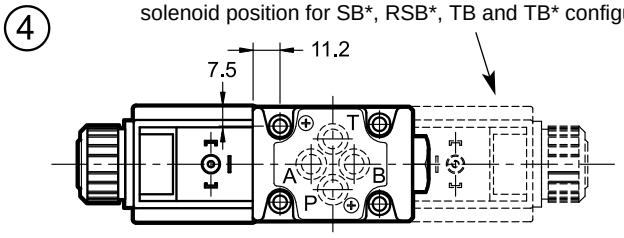
DS3 - S*
DS3 - RK



DS3-SA*, DS3-RSA*
DS3-TA, DS3-TA*



solenoid position for SB*, RSB*, TB and TB* configurations



Valve fastening: 4 SHC screws ISO 4762 M5x30
Tightening torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

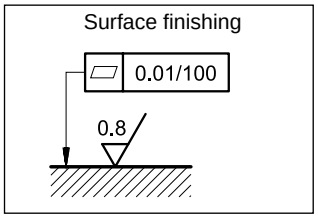
1	Mounting surface with sealing rings: 4 OR 2037 (9.25x1.78) - 90 shore
2	Standard manual override included in the solenoid tube
3	Coil (90° revolving)
4	Coil removal space
5	EN 175301-803 (ex DIN 43650) connector To be ordered separately. See cat. 49 000
6	Connector removal space
7	Locking ring: tightening torque 5 ±0.5 Nm

11 - INSTALLATION

Configurations with centering and return springs may be mounted in any position; type RK valves - without springs and with mechanical detent - must be mounted with the longitudinal axis horizontal.

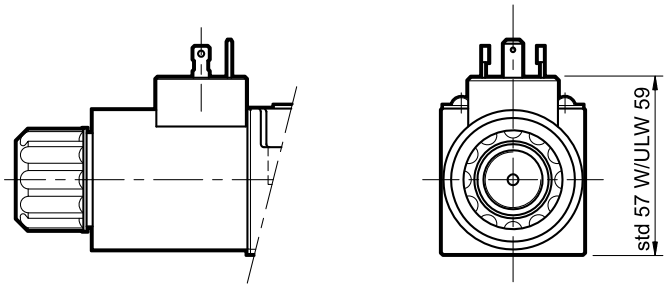
Valve fixing takes place by means of screws or tie rods, with the valve mounted on a lapped surface, with values of planarity and smoothness that are equal to or better than those specified by the relevant symbol.

If the minimum flatness and/or surface finish requirements are not met, fluid leakage may occur between the valve and the mounting surface.



12 - ELECTRIC CONNECTIONS

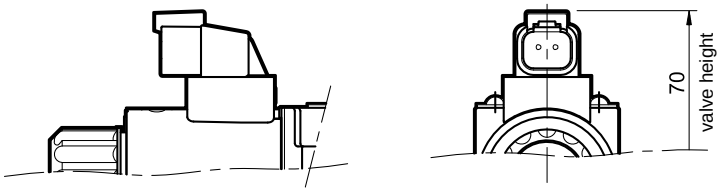
connection for EN 175301-803
(ex DIN 43650) connector
code **K1**



connection for AMP JUNIOR
connector
code **K2**



connection for
DEUTSCH DT06-2S male connector
code **K7**
code **K7D** (with diode)



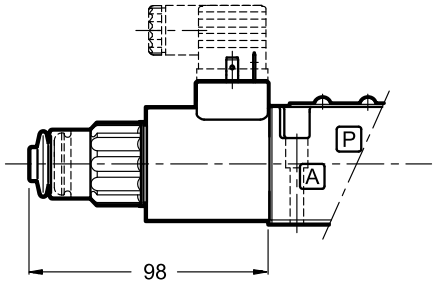
13 - ELECTRIC CONNECTORS

Solenoid operated valves are delivered without connectors. Connectors type EN 175301-803 (ex DIN 43650) for K1 connections can be ordered separately. See catalogue 49 000.

14 - MANUAL OVERRIDES

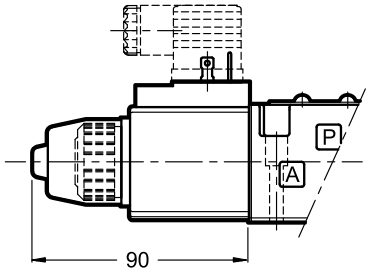
14.1 - Manual override, boot protected

CM-DS3/11 - Version for DC solenoid valve



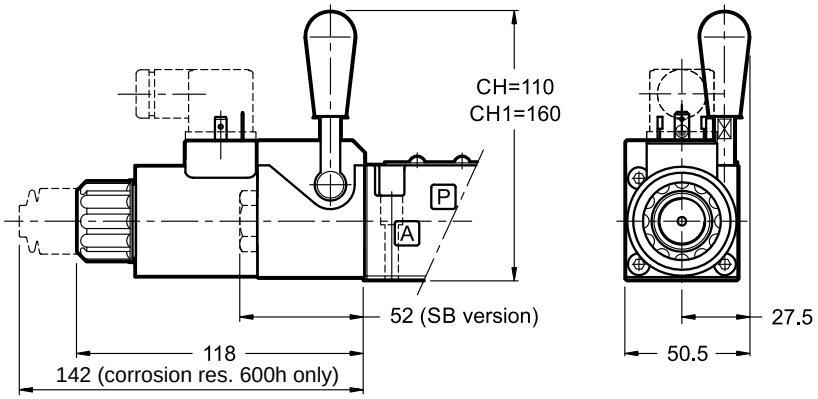
Code: 3401150006

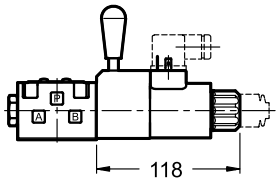
Version for AC solenoid valve



Code: 0269201

14.2 - CH-DS3/11 and CH1-DS3/10 Lever manual override (only for DC solenoid valve)

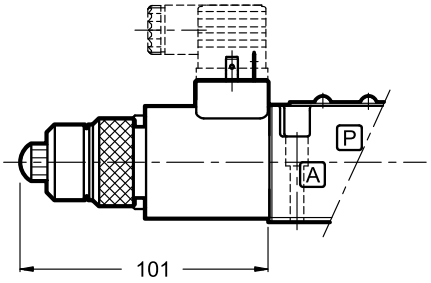




NOTES: The CH device is located on side A of the valve, except on DS3-TB valves.

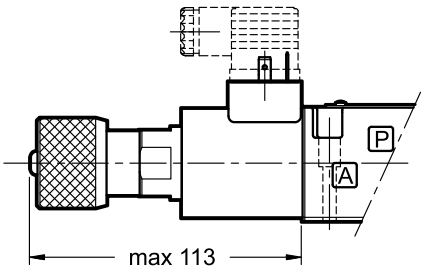
600h corrosion-resistant valves include a solenoid tube cap.

14.3 - CP-DS3/10 Push manual override (only for DC solenoid valve)



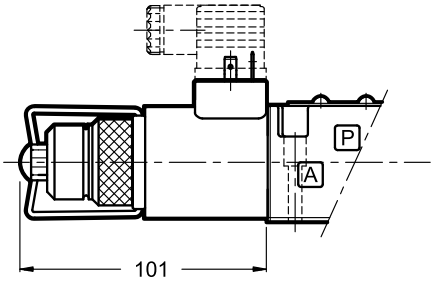
Code: 3401150005

13.4 - CK1-DS3/14 Knob manual override, turning (only for DC solenoid valve)



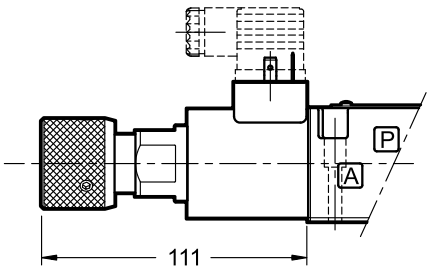
Code: 3401150031

14.5 - CPK-DS3/10 Push manual override with mechanical retention (only for DC solenoid valve)



Code: 3401150004

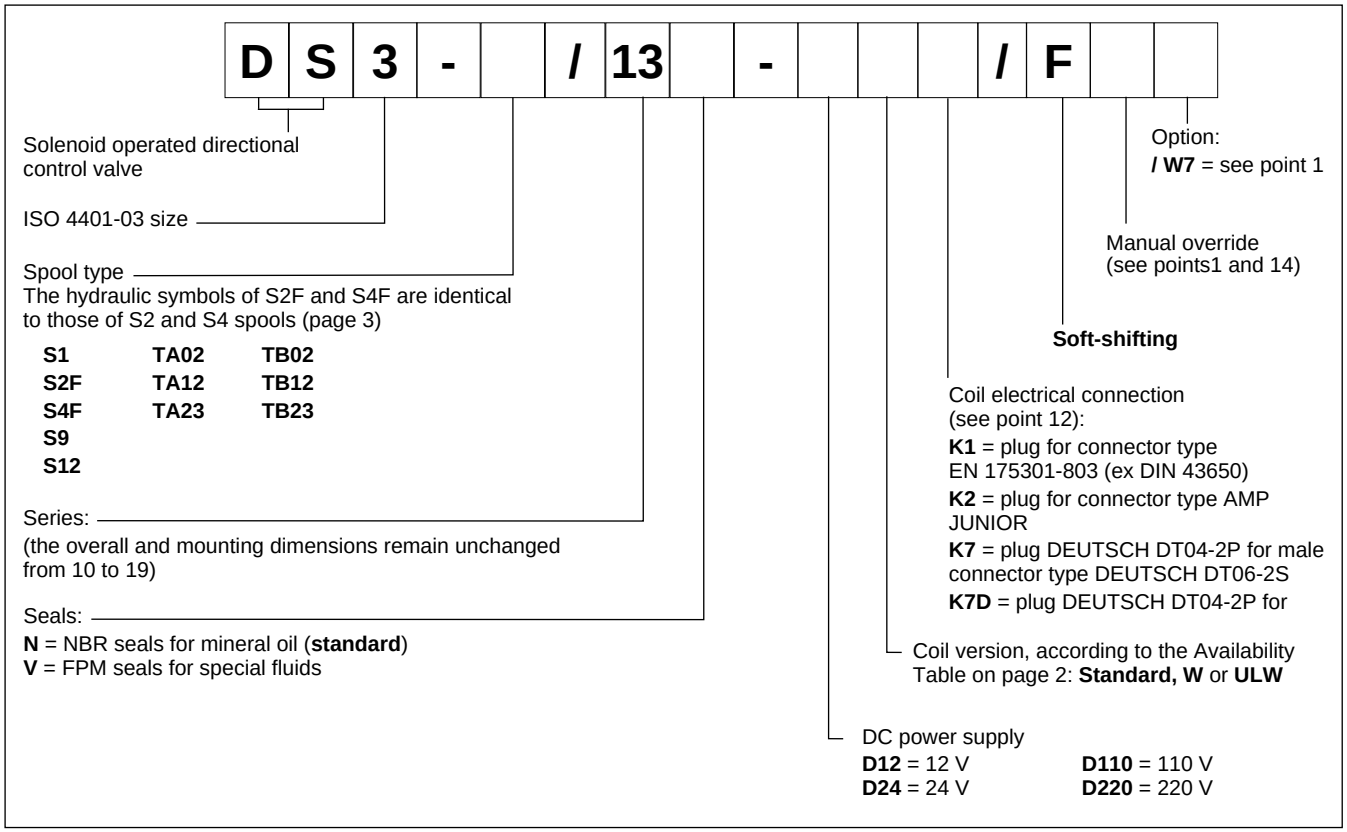
14.6 - CK2-DS3/12 Push and twist manual override (only for DC solenoid valve)



Code: 3401150026

15 - SOFT-SHIFT VERSION FOR DC VALVE

15.1 - Identification code



This version enables hydraulic actuators to perform a smooth start and stop by reducing the speed of movement of the valve spool.

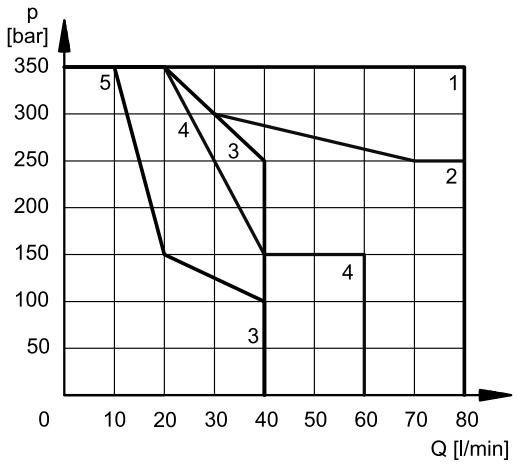
In this version, the S9 spool must be used instead of the S3 type.

The diagram on the side shows the operating limits of the spools available in the soft-shifting version, while the table shows the switching times.

The values indicated are obtained according to ISO 6403 standard, with mineral oil viscosity 36 cSt at 50°C.

The shifting time and characteristics curves are influenced by the viscosity (and thus by the temperature) of the operating fluid. Moreover, times can vary according to the flow rate and operating pressure values of the valve.

For correct operation of the soft-shifting ensure the solenoid tubes are always filled with fluid. For this matter, we recommend to install a backpressure valve set at 1 ÷ 2 bar on T line.



SPOOL	CURVE	TIMES [ms]	
		ENERGIZING	DE-ENERGIZING
S1, S12	1	350	200 ÷ 300
S2F	2	200	300 ÷ 400
S4F	3	350	150 ÷ 300
S9	1	400	200 ÷ 300
TA02, TB02	4	180	200 ÷ 300
TA12, TB12	5	180	200 ÷ 300
TA23, TB23		300	200 ÷ 300

16 - VERSION WITH FIXING INTERCHANGEABLE WITH 4WE6*6X REXROTH

16.1 - Identification code

D	S	3	R	-		/	11		-			/		

Directional valve, solenoid operated

ISO 4401-03 size

Fastening screws interchangeable with Rexroth 4WE6*6X valve.

Spool type (see point 3)

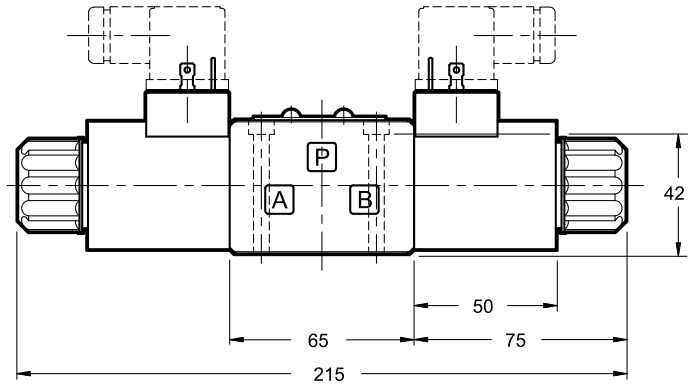
S* **SA*** **SB*** **RSA*** **RSB*** **TA** **TB** **TA*** **TB*** **RK**

Complete the indentification code configuration as for in point 1.

Series:
(the overall and mounting dimensions remain unchanged from 10 to 19)

16.2 - Overall and mounting dimensions for DC solenoid valves

dimensions in mm

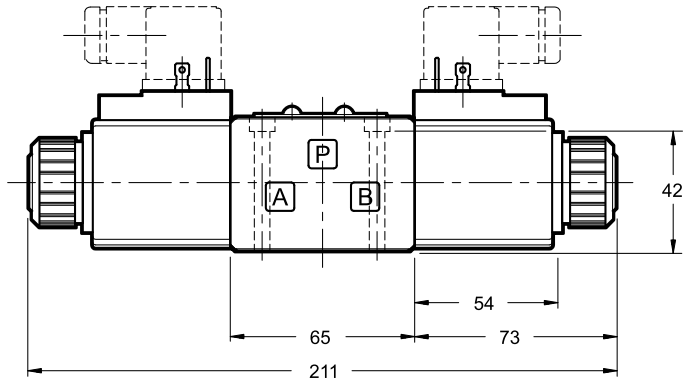


Please refer to the standard valve at point 9 for non-quoted dimensions.

Valve fastening: 4 SHC screws ISO 4762 M5x50
Tightening torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

16.3 - Overall and mounting dimensions for AC solenoid valves

dimensions in mm



Please refer to the standard valve at point 10 for non-quoted dimensions.

Valve fastening: 4 SHC screws ISO 4762 M5x50
Tightening torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

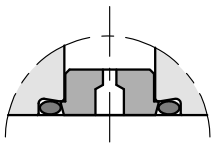
17 - PORT RESTRICTORS

Port restrictors are recommended when flow variations during switching exceed the valve's performance limits, or when circuit dampening is required.

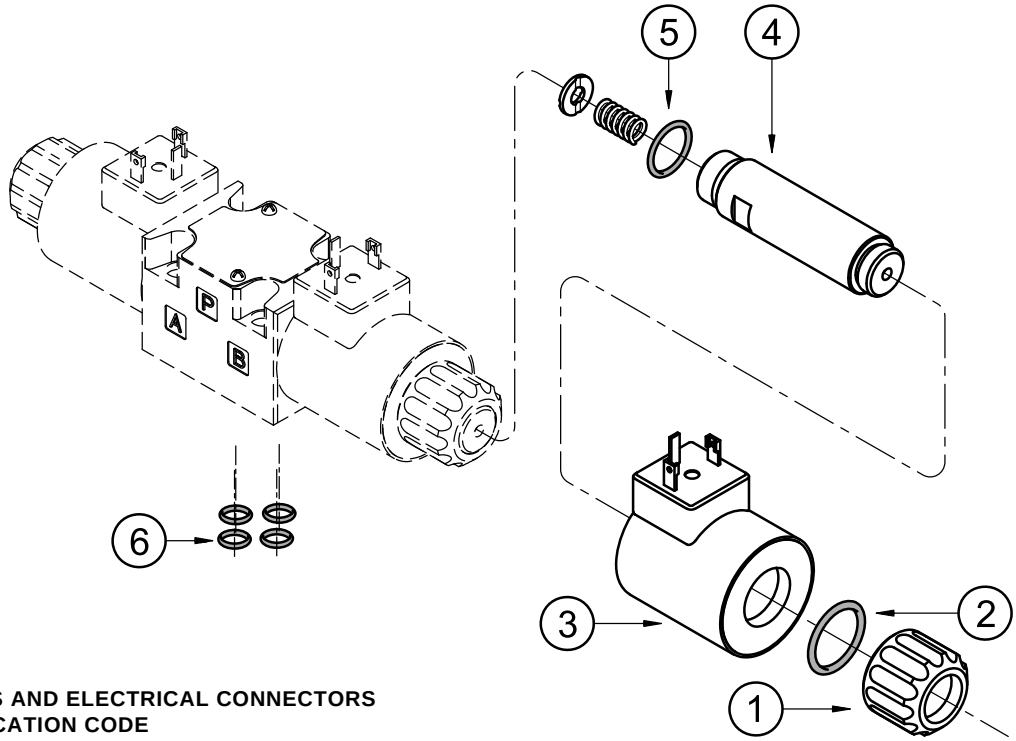
Port restrictor can be ordered separately using the part numbers shown at left.

Ø (mm)	part number
blank	**0144162**
0.6	**0144163**
0.8	**0144033**
1	**0144034**

Ø (mm)	part number
1.2	**0144035**
1.5	**0144036**
1.8	**0144164**
2	**0144165**



18 - SPARE PARTS FOR DC SOLENOID VALVE



DC COILS AND ELECTRICAL CONNECTORS IDENTIFICATION CODE

C	22S3	-				/		

Supply voltage

D12 = 12 V
D14 = 14 V
D24 = 24 V
D26 = 26.4 V
D48 = 48 V
D110 = 110 V
D125 = 125 V
D220 = 220 V

Only for ULW coils:
A = internal code

Series no.:
11 = for D12 and D24 K1 standard
20 = for W and ULW coils types

Coil electrical connection (see point 12):

K1 = plug for connector EN 175301-803 (ex DIN 43650)

K2 = plug for connector AMP JUNIOR

K7 = plug DEUTSCH DT04-2P, for male connector type DEUTSCH DT06-2S.

K7D = plug DEUTSCH DT04-2P, for male connector type DEUTSCH DT06-2S, with diode.

Coil version
(see availability table on page 2):

Omit for standard zinc-plated version
W = corrosion-protected
ULW = UL Recognized and corrosion-protected

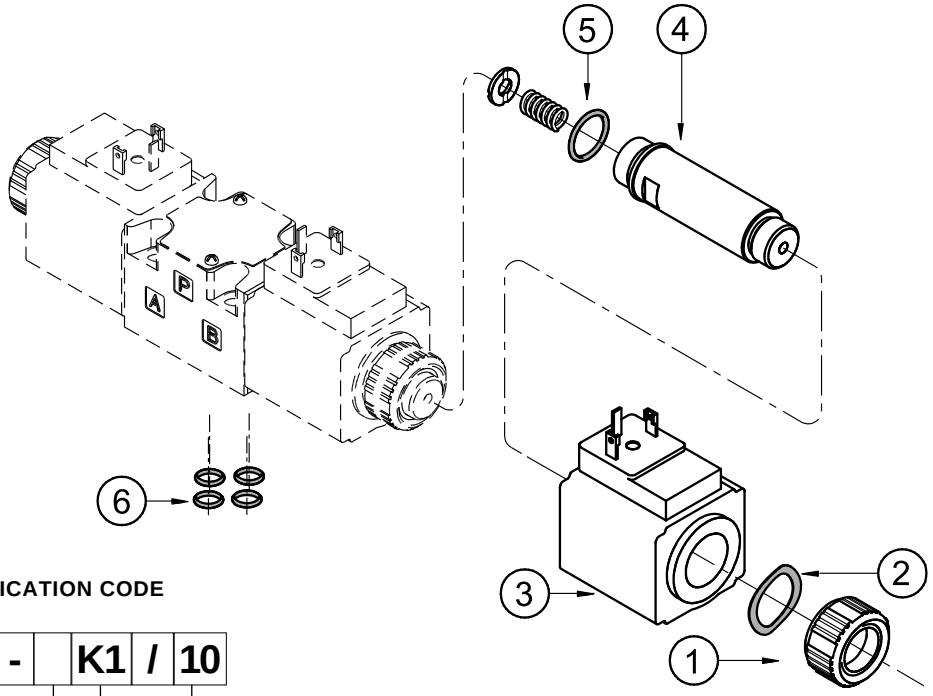
1	Coil locking ring with seal included cod. 0119412 Tightening torque 5 ±0.5 Nm
2	ORM type 0220-20 (22x2) - 70 Shore
3	Coil (see identification code)
4	Solenoid tube for standard version: **NOTE:** OR n°5 included
5	OR type 2062 (15.6x1.78) - 70 Shore
6	4 OR type 2037 (9.25x1.78) - 90 Shore

SEALS KIT

The codes include the O-Ring No. 2, 5 and 6.

Cod. 1985406 NBR seals
Cod. 1985410 FPM (viton) seals

19 - SPARE PARTS FOR AC SOLENOID VALVE



AC COILS IDENTIFICATION CODE

C	20.6S3	-		K1	/	10

Supply voltage
A24 = 24 V - 50 Hz
A48 = 48 V - 50 Hz
A100 = 100 V - 50 Hz
100 V - 60 Hz
A110 = 110 V - 50 Hz
120 V - 60 Hz
A230 = 230 V - 50 Hz
240 V - 60 Hz
F110 = 110 V - 60 Hz
F220 = 220 V - 60 Hz

Plug for connector type
EN 175301-803
(ex DIN 43650)

Series no.:
(the overall and mounting dimensions remain unchanged from 10 to 19)

1	Coil locking ring cod. 0119333 Tightening torque 5 ±0.5 Nm
2	Snap ring cod. 0550483
3	Coil (see identification code on the side)
4	Solenoid tube : **NOTE**: OR n° 5 included
5	OR type 2062 (15.6x1.78) - 70 Shore
6	N. 4 OR type 2037 (9.25x1.78) - 90 Shore

SEALS KIT
The codes include the OR No. 5 and 6.

Cod. 1985406 NBR seals
Cod. 1985410 FPM (viton) seals

20 - SUBPLATES
(see catalogue 51 000)

Type PMMD-AI3G with rear ports 3/8” BSP
Type PMMD-AL3G with side ports 3/8” BSP

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duplomaticmotionsolutions.com

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MOTION SOLUTIONS

WWW.SUMY.IR



DS3L

8 WATT SOLENOID OPERATED DIRECTIONAL CONTROL VALVE

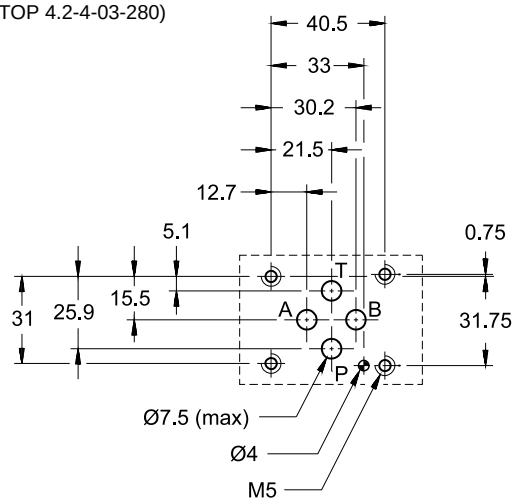
SERIES 10

SUBPLATE MOUNTING ISO 4401-03

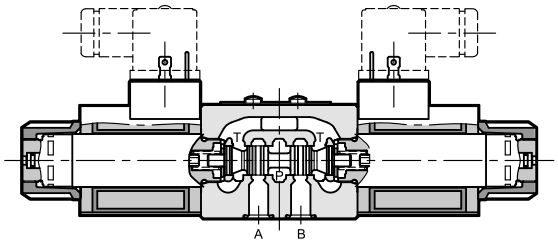
p max **280** bar
Q max **60** l/min

MOUNTING INTERFACE

ISO 4401-03-02-0-05
(CETOP 4.2-4-03-280)



OPERATING PRINCIPLE



— Low consumption (8 watt) direct operated directional solenoid valve for subplate mounting, with mounting surface according to ISO 4401-03 standards.

— The valve body is made with high strength iron castings provided with wide internal passages in order to minimize the flow pressure drop. Wet armature solenoids with interchangeable coils are used (for further information on solenoids see point 7).

— The valve is available in the 4-port version, 2 or 3 positions, and with the most common spools.

— It is available also with zinc-nickel surface treatment, that ensures a salt spray resistance up to 240 hours.

— Solenoids are 24 V power supply, DC.

PERFORMANCES

(with mineral oil of viscosity of 36 cSt at 50°C)

Maximum operating pressure: - ports P - A - B - port T	bar	 280 210
Maximum flow rate	l/min	60
Pressure drop Δp-Q	see point 4	
Operating limits	see point 5	
Electrical features	see point 7	
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	according to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass: single solenoid valve double solenoid valve	kg	1.5 2

1 - IDENTIFICATION CODE

D	S	3	L	-		/	10		-	DL24	WK1	

Solenoid operated directional control valve

ISO 4401-03 size

Low energy consumption

Spool type (see point 2):

S*	**TA**
SA*	**TB**
SB*	**RK**

Series No.
(the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
N = NBR seals for mineral oil (standard)
V = FPM seals for special fluids

DC power supply 24 V

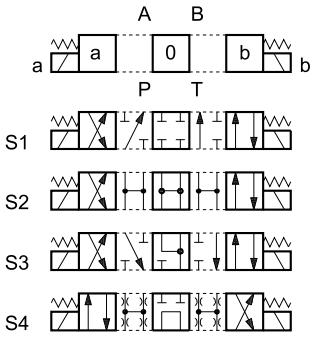
Coil electrical connection:
plug for connector type
EN 175301-803 (ex DIN 43650)

Option:
/ W7 = Zinc-nickel surface treatment (see **NOTE**).
Omit if not required

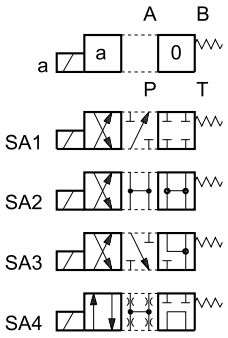
NOTE: The standard valve is supplied with surface treatment of phosphating black.
The zinc-nickel finishing on the valve body makes the valve suitable to ensure a salt spray resistance up to **240** hours.
For a salt spray resistance up to **600** hours refer to **point 11.**
(test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

2 - SPOOL TYPE

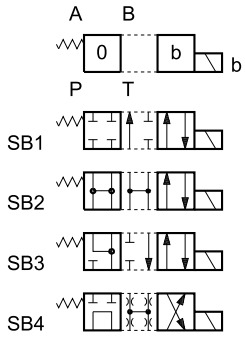
Type **S***:
2 solenoids - 3 positions
with spring centering



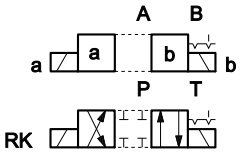
Type **SA***:
1 solenoid side A
2 positions (central + external)
with spring centering



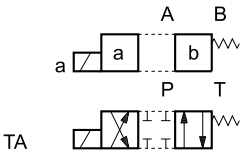
Type **SB***:
1 solenoid side B
2 positions (central + external)
with spring centering



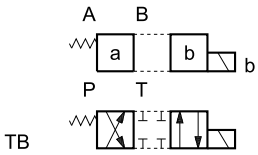
Type **RK**:
2 solenoids - 2 positions
with mechanical retention



Type **TA**:
1 solenoid side A
2 external positions
with return spring



Type **TB**:
1 solenoid side B
2 external positions
with return spring



NOTE: Others spools are available on request only.

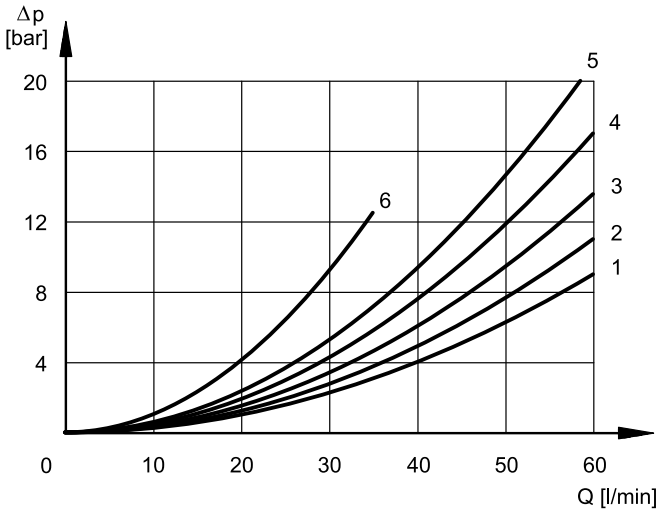
3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

4 - PRESSURE DROPS ΔP-Q

(obtained with viscosity of 36 cSt at 50 °C)



ENERGIZED VALVE

SPOOL	FLOW DIRECTIONS				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S1, SA1, SB1	2	2	3	3	
S2, SA2, SB2	1	1	2	2	3
S3, SA3, SB3	3	3	1	1	
S4, SA4, SB4	5	5	5	5	
TA, TB	3	3	4	3	
RK	2	2	3	3	

DE-ENERGIZED VALVE

SPOOL	FLOW DIRECTIONS				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S3, SA3, SB3			6	6	

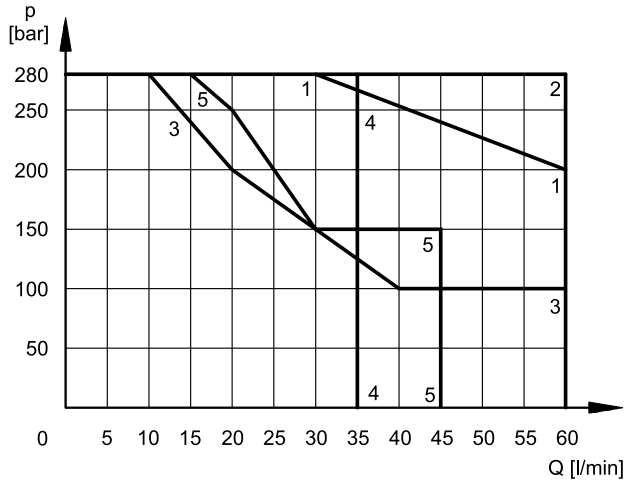
5 - OPERATING LIMITS

The curves define the flow rate operating fields according to the valve pressure of the different versions.

The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage and connectors type EN 175301-803 supplied by a mechanical relay without any electronics (e.g. diode) in between.

The values have been obtained with mineral oil, viscosity 36 cSt, temperature 50 °C and filtration according to ISO 4406:1999 class 18/16/13.

TA spools limits refer to the 4-port operation. The operating limits of a 4-port valve in 3-port operation or with port A or B plugged or without flow may reduce considarbly.



SPOOL	CURVE
S1	1
S2	2
S3	3
S4	4
TA	5
RK	2

6 - SWITCHING TIMES

The values indicated are obtained with spool S2, according to ISO 6403 standard, with mineral oil viscosity 36 cSt at 50 °C.

TIMES (±10%) [ms]	
ENERGIZING	DE-ENERGIZING
100	20 ÷ 30

7 - ELECTRICAL FEATURES

7.1 - Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation.

The coil is fastened to the tube by a threaded ring, and can be rotated 360°, to suit the available space.

SUPPLY VOLTAGE FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY	7.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	In compliance with 2014/30/EU
LOW VOLTAGE	In compliance with 2014/35/EU
CLASS OF PROTECTION Atmospheric agents IEC 60529 Coil insulation (VDE 0580) Impregnation	 IP65 (**NOTE**) class H class F

NOTE: The IP65 protection degree is guaranteed only with the connector correctly connected and installed.

7.2 - Current and absorbed power for solenoid valve

The table shows current and power consumption values relevant to the 24 VDC coil.

Coil for direct current (values ±10%)

	Nominal voltage [V]	Resistance at 20°C [Ω]	Current consumpt. [A]	Power consumpt. [W]	Coil code
DL24	24	64.6	0.37	8.92	3984000022

8 - ELECTRIC CONNECTORS

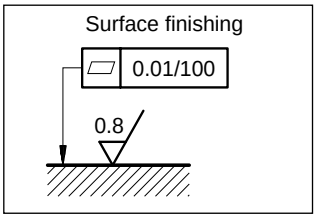
Connectors must be ordered separately. See catalogue 49 000.

9 - INSTALLATION

Configurations with centering and return springs can be mounted in any position; type RK valves - without springs and with mechanical detent - must be mounted with the longitudinal axis horizontal.

Valve fitting takes place by means of screws or tie rods, fixing the valve on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing.

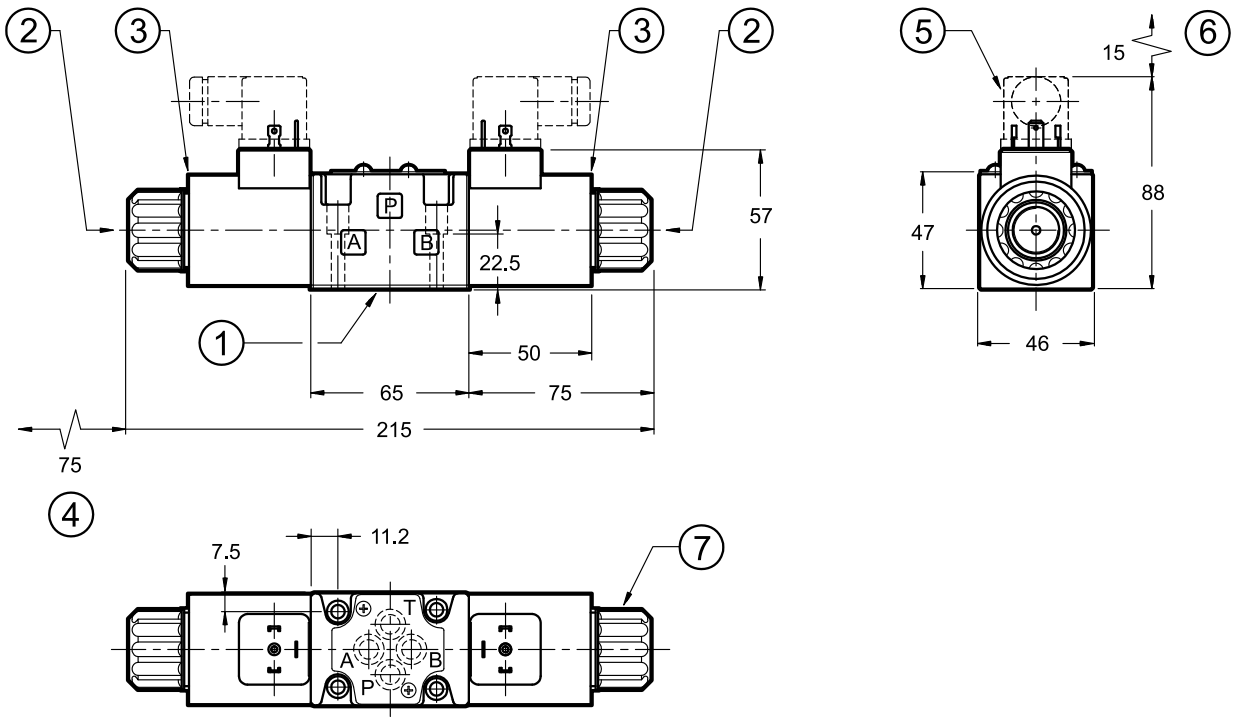
If the minimum values of planarity or smoothness are not met, fluid leakages between valve and mounting surface can easily occur.



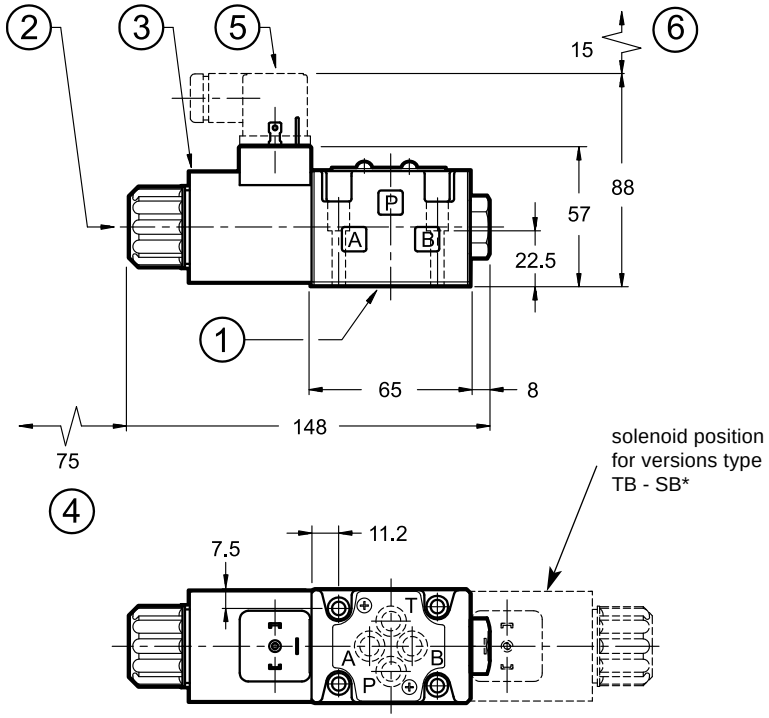
10 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

DS3L-S*



DS3L-TA, DS3L-SA*



Valve fastening: 4 SHC screws ISO 4762 M5x30
Tightening torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

1	Mounting surface with sealing rings: 4 OR 2037 (9.25x1.78) - 90 shore
2	Standard manual override included in the solenoid tube
3	Coil (360° revolving)
4	Coil removal space
5	EN 175301-803 (ex DIN 43650) connector to be ordered separately (see cat. 49 000)
6	Connector removal space
7	Locking ring: tightening torque 5 ±0.5 Nm

11 - HIGH IP DEGREE AND CORROSION RESISTANCE VERSION

11.1 - Identification code

D	S	3	L	-		/	10		-	DL24	WK1	/	CM	/	W7

Choices as in standard identification code (see point 1)

Coil electrical connection: plug for connector type EN 175301-803 (ex DIN 43650)

Manual override, boot protected

11.2 - Corrosion resistance

This version features the zinc-nickel coating on all exposed metal parts of the valve, making it resistant to exposure to the salt spray for **600** hours (test performed according to UNI EN ISO 9227 and assessment test performed according to UNI EN ISO 10289).

11.3 - Coils

The coils feature a zinc-nickel surface treatment.

The electrical characteristics do not change compared to the standard version: see table in point 7.2.

11.4 - Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree, correctly connected and installed.

electric connection	electric connection protection	whole valve protection
WK1	IP66	IP66

NOTE: As regards the liquid ingress protection (second digit), there are three means of protection.

Codes from 1 to 6 are related to water jets.

Rates 7 and 8 are related to immersion.

Rate 9 is reserved for high pressure and temperature water jets.

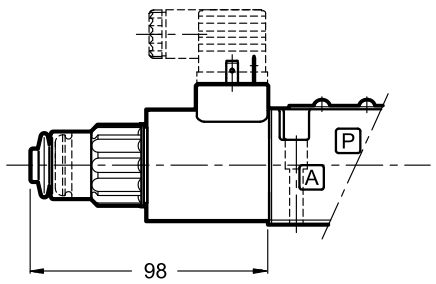
This means that IPX6 covers all the lower steps, rate IPX8 covers IPX7 but not IPX6 and lower, instead IPX9 does not cover any of them.

Whether a device meets two types of protection requirements it must be indicated by listing both the tests separated by a slash.

(E.g. a marking of an equipment covered both by temporary immersion and water jets is IP66/IP68).

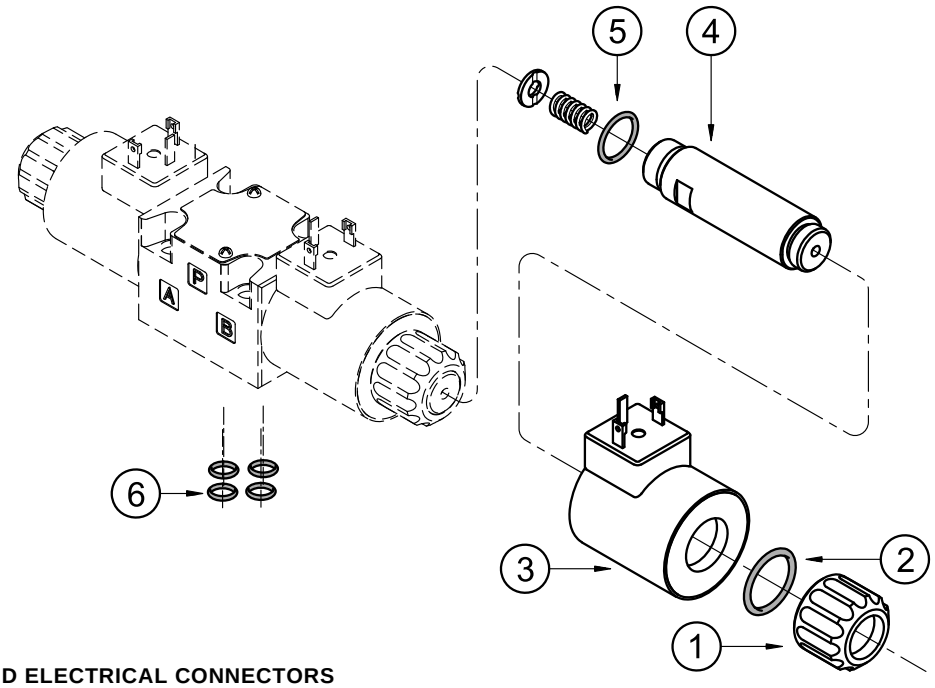
12 - MANUAL OVERRIDE

CM manual override, boot protected



Code: 3401150006

13 - SPARE PARTS



DC COILS AND ELECTRICAL CONNECTORS IDENTIFICATION CODE

C	22L3B	-	DL24	WK1	/	20

Supply voltage

Series no.:
(the overall and mounting dimensions remain unchanged from 20 to 29)

Coil electrical connection:
plug for connector type
EN 175301-803 (ex DIN 43650)

1	Coil locking ring with seal included cod. 0119412 Tightening torque 5 ±0.5 Nm
2	ORM type 0220-20 (22x2) - 70 Shore
3	Coil (see identification code on the side)
4	Solenoid tube for standard version: TDM22-DS3L/10N (NBR seals) TDM22-DS3L/10V (FPM seals) **NOTE:** OR n°5 included
5	OR type 2062 (15.6x1.78) - 70 Shore
6	N. 4 OR type 2037 (9.25x1.78) - 90 Shore

SEALS KIT

The codes include the O-Ring n° 2, 5 and 6.
Cod. 1985406 NBR seals
Cod. 1985410 FPM (viton) seals

14 - SUBPLATES

(see catalogue 51 000)

Type PMMD-AI3G with rear ports 3/8” BSP
Type PMMD-AL3G with side ports 3/8” BSP

DUPLOMATIC
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IO-Link



DS3GL

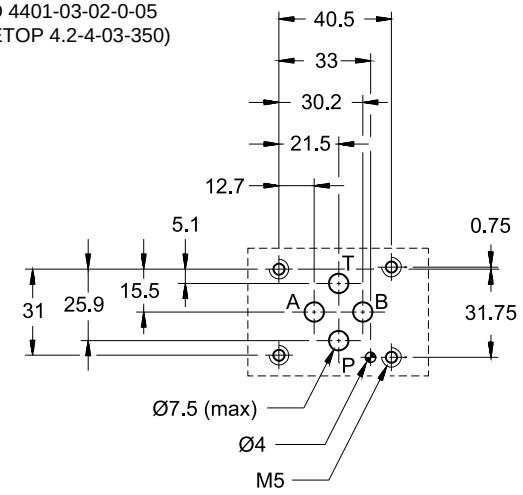
SOLENOID OPERATED DIRECTIONAL VALVE WITH DIGITAL INTERFACE

SUBPLATE MOUNTING ISO 4401-03

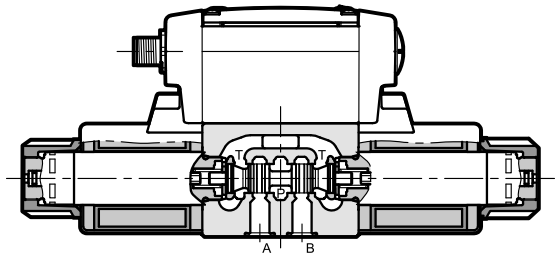
p max **350** bar
Q max **80** l/min

MOUNTING INTERFACE

ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)



OPERATING PRINCIPLE



— Directional valve with digital interface, solenoid actuated, with mounting surface compliant with ISO 4401-03 standards.

— Available in configurations with 3 or 4 ports, 2 or 3 positions, and a wide range of spool types.

— The on-board electronics enables control by low-power digital signals from a PLC.

— The IO-Link version allows seamless integration into PLC-controlled digital systems, enabling real-time acquisition of operational data for monitoring and predictive maintenance.

— Supplied with DC solenoids.

— Available with zinc-nickel surface treatment applied to the valve body, providing up to 240 hours of salt spray resistance according to standard test procedures.

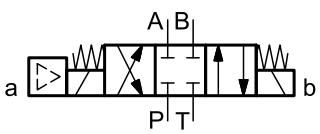
— Alternative versions to the standard tube-integrated manual override are available with boot-protected, knob, twist-and-lock, and mechanical detent options.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50 °C)

Maximum operating pressure: - P - A - B ports - T port	bar	 350 210
Maximum flowrate	l/min	80
Pressure drops Δp-Q	see point 5	
Operating limits	see point 7	
Electrical features	see point 8	
Electrical connection	M12 5 pin male A	
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	according to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass: single solenoid valve double solenoid valve	kg	1.5 2

HYDRAULIC SYMBOL (typical)



1 - IDENTIFICATION CODE

D	S	3	GL	-		/			-		K12	/		

Directional valve, solenoid operated

ISO 4401-03 size

With on-board digital amplifier

Spools types (see point 3)

S*	**TA**	**RK**
SA*	**TB**	
SB*	**TA***	
	TB*	

Series No. (the overall and mounting dimensions remain unchanged from 10 to 19):
12 = version with IOL interface
11 = versions with EC1 and EC2 interfaces

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Electronic function (see point 2):
IOL = IO-Link interface
EC1 = digital command via PLC for 12V coils
EC2 = digital command via PLC for 24V coils

Connection: 5 pin M12, male

Manual override:
omit for override integrated in the tube (**standard**)
CM = manual override, boot protected
CP = push manual override
CK1 = turning knob override
CK2 = twist and lock knob override
CPK = push manual override with mechanical retention
Please refer to catalogue 41150 for details on manual overrides

Option:
/ W7 = Zinc-nickel surface treatment (see **NOTE**)
Omit if not required

NOTE: The standard valve is supplied with black phosphating surface treatment. The zinc-nickel coating on the valve body ensures salt spray resistance up to **240** hours (test performed according to UNI EN ISO 9227 and evaluated according to UNI EN ISO 10289 standards).

2 - ELECTRONICS FUNCTIONS

2.1 - IOL version with IO-Link interface

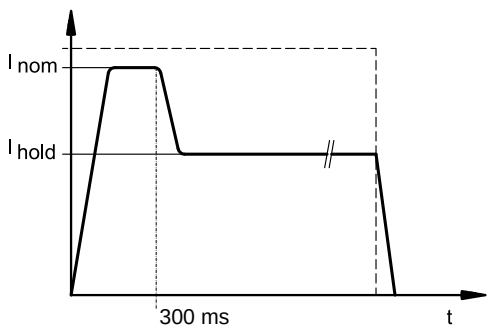
The IOL version controls the valve via the IO-Link communication. Both the control signal and solenoid power are supplied through IO-Link interface. The IOL version operates exclusively at 24 V DC. The IO-Link master must ensure that the port to which the valve is connected can deliver the nominal current specified in Table 8.2.

A data register is available, recording the energizing and de-energizing times of both solenoids.

2.2 - EC* versions

EC1 and EC2 versions allow the solenoid to be controlled by a digital low-power signal from the PLC. The on-board electronics supply the coil with the nominal voltage for the time needed to energize it (up to 300 ms) and move the spool, and then decrease the current to a holding value sufficient to maintain the spool position until the next switching (approx. 70% of the I nom).

Current supplied to the coils by the on-board electronics



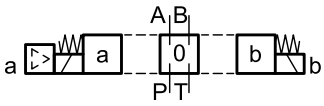
3 - HYDRAULIC FLUIDS

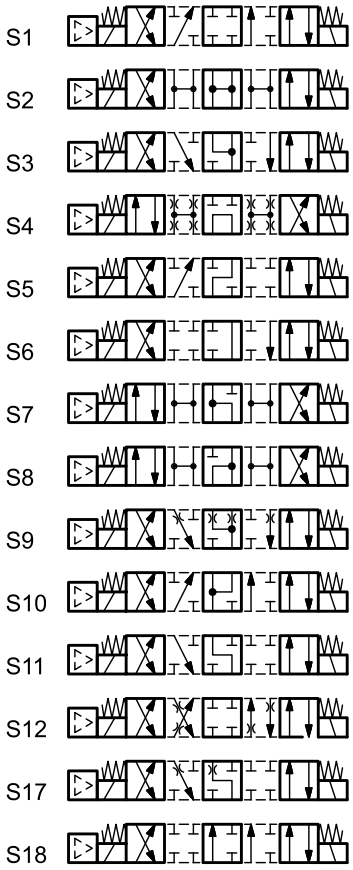
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

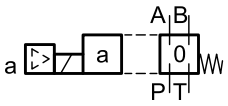
4 - SPOOL TYPE

Type **S***:
2 solenoids - 3 positions
with spring centreing



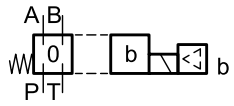


Type **SA***:
1 solenoid side A
2 positions (central + external)
with spring centreing



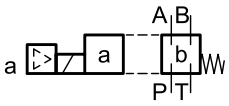


Type **SB***:
1 solenoid side B
2 positions (central + external)
with spring centreing



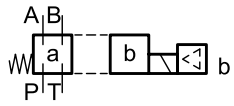


Type **TA**:
1 solenoid side A
2 external positions
with return spring



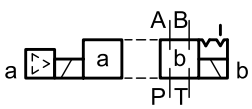


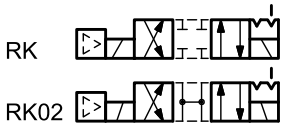
Type **TB**:
1 solenoid side B
2 external positions
with return spring





Type **RK**:
2 solenoids - 2 positions
with mechanical retention

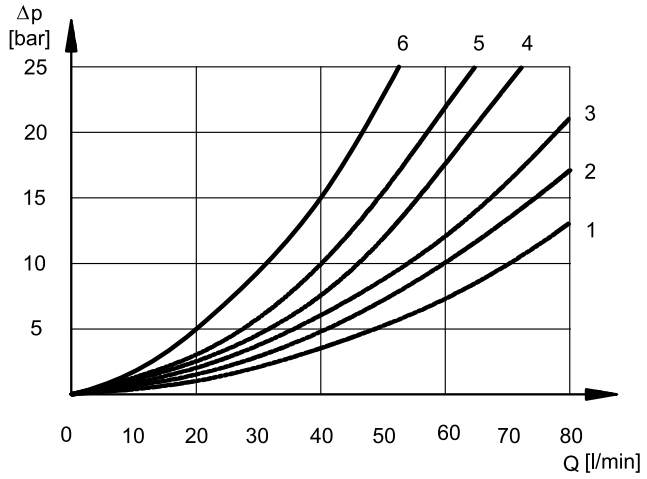




NOTE 1: Besides the diagrams shown, which are the most frequently used, other are available: please refer to catalogue 41 150.

5 - PRESSURE DROPS Δp-Q

(obtained with viscosity 36 cSt at 50 °C)



ENERGIZED POSITION

SPOOL TYPE	FLOW DIRECTION			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPH			
S1, SA1, SB1	2	2	3	3
S2, SA2, SB2	1	1	3	3
S3, SA3, SB3	3	3	1	1
S4, SA4, SB4	5	5	5	5
S5	2	1	3	3
S6	2	2	3	1
S7, S8	4	5	5	5
S9	2	2	3	3
S10	1	3	1	3
S11	2	2	1	3
S12, S17	2	2	3	3
S18	1	2	3	3
TA, TB	3	3	3	3
TA02, TB02	2	2	2	2
TA23, TB23	3	3		
RK, RK02	2	2	2	2

For pressure drops between A and B lines of S10 spools used in regenerative diagrams, refer to curve 5.

DE-ENERGIZED POSITION

SPOOL TYPE	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S2, SA2, SB2					2
S3, SA3, SB3			3	3	
S4, SA4, SB4					3
S5		4			
S6				3	
S7, S8			6	6	3
S10	3	3			
S11			3		
S18	4				

6 - SWITCHING TIMES

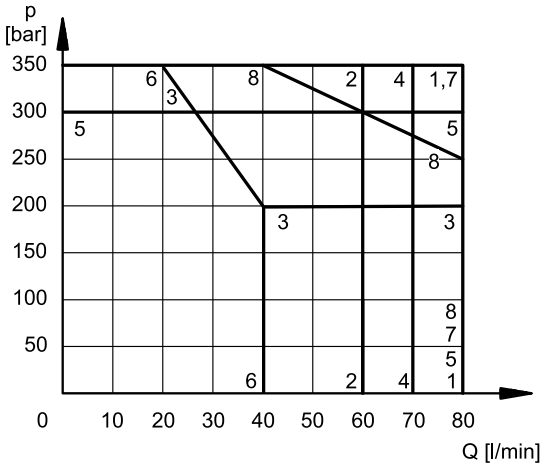
The values indicated are obtained according to ISO 6403 standard, with mineral oil viscosity 36 cSt at 50 °C.

TIMES [ms]		
versions	ENERGIZING	DE-ENERGIZING
IOL	set via bus	set via bus
EC1, EC2	25 ÷ 75	15 ÷ 25

7 - OPERATING LIMITS

The curves define the flow rate operating ranges according to the valve pressure for the different versions. The values have been obtained in accordance with ISO 6403, with solenoids at rated temperature and supplied with 90% of the nominal voltage.The values were measured using mineral oil with a viscosity of 36 cSt at a temperature of 50 °C, and filtration compliant with ISO 4406:1999 class 18/16/13.

The limits for TA02 and TA spools refer to 4-port operation. The operating limits of a 4-port valve in 3-port operation, with either port A or B plugged, or with no flow, are shown in the corresponding diagram.

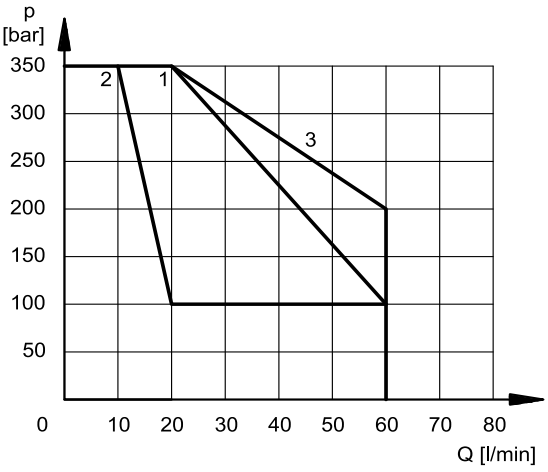


SPOOL	CURVE	
	P→A	P→B
S1,SA1,SB1	1	1
S2, SA2, SB2	2	2
S3, SA3, SB3	3	3
S4, SA4, SB4	4	4
S5	5	5
S6	4	6
S7	4	4
S8	4	4
S9	7	7
S10	7	7
S11	4	6
S12	1	1
S17	4	4
S18	5	5

SPOOL	CURVE	
	P→A	P→B
TA, TB	7	7
TA02, TB02	8	8
TA23, TB23	2	2
RK	7	7
RK02	8	8

4-PORT VALVE IN 3-PORT OPERATION

Operating limits of a 4-port valve in 3-port operation or with port A or B plugged or without flow.



SPOOL	CURVE
TA backpr. A; TB backpr. B	1
TA02 backpr. A; TB02 backpr. B	1
TA backpr. B; B backpr. A	2
TA02 backpr. B; TB02 backpr. A	3

8 - ELECTRICAL FEATURES

8.1 - Solenoids

The solenoids are composed of two primary components: the tube and the coil.

The tube is threaded into the valve body and contains the armature, which moves within the oil without any wear. The inner section, in contact with the oil in the return line, facilitates heat dissipation.

The coil is securely mounted to the tube using a threaded ring and can be easily replaced.

Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree, correctly connected and installed.

electric connection	electric connection protection	whole valve protection
K6 - 2 pins for junction box	IP65	IP65

SUPPLY VOLTAGE FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY	18.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	In compliance with 2014/30/EU
LOW VOLTAGE	In compliance with 2014/35/EU
CLASS OF PROTECTION Coil insulation (VDE 0580) Impregnation	 class H class F

8.2 - Current and absorbed power

The table shows current and power consumption values for each function (values ± 10%).

Function	Supply voltage [V]	Current consumption (RMS) [A]		Power absorption (RMS) [W]		Coil nominal voltage [V]	Resistance at 20°C [ohm]	Coil code
		I nom	I hold	P nom	P hold			
EC1	12	2.2	1.8	26.4	21.5	12	4.5	1904060
EC2, IOL	24	1.2	0.85	29	20.5	24	18.6	1903801

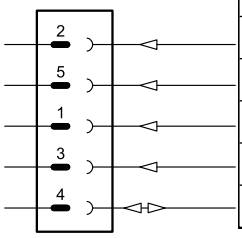
8.3 - IOL function: IO-Link communication

2L- and 1L- pin are galvanic isolated up to100 V to avoid earth loops. In IO-Link networks, the length of the connecting cables is limited to 20 metres.

Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
IO-Link communication (IOL): Data rate	 kBaud	IO-Link Port Class B 38.4
Managed breakdowns		overload and electronics overheating, cable breakdown, supply voltage failures
Connection		5-pin M12 code A (IEC 61076-2-101), male

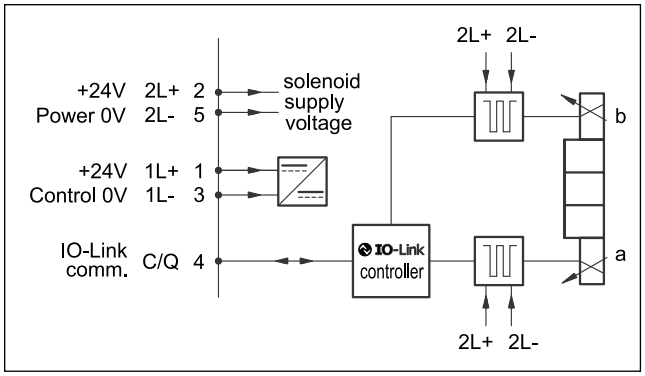
8.4 - IOL pin table





Pin	Values		Function
2	2L+	+24 V DC	Solenoid voltage supply
5	2L-	0 V (GND)	
1	1L+	+24 V DC	IO-Link voltage supply
3	1L-	0 V (GND)	
4	C/Q		IO-Link Communication

8.5 - IOL on-board electronics diagram



8.6 - IOL functions: LED

The valve has two visible LEDs. Only one LED is active at a time.

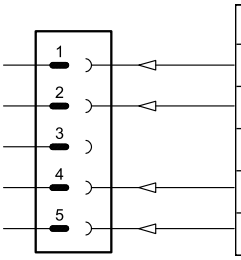
led	colour	ON	Blink
L1	green	-	IO-Link connection OK
	red		no IO-Link connection
L2	green	ch A ON	-
	orange	ch B ON	
	red		error

8.7 - EC* functions: electrical characteristics

Supply voltage: EC2 EC1	V DC	24, ripple max 3 Vpp 12, ripple max 3 Vpp
Power consumption	W	1 + solenoid consumption (see p. 8.2)
Fuse protection, external	A	3
Managed breakdowns		overload and electronics overheating, supply voltage failures

8.8 - EC1 pin table

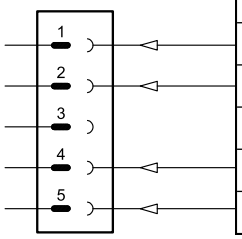




Pin	Values	Function
1	8 ÷ 12 V DC	Digital command coil B
2	+12 V DC	Solenoid supply voltage
3	NC	-
4	8 ÷ 12 V DC	Digital command coil A
5	0V GND	Supply voltage reference

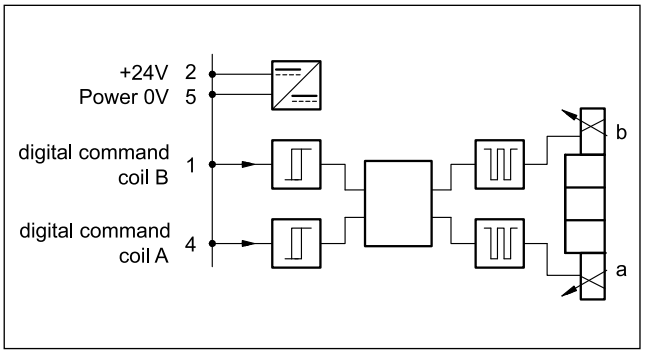
8.9 - EC2 pin table





Pin	Values	Function
1	8 ÷ 24 V DC	Digital command coil B
2	+24 V DC	Solenoid supply voltage
3	NC	-
4	8 ÷ 24 V DC	Digital command coil A
5	0V GND	Supply voltage reference

8.10 - EC* on-board electronics diagram



8.11 - EC* functions: LED

The valve has two visible LEDs.

led	colour	ON	Blink
L1	red	-	Powered valve
L2	green	ch A ON	-
	orange	ch B ON	-
	red	-	Error

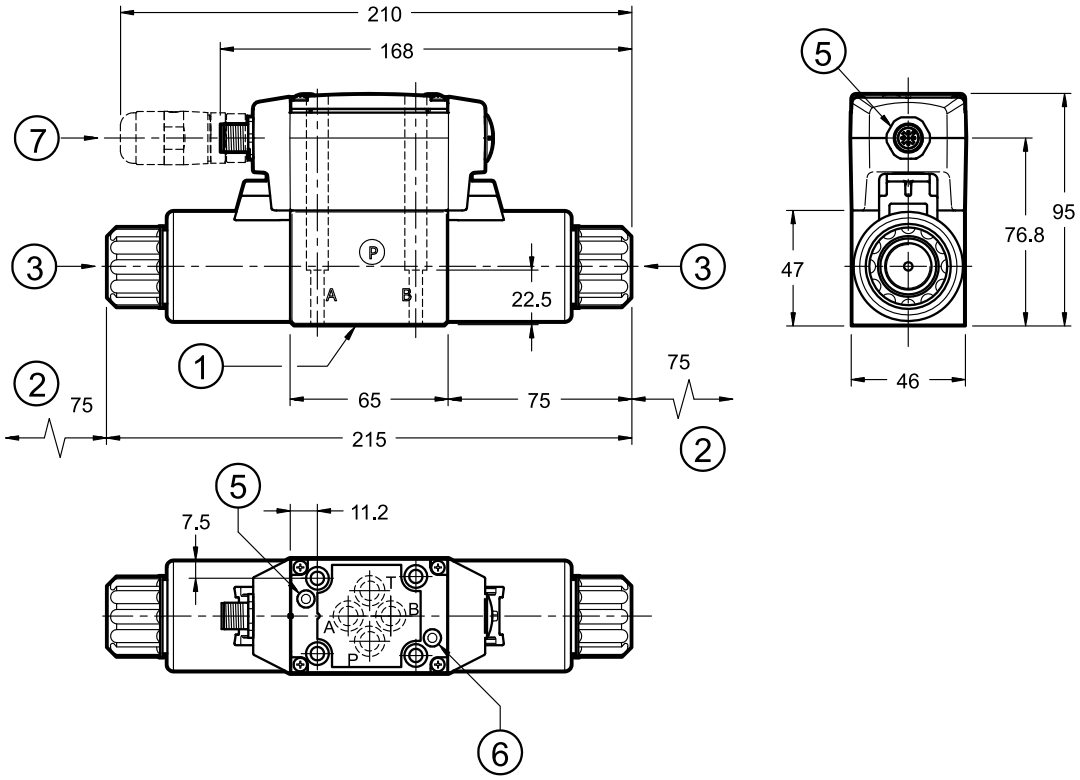
9 - ELECTRIC CONNECTORS

A 5-poles M12 code A female connector is required. It can be ordered separately with code 3491001001. See catalogue 89 000 for details.

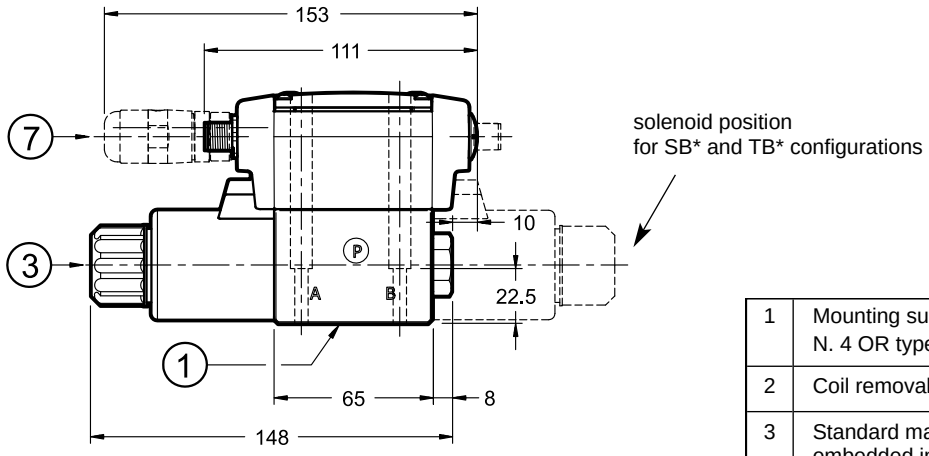
10 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

DS3GL-S*
DS3GL-RK



DS3GL-SA*
DS3GL-TA*



solenoid position
for SB* and TB* configurations

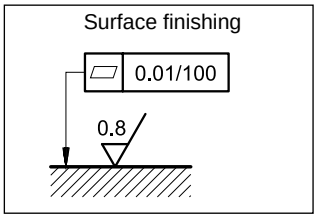
Valve fastening: 4 SHC screws ISO 4762 M5x30	
Tightening torque: 5 Nm (A8.8)	
Threads of mounting holes: M5x10	

1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Coil removal space
3	Standard manual override embedded in the solenoid tube
4	Connection M12 A 5 pin
5	Led L1
6	Led L2
7	Mating connector M12 5 poles - code A, female **To be ordered separately.** See catalogue 89 000

11 - INSTALLATION

Configurations with centering and return springs can be mounted in any position. For RK valves, which do not have springs and feature a mechanical detent, the valve must be installed with the spool in a horizontal position.

The valve is fixed using screws or tie rods and should be mounted on a lapped surface. The surface flatness and smoothness should meet or exceed the values indicated in the drawing. If the minimum requirements for flatness and/or smoothness are not met, fluid leakage between the valve and the mounting surface may occur.



12 - SUBPLATES

(see catalogue 51 000)

Type PMMD-AI3G with rear ports 3/8” BSP
Type PMMD-AL3G with side ports 3/8” BSP

DUPLOMATIC MOTION SOLUTIONS
a member of DAIKIN group

DUPLOMATIC MS Spa
via Mario Re Depaolini, 24 | 20015 Parabiago (MI) | Italy
T +39 0331 895111 | E vendite.ita@duplomatic.com | sales.exp@duplomatic.com
duplomaticmotionsolutions.com

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DS3B

SOLENOID ACTUATED DIRECTIONAL VALVE, DIRECT OPERATED

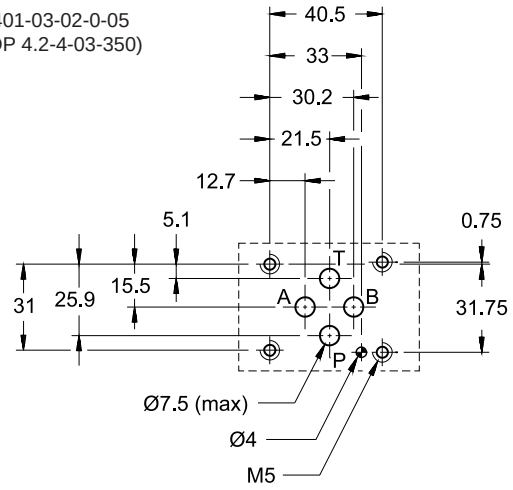
SERIES 10

SUBPLATE MOUNTING ISO 4401-03

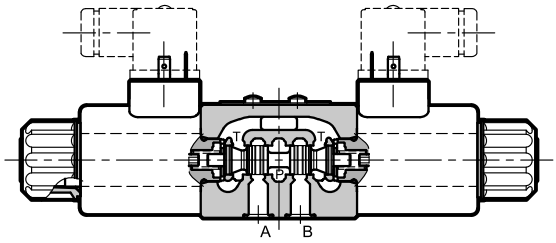
p max **350** bar
Q max **80** l/min

MOUNTING INTERFACE

ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)



OPERATING PRINCIPLE



— Solenoid actuated directional control valve, direct operated with mounting surface according to ISO 4401-03 standards.

— The valve is supplied with 3 or 4 ways design, 2 or 3 positions, with a wide range of spools.

— The valve body is made with high strength iron castings provided with wide internal paths in order to minimize the flow pressure drop. Wet armature solenoids with interchangeable coils are used (for further information on solenoids see p. 7).

— The valve is available with DC solenoids.

— The valve is also available with zinc-nickel coating that ensures a salt spray resistance up to 120 hours.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C)

Maximum operating pressure: - P - A - B ports - T port	bar	 350 210
Maximum flowrate	l/min	80
Pressure drops Δp-Q	see point 4	
Operating limits	see point 5	
Electrical features	see point 7	
Electrical connections	EN 175301-803 (ex DIN 43650)	
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	according to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass: single solenoid valve double solenoid valve	kg	1.4 2

1 - IDENTIFICATION CODE



Directional valve, solenoid operated

ISO 4401-03 size

Spool type (see point 3)

S*	TA	RK
SA*	TB	
SB*	TA*	
	TB*	

Series:
(the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
N = NBR seals for mineral oil (standard)
V = FPM seals for special fluids

DC power supply
SD12 = 12 V
SD24 = 24 V
SD28 = 28 V
SD00 = valve without coils (see **NOTE 1**)

Coil electrical connection (see p. 10):
K1 = plug for connector type EN 175301-803 (ex DIN 43650) (standard)
K2 = plug for connector type AMP JUNIOR (available on **D12** and **D24** coils only)
K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S

Manual override:
omit for override integrated in the tube (standard) (see p. 12)
CM = manual override, boot protected
CK2 = push and twist override

Option:
/ W7 = Zinc-nickel surface treatment (see **NOTE 2**)
Omit if not required

NOTE 1: Coils locking ring and related OR are supplied together with the valves.

NOTE 2: The standard valve is supplied with surface treatment of phosphating black.

The zinc-nickel finishing on the valve body makes the valve suitable to ensure a salt spray resistance up to **120** hours.
(test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

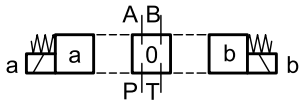
2 - HYDRAULIC FLUIDS

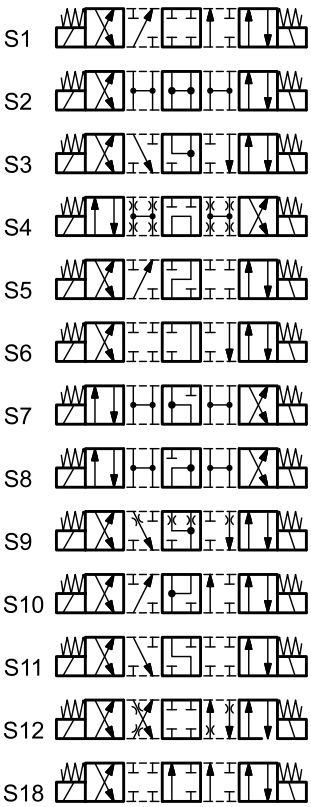
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

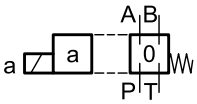
3 - SPOOL TYPE

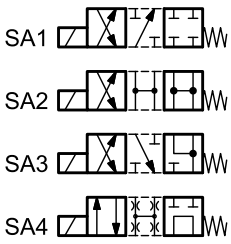
Type **S***:
2 solenoids - 3 positions
with spring centering



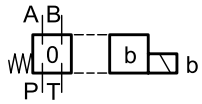


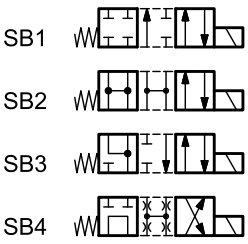
Type **SA***:
1 solenoid side A
2 positions (central + external)
with spring centering



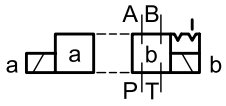


Type **SB***:
1 solenoid side B
2 positions (central + external)
with spring centering



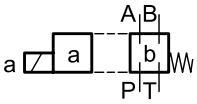


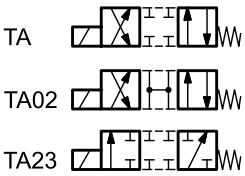
Type **RK**:
2 solenoids - 2 positions
with mechanical retention



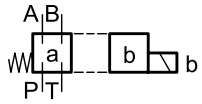


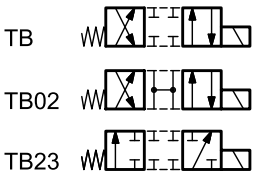
Type **TA**:
1 solenoid side A
2 external positions
with return spring





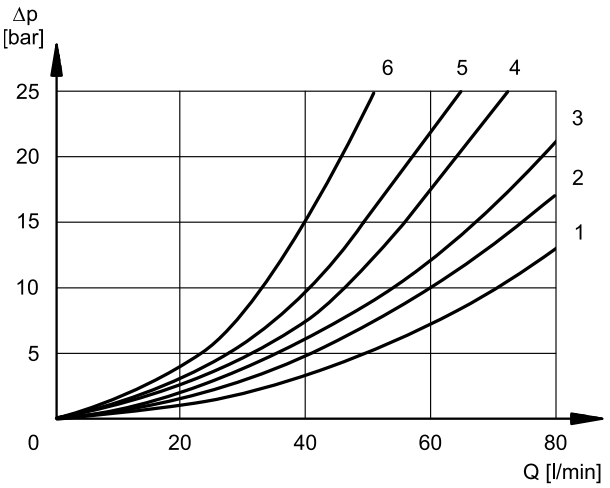
Type **TB**:
1 solenoid side B
2 external positions
with return spring





4 - PRESSURE DROPS Δp-Q

(obtained with viscosity 36 cSt at 50 °C)



ENERGIZED POSITION

SPOOL TYPE	FLOW DIRECTION			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPH			
S1, SA1, SB1	2	2	3	3
S2, SA2, SB2	1	1	3	3
S3, SA3, SB3	3	3	1	1
S4, SA4, SB4	5	5	5	5
S5	2	1	3	3
S6	2	2	3	1
S7, S8	4	5	5	5
S9	2	2	3	3
S10	1	3	1	3
S11	2	2	1	3
S12	2	2	3	3
S18	1	2	3	3
TA, TB	3	3	3	3
TA02, TB02	2	2	2	2
TA23, TB23	3	3		
RK	2	2	2	2

Please refer to curve no. 5 for pressure drops between A and B lines of the S10 spool when used in regenerative circuits.

DE-ENERGIZED POSITION

SPOOL TYPE	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S2, SA2, SB2					2
S3, SA3, SB3			3	3	
S4, SA4, SB4					3
S5		4			
S6				3	
S7, S8			6	6	3
S10	3	3			
S11			3		
S18	4				

5 - SWITCHING TIMES

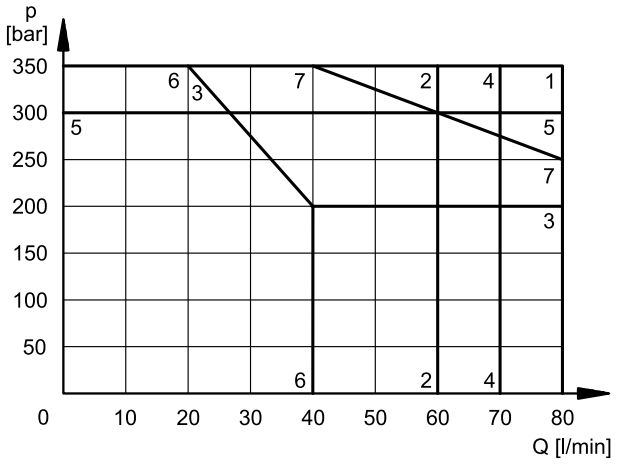
The values indicated are obtained according to ISO 6403 standard, with mineral oil viscosity 36 cSt at 50°C.

TIMES [ms]	
ENERGIZING	DE-ENERGIZING
25 ÷ 75	15 ÷ 25

6 - OPERATING LIMITS

The curves define the flow rate operating fields according to the valve pressure of the different versions. The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage. The value have been obtained with mineral oil, viscosity 36 cSt, temperature 50 °C and filtration according to ISO 4406:1999 class 18/16/13.

The limits have been verified with standard 4-port valve. Performance can be considerably reduced if a 4-port valve is used as 3-port, with port A or B plugged or without flow.



SPOOL	CURVE	
	P→A	P→B
S1,SA1,SB1	1	1
S2, SA2, SB2	2	2
S3, SA3, SB3	3	3
S4, SA4, SB4	4	4
S5	5	5
S6	4	6
S7	4	4
S8	4	4
S9	1	1
S10	1	1
S11	4	6
S12	1	1
S18	5	5

SPOOL	CURVE	
	P→A	P→B
TA, TB	1	1
TA02, TB02	1	1
TA23, TB23	2	2
RK	7	7

7 - ELECTRICAL FEATURES

7.1 - Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation. The coil is fastened to the tube by a threaded ring, and can be rotated 360°, to suit the available space.

Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree, correctly connected and installed.

electric connection	electric connection protection	whole valve protection
K1 EN 175301-803 (ex DIN 43650)	IP65	IP65
K2 AMP JUNIOR	IP65	
K7 DEUTSCH DT04 male	IP65/67	

SUPPLY VOLTAGE FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY	18.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC) (NOTE)	In compliance with 2014/30/EU
LOW VOLTAGE	In compliance with 2014/35/EU
CLASS OF PROTECTION Coil insulation (VDE 0580) Impregnation: DC valve	 class H class F

NOTE: In order to further reduce the emissions, with DC supply, use of type H connectors is recommended. These prevent voltage peaks on opening of the coil supply electrical circuit (see cat. 49 000).

7.2 - Current and absorbed power

The table shows current and power consumption values of the DC coils.

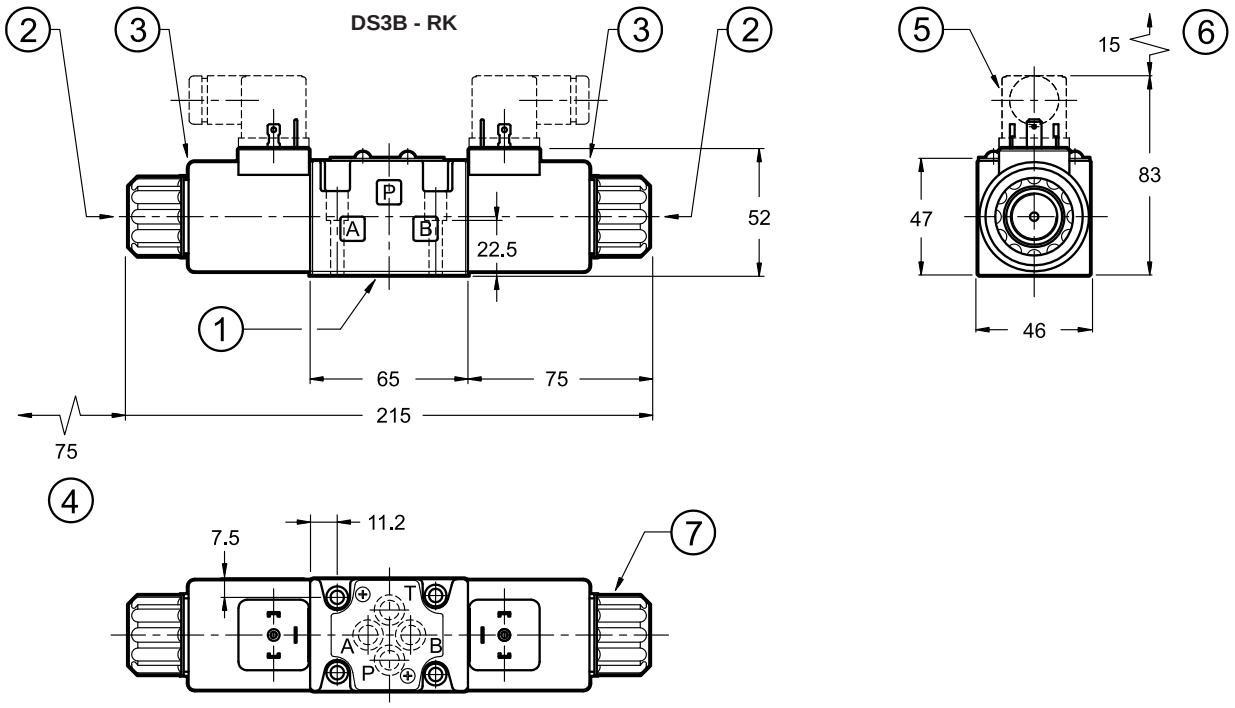
Coils for direct current (values ±10%)

	Nominal voltage [V]	Resistance at 20°C [Ω]	Current consumpt. [A]	Power consumpt. [W]	Coil code K1	Coil code K2	Coil code K7
SD12	12	4.5	2.67	32	1903780	1904190	1904050
SD24	24	18.6	1.29	31	1903781	1904191	1904051
SD28	28	25.3	1.07	31	1903782	-	1904052

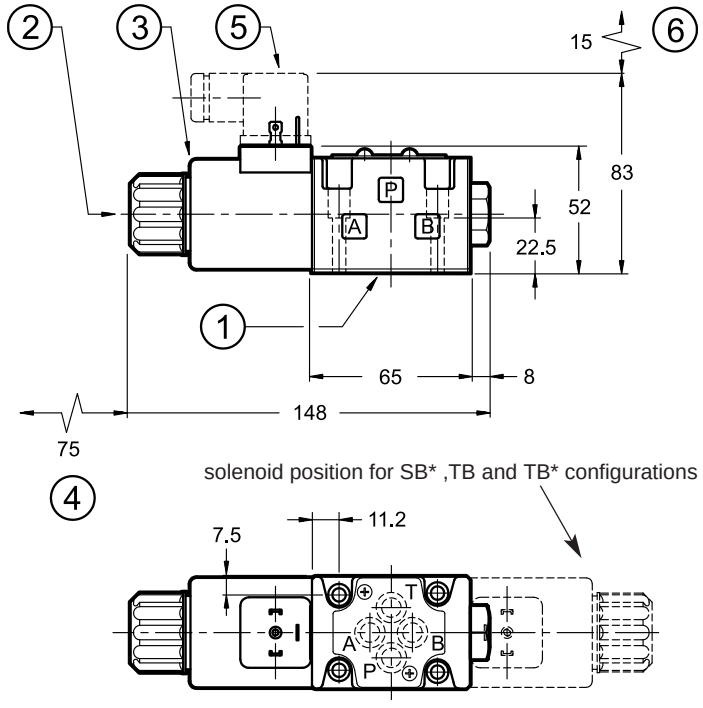
8 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

DS3B - S*
DS3B - RK



DS3B-SA*, DS3B-TA,
DS3B-TA*



solenoid position for SB* ,TB and TB* configurations

Valve fastening: 4 SHC screws ISO 4762 M5x30	
Tightening torque: 5 Nm (A8.8)	
Threads of mounting holes: M5x10	

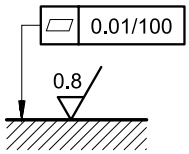
1	Mounting surface with sealing rings: 4 OR 2037 (9.25x1.78) - 90 shore
2	Standard manual override included in the solenoid tube
3	Coil (360° revolving)
4	Coil removal space
5	EN 175301-803 (ex DIN 43650) connector To be ordered separately. See cat. 49 000
6	Connector removal space
7	Locking ring: tightening torque 5 ±0.5 Nm

9 - INSTALLATION

Configurations with centering and return springs can be mounted in any position; type RK valves - without springs and with mechanical detent - must be mounted with the longitudinal axis horizontal.

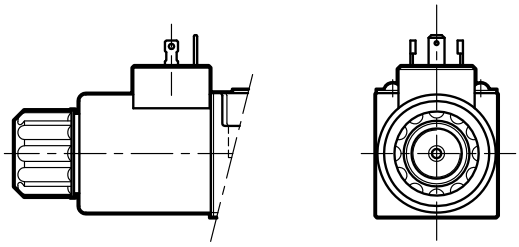
Valve fixing takes place by means of screws or tie rods, with the valve mounted on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing. If the minimum values of planarity and/or smoothness are not met, fluid leakages between valve and mounting surface can easily occur.

Surface finishing



10 - ELECTRIC CONNECTIONS

connection for EN 175301-803
(ex DIN 43650) connector
code **K1** (**standard**)



connection for AMP JUNIOR
connector
code **K2**



connection for
DEUTSCH DT06-2S male connector
code **K7**

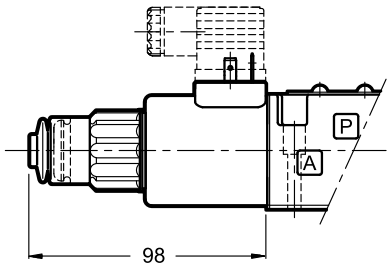


11 - ELECTRIC CONNECTORS

Solenoid operated valves are delivered without connectors. Connectors type EN 175301-803 (ex DIN 43650) for K1 connections can be ordered separately. See catalogue 49 000.

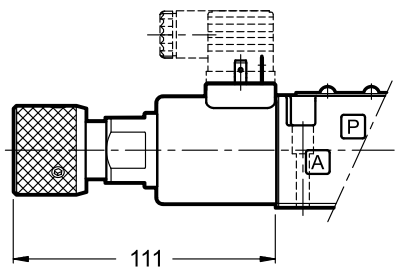
12 - MANUAL OVERRIDES

12.1 - CM-DS3/11 manual override, boot protected



Code: 3401150006

12.2 - CK2-DS3B/10 push and twist manual override



Code: 3401150051

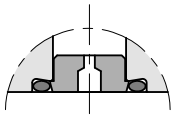
13 - PORT RESTRICTORS

Port restrictors are recommended if flow variations which exceed the valve performance limit during the switching processes occur, or for circuit dampening.

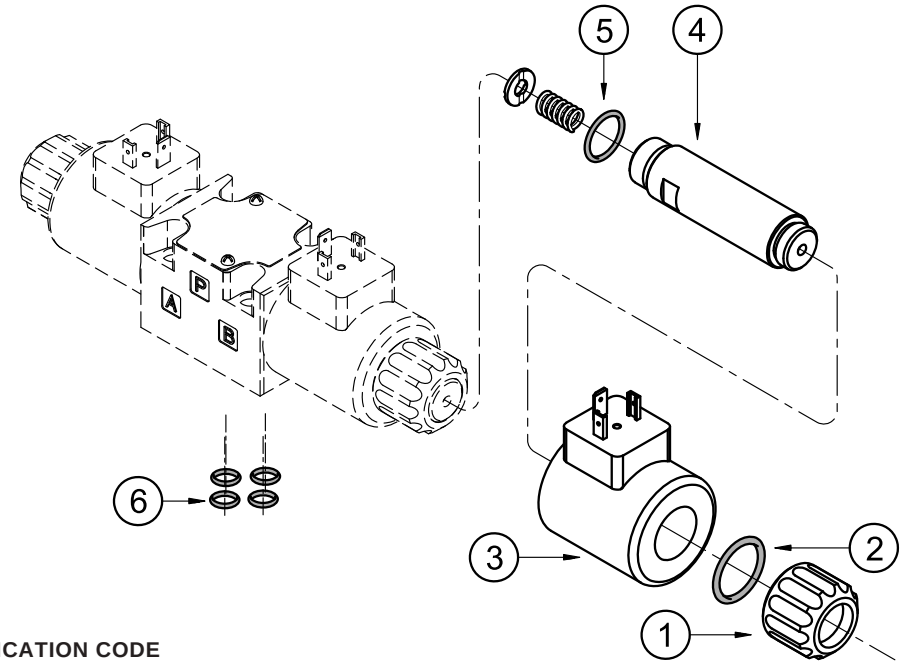
Port restrictor plugs can be ordered separately with the part numbers shown at left.

Ø (mm)	part numb.
blank	**0144162**
0.6	**0144163**
0.8	**0144033**
1	**0144034**

Ø (mm)	part numb.
1.2	**0144035**
1.5	**0144036**
1.8	**0144164**
2	**0144165**



14 - SPARE PARTS



COILS IDENTIFICATION CODE

C	22S3	-			/	

Supply voltage
SD12 = 12 V
SD24 = 24 V
SD28 = 28 V

Series no.:
12 = for K1
13 = for K2 and K7

Coil electrical connection
K1 = plug for connector EN 175301-803 (ex DIN 43650) (**standard**)
K2 = plug for connector type AMP JUNIOR (available on **D12** and **D24** coils only)
K7 = plug DEUTSCH DT04-2P, for male connector type DEUTSCH DT06-2S.

1	Coil locking ring with seal included cod. 0119412 Tightening torque 5 ±0.5 Nm
2	ORM type 0220-20 (22x2) - 70 Shore
3	Coil (see identification code)
4	Solenoid tube for standard version: TDS22-DS3/10N (NBR seals) TDS22-DS3/10V (FPM seals) **NOTE**: OR n°5 included
5	OR type 2062 (15.6x1.78) - 70 Shore
6	4 OR type 2037 (9.25x1.78) - 90 Shore

NOTE: You can also order coils using the coil codes at point 7.2

SEALS KIT

The codes include the O-Ring n° 2, 5, and 6

Cod. **1985406** NBR seals
Cod. **1985410** FPM (viton) seals

15 - SUBPLATES

(see catalogue 51 000)

Type PMMD-AI3G with rear ports 3/8” BSP
Type PMMD-AL3G with side ports 3/8” BSP

DUPLOMATIC MOTION SOLUTIONS
a member of DAIKIN group

DUPLOMATIC MS Spa
via Mario Re Depaolini, 24 | 20015 Parabiago (MI) | Italy
T +39 0331 895111 | E vendite.ita@duplomatic.com | sales.exp@duplomatic.com
duplomaticmotionsolutions.com

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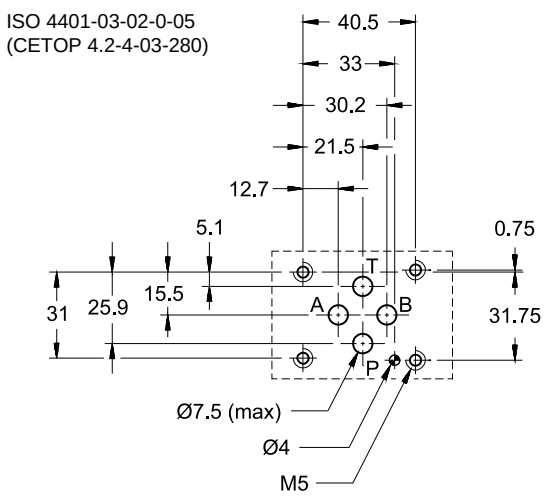
DL3

SOLENOID OPERATED DIRECTIONAL CONTROL VALVE COMPACT VERSION

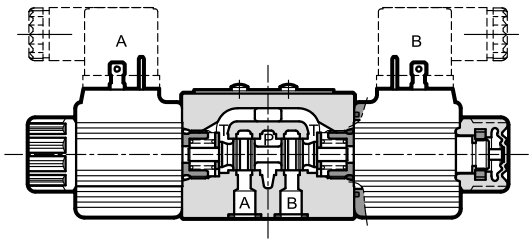
SUBPLATE MOUNTING ISO 4401-03

p max **280** bar
Q max **50** l/min

MOUNTING SURFACE



OPERATING PRINCIPLE



— Solenoid actuated directional control valve, direct operated, with mounting surface according to ISO 4401-03 standards.

— It is available in 3 and 4-ports versions, with 2 or 3 positions, in a wide range of spools.

— Compact design with reduced solenoid dimensions, suitable for mini-power packs and mobile and agricultural applications.

— The valve body is made with high strength iron castings provided with wide internal passages in order to minimize the flow pressure drop. Wet armature solenoids with interchangeable coils are used (for further information on solenoids see point 7).

— The valve is available with DC or AC current solenoids and with several types of electrical connections to cover various installation requirements (see points 7 and 11).

— The DC valve comes with boot protected manual override which ensures a protection degree IP69K for connections types K7 and K8.

— It is available also with zinc-nickel surface treatment, that ensures a salt spray resistance up to 600 hours.

PERFORMANCES

(with mineral oil of viscosity of 36 cSt at 50°C)

		CC	CA
Maximum operating pressure: - ports P - A - B - port T	bar	280 250	 160
Maximum flow rate	l/min	50	
Pressure drop Δp-Q	see point 4		
Operating limits	see point 5		
Electrical features	see point 7		
Electrical connections	see point 11		
Ambient temperature range	°C	-20 / +50	
Fluid temperature range	°C	-20 / +80	
Fluid viscosity range	cSt	10 ÷ 400	
Fluid contamination degree	according to ISO 4406:1999 class 20/18/15		
Recommended viscosity	cSt	25	
Masse: single solenoid valve double solenoid valve	kg	1,1 1,4	

1 - IDENTIFICATION CODE

D	L	3	-		/			-			/		

Solenoid operated directional valve

Compact version

ISO 4401-03 size

Spool type (see point 3):

S*	**TA**
SA*	**TB**
SB*	**RK**

Series no.:

10 = for direct current valves
11 = for alternate current valves
(the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Option:
/ W7 = Zinc-nickel surface treatment (see **NOTE 2**)
Not available for AC valves.
Omit if not required.

Manual override (see point 13)
for **DC** version:
omit for boot manual override integrated in the coil locking ring
CK1 = knob manual override
for **AC** version:
omit for manual override integrated in the tube
CM = manual override boot protected

Coil electrical connection:
(see point 11)
K1 = plug for connector type EN 175301-803 (ex DIN 43650) **(standard)**

For **D12** and **D24** coils only:
K2 = plug for connector type AMP JUNIOR
K4 = outgoing cables
K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S
K8 = plug for connector type AMP SUPER SEAL

DC power supply
D12 = 12 V
D24 = 24 V
D28 = 28 V
D48 = 48 V
D110 = 110 V
D220 = 220 V
D00 = valve without coils (see **NOTE 1**)

AC power supply
A24 = 24 V - 50 Hz
A110 = 110 V - 50 Hz
A230 = 230 V - 50 Hz
A00 = valve without coils (see **NOTE 1**)

NOTE 1: Coils locking ring and related OR are supplied together with the valves.

NOTE 2:The standard surface treatment is phosphating black.

On request we can supply these valves with zinc-nickel finishing, making the valve suitable to ensure a salt spray resistance up to 600 hours (test operated according to UNI EN ISO 9227 standard and test evaluation operated according to UNI EN ISO 10289 standard)

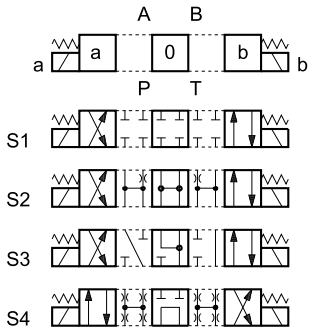
2 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

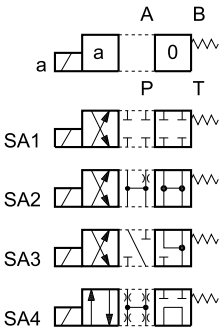
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

3 - SPOOL TYPE

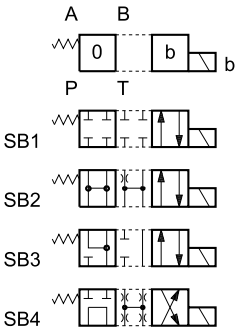
Type **S***:
2 solenoids - 3 positions
with spring centering



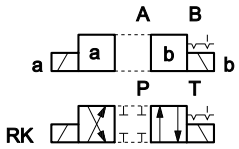
Type **SA***:
1 solenoid side A
2 positions (central + external)
with spring centering



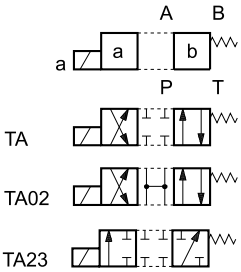
Type **SB***:
1 solenoid side B
2 positions (central + external)
with spring centering



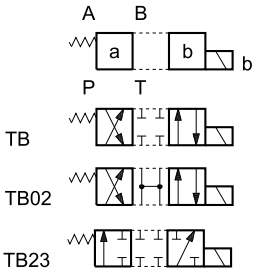
Type **RK**:
2 solenoids - 2 positions
with mechanical retention



Type **TA**:
1 solenoid side A
2 external positions
with return spring



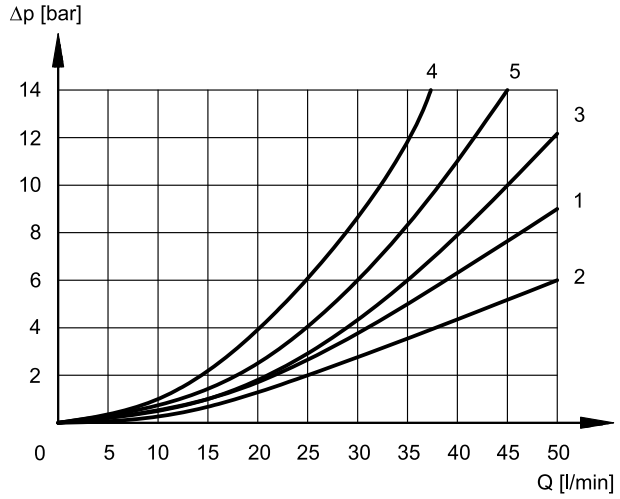
Type **TB**:
1 solenoid side B
2 external positions
with return spring



NOTE: Others spools available on request only.

4 - PRESSURE DROPS ΔP-Q

(obtained with viscosity of 36 cSt at 50 °C)



ENERGIZED VALVE

SPOOL	FLOW DIRECTIONS				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPHS				
S1	1	1	1	1	-
S2	1	1	2	2	3
S3	3	3	2	2	-
S4	4	4	4	4	5
RK	1	1	1	1	-
TA, TB	3	3	3	3	-
TB23	3	5	-	-	-
TA23	5	3	-	-	-

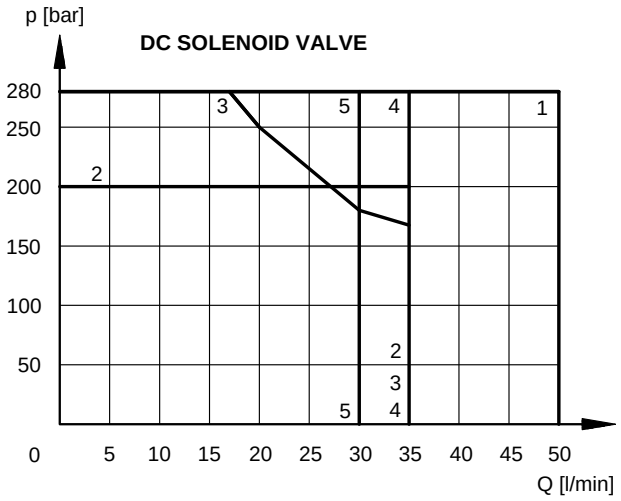
5 - OPERATING LIMITS

The curves define the flow rate operating fields according to the valve pressure of the different versions. The values indicated in the graphs are relevant to the standard solenoid valve.

The limits have been tested with a standard valve, with 4-ports operation. They can be considerably reduced if a 4-ports valve is used as 3-ports valve with port A or B plugged or without flow.

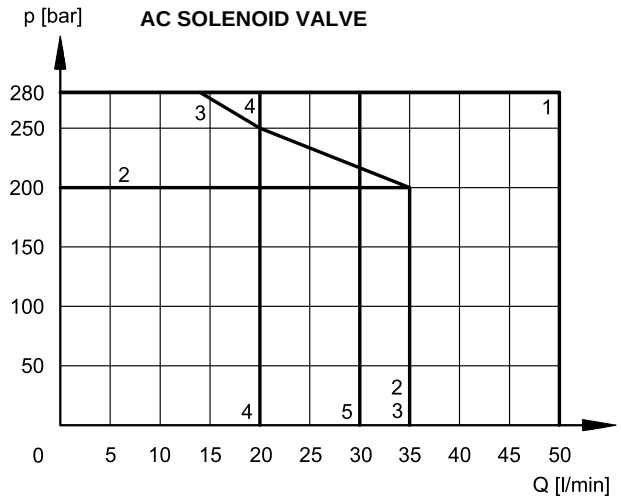
The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage. The value have been obtained with mineral oil, viscosity 36 cSt, temperature 50 °C and filtration according to ISO 4406:1999 class 18/16/13.

DC SOLENOID VALVE



SPOOL	CURVE
S1, TA	1
S2	2
S3	3
S4	4
RK	5
TA23, TB23	1

AC SOLENOID VALVE



SPOOL	CURVE
S1, TA	1
S2	2
S3	3
S4	4
RK	5
TA23, TB23	1

6 - SWITCHING TIMES

The values indicated are obtained with spool S1, according to ISO 6403 standard, with mineral oil viscosity 36 cSt at 50°C.

SUPPLY	TIMES (±10%) [ms]	
	ENERGIZING	DE-ENERGIZING
DC	25 ÷ 75	15 ÷ 25
AC	10 ÷ 25	15 ÷ 30

7 - ELECTRICAL FEATURES

7.1 - Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation.

The coil is fastened to the tube by a threaded ring, and can be rotated freely, to suit the available space.

The interchangeability of coils of different voltages is allowed within the same type of supply current, alternating or direct.

Protection from atmospheric agents IEC 60529

The IP protection degree is intended for the whole valve. It is guaranteed only with both valve and connectors of an equivalent IP degree, correctly connected and installed.

Electric connection	IP65	IP66	IP67	IP68	IP69 IP69K (*)
K1	x	x (#)			
K2	x		x		
K4	x				
K7	x		x	x	x
K8	x	x	x	x	x

(#) valid for DC valves only

(*) The protection degree IP69K is not taken into account in IEC 60529 but it is included in both ISO 20653.

SUPPLY VOLTAGE FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY	10.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	In compliance with 2014/30/EU
LOW VOLTAGE	In compliance with 2014/35/EU
CLASS OF PROTECTION Coil insulation (VDE 0580) Impregnation	 class H class H

NOTE: In order to further reduce the emissions, with DC supply, use of type H connectors is recommended. These prevent voltage peaks on opening of the coil supply electrical circuit (see cat. 49 000).

7.2 - Current and absorbed power for DC solenoid valve

The table shows current and power consumption values of the DC coils.

Using connectors type "D" (see cat. 49 000) with embedded bridge rectifier it is possible to feed DC coils (starting from 48V voltage) with alternating current (50 or 60 Hz), considering a reduction of the operating limits.

Coils for direct current (values ±5%)

	Resistance at 20°C [Ω]	Current consumption [A]	Power consumption [W]
D12	5,4	2,20	26,5
D24	20,7	1,16	27,8
D28	27,5	1,02	28,5
D48	82	0,58	28
D110	424	0,26	28,5
D220	1856	0,12	26,1

7.3 - AC valve - Current and power consumption

In alternating current energizing, an initial phase (maximum movement) is seen, during which the solenoid consumes elevated value currents (inrush current); the current values diminish during the plunger stroke until it reaches the minimum values (holding current) when the plunger reaches the stroke end. The table shows the values of absorption at the inrush and at holding.

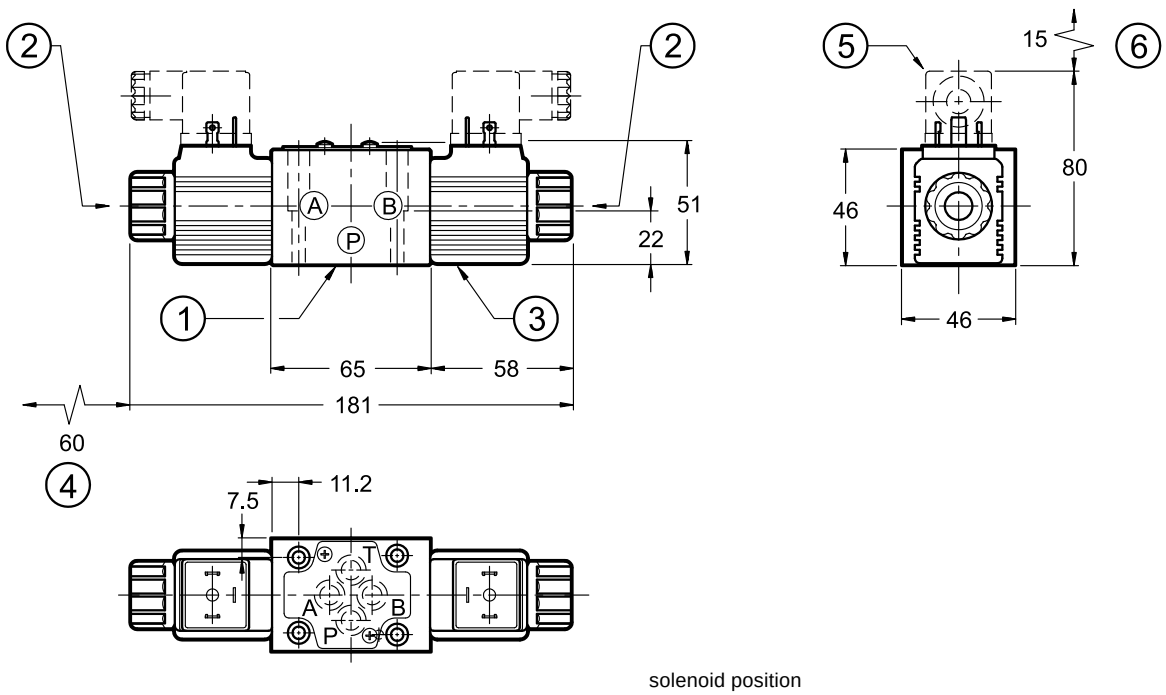
Coils for alternating current (values ±10%)

	Nominal voltage [V]	Freq. [Hz]	Resistance at 20°C [Ω]	Current consumption at inrush [A]	Current consumption at holding [A]	Power consumption at inrush [VA]	Power consumption at holding [VA]
A24	24	50	2,7	4,5	1,47	109,2	35,3
A110	110		73,4	1,0	0,31	107,8	34,1
A230	230		320	0,5	0,16	112,7	36,8

8 - DL3 DC OVERALL AND MOUNTING DIMENSIONS

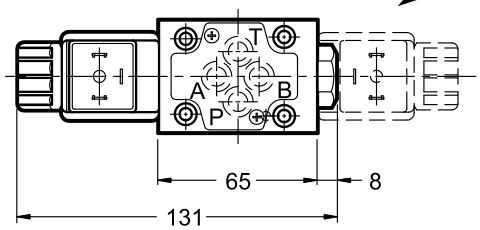
dimensions in mm

DL3 - S*



solenoid position for execution type TB* - SB*

DL3 - TA, DL3-SA*



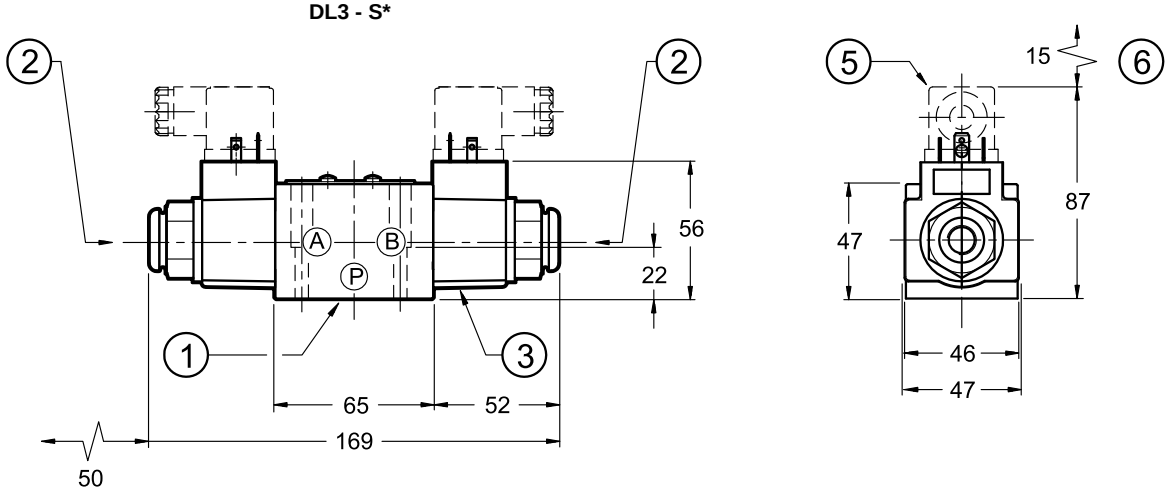
Valve fastening: 4 SHC screws ISO 4762 M5x30
Tightening torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

1	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) - 90 shore
2	Locking ring with boot protected manual override
3	Coil
4	Coil removal space
5	EN 175301-803 (ex DIN 43650) electrical connector (representation with K1 standard connection - see point 11 for other connection types)
6	Connector removal space

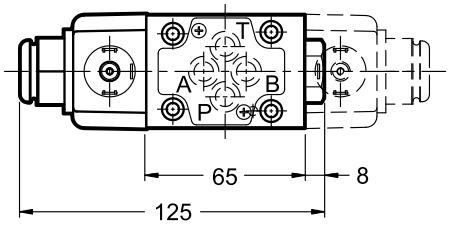
9 - DL3 AC OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

DL3 - S*



DL3 - TA, DL3-SA*



1	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) - 90 shore
2	Locking ring with boot protected manual override
3	Coil
4	Coil removal space
5	EN 175301-803 (ex DIN 43650) electrical connector
6	Connector removal space

Valve fastening: 4 SHC screws ISO 4762 M5x30
Tightening torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

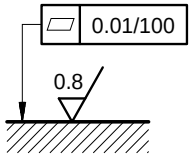
10 - INSTALLATION

Configurations with centering and return springs can be mounted in any position; type RK valves - without springs and with mechanical detent - must be mounted with the longitudinal axis horizontal.

Valve fitting takes place by means of screws or tie rods, fixing the valve on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing.

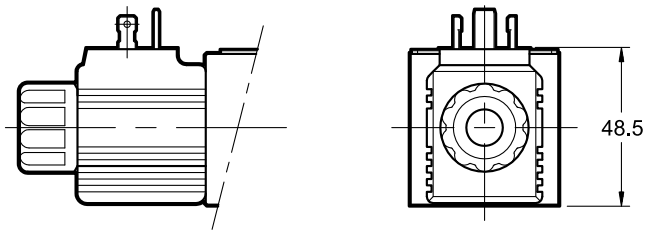
If the minimum values of planarity or smoothness are not met, fluid leakages between valve and mounting surface can easily occur.

Surface finishing

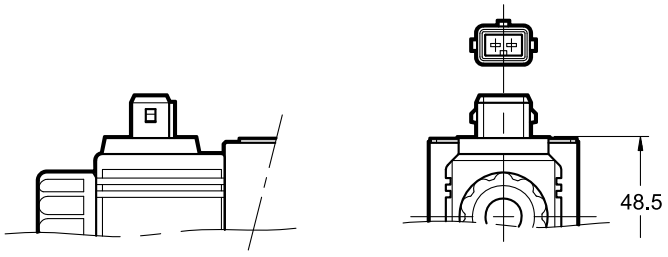


11 - ELECTRIC CONNECTIONS

connection for EN 175301-803
(ex DIN 43650) connector
code **K1** (**standard**)



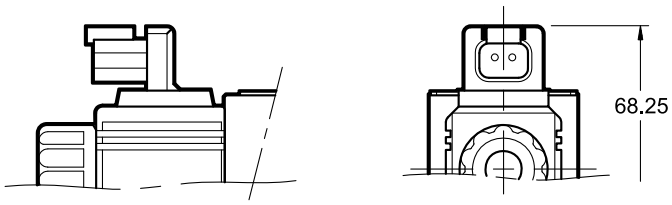
connection for AMP JUNIOR
connector type
code **K2**



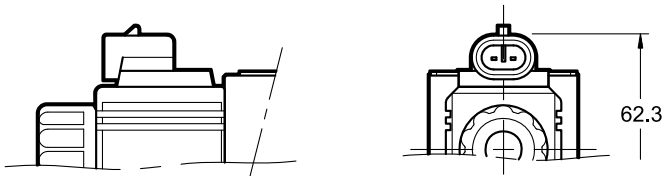
outgoing cable connections
cable length = 1 mt
code **K4**



connection for DEUTSCH DT04-2P
for male connector type DEUTSCH DT06
code **K7**



connection for AMP SUPER SEAL
(two contacts) connector type
code **K8**



12 - ELECTRIC CONNECTORS

Solenoid operated valves are delivered without connectors. Connectors type EN 175301-803 (ex DIN 43650) for K1 connections can be ordered separately. See catalogue 49 000.

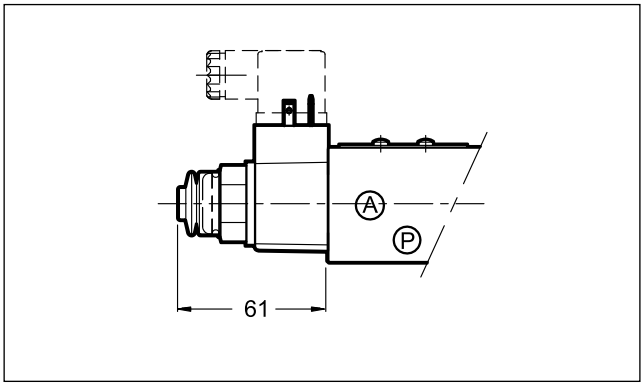
13 - OPTIONAL MANUAL OVERRIDES

13.1 - Boot protected manual override

On the DC version the boot override is integrated in the coil locking ring, as standard.

On the AC version, however, the boot override can be ordered by entering the code **CM** in the identification code at point 1, or is available as option to be ordered separately.

code **3401210001**

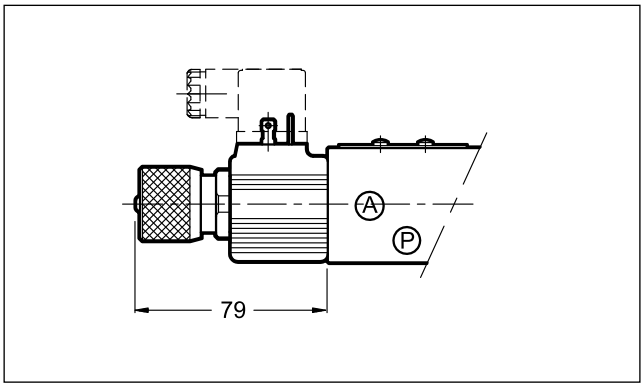


13.2 - Knob manual override

Available only for DC version.

The knob override can be ordered by entering the code **CK1** in the identification code at point 1, or is available as option to be ordered separately.

code **3404100046**



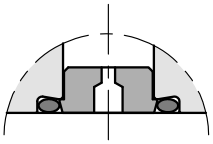
14 - PORT RESTRICTORS

Port restrictors are recommended if flow variations which exceed the valve performance limit during the switching processes occur, or for circuit dampening.

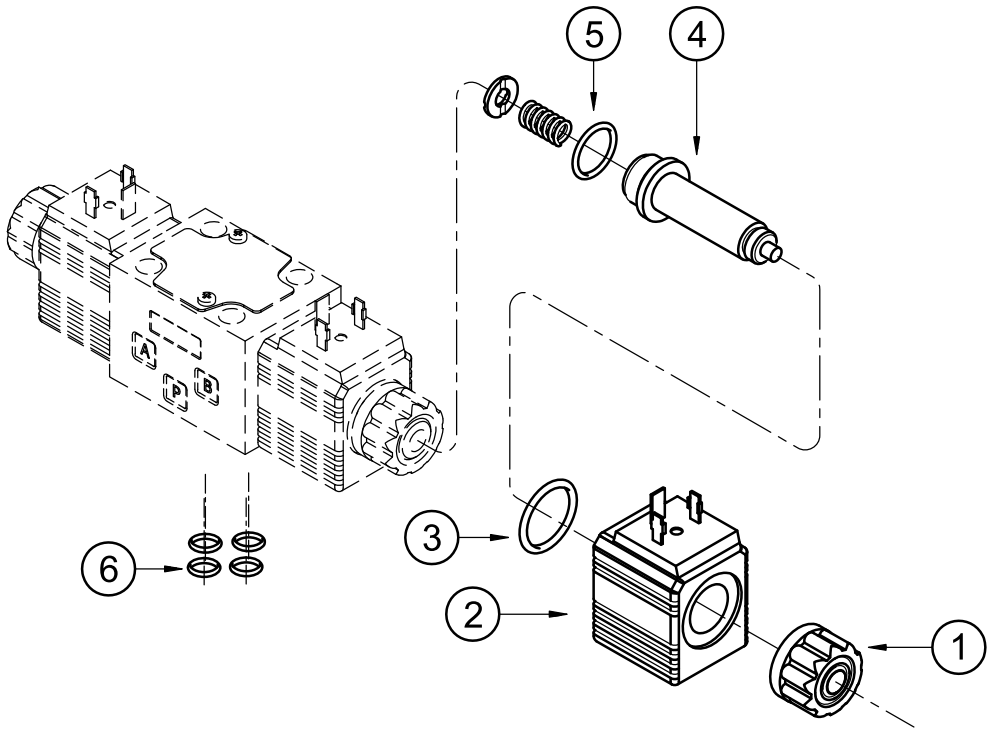
Port restrictor plugs can be ordered separately with the part numbers shown at left.

Ø (mm)	part number
blank	**0144162**
0.6	**0144163**
0.8	**0144033**
1	**0144034**

Ø (mm)	part number
1.2	**0144035**
1.5	**0144036**
1.8	**0144164**
2	**0144165**



15 - SPARE PARTS FOR DC SOLENOID VALVE



IDENTIFICATION CODE FOR DC COILS

C	14	L3	-			/	11

Supply voltage
D12 = 12 V
D24 = 24 V
D28 = 28 V
D48 = 48 V
D110 = 110 V
D220 = 220 V

Series no.:
(the overall and mounting dimensions remain unchanged from 10 to 19)

Coil electrical connection:
K1 = plug for connector type EN 175301-803 (ex DIN 43650)

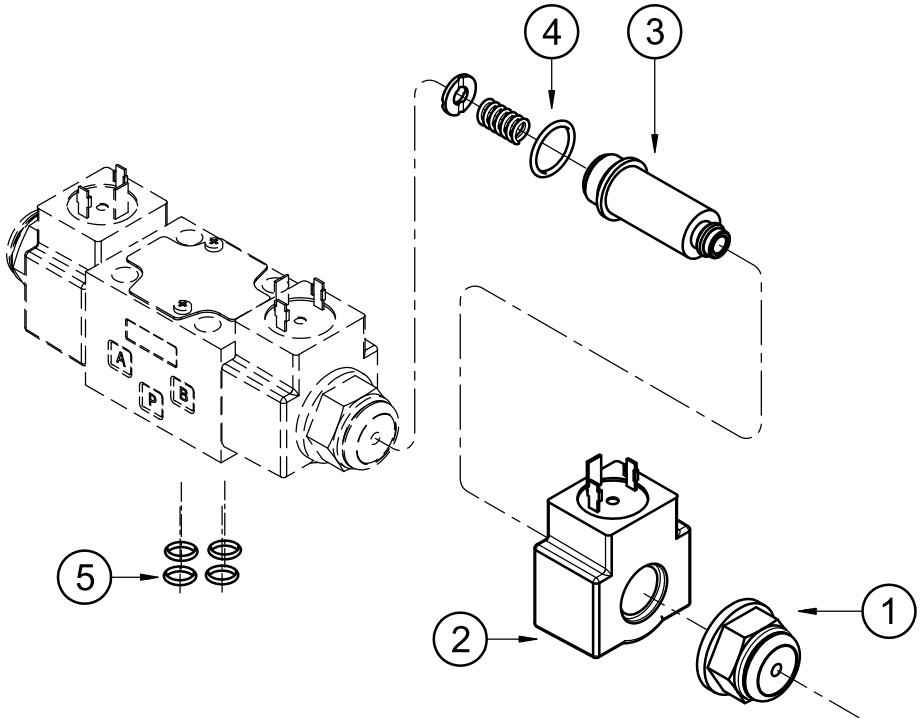
D12 and **D24** coils only:
K2 = plug for connector type AMP JUNIOR
K4 = outgoing cables
K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S
K8 = plug for connector type AMP SUPER SEAL

1	Coil locking ring - code 0119382 tightening torque: 3 ÷ 3.4 Nm
2	Coil (see identification code)
3	OR type 2112 (28.3x1.78) Supplied together with the coil
4	Solenoid tube: TD14-M18/11N (NBR seals) TD14-M18/11V (FPM seals) (OR n° 5 included)
5	OR type 2062 (15.6x1.78) - 70 Shore
6	N. 4 OR type 2037 (9.25x1.78) - 90 Shore

SEAL KIT

The codes included the OR n° 5 and 6.
Cod. 1984435 NBR seals
Cod. 1984436 FPM seals

16 - SPARE PARTS FOR AC SOLENOID VALVE



IDENTIFICATION CODE FOR AC COILS

C	18	L3	-		K1	/	11

Supply voltage
A24 = 24 V - 50 Hz
A110 = 110 V - 50 Hz
A230 = 230 V - 50 Hz

Coil electrical connection:
plug for connector type
EN 175301-803 (ex DIN 43650)

Series no.:
(the overall and
mounting dimensions
remain unchanged from
10 to 19)

1	Coil locking ring - code. 0119469 tightening torque: 3 ÷ 3.4 Nm
2	Coil (see identification code)
3	Solenoid tube: TA18-M18/11N (NBR seals) TA18-M18/11V (FPM seals) (OR n° 4 included)
4	OR type 2062 (15.6x1.78) - 70 Shore
5	N. 4 OR type 2037 (9.25x1.78) - 90 Shore

SEAL KIT
The codes included the OR n° 4 and 5.
Cod. 1984435 NBR seals
Cod. 1984436 FPM seals

17 - SUBPLATES
(see catalogue 51 000)

Type PMMD-AI3G with rear ports
Type PMMD-AL3G with side ports
P, T, A, B port threading: 3/8” BSP

DUPLOMATIC MOTION SOLUTIONS
a member of DAIKIN group

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MDS3

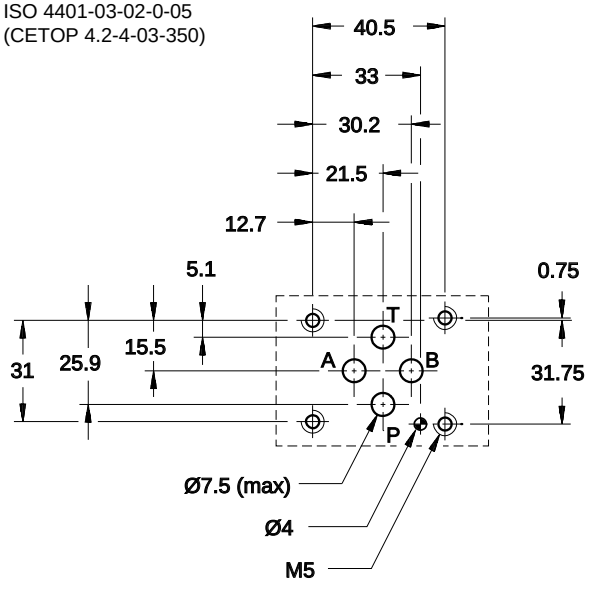
SOLENOID OPERATED SWITCHING VALVE

MODULAR VERSION ISO 4401-03

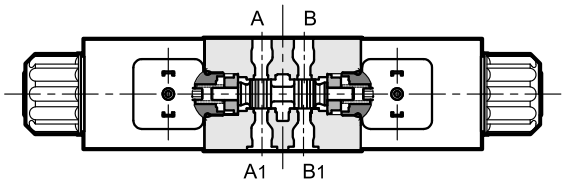
p max **350** bar
Q max **50** l/min

MOUNTING INTERFACE

ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)



OPERATING PRINCIPLE



— The MDS3 valve is used to switch multiple flow directions, or to select pressure values. An application example is showed here below.

— The straight flow paths pass the valve body and due to this particular design feature, the MDS3 can be assembled with all ISO 4401-03 modular valves.

— The mounting pattern of the valve allows an easy construction of differents hydraulic configurations, with pressure drops reduced to a minimal value.

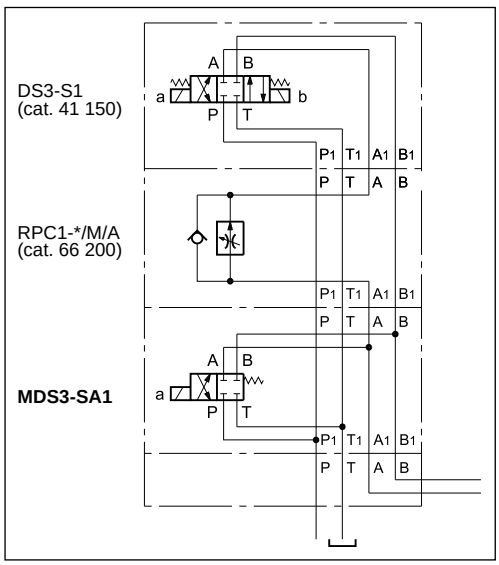
— Versions for AC current are supplied with specific connectors with rectifier bridge.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C)

Max operating pressure: P - A - B ports T port	bar	 350 210
Maximum flow on P - A - B ports	l/min	50
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass: double solenoid single solenoid	kg	2 1.5

APPLICATION EXAMPLE



1 - IDENTIFICATION CODE

MDS	3	-		/			-			/	

Modular switching valve

Size: ISO 4401-03

Spools (see point 2):

S* **SA*** **SB*** **TA**
RSA1 **RSB1** **TB**
TA31 DC only
TB31 DC only

Series no.:
10 = for DC valves
20 = for AC valves
(the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
N = NBR seals for mineral oils (**standard**)
V = FPM seals for special fluids

Manual override (see at point 12):
Omit for override integrated in the tube (**standard**)

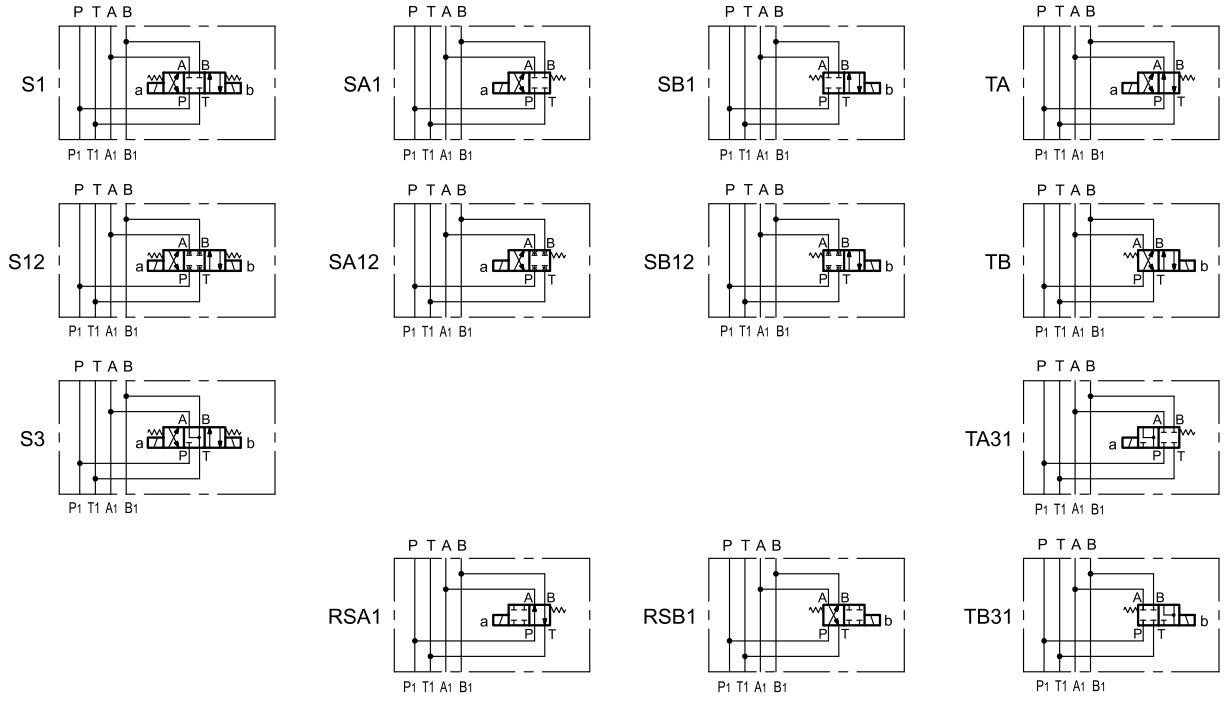
Coil electrical connection :
K1 = plug for connector type EN 175301-803 (ex DIN 43650) (**standard**)
K7 = plug for connector type DEUTSCH DT04-2P male (available on **D12** and **D24** coils only)

DC power supply
D12 = 12 V
D24 = 24 V
D28 = 28 V
D48 = 48 V
D110 = 110 V
D220 = 220 V

AC power supply (**NOTE**)
RD24 = 24 V - 50 Hz
RD48 = 48 V - 50 Hz
RD110 = 110 V - 50 Hz / 120 V - 60 Hz
RD220 = 220 V - 50 Hz / 240 V - 60 Hz

NOTE: Connectors with rectifier bridge included.

2 - SPOOLS TYPES

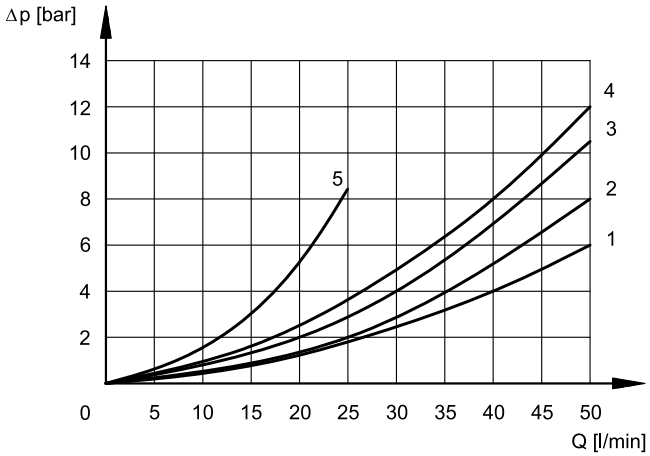


3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

4 - PRESSURE DROPS Δp-Q



SPOOL	FLOW DIRECTIONS			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPHS			
S1, S12	2	2	3	3
S3 (*)	2	2	1	1
RSA1	2			2
TA	3	4	4	4
TA31			3	

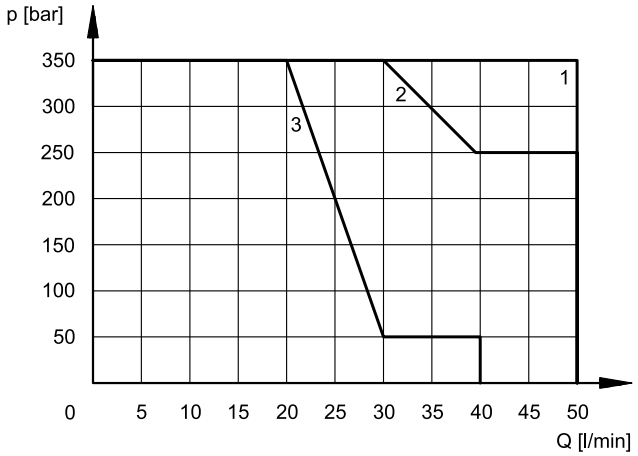
(*) the limit for central position of S3 spool is 25 l/min (curve 5)

5 - OPERATING LIMITS

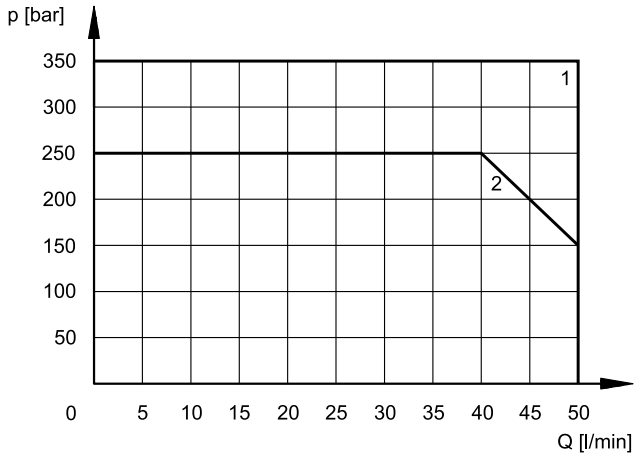
The curves define the flow rate operating fields according to the valve pressure of the different versions. The values indicated in the graphs are relevant to the standard solenoid valve.

The operating limits can be considerably reduced if a 4-way valve is used as 3-way valve with port A or B plugged or without flow.

The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage. The value have been obtained with mineral oil, viscosity 36 cSt, temperature 50 °C and filtration according to ISO 4406:1999 class 18/16/13.



SPOOL	CURVE
S1, S12, RSA1, TA	1
S3	2
TA31	3



SPOOL	CURVE
S1, S12, RSA1, TA	1
S3	2

6 - SWITCHING TIMES

The values indicated are obtained, according to ISO 6403 standards, with mineral oil viscosity 36 cSt at 50°C.

	TIMES (±10%) [ms]	
	ENERGIZING	DE-ENERGIZING
DC	80 -150	15 - 25
AC	25 - 50	20 - 40

7 - ELECTRICAL FEATURES

7.1 - Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation.

The coil is fastened to the tube by a threaded ring, and can be rotated to suit the available space.

Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree, correctly connected and installed.

electric connection	electric connection protection	whole valve protection
K1	IP65	IP65
K7	IP65/67	

SUPPLY VOLTAGE FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY DC valve AC valve	 18.000 ins/hr 10.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC) (NOTE)	In compliance with 2014/30/EU
LOW VOLTAGE	In compliance with 2014/35/EU
CLASS OF PROTECTION: Coil insulation (VDE 0580) Impregnation	 class H class F

NOTE: In order to further reduce the emissions is recommended the use of type H connectors. These prevents voltage peaks on opening of the coil supply electrical circuit (see cat. 49 000).

7.2 - Current and absorbed power for DC solenoid valve

The table shows current and power consumption values relevant to the DC coils.

Available DC coils (values ±10%)

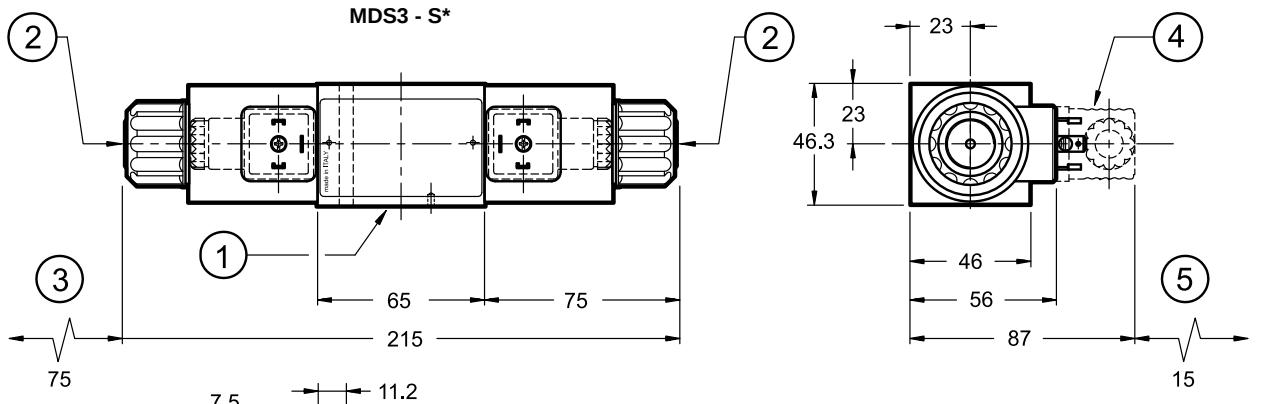
	Nominal voltage [V]	Resistance at 20°C [Ω]	Current consumpt. [A]	Power consumpt [W]	Coil code K1	Coil code K7
D12	12	4.4	2.72	32.7	1903080	1902940
D24	24	18.6	1.29	31	1903081	1902941
D28	28	26	1.11	31	1903082	
D48	48	78,6	0.61	29.5	1903083	
D110	110	423	0.26	28.2	1903464	
D220	220	1692	0.13	28.2	1903465	

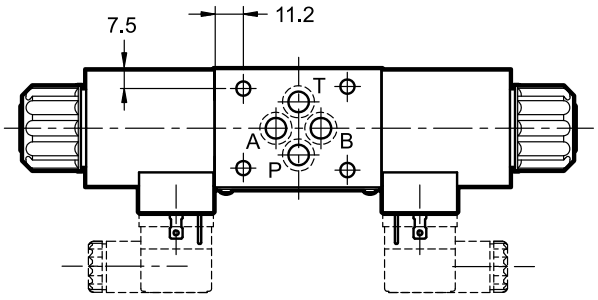
7.3 - Current and absorbed power for AC solenoid valve

Refer to the DC coil values table at 8.2 as the coils are the same. Alternate current usage is possible applying the relevant connectors with rectifier bridge, delivered with the valve.

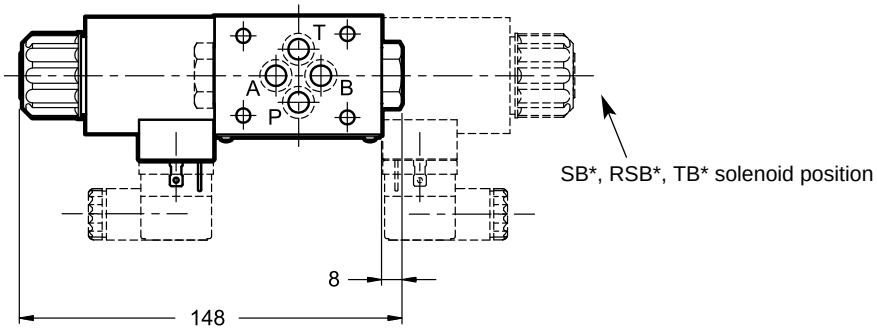
8 - DC VALVE - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

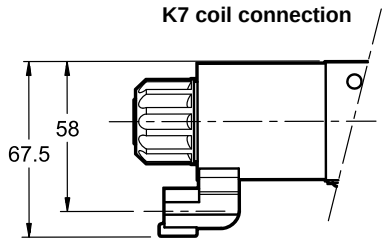




MDS3-SA*, -RSA*, -TA*



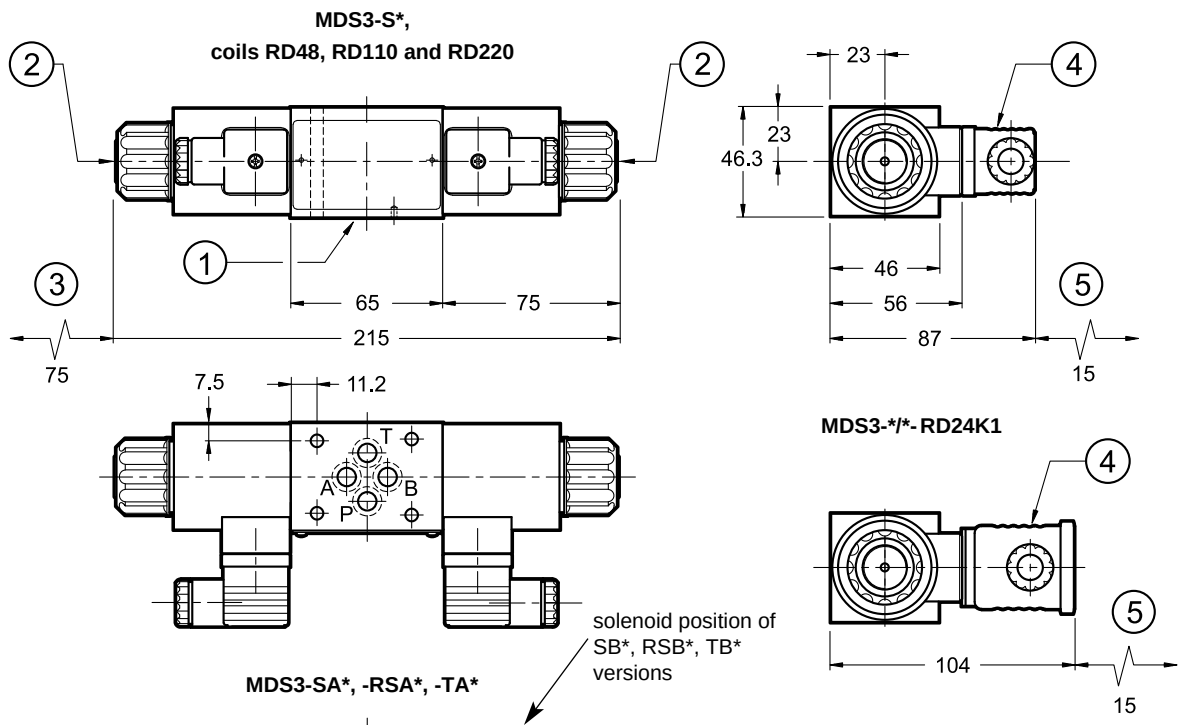
K7 coil connection



1	Mounting surface with sealing rings: N° 4 OR 2037 (9.25x1.78) - 90 Shore
2	Standard manual override included in the solenoid tube
3	Coil removal space
4	EN 175301-803 (ex DIN 43650) electrical connector (K1 standard connector shown) to be ordered separately (see cat. 49 000)
5	Connector removal space

9 - AC VALVE - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

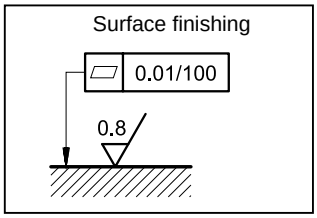


1	Mounting surface with sealing rings: N° 4 OR 2037 (9.25x1.78) - 90 Shore
2	Standard manual override included in the solenoid tube
3	Coil removal space
4	EN 175301-803 (ex DIN 43650) electrical connector, supplied
5	Connector removal space

10 - INSTALLATION

The valve can be mounted in any position. Valve fixing takes place by means of screws or tie rods, with the valve mounted on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing.

If the minimum values of planarity and/or smoothness are not met, fluid leakages between valve and mounting surface can easily occur.



11 - ELECTRIC CONNECTORS

Solenoid valves for AC are supplied with connectors. Instead, DC solenoid valves are delivered without connectors. Connectors for K1 connections ,type EN 175301-803 (ex DIN 43650), can be ordered separately. See catalogue 49 000.

12 - MANUAL OVERRIDES

The standard valve has solenoids whose pin for the manual operation is integrated in the tube. The operation of this control must be executed with a suitable tool, minding not to damage the sliding surface.

Three different manual override versions are available upon request: **CM** boot protected; **CP** push button; **CPK** push button with mechanical retention.

For more information please refer to the catalogue 41150, manual overrides for DC versions.

DUPLOMATIC
MOTION SOLUTIONS
a member of DAIKIN group

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duplomaticmotionsolutions.com

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MOTION SOLUTIONS

WWW.SUMY.IR



M*F3(M)

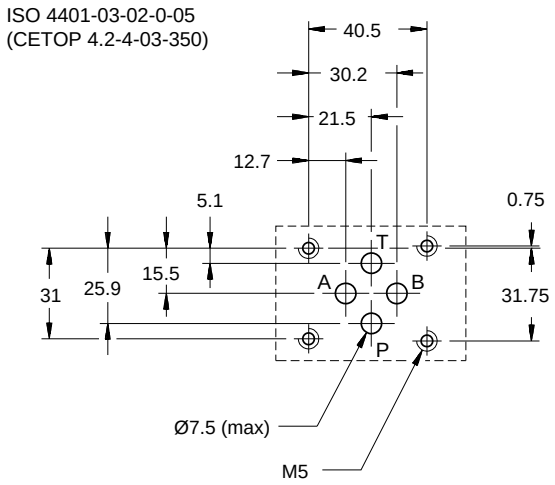
SHUT-OFF VALVES SOLENOID OR HYDRAULICALLY ACTUATED, WITH OR WITHOUT POSITION MONITORING

SERIES 10

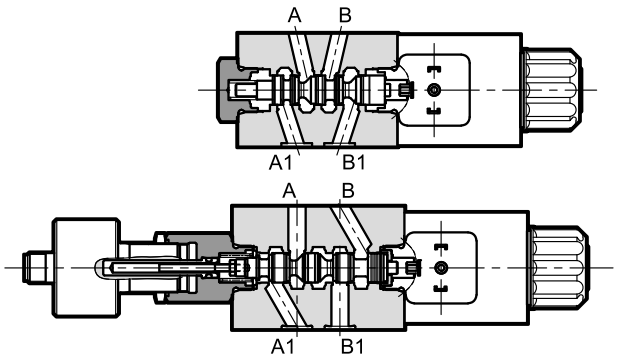
MODULAR VERSION ISO 4401-03

p max **350** bar
Q max **50** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



— M*F3 are shut-off valves, solenoid or hydraulically actuated, with or without spool position monitoring, in modular version, with mounting interface according to ISO 4401-03 standard.

— M*F3 valves are placed under directional control servovalves in order to guarantee the safety of circuit when a power failure occurs.

— Spools with float, closed, parallel or cross position in de-energized condition are available.

— Versions with spool monitoring do not have manual override and can not be disassembled, because of their characteristics and their possible use on machinery subject to safety requirements.

— The spool position monitoring is available either for initial position or for actuated position.

PERFORMANCE RATINGS

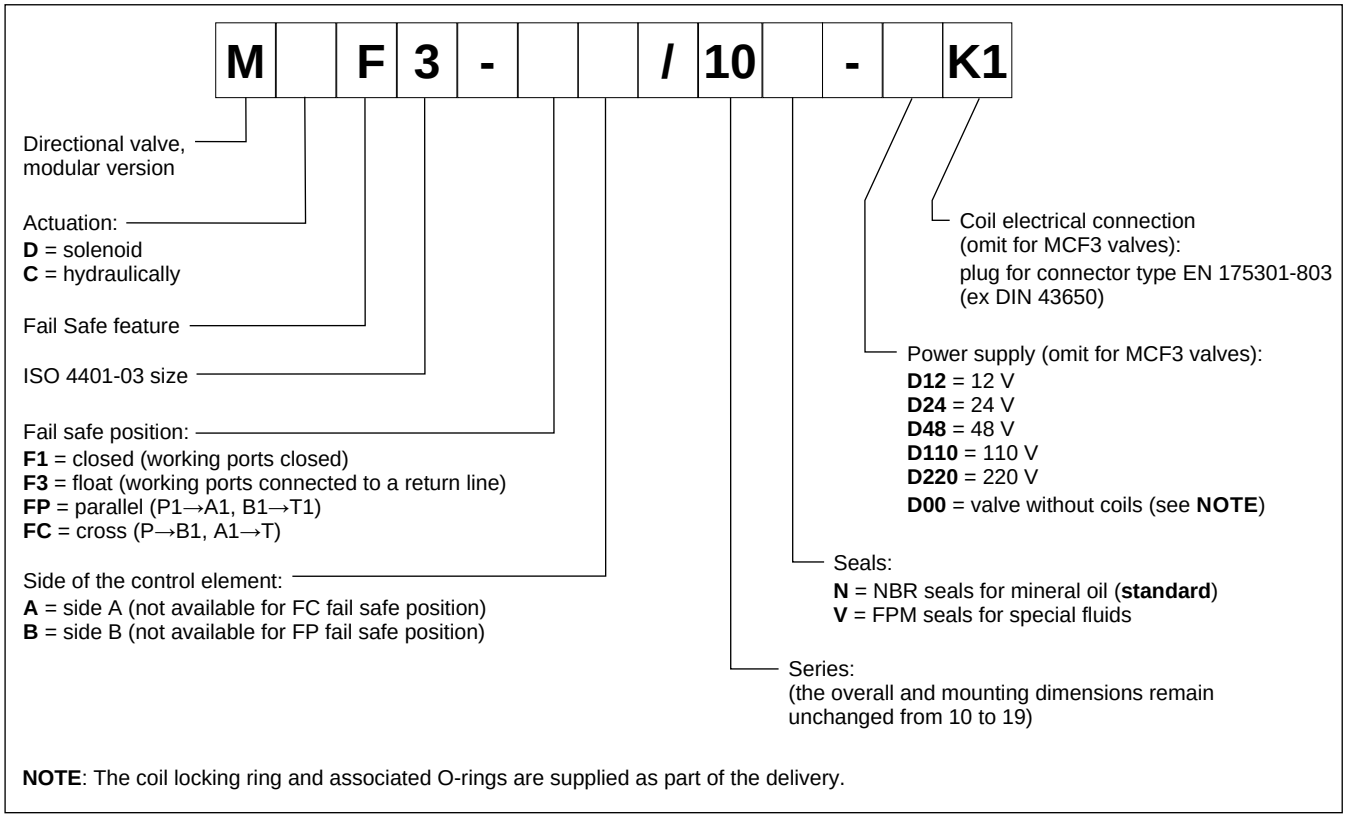
(working with mineral oil of viscosity of 36 cSt at 50°C)

		MDF3	MCF3
Maximum operating pressure: P - A - B ports T port	bar	350 210	350 25
Pilot pressure: min max	bar	-	15 (**NOTE**) 210
Maximum flow rate	l/min	50	40
Ambient temperature range	°C	-20 / +50	
Fluid temperature range	°C	-20 / +80	
Fluid viscosity range	cSt	10 ÷ 400	
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15		
Recommended viscosity	cSt	25	
Mass	kg	1,5	1,3

NOTE: The pilot pressure must be 10 to 20 bar higher than the return pressure to allow the fluid discharge from the pressure chamber.

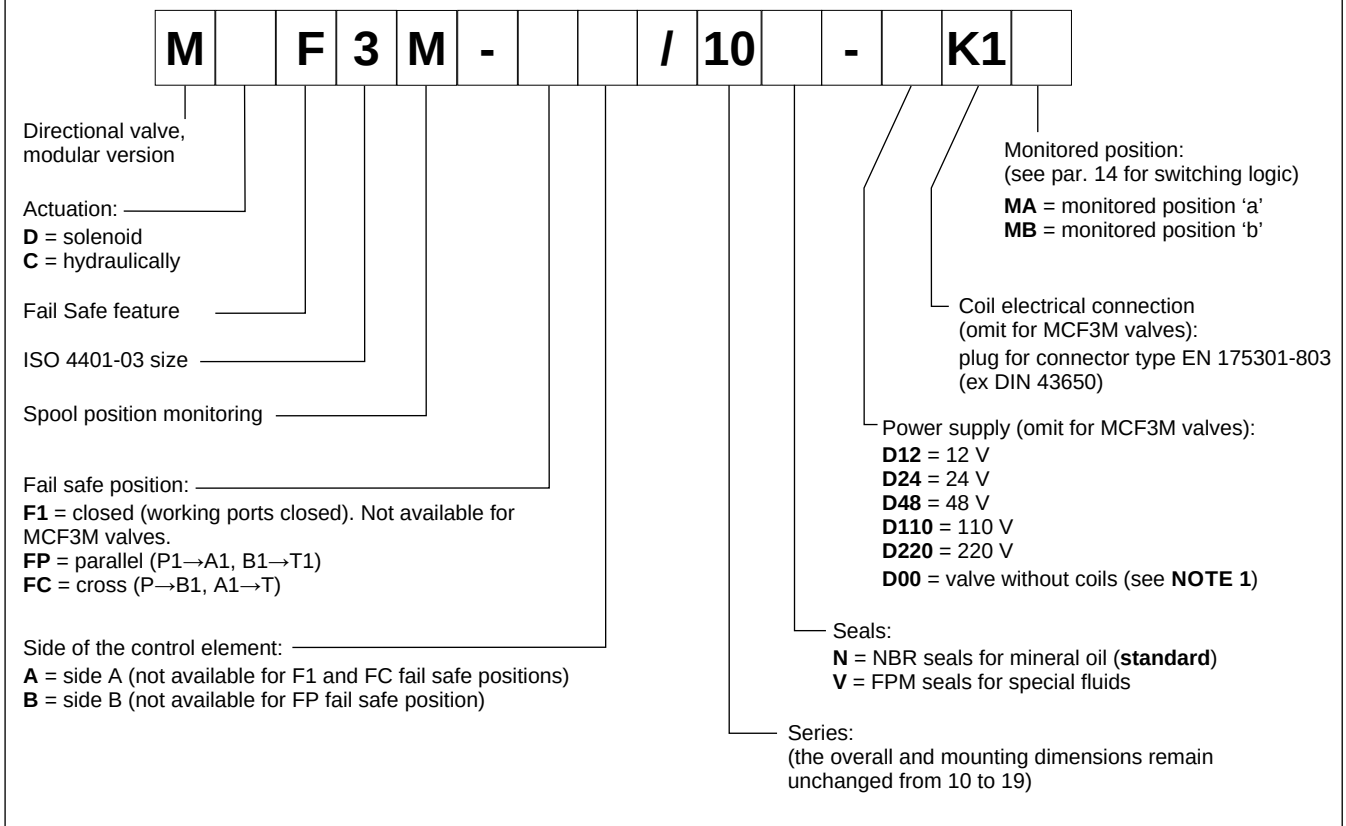
1 - IDENTIFICATION CODES

1.1 - M*F3 valves



NOTE: The coil locking ring and associated O-rings are supplied as part of the delivery.

1.2 - M*F3M valves with monitored spools



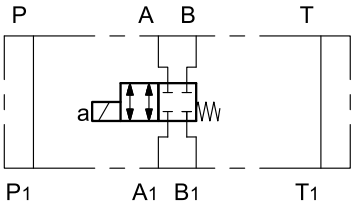
NOTE: The coil locking ring and associated O-rings are supplied as part of the delivery.

2 - HYDRAULIC SYMBOLS

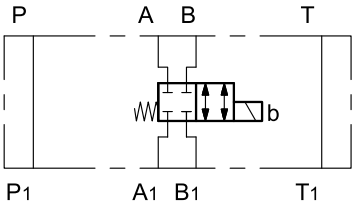
2.1 - MDF3 valves

F1A

closed fail safe position

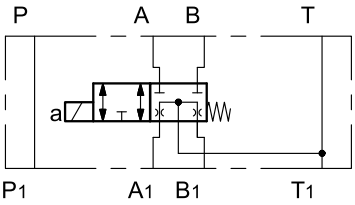


F1B

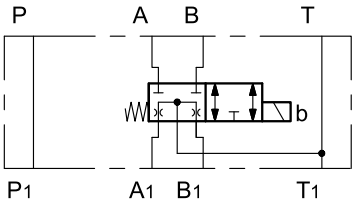


F3A

float fail safe position

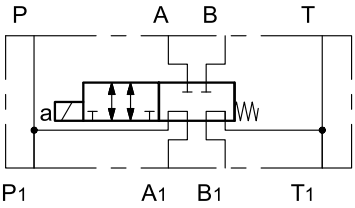


F3B



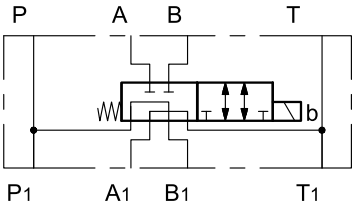
FPA

parallel fail safe position



FCB

cross fail safe position

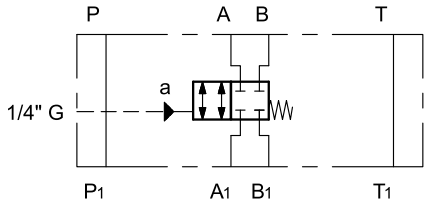


NOTE: P1, T1, A1, B1 are plate side.

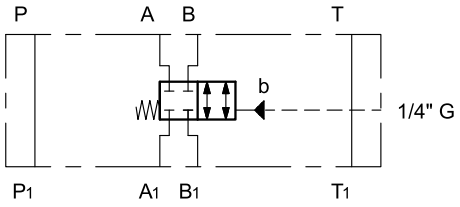
2.2 - MCF3 valves

F1A

closed fail safe position

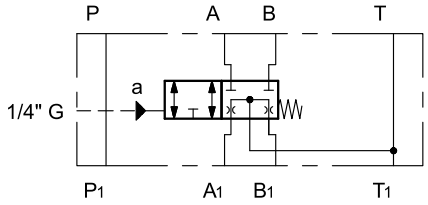


F1B

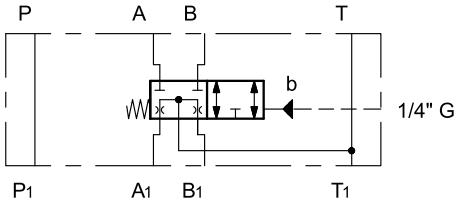


F3A

float fail safe position

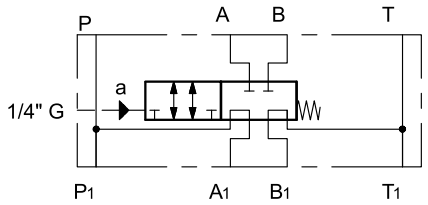


F3B



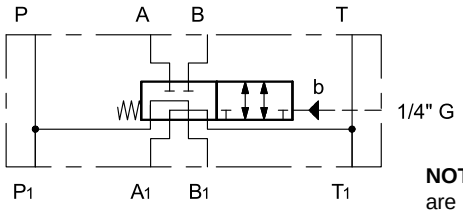
FPA

parallel fail safe position



FCB

cross fail safe position

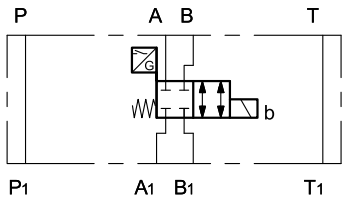


NOTE: P1, T1, A1, B1 are plate side.

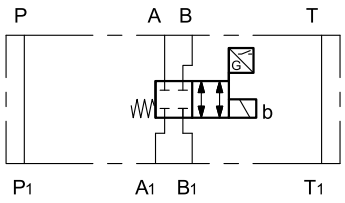
2.3 - MDF3M valves with monitored spools

Type **F1B**:
1 solenoid side B - closed fail safe position

Sensor **MA**

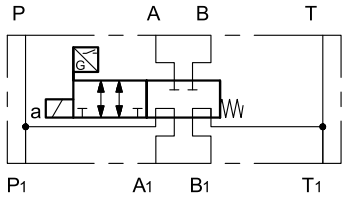


Sensor **MB**

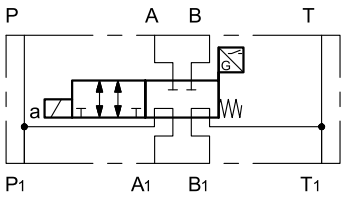


Type **FPA**:
1 solenoid side A - parallel fail safe position

Sensor **MA**

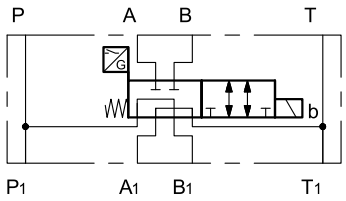


Sensor **MB**

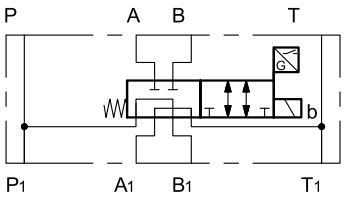


Type **FCB**:
1 solenoid side B - cross fail safe position

Sensor **MA**



Sensor **MB**

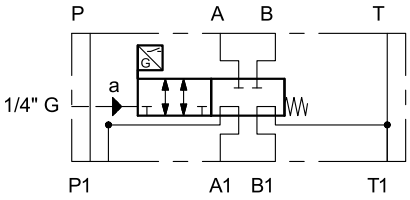


NOTE: P1, T1, A1, B1 are plate side.

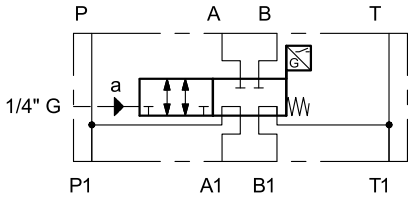
2.4 - MCF3M valves

Type **FPA**:
hydraulic actuation side A - parallel fail safe position

Sensor **MA**

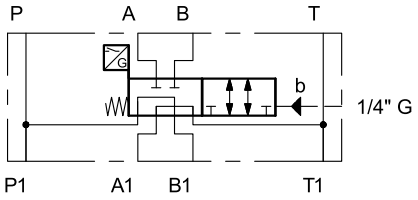


Sensor **MB**

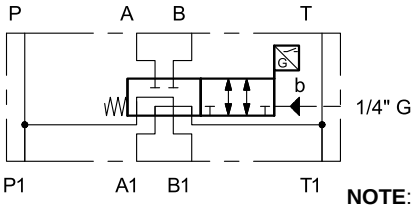


Type **FCB**:
hydraulic actuation side B - cross fail safe position

Sensor **MA**



Sensor **MB**



NOTE: P1, T1, A1, B1 are plate side.

3 - HYDRAULIC FLUIDS

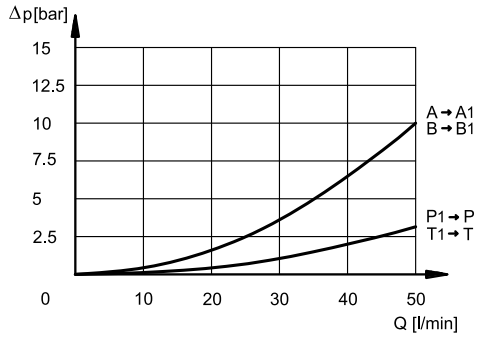
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

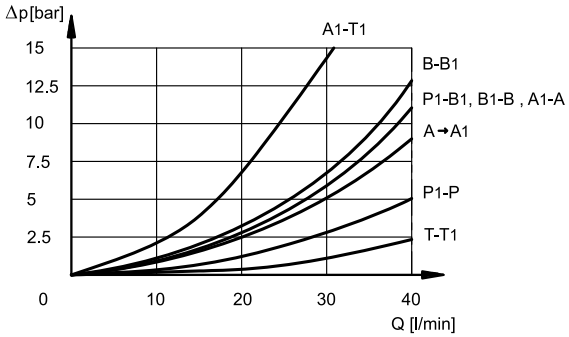
4 - PRESSURE DROPS Δp-Q

(obtained with viscosity 36 cSt at 50 °C)

MD*3-F1*, MD*3-F3*



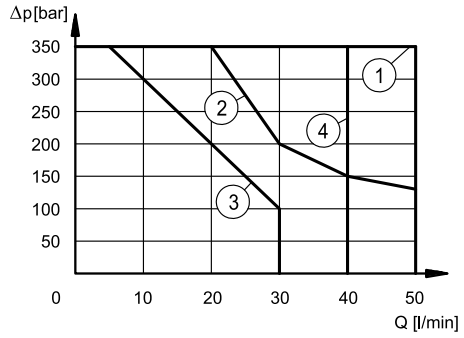
M*F3-FCB



5 - OPERATING LIMITS

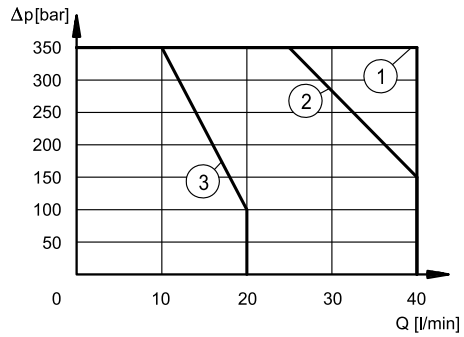
The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage. The values have been obtained with mineral oil, viscosity 36 cSt, temperature 50 °C and filtration according to ISO 4406:1999 class 18/16/13.

MDF3-*



SPOOL TYPE	De-energizing	Energizing	
		with flow in A and B	without flow in A and B
	CURVES ON GRAPH		
F1*, F3*	1	2	1
FCB	4	3	3

MCF3-*



SPOOL TYPE	De-actuating	Actuating	
		pilot pressure tank +10 bar	pilot pressure tank +20 bar
	CURVES ON GRAPH		
FCB	1	3	2

6 - SWITCHING TIMES

The values indicated are obtained according to ISO 6403 standard, with mineral oil viscosity 36 cSt at 50°C.

TIMES [ms]	ENERGIZING	DE-ENERGIZING
MDF3 - F1	60 ÷ 90	20 ÷ 50 ms

7 - MDF3 - ELECTRICAL FEATURES

7.1 - Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation.

The coil is fastened to the tube by a threaded ring; versions without the spool monitoring and can be rotated, to suit the available space.

NOTE 1: In order to further reduce the emissions, use of type H connectors is recommended. These prevent voltage peaks on opening of the coil supply electrical circuit (see cat. 49 000).

NOTE 2: The IP65 protection degree is guaranteed only with the connector correctly connected and installed.

VOLTAGE SUPPLY FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY	18.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC) (NOTE 1)	In compliance with 2014/30/EU
LOW VOLTAGE	In compliance with 2014/35/EU
CLASS OF PROTECTION Atmospheric agents (IEC 60529) Coil insulation (VDE 0580) Impregnation	IP65 (**NOTE 2**) class H class F

7.2 - Current and absorbed power

The table shows current and power consumption values relevant to the different coil types for DC.

Using connectors type "D" (see cat. 49 000) with embedded bridge rectifier it is possible to feed DC coils (starting from 48V voltage) with alternating current (50 or 60 Hz), considering a reduction of the operating limits of about 5-10%.

Coils for direct current (values ±10%)

	Nominal voltage [V]	Resistance at 20°C [Ω]	Current consumpt. [A]	Power consumpt [W]	Coil code
D12	12	4,4	2,72	32,7	1903080
D24	24	18,6	1,29	31	1903081
D48	48	78,6	0,61	29,5	1903083
D110	110	423	0,26	28,2	1903464
D220	220	1692	0,13	28,2	1903465

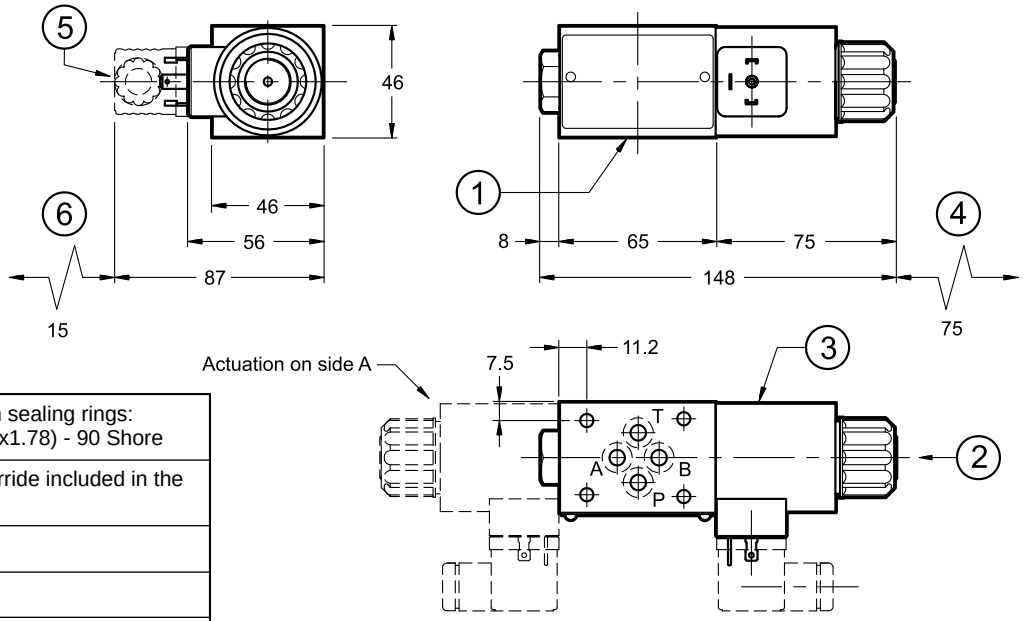
8 - ELECTRIC CONNECTORS

Solenoid operated valves are delivered without connectors. Connectors can be ordered separately. See catalogue 49 000.

9 - MDF3 OVERALL AND MOUNTING DIMENSIONS

MDF3-F1*
MDF3-F3*

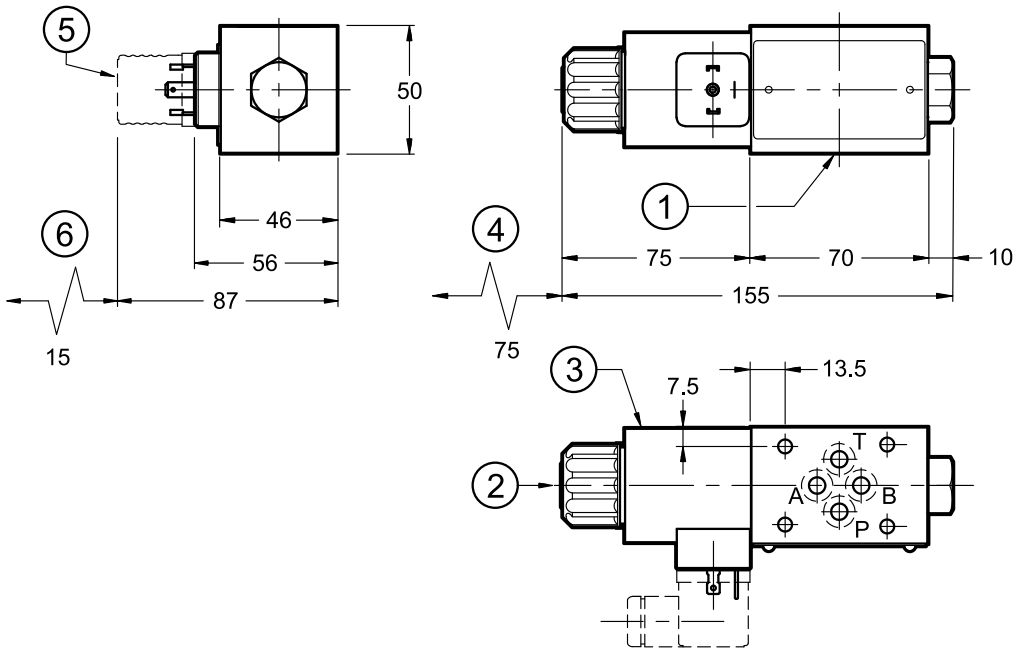
dimensions in mm



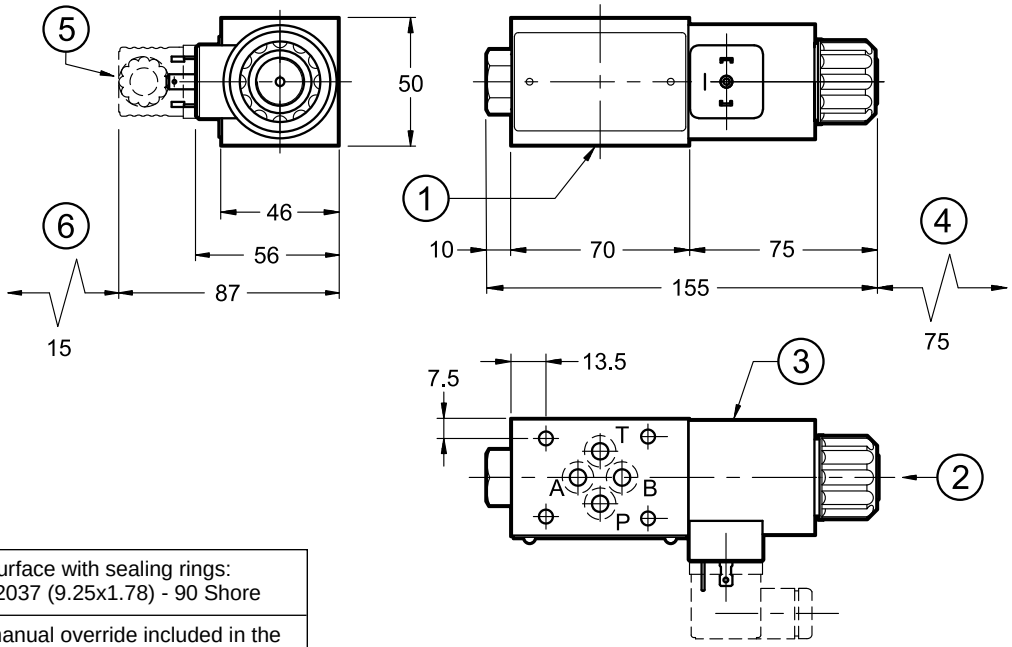
1	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) - 90 Shore
2	Standard manual override included in the solenoid tube
3	Coil 360° revolving
4	Coil removal space
5	EN 175301-803 (ex DIN 43650) electrical connector to be ordered separately (see cat. 49 000)
6	Connector removal space

dimensions in mm

MDF3-FPA



MDF3-FCB

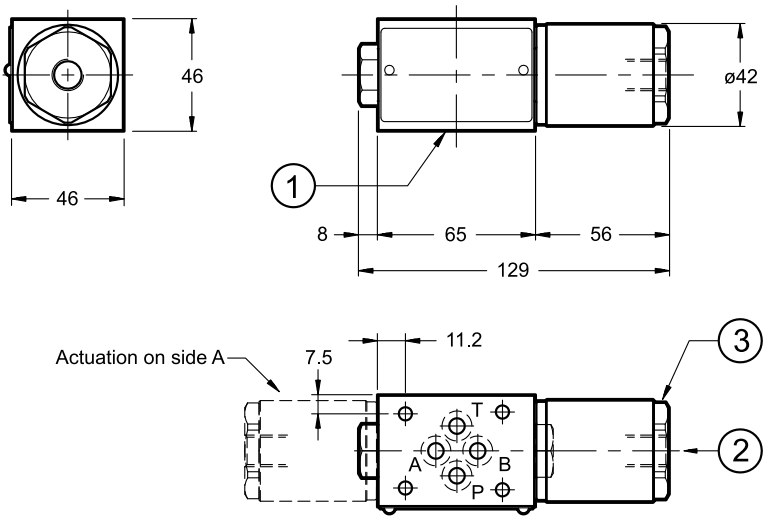


1	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) - 90 Shore
2	Standard manual override included in the solenoid tube
3	Coil 360° revolving
4	Coil removal space
5	EN 175301-803 (ex DIN 43650) electrical connector to be ordered separately (see cat. 49 000)
6	Connector removal space

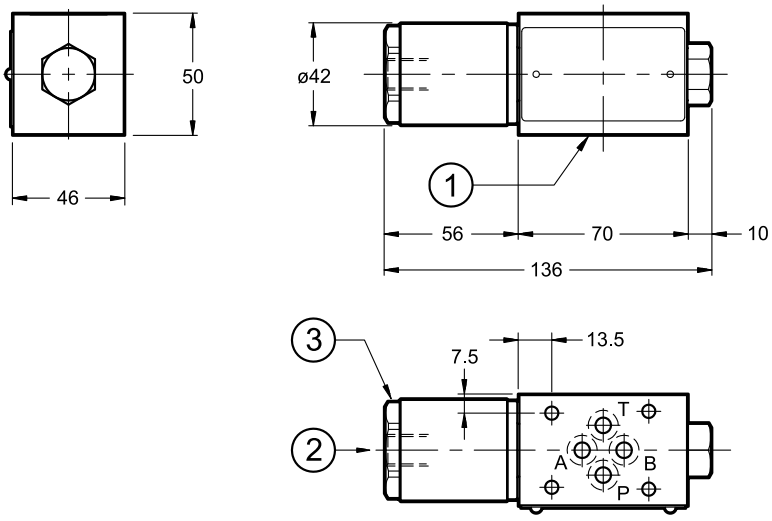
10 - MCF3 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

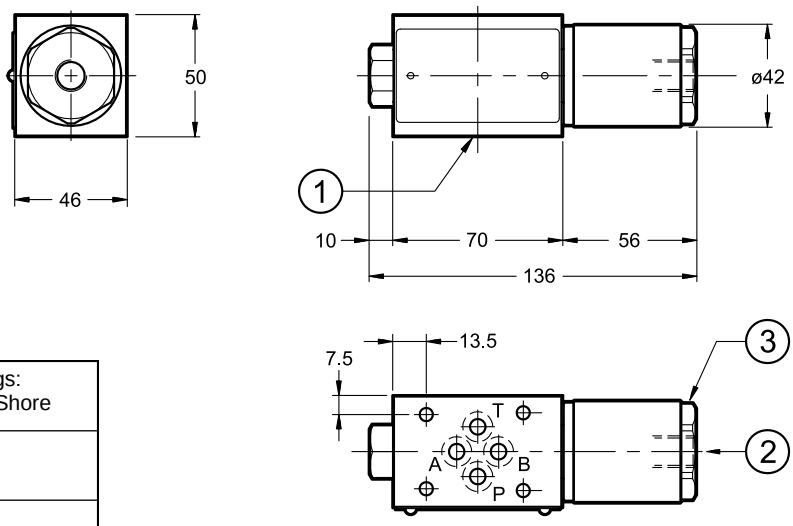
MCF3-F1*
MCF3-F3*



MCF3-FPA



MCF3-FCB

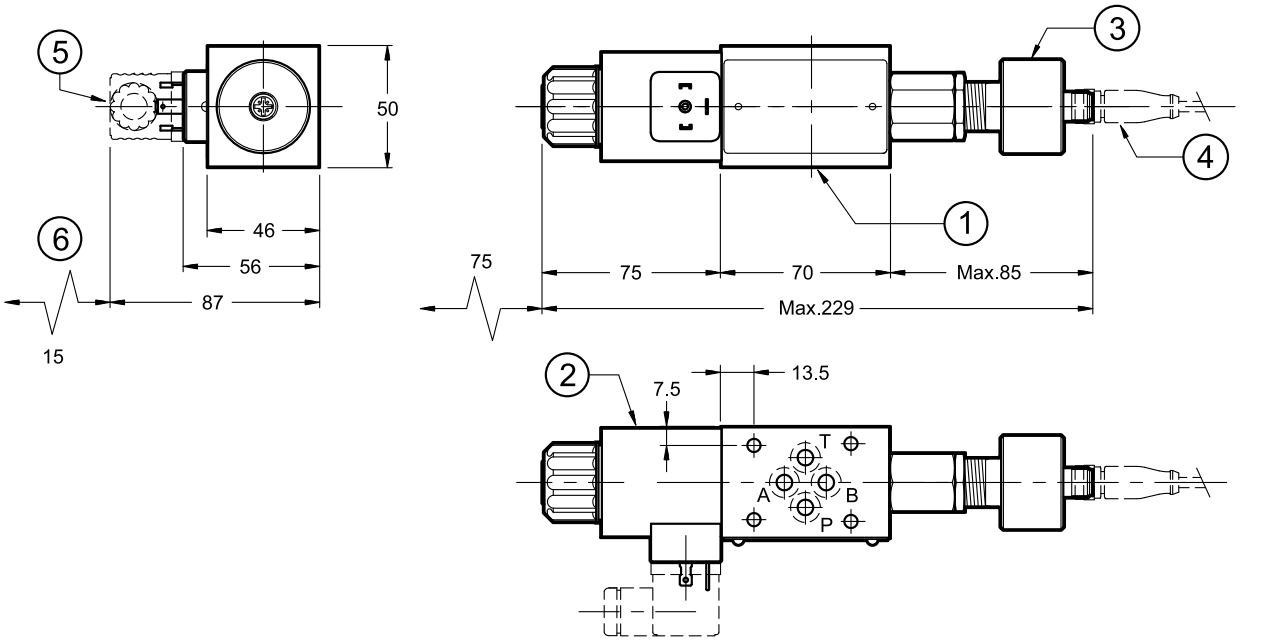


1	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) - 90 Shore
2	1/4” BSP connection for hydraulic actuation
3	Hexagon: spanner 38 Tightening torque 35 ÷ 40 Nm

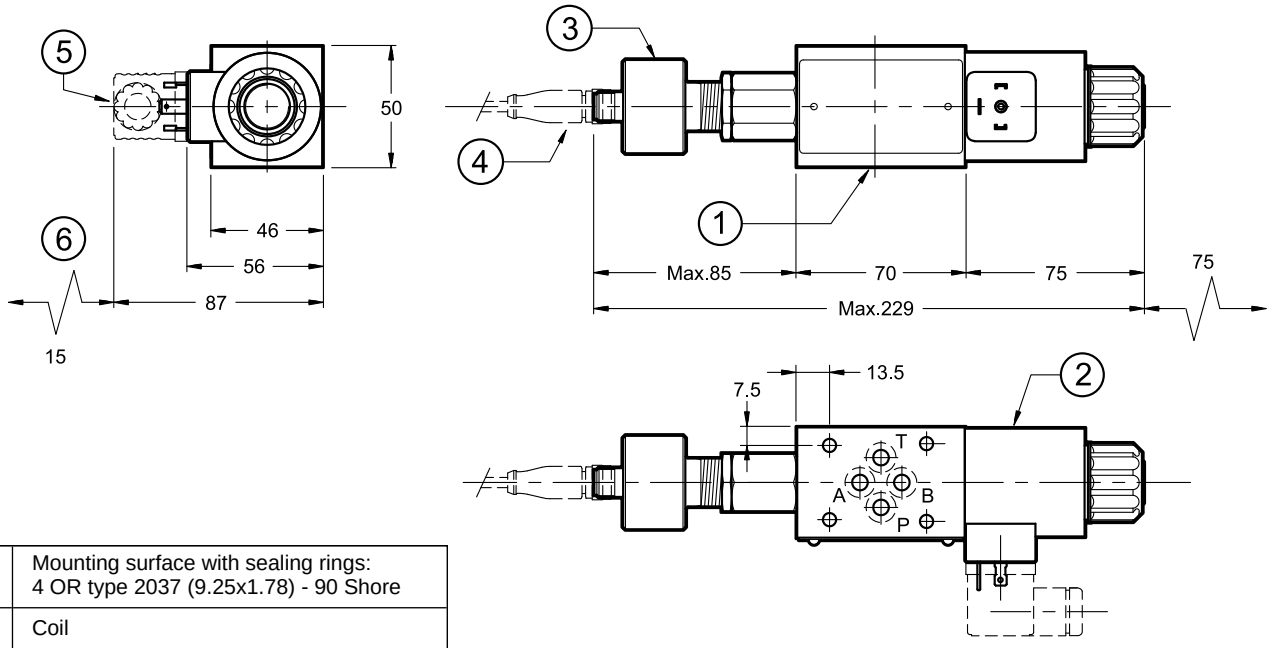
11 - MDF3M OVERALL AND MOUNTING DIMENSIONS

MDF3M - FPA

dimensions in mm



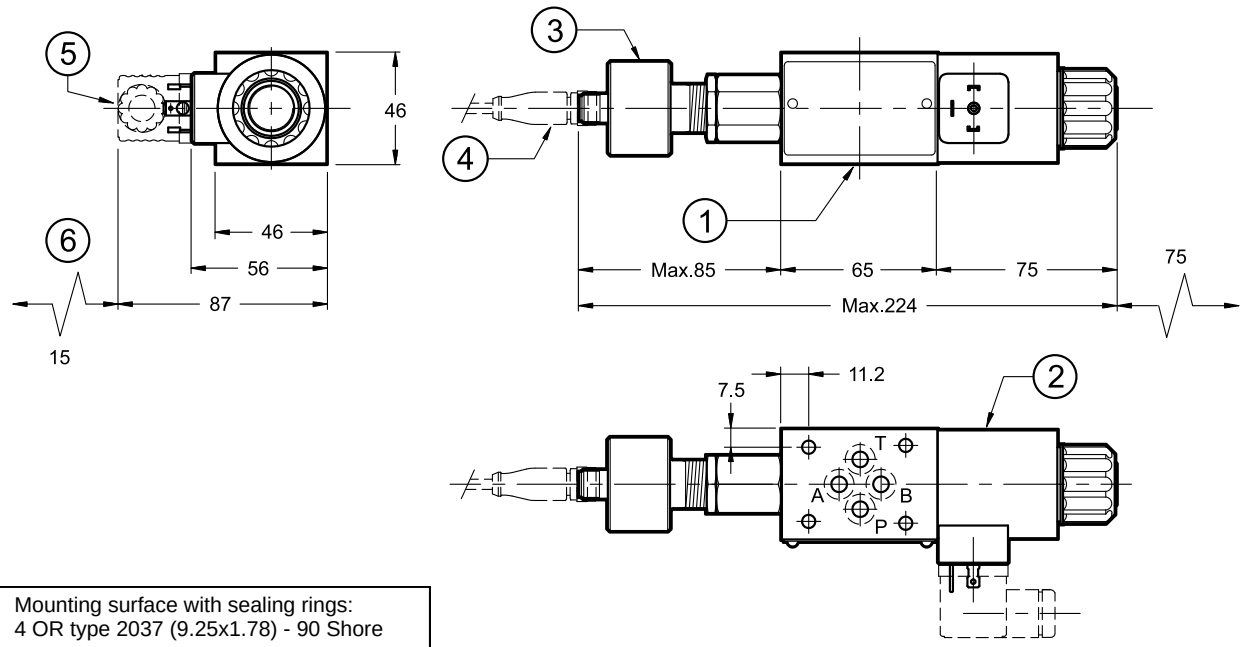
MDF3M - FCB



1	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) - 90 Shore
2	Coil
3	Position sensor: setting sealed at factory, do not tamper.
4	Connector for position sensor. To be ordered separately (see cat. 41 505)
5	EN 175301-803 (ex DIN 43650) electrical connector to be ordered separately (see cat. 49 000)
6	Connector removal space

MDF3M - F1B

dimensions in mm

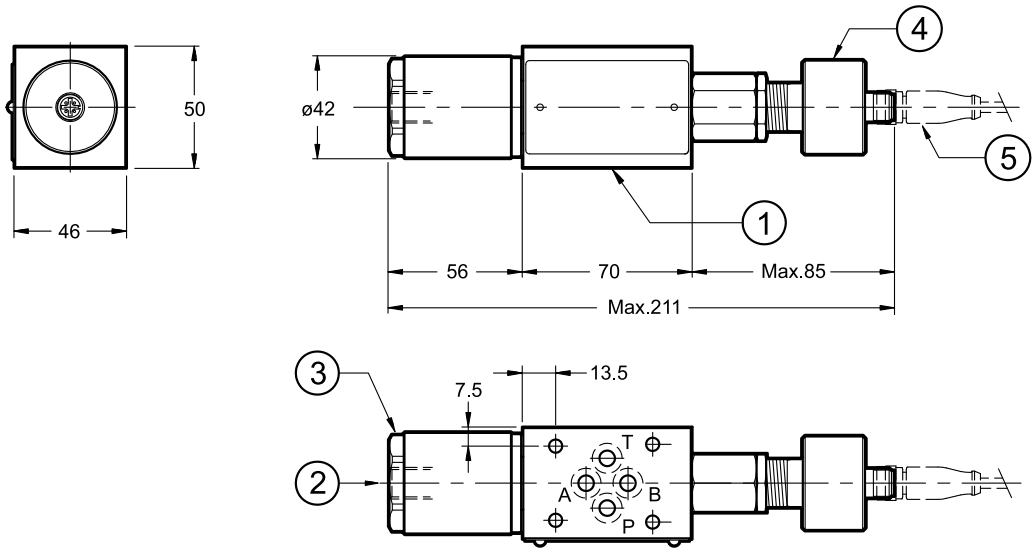


1	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) - 90 Shore
2	Coil
3	Position sensor: setting sealed at factory, do not tamper.
4	Connector for position sensor. To be ordered separately (see cat. 41 505)
5	EN 175301-803 (ex DIN 43650) electrical connector to be ordered separately (see cat. 49 000)
6	Connector removal space

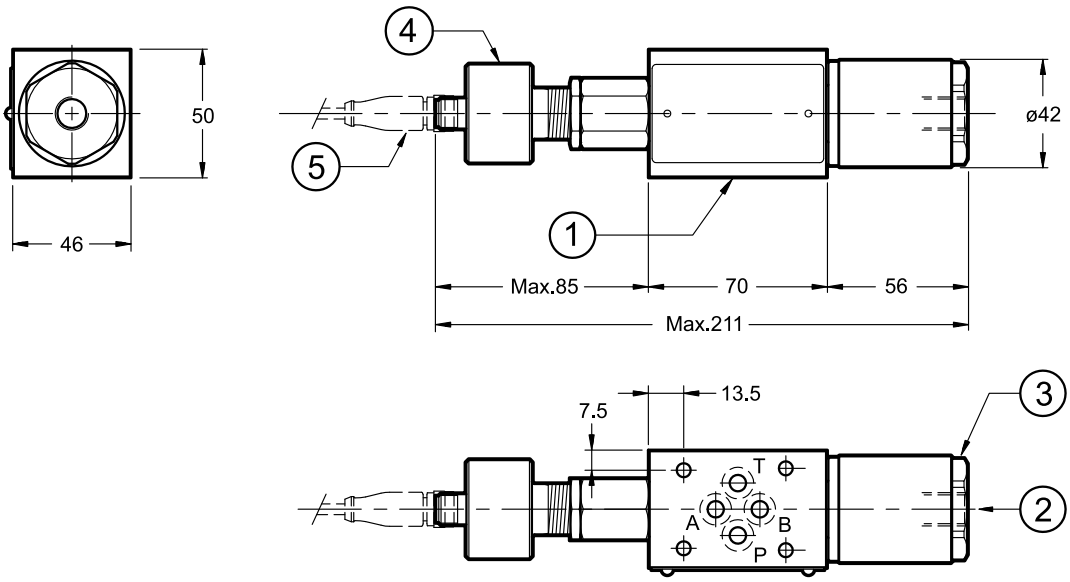
12 - MCF3M OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

MCF3M - FPA



MCF3M - FCB

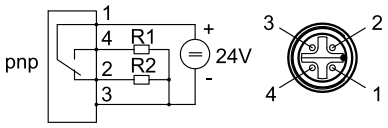


1	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) - 90 Shore
2	1/4” BSP connection for hydraulic actuation
3	Hexagon: spanner 38 Tightening torque 35 ÷ 40 Nm
4	Position sensor: setting sealed at factory, do not tamper.
5	Connector for position sensor. To be ordered separately (see cat. 41 505)

13 - M*F3M POSITION SENSOR

WARNING ! Valve disassembling is not allowed.
Sensors must not be unscrewed or tampered.

CONNECTION SCHEME



Pin	Values	Function
1	+24 V	Supply
2	NC	Normal Closed
3	0 V	-
4	NO	Normal Open

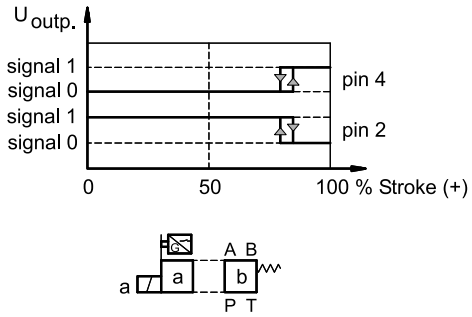
Operating voltage range	V DC	20 ÷ 32
Absorbed current	A	0.4
Max output load	mA	400
Output		2 PNP
Electric protections		polarity inversion short circuit
Hysteresis	mm	≤ 0.1
Operating temperature range	°C	- 25 / +80
Class of protection from atmospheric agents (IEC 60529)		IP65
EMC Electromagnetic compatibility		In compliance with 2014/30/EU

14 - SWITCHING LOGICS

14.1 - MA monitoring

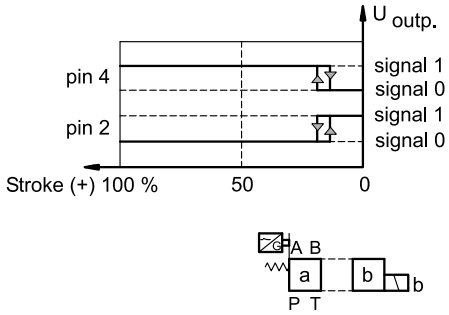
Energized position monitored.

for M*F3M-*F*A valves



De-energized position monitored.

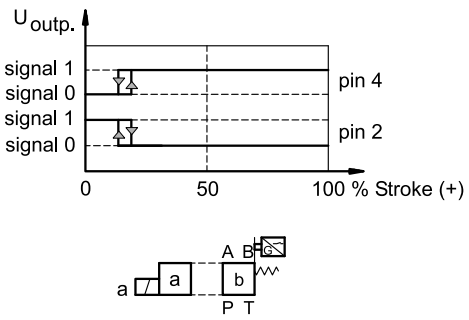
for M*F3M-F*B valves



14.2 - MB monitoring

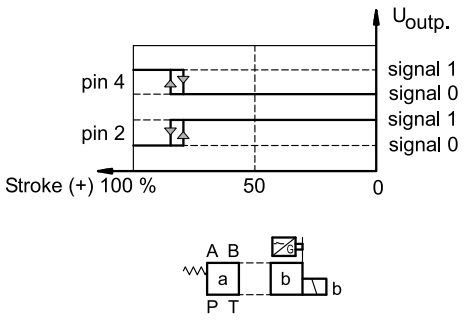
De-energized position monitored.

for M*F3M-*A valves



Energized position monitored.

for M*F3M-*B valves



DUPLOMATIC MOTION SOLUTIONS
a member of DAIKIN group

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duplomaticmotionsolutions.com

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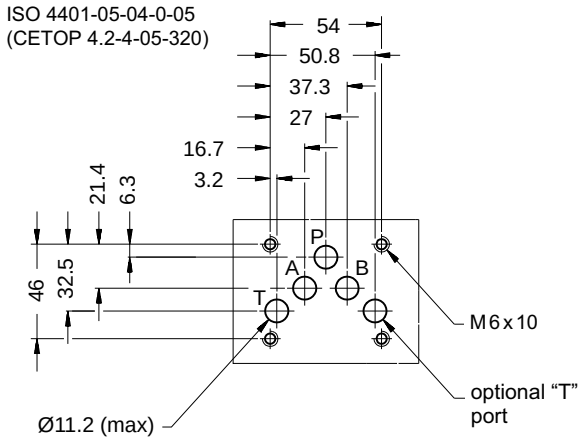
DS5

SOLENOID OPERATED DIRECTIONAL CONTROL VALVE

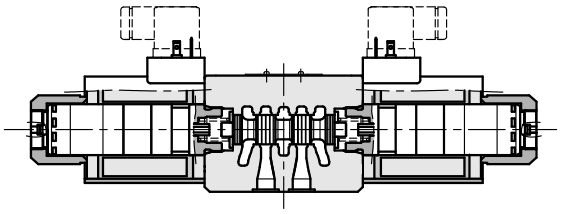
SUBPLATE MOUNTING ISO 4401-05

p max **320** bar
Q max **150** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



— Direct acting, subplate mounting directional control valve, with mounting surface according to ISO 4401.

— The valve is designed for 3 or 4 way and with several interchangeable spools, with different porting arrangements.

— The valve body is made with high strength iron castings provided with wide internal passages, in order to minimize the flow pressure drop. Wet armature solenoids with interchangeable coils are used (see paragraph 7).

— The valve is available with DC or AC solenoids. DC solenoids can also be fed with AC power supply, by using connectors with a built-in rectifier bridge (see paragraph 7.2).

— The DS5 direct current version is available in the following special versions:

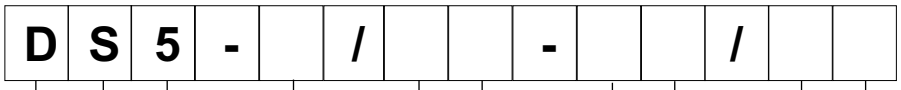
- with Y external subplate drain port, (see par. 13.1 and 13.2).
- with soft-shifting (see par. 13.3 and 13.4)
- with adjustable "soft-shift" device (see paragraph 13.5)

PERFORMANCES

(with mineral oil of viscosity of 36 cSt at 50°C)

		DC	AC
Maximum operating pressure P - A - B ports T port - standard version T port - version with Y port (ext.drain)	bar	320 210 320	 140 -
Maximum flow rate	l/min	150	120
Pressure drops Δp-Q		see paragraph 4	
Operating limits		see paragraph 6	
Electrical features		see paragraph 7	
Electrical connections		see paragraph 11	
Ambient temperature range	°C	-20 / +50	
Fluid temperature range	°C	-20 / +80	
Fluid viscosity range	cSt	10 ÷ 400	
Fluid contamination degree		according to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25	
Mass: single solenoid valve double solenoid valve	kg	4.5 6.1	3.6 4.3

1 - IDENTIFICATION CODE



Solenoid operated directional control valve

ISO 4401-05 size

Spool type (see par. 3)

S*	**TA**
SA*	**TB**
SB*	**RK**

Series:
(the overall and mounting dimensions remain unchanged from 10 to 19)
14 = for DC valves type D*K1 and D12K7
DC valves without coils D00
12 = for AC valves
DC valves D24K7

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

DC power supply
D12 = 12 V
D24 = 24 V
D26 = 26.4 V
D110 = 110 V
D220 = 220 V
D00 = valve without coils (see **NOTE 1**)

AC power supply
A24 = 24 V - 50 Hz.
Not available for S4, SA4, SB4, S7 and S8 spools
A48 = 48 V - 50 Hz
A110 = 110 V - 50 Hz / 120 V - 60 Hz
A230 = 230 V - 50 Hz / 240 V - 60 Hz
A00 = valve without coils (see **NOTE 1**)
F110 = 110 V - 60 Hz
F220 = 220 V - 60 Hz

Option: Surface treatment not standard.
Not available for AC valves.
Omit if not required.
(see **NOTE 2**)

Manual override:
omit for override integrated in the tube (**standard**)
CM = manual override, boot protected (only for DC version)
CK = knob manual override (only for DC version)
CK2 = push and twist knob override (only for DC version)

Coil electrical connection (see par. 11):
K1 = plug for connector type EN 175301-803 (ex DIN 43650) (**standard**)
Only for **D12** and **D24**:
K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S

NOTE 1: Coils locking ring and related OR are supplied together with valves.

NOTE 2:The standard surface treatment is phosphating black.

On request we can supply these valves with zinc-nickel finishing, making the valve suitable to ensure a salt spray resistance up to 240 hours (test operated according to UNI EN ISO 9227 standard and test evaluation operated according to UNI EN ISO 10289 standard)

Add **/W7** at the end of the identification code.

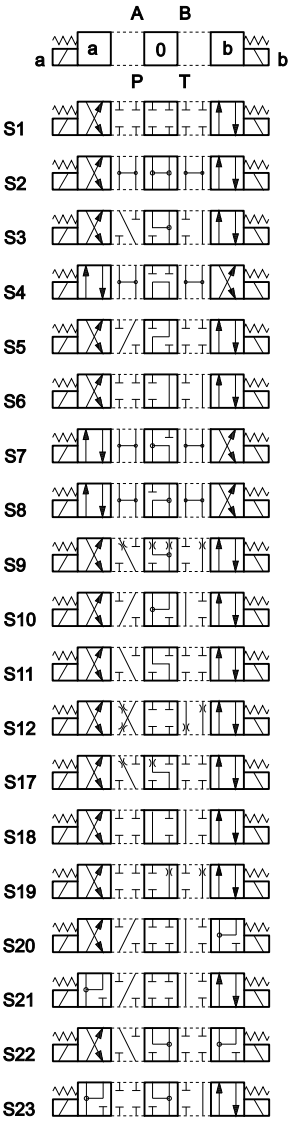
2 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

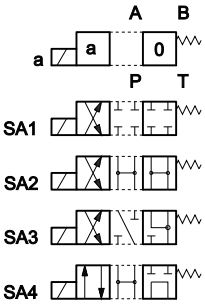
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

3 - SPOOL TYPE

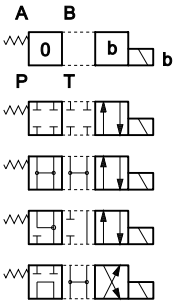
Type **S***:
2 solenoids - 3 positions
with spring centering



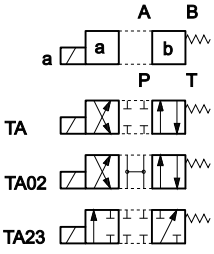
Type **SA***:
1 solenoid side A
2 positions (central + external)
with spring centering



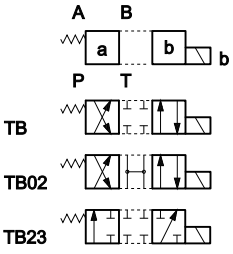
Type **SB***:
1 solenoid side B
2 positions (central + external)
with spring centering



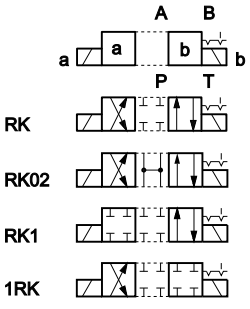
Type **TA**:
1 solenoid side A
2 external positions
with return spring



Type **TB**:
1 solenoid side B
2 external positions
with return spring



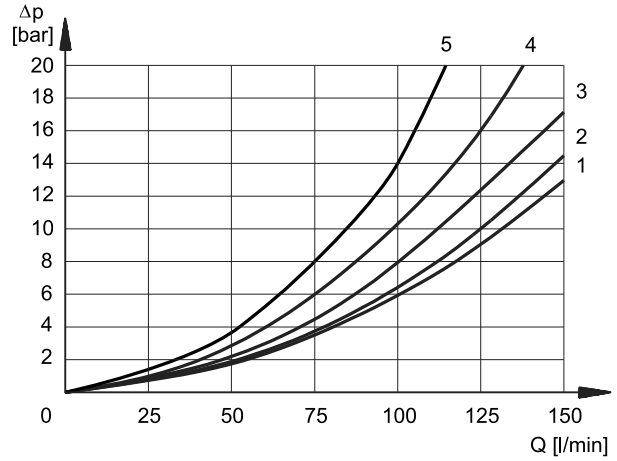
Type **RK**:
2 solenoids - 2 positions
with mechanical retention



Besides the diagrams shown, which are the most frequently used, other special versions are available: consult our technical department for their identification, feasibility and operating limits.

4 - PRESSURE DROPS Δp-Q

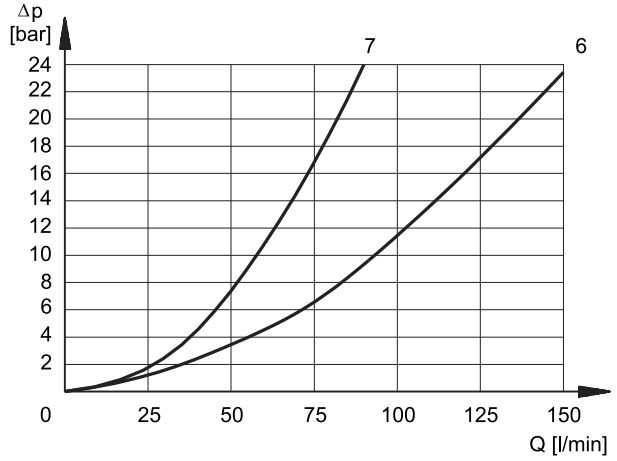
(obtained with viscosity 36 cSt at 50 °C)



ENERGIZED POSITION

SPOOL TYPE	FLOW DIRECTION			
	P-A	P-B	A-T	B-T
	CURVES ON GRAPH			
S1, SA1, SB1	2	2	1	1
S2, SA2, SB2	3	3	1	1
S3, SA3, SB3	3	3	2	2
S4, SA4, SB4	1	1	2	2
S5	2	1	1	1
S6, S11	3	3	2	2
S7, S8	1	1	2	2
S9	3	3	2	2
S10	1	1	3	3
S12	2	2	1	1
S17, S19	2	2	1	1
S18	1	2	1	1
S20, S22	2	4	4	-
S21, S23	4	2	-	4
TA, TB	3	3	2	2
TA02, TB02	3	3	2	2
TA23, TB23	4	4		
RK	3	3	2	2
RK02	3	3	2	2
RK1, 1RK	3	3	2	2

For pressure drops between A and B lines of S10, S20, S21, S22 spools which are used in the regenerative diagram, refer to curve 5.



DE-ENERGIZED POSITION

SPOOL TYPE	FLOW DIRECTION				
	P-A	P-B	A-T	B-T	P-T
	CURVES ON GRAPH				
S2, SA2, SB2					6
S3, SA3, SB3			7	7	
S4, SA4, SB4					6
S5		3			
S6				7	
S7					6
S8					6
S10	3	3			
S11			7		
S18	3				
S22			7	7	

5 - SWITCHING TIMES

The values indicated are obtained according to ISO 6403 standard, with mineral oil viscosity 36 cSt at 50°C.

COIL TYPE	TIMES [ms]	
	ENERGIZING	-ENERGIZING
DC	100 ÷ 150 ms	20 ÷ 50 ms
AC	15 ÷ 30 ms	20 ÷ 50 ms

6 - OPERATING LIMITS

The curves define the flow rate operating fields according to the valve pressure of the different versions.

The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage.

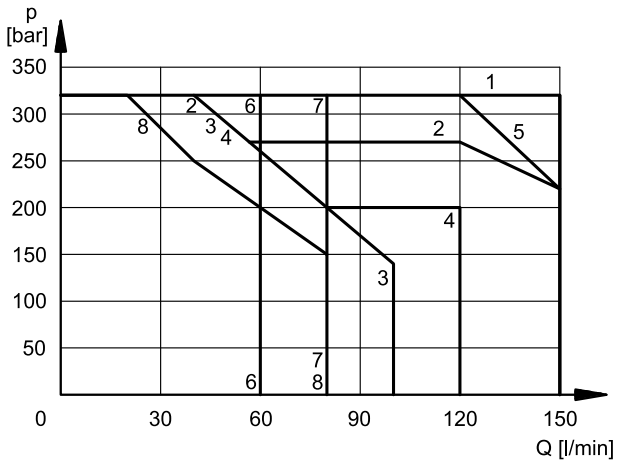
The values have been obtained with mineral oil, viscosity 36 cSt, temperature 50 °C and filtration according to ISO 4406:1999 class 18/16/13 and are relevant to the standard solenoid valve.

The operating limits can be considerably reduced if a 4-way valve is used as 3-way valve with port A or B plugged or without flow.

For flow and pressure performances of soft-shifting configuration (options F) see par. 13.4.

Flow and pressure performances of adjustable soft-shifting device configurations (options S, par. 13.5) are influenced by the set shifting time.

DC SOLENOID VALVE

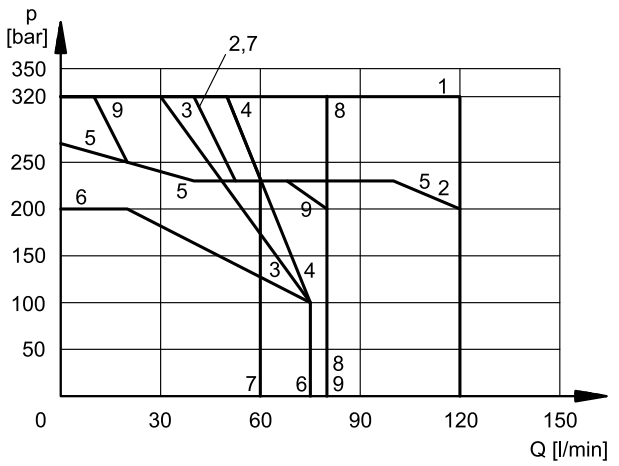


SPOOL	CURVE	
	P→A	P→B
S1, SA1, SB1	1	1
S2, SA2, SB2	1	1
S3, SA3, SB3	2	2
S4, SA4, SB4	3	3
S5	1	1
S6	2	1
S7	3	3
S8	3	3
S9	1	1
S10	3	3
S11	1	2
S12	1	1

SPOOL	CURVE	
	P→A	P→B
S17	1	4
S18	1	1
S19	4	1
S20	8*	7
S21	7	8*
S22	6*	6
S23	6	6*
TA, TB	5	5
TA02, TB02	4	4
TA23, TB23	1	1
RK	1	1
RK02	1	1
RK1, 1RK	1	1

* Performance obtained for a valve with A and B lines connected the one to the piston-side chamber and the other to the rod-side chamber of a double-acting cylinder with area ratio 2:1.

26AC SOLENOID VALVE



SPOOL	CURVE	
	P→A	P→B
S1, SA1, SB1	1	1
S2, SA2, SB2	2	2
S3, SA3, SB3	2	2
S4, SA4, SB4	4	4
S5	1	1
S6	2	1
S7	3	3
S8	3	3
S9	2	2
S10	1	1
S11	1	2
S12	1	1

SPOOL	CURVE	
	P→A	P→B
S17	1	5
S18	1	1
S19	5	1
S20	9*	8
S21	8	9
S22	7	7
S23	7	7
TA, TB	1	1
TA02, TB02	5	5
TA23, TB23	1	1
RK	1	1
RK02	1	1
RK1, 1RK	1	1

7 - ELECTRICAL FEATURES

7.1 - Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation.

The coil is fastened to the tube by a threaded ring, and can be rotated, to suit the available space.

Protection from atmospheric agents IEC 60529

he IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree, correctly connected and installed.

connection type	electric connection protection	whole valve protection
K1 EN 175301-803	IP65	IP65
K7 DEUTSCH DT04 male	IP65/IP67/IP69 IP69K (*)	

(*) The IP69K protection degree is not taken into account in IEC 60529 but it is included in ISO 20653.

VOLTAGE SUPPLY FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY	15.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC) (**NOTE 1**)	In compliance with 2014/30/EU
LOW VOLTAGE	In compliance with 2014/35/EU
CLASS OF PROTECTION Coil insulation (VDE 0580) Impregnation	 class H class F

NOTE 1: In order to further reduce the emissions, use of type H connectors is recommended. These prevent voltage peaks on opening of the coil supply electrical circuit (see catalogue 49 000).

7.2 - Current and absorbed power for DC solenoid valve

The table shows current and power consumption values relevant to the coil types for DC.

Using connectors type "D" (see cat. 49 000) with embedded bridge rectifier it is possible to feed DC coils (starting from 110V voltage) with alternating current (50 or 60 Hz).

However, when supplying the valve with rectified current, it is necessary to consider a reduction of the operating limits by 15-20% approx.

Coils for direct current (values ± 5%)

Suffix	Nominal voltage [V]	Resistance at 20°C [Ω]	Current consumpt. [A]	Power consumpt. [W]	Coil code K1	Coil code K7
D12	12	3	4	48	1903550	1903620
D24	24	12	2	48	1903551	1903221
D26	26.4	14.5	1.82	48	1903559	
D110	110	250	0.44	48	1903554	
D220	220	1010	0.22	48	1903555	

7.3 - Current and absorbed power for AC solenoid valve

The table shows current and power consumption values at inrush and at holding, relevant to the different coil types for AC current.

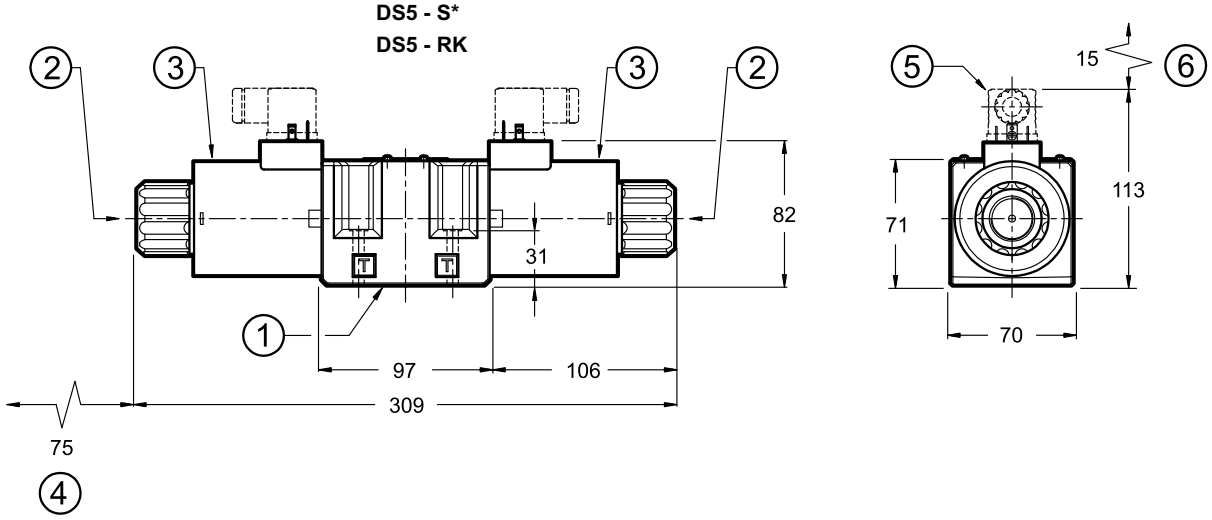
Coils for alternating current (values ± 5%)

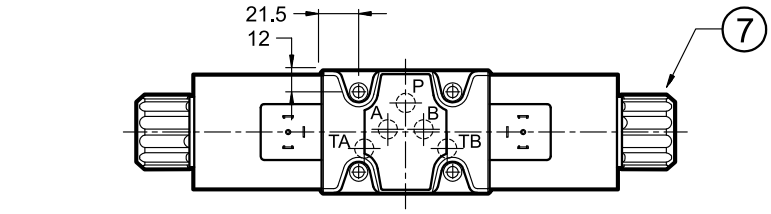
Suffix	Nominal voltage [V]	Frequency [Hz]	Resistance at 20°C [ohm]	Current consumption at inrush [A]	Current consumption at holding [A]	Power consumption at inrush [VA]	Power consumption at holding [VA]	Coil code
A24	24	50	0.53	25	3.96	600	95	1902890
A48	48		2.09	12.5	2.3	600	110	1902891
A110	110V-50Hz	50/60	10.9	5.2	0.96	572	105	1902892
	120V-60Hz		10.9	5.2	0.89	572	105	
A230	230V-50Hz		52.7	2.8	0.46	644	105	1902893
	240V-60Hz		52.7	2.8	0.38	644	105	
F110	110	60	8.80	5.2	0.95	572	105	1902894
F220	220		35.2	2.7	0.48	594	105	1902895

8 - OVERALL AND MOUNTING DIMENSIONS FOR DC SOLENOID VALVES

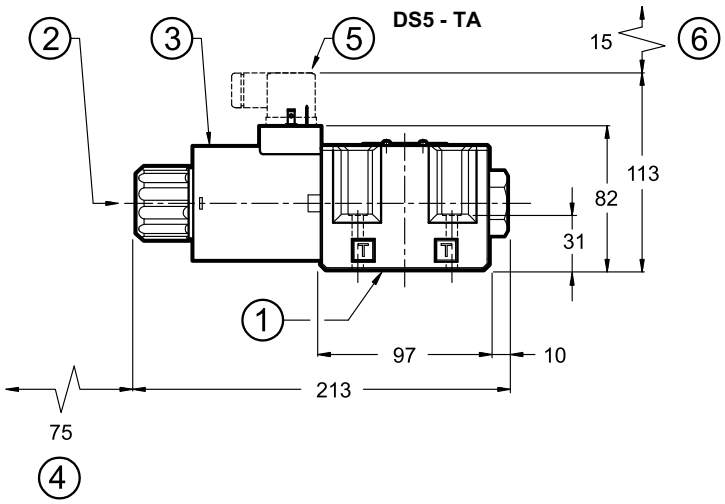
dimensions in mm

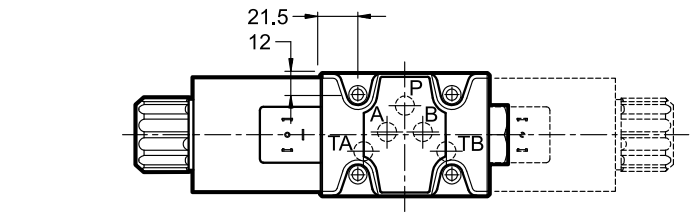
DS5 - S*
DS5 - RK





DS5 - SA*
DS5 - TA



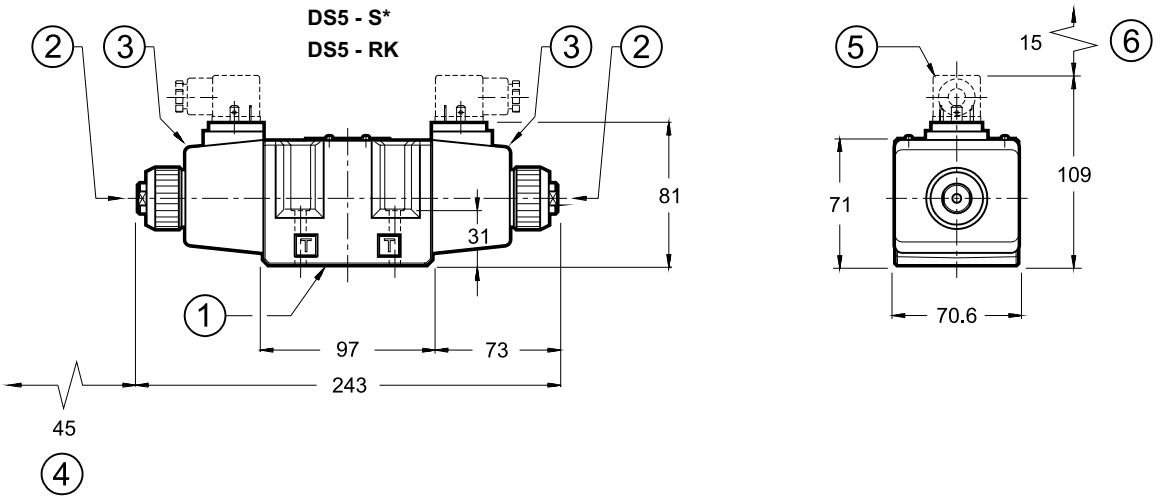


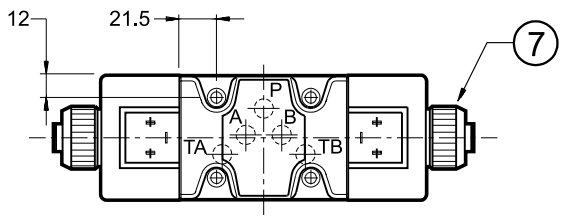
Valve fastening: 4 SHC screws ISO 4762 M6x40
Tightening torque: 8 Nm (screws A8.8)
Threads of mounting holes: M6x10

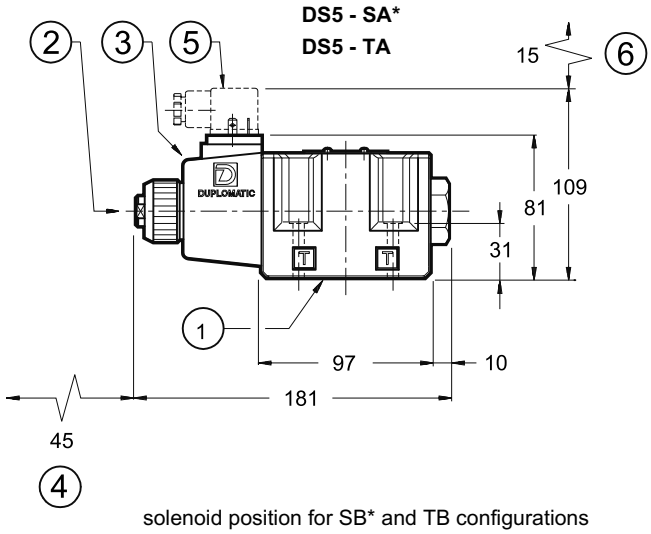
1	Mounting surface with sealing rings: 5 OR type 2050 (12.42x1.78) - 90 Shore Additional for Y version only: 1 OR 2037 (9.25x1.78) - 90 shore
2	Standard manual override included in the solenoid tube
3	Coil (360° revolving)
4	Coil removal space
5	EN 175301-803 (ex DIN 43650) connector (standard K1 shown) to be ordered separately (see cat. 49 000)
6	Connector removal space
7	Locking ring: tightening torque: 6 Nm

9 - OVERALL AND MOUNTING DIMENSIONS FOR AC SOLENOID VALVES

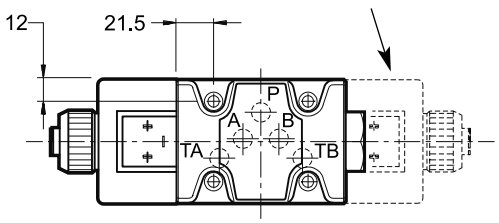
dimensions in mm







solenoid position for SB* and TB configurations



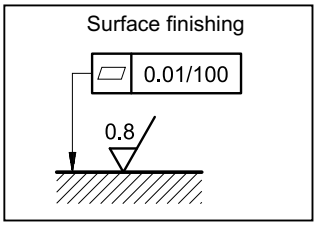
Valve fastening: 4 SHC screws ISO 4762 M6x40
Tightening torque: 8 Nm (screws A8.8)
Threads of mounting holes: M6x10

1	Mounting surface with sealing rings: 5 OR type 2050 (12.42x1.78) - 90 Shore
2	Standard manual override included in the solenoid tube
3	Coil (360° revolving)
4	Coil removal space
5	EN 175301-803 (ex DIN 43650) connector to be ordered separately (see cat. 49 000)
6	Connector removal space
7	Locking ring: tightening torque: 4.5 - 5 Nm

10 - INSTALLATION

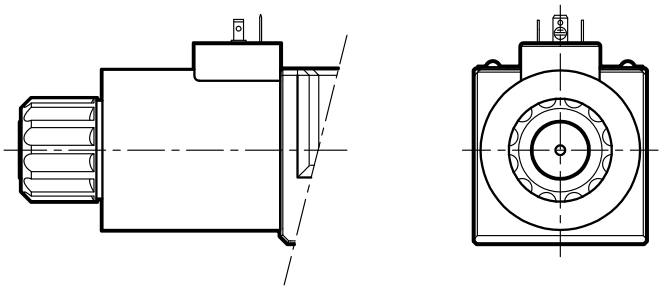
Configurations with centering and return springs can be mounted in any position; type RK valves - without springs and with mechanical detent - must be mounted with the longitudinal axis horizontal. Valve fixing is by means of screws or tie rods, with the valve mounted on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing.

If the minimum values of planarity and/or smoothness are not met, fluid leakage between valve and mounting surface can easily occur.

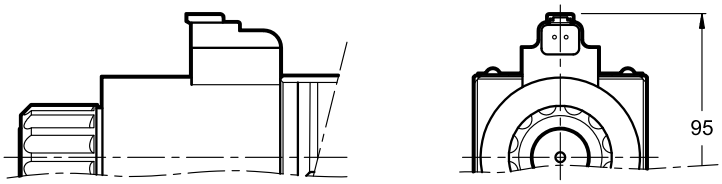


11 - ELECTRIC CONNECTIONS

connection for EN 175301-803 (ex DIN 43650)
connector type
code **K1** (**standard**)



connection for
DEUTSCH DT06-2S male connector type
code **K7**

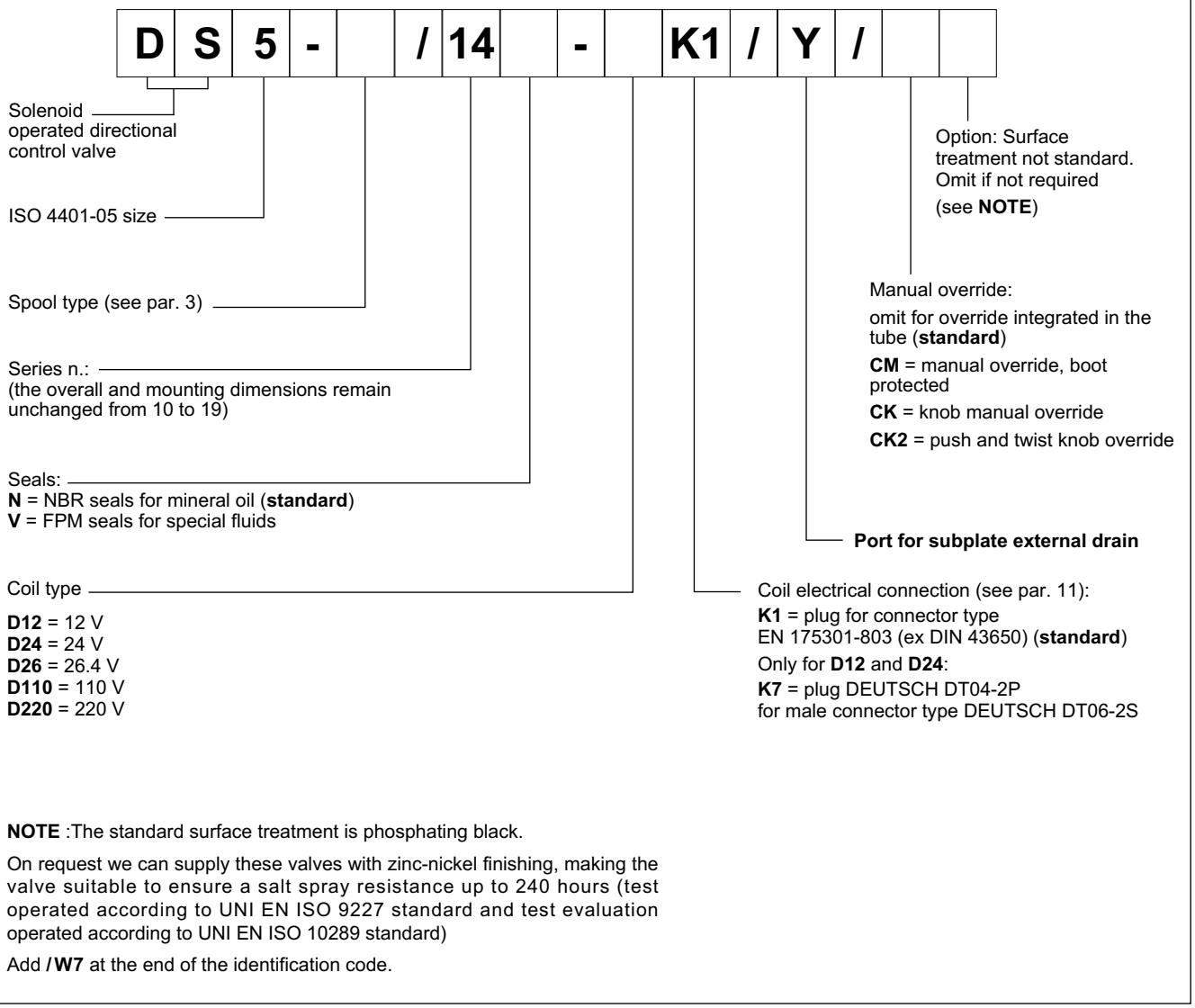


12 - ELECTRIC CONNECTORS

Solenoid operated valves are delivered without connectors. Connectors type EN 175301-803 (ex DIN 43650) for K1 connections can be ordered separately. See catalogue 49 000.

13 - SPECIAL VERSIONS FOR DC SOLENOID VALVE

13.1 - Identification code for external drain version



NOTE :The standard surface treatment is phosphating black.

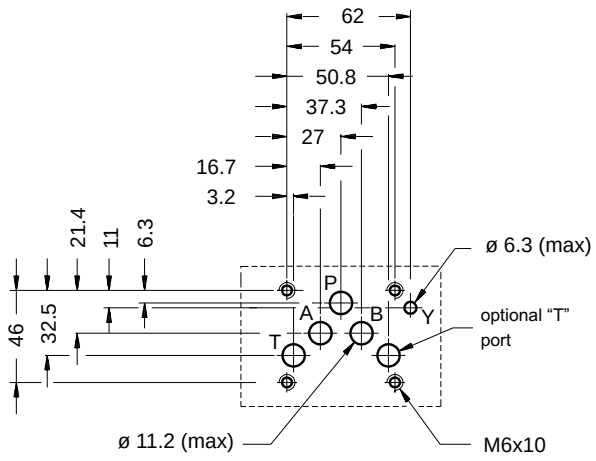
On request we can supply these valves with zinc-nickel finishing, making the valve suitable to ensure a salt spray resistance up to 240 hours (test operated according to UNI EN ISO 9227 standard and test evaluation operated according to UNI EN ISO 10289 standard)

Add **/W7** at the end of the identification code.

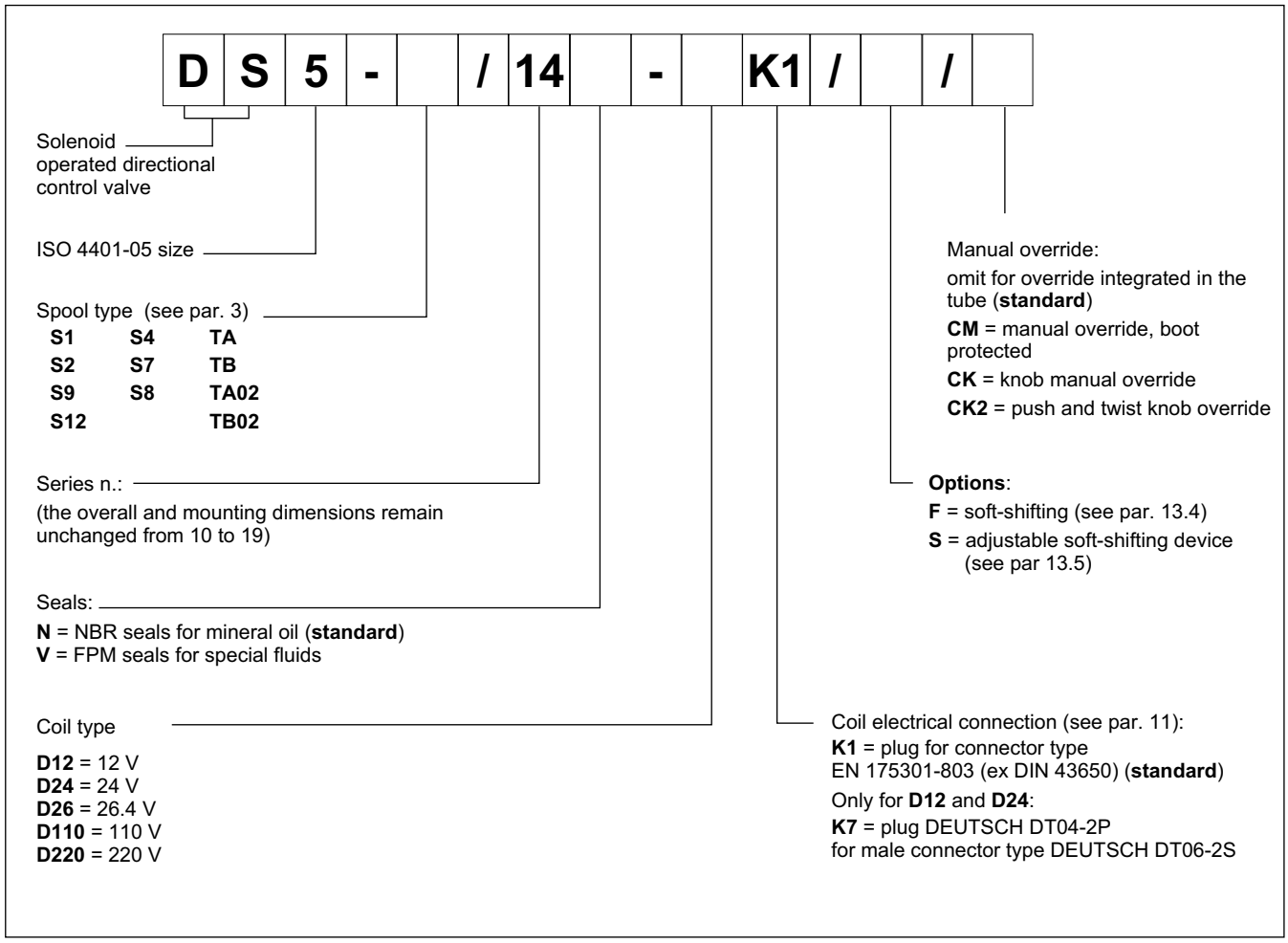
13.2 - Subplate external drain port (option Y)

This version allows the operation with pressures up to 320 bar on the valve T port.

It is a drain port Y realized on the valve mounting interface in compliance with ISO 4401-05-05-0-05. The Y port is connected with the solenoid chamber: in this way the tubes are not stressed by the pressure operating on the valve T port.



13.3 - Identification code for soft-shifting versions

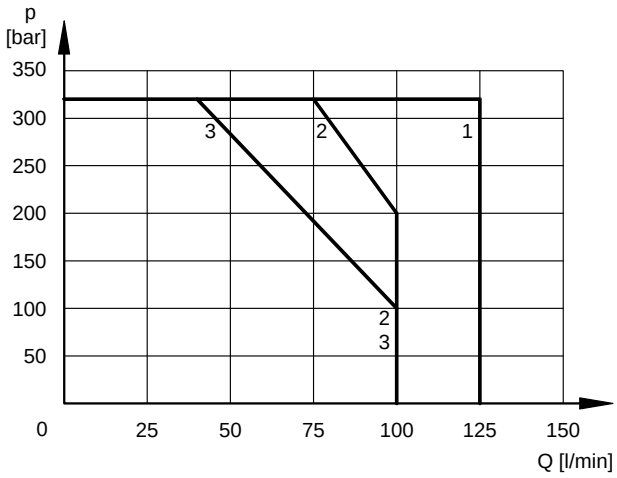


13.4 - Fixed restrictor for soft-shifting (option F)

This version enables hydraulic actuators to perform a smooth start and stop, by reducing the speed of movement of the valve spool.

The diagram below shows the operating limits for available spools in the soft-shifting version (**NOTE**: for this version, the S9 spool must be used instead of the S3 one). The table on the side shows the switching times. Indicated values are obtained according to ISO 6403 standard, with mineral oil viscosity 36 cSt at 50°C.

Both shifting time and characteristics curves are influenced by the viscosity (and thus by the temperature) of the operating fluid. Moreover, times can vary according to the flow rate and operating pressure values of the valve.



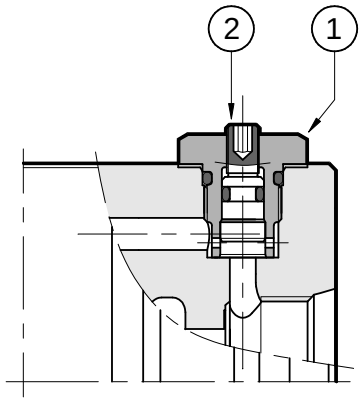
SPOOL TYPE	CURVE		TIMES	
	P-A	P-B	ENERGIZING	DE-ENERGIZING
S1, S12	1	1	300 ÷ 500	300 ÷ 500
S2	2	2	450	200 ÷ 300
S4, S7, S8	3	3	400	400 ÷ 200
S9	1	1	300 ÷ 500	300 ÷ 500
TA, TB	2	2	300 ÷ 400	300 ÷ 400
TA02, TB02	2	2	400	200 ÷ 300

13.5 - Directional solenoid valve with adjustable “soft-shifting” device (option S)

This solenoid valve is supplied with a suitable device, adjustable by the user, which enables the control of the valve spool shifting time.

In this way the hydraulic actuators can perform smooth movements, by controlling the valve switching time according to the machine cycle and the inertia of the moving parts.

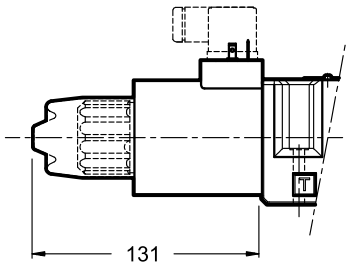
NOTE: during the first start-up the valve body must be filled with the operating fluid through the tap (1) .



1	Spanner for plug: 17 mm - tightening torque 20 Nm
2	Socket hex adjustment screw for shifting time: spanner 2.5 mm

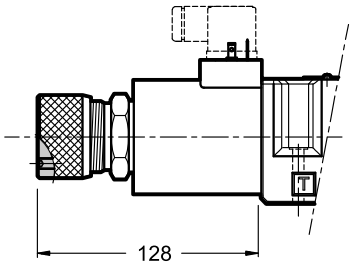
14 - MANUAL OVERRIDES FOR DC SOLENOID VALVES

14.1 - CM - Manual override, boot protected



Code: valves in series 12 = 0239050
valves in series 14 = 0239051

14.2 - CK - Turning knob

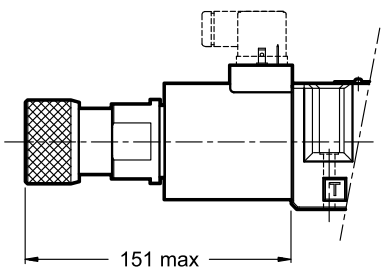


When the set screw is screwed and its point is aligned with the edge of the knob, tighten the knob till it touches the spool: in this position the override is not engaged and the valve is de-energized. After adjusting the override, tighten the set screw in order to avoid the knob loosing.

Spanner: 3 mm

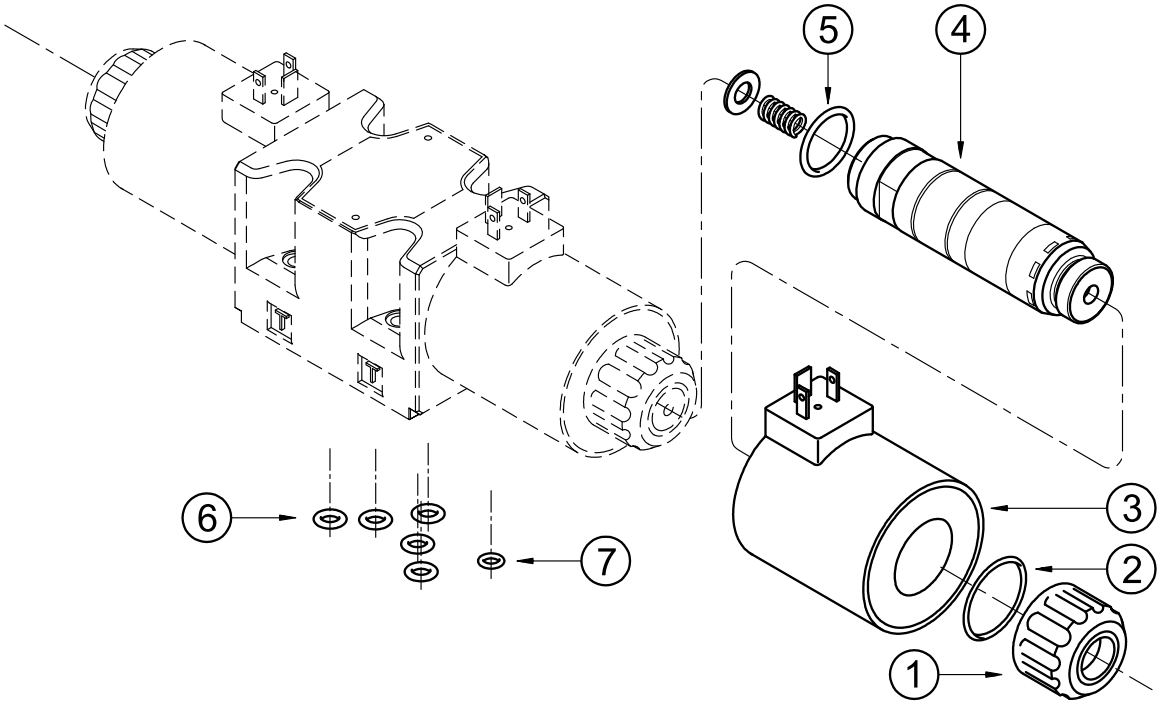
Code: 3803260003

14.3 - CK2 - Push and twist



Code: 3401310001

15 - SPARE PARTS FOR DC SOLENOID VALVE



DC COILS IDENTIFICATION CODE

C	31	-			/	

Supply voltage

D12 = 12 V
D24 = 24 V
D26 = 26.4 V
D110 = 110 V
D220 = 220 V

Series no.:
22 = for K1 and D12K7 coils
21 = for D24K7 coils

Coil electrical connection
K1 = plug for connector type EN 175301-803 (ex DIN 43650) (**standard**)
Only for **D12** and **D24**:
K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S

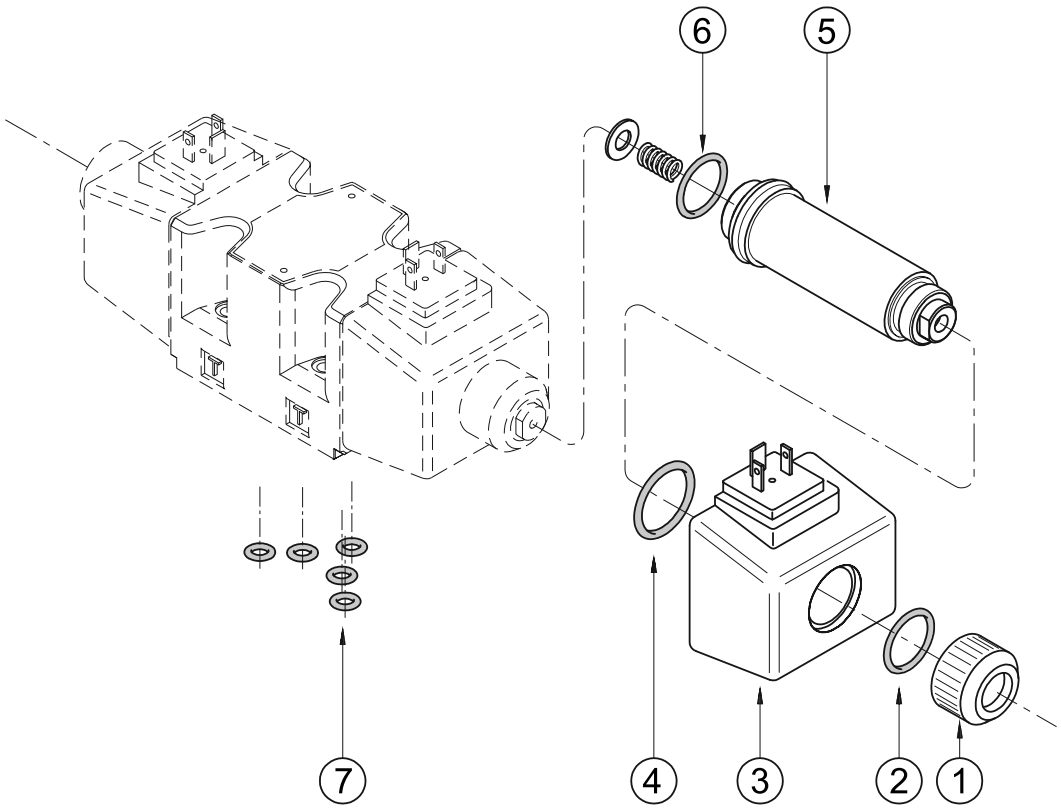
1	Coil locking ring with seal included cod. 0119383 tightening torque: 6 Nm
2	ORM type 0320 - 25 (32x2.5) - 70 Shore
3	Coil (see identification code)
4	Solenoid tube TD31-M27/20N (NBR seals) TD31-M27/20V (FPM seals) **NOTE**: OR n° 5 supplied with.
5	OR type 3-912 (23.47x2.95) - 70 Shore
6	N. 5 OR type 2050 (12.42x1.78) - 90 Shore
7	For version with external subplate drain only (Y option): OR type 2037 (9.25x1.78) - 90 Shore

SEALS KIT

The codes here below include O-Rings ref. 2, 5, 6 and 7.

Cod. 1984418 NBR seals
Cod. 1984419 FPM (viton) seals

16 - SPARE PARTS FOR AC SOLENOID VALVE



AC COILS IDENTIFICATION CODE

C	25.4	-		K1	/	11

Supply voltage
A24 = 24 V - 50 Hz
A48 = 48 V - 50 Hz
A110 = 110 V - 50 Hz
120 V - 60 Hz
A230 = 230 V - 50 Hz
240 V - 60 Hz
F110 = 110 V - 60 Hz
F220 = 220 V - 60 Hz

Plug for connector type
EN 175301-803
(ex DIN 43650)

Series no.:
(the overall and mounting dimensions remain unchanged from 10 to 19)

SEALS KIT

The codes here below include O-Rings ref. 2, 4, 6 and 7.

Cod. 1984420 NBR seals
Cod. 1984421 FPM (viton) seals

1	Coil locking ring cod. 0119402 tightening torque: 4.5 - 5 Nm
2	OR type 4100 (24.99x3.53) - 70 Shore
3	Coil (see identification code)
4	OR type 2112 (28.30x1.78) - 70 Shore
5	Solenoid tubes: TA25.4-M27/11N (NBR seals) TA25.4-M27/11V (FPM seals) **NOTE**: OR n° 6 supplied with.
6	OR type 3-912 (23.47x2.95) - 70 Shore
7	N. 5 OR type 2050 (12.42x1.78) - 90 Shore

17 - SUBPLATES

(see catalogue 51 000)

Type PMD4-AI4G with rear ports 1/2” BSP
Type PMD4-AL4G with side ports 1/2” BSP

DUPLOMATIC MOTION SOLUTIONS

DUPLOMATIC MS S.p.A.
via M. Re Depaolini 24 • 20015 PARABIAGO (MI) • ITALY
tel. +39 0331.895.111 • www.duplomatic.com • e-mail: sales.exp@duplomatic.com

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MOTION SOLUTIONS

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DL5

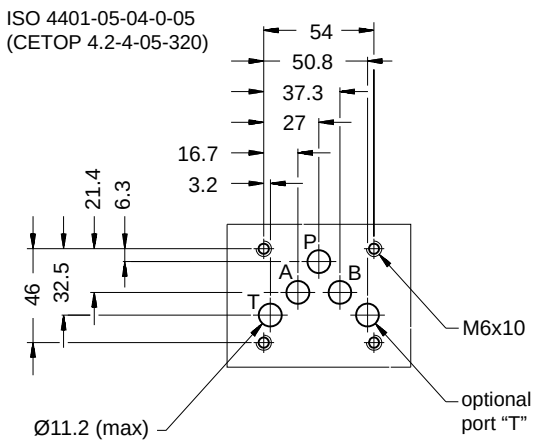
SOLENOID OPERATED DIRECTIONAL VALVE COMPACT VERSION

SERIES 10

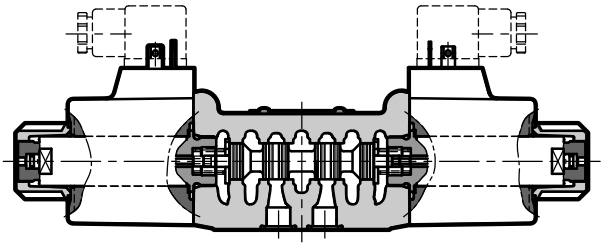
SUBPLATE MOUNTING ISO 4401-05

p max **320** bar
Q max **125** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



— Direct acting, subplate mounting directional control valve, with mounting surface according to ISO 4401 standards.

— The valve is suitable for special applications, guaranteed by the reduced solenoid dimensions.

— The valve body is made with high strength iron castings provided with wide internal passages in order to minimize the flow pressure drop. Wet armature solenoids with interchangeable coils are used (for further information on solenoids see point 7).

— The valve is supplied with 3 or 4 way designs, and several types of spools.

— The valve is available with DC or AC current solenoids.

PERFORMANCES

(with mineral oil of viscosity of 36 cSt at 50°C)

		CC	CA
Maximum operating pressure: - ports P - A - B - port T	bar	320 210	160
Maximum flow rate	l/min	125	100
Pressure drop Δp-Q	see point 4		
Operating limits	see point 5		
Electrical features	see point 7		
Electrical connections	EN 175301-803 (ex DIN 43650)		
Ambient temperature range	°C	-20 / +50	
Fluid temperature range	°C	-20 / +80	
Fluid viscosity range	cSt	10 ÷ 400	
Fluid contamination degree	according to ISO 4406:1999 class 20/18/15		
Recommended viscosity	cSt	25	
Masse: single solenoid valve double solenoid valve	kg	2,8 3,7	

1 - IDENTIFICATION CODE

D	L	5	-		/	10		-		K1	/		

Solenoid operated directional valve, direct acting

Compact version

ISO 4401-05 size

Spool type (see point 3):

S* **TA***
SA* **TB***
SB* **RK**

Series no.: (the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Option:
/ W7 = Zinc-nickel surface treatment. (see **NOTE 2**)
Not available for AC valves.
Omit if not required

Manual override - see point 12
Omit for override integrated in the tube (**standard**)
CM = boot protected.
For DC version only.

Coil electrical connection:
plug for connector type
EN 175301-803 (ex DIN 43650)

DC power supply
D12 = 12 V
D24 = 24 V
D00 = valve without coils (see **NOTE 1**)

AC power supply
A24 = 24 V - 50 Hz
A48 = 48 V - 50 Hz
A110 = 110 V - 50 Hz
A230 = 230 V - 50 Hz
A00 = valve without coils (see **NOTE 1**)

NOTE 1: Coils locking ring and related OR are supplied together with valves.

NOTE 2:The standard valve is supplied with surface treatment of phosphating black.

The zinc-nickel finishing makes the valve suitable to ensure a salt spray resistance up to 600 hours (test operated according to EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

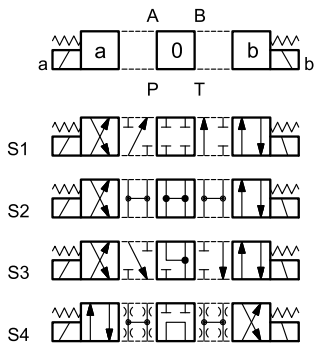
2 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

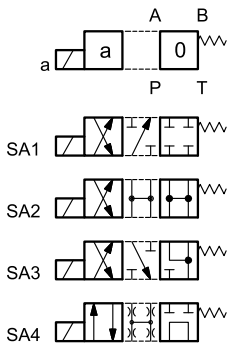
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

3 - SPOOL TYPE

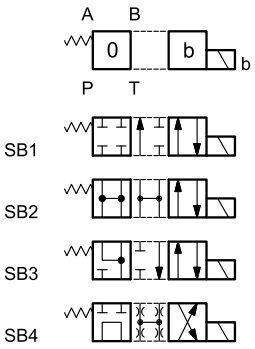
Type **S***:
2 solenoids - 3 positions
with spring centreing



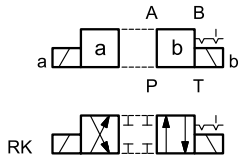
Type **SA***:
1 solenoid side A
2 positions (central + external)
with spring return



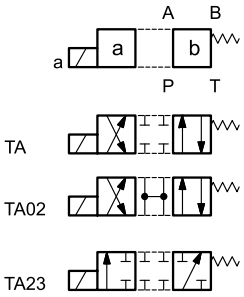
Type **SB***:
1 solenoid side B
2 positions (central + external)
with spring return



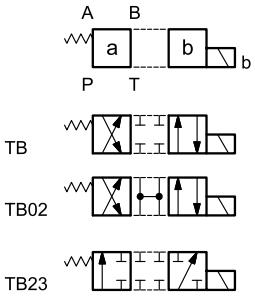
Type **RK**:
2 solenoids - 2 positions
with mechanical retention



Type **TA**:
1 solenoid side A
2 external positions
with spring return



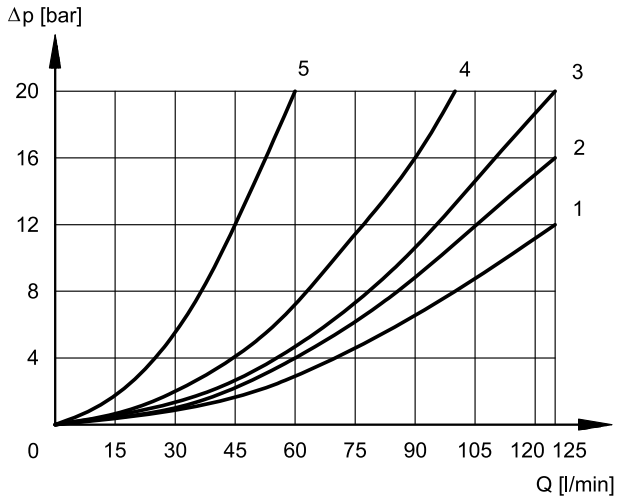
Type **TB**:
1 solenoid side B
2 external positions
with spring return



NOTE: Others spools available on request only.

4 - PRESSURE DROPS Δp-Q

(obtained with viscosity of 36 cSt at 50 °C)



ENERGIZED VALVE

SPOOL	FLOW DIRECTIONS			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPHS			
S1	1	1	2	2
S2	1	1	1	1
S3	1	1	1	1
S4	4	4	4	4
RK	2	2	2	2
TA	2	2	3	3
TA02	2	2	1	1
TA23	3	3	-	-

DE-ENERGIZED VALVE

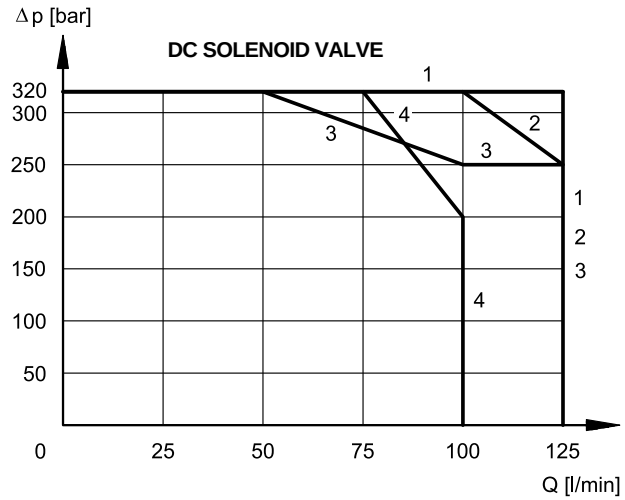
SPOOL	FLOW DIRECTIONS		
	A→T	B→T	P→T
	CURVES ON GRAPHS		
S2	-	-	1
S3	5	5	-
S4	-	-	1

5 - OPERATING LIMITS

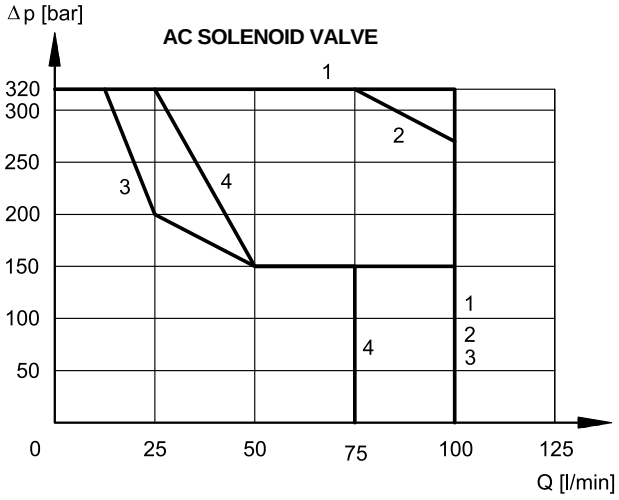
The curves define the flow rate operating fields according to the valve pressure of the different versions.The values indicated in the graphs are relevant to the standard solenoid valve. The operating limits can be considerably reduced if a 4-way valve is used as 3-way valve with port A or B plugged or without flow.

The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage. The value have been obtained with mineral oil, viscosity 36 cSt, temperature 50 °C and filtration according to ISO 4406:1999 class 18/16/13.

5.1 - Standard operating limits



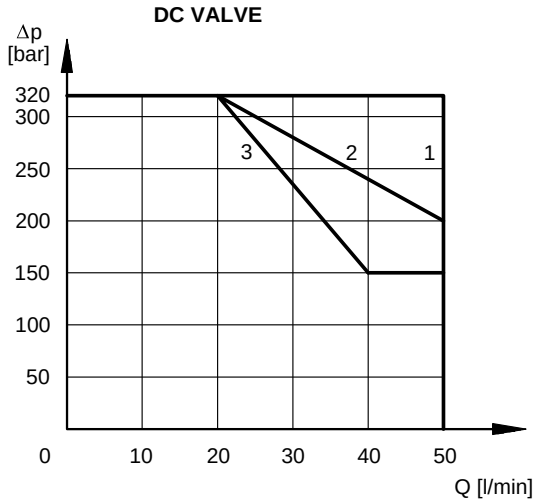
SPOOL	CURVE
S1, S2, RK, TA, TA23	1
S9, TA02	2
S3	3
S4	4

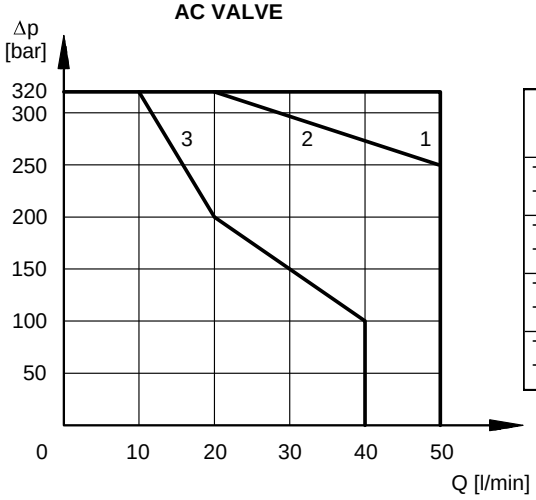


SPOOL	CURVE
S1, RK, TA, TA02, TA23	1
S2	2
S3, S9	3
S4	4

5.2 - 4-way valve in 3-way operation

Operating limits of a 4-way valve in 3-way operation or with port A or B plugged or without flow.





SPOOL	CURVE	
	DC	AC
TA backpr. A TB backpr. B	2	1
TA02 backpr. A TB02 backpr. B	1	1
TA backpr. B TB backpr. A	3	3
TA02 backpr. B TB02 backpr. A	2	2

6 - SWITCHING TIMES

The values indicated are obtained with spool S1, according to ISO 6403 standard, with mineral oil viscosity 36 cSt at 50°C.

SUPPLY	TIMES (±10%) [ms]	
	ENERGIZING	DE-ENERGIZING
DC	40 ÷ 90	20 ÷ 50
AC	15 ÷ 30	20 ÷ 50

7 - ELECTRICAL FEATURES

7.1 - Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation. The coil is fastened to the tube by a threaded ring, and can be rotated +/- 90°, to suit the available space.

The interchangeability of coils of different voltages is allowed within the same type of supply current, alternating or direct.

SUPPLY VOLTAGE FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY	10.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC) - NOTE	In compliance with 2014/30/EU
LOW VOLTAGE	In compliance with 2014/35/EU
CLASS OF PROTECTION Atmospheric agents EN 60529 Coil insulation (VDE 0580) Impregnation:	 IP65 (*) class H class H

(*****) The protection degree is guaranteed only with the connector correctly connected and installed

NOTE: In order to further reduce the emissions, with DC supply, use of type H connectors is recommended. These prevent voltage peaks on opening of the coil supply electrical circuit (see cat. 49 000).

7.2 - DC valve - Current and power consumption

In direct current energizing, current consumption stays at fairly constant values, essentially determined by Ohm's law: V = R x I

The table shows current and power consumption values for DC types.

	Resistance at 20°C [Ω] (±5%)	Current consumption [A] (±10%)	Power consumption [W] (±10%)	Coil code K1
C22L5-D12K1	2,9	4,14	50	1903150
C22L5-D24K1	12,3	1,95	47	1903151

7.3 - AC valve - Current and power consumption

In alternating current energizing, an initial phase (maximum movement) is seen, during which the solenoid consumes elevated value currents (inrush current); the current values diminish during the plunger stroke until it reaches the minimum values (holding current) when the plunger reaches the stroke end.

The table shows the values of absorption at the inrush and at holding.

	Freq. [VAC/Hz] (±10%)	Resistance at 20°C [Ω] (±5%)	Current consumption at inrush [A] (±10%)	Current consumption at holding [A] (±5%)	Power consumption at inrush (±10%) [VA]	Power consumption at holding (±10%) [VA]	Coil code K1
C26L5-A24K1	24/50	0,58	15,1	2,84	362,4	68,2	1903160
C26L5-A48K1	48/50	2,34	7,4	1,29	355,2	61,9	1903161
C26L5-A110K1	110/50-120/60	12,3	3,6 - 3,3	0,64 - 0,62	396	70,4 - 74,4	1903162
C26L5-A230K1	230/50-240/60	51,6	1,8 - 1,6	0,31 - 0,28	414 - 384	71,3 - 67,2	1903163

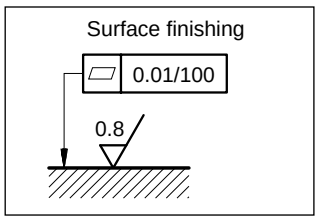
8 - ELECTRIC CONNECTORS

Solenoid operated valves are delivered without connectors. Connectors can be ordered separately. See catalogue 49 000.

9 - INSTALLATION

The configuration with centreing and return springs can be mounted in any position.

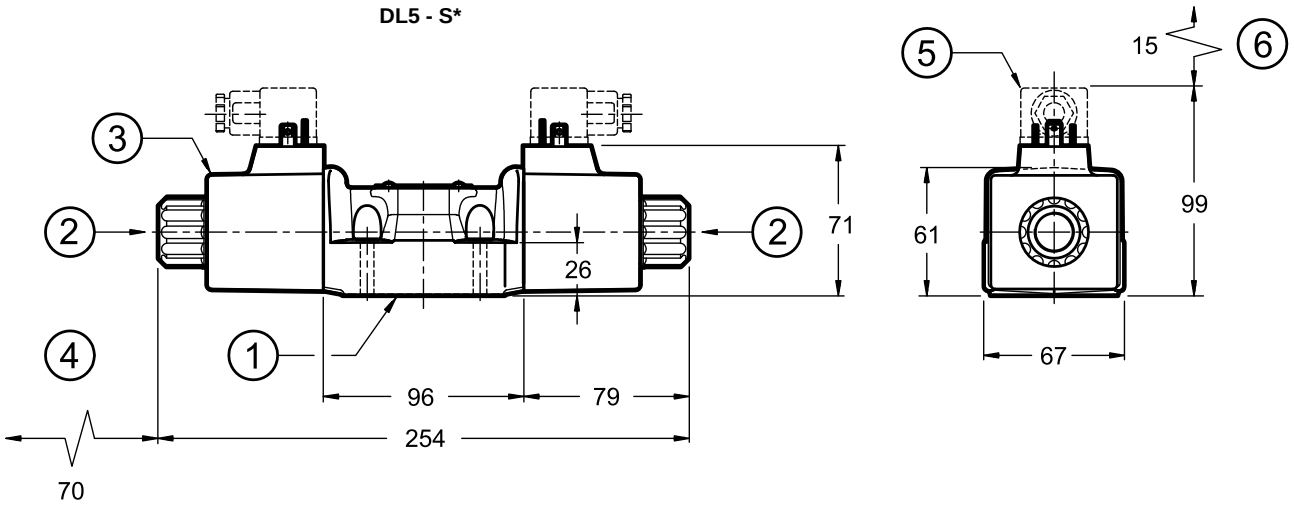
Valve fitting takes place by means of screws or tie rods, fixing the valve on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing. If the minimum values of planarity or smoothness are not met, fluid leakages between valve and mounting surface can easily occur.

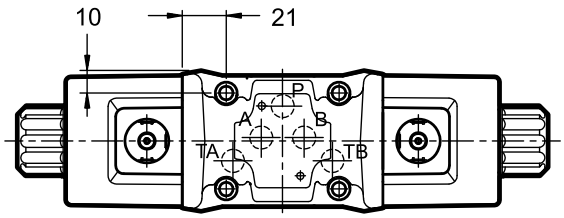


10 - DL5 DC OVERALL AND MOUNTING DIMENSIONS

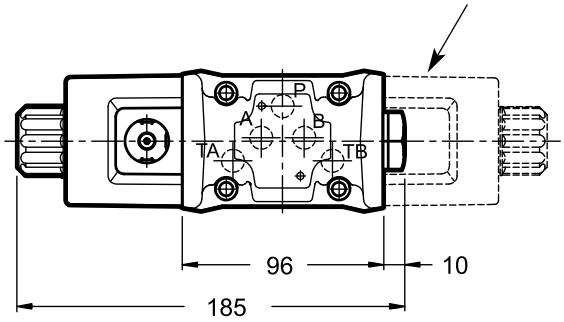
dimensions in mm

DL5 - S*





DL5 - TA, DL5-SA*



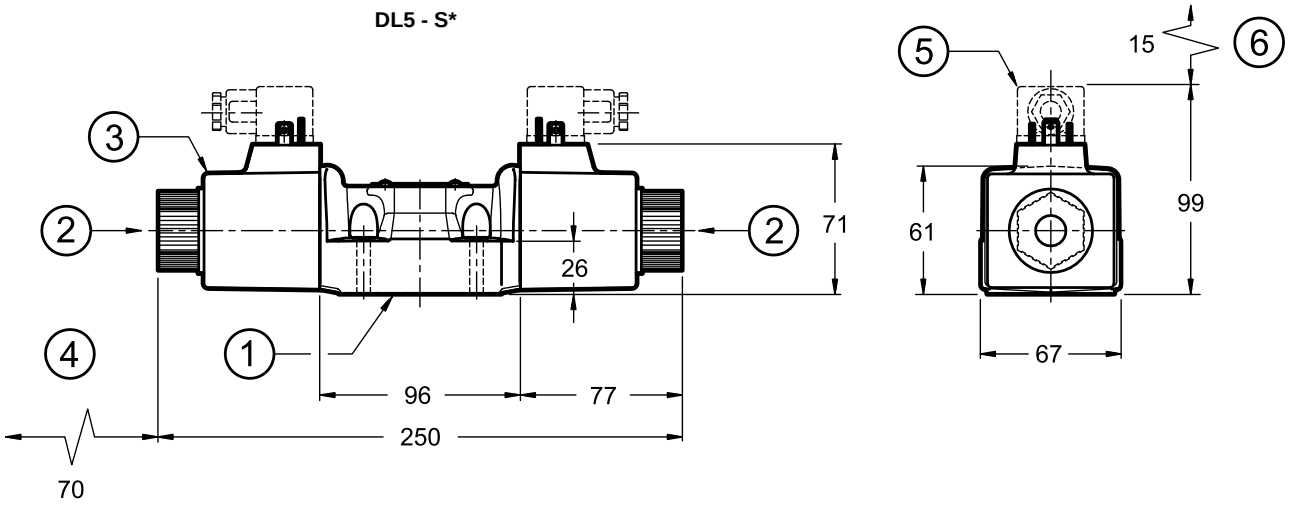
Valve fastening: 4 SHC screws ISO 6742 M6x35	
Tightening torque: 8 Nm (A8.8)	
Threads of mounting holes: M6x10	

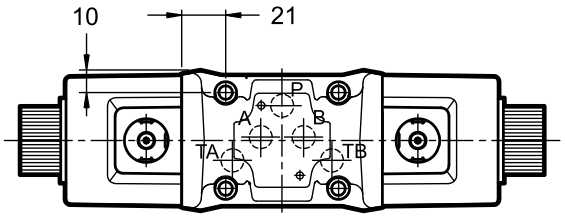
1	Mounting surface with sealing rings: 5 OR type 2050 (12.42x1.78) - 90 Shore
2	Locking ring with standard manual override integrated in the tube
3	Coil
4	Coil removal space
5	EN 175301-803 (ex DIN 43650) electrical connector
6	Connector removal space

11 - DL5 AC OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

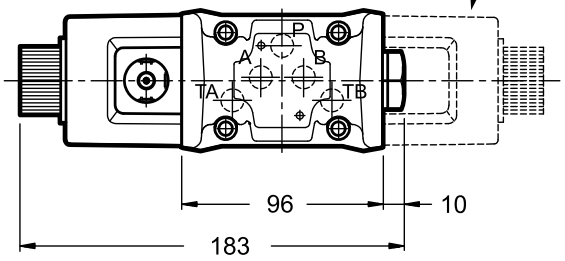
DL5 - S*





solenoid position
for version type
TB* - SB*

DL5 - TA*, DL5-SA*



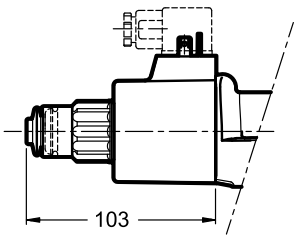
Valve fastening: 4 SHC screws ISO 6742 M6x35
Tightening torque: 8 Nm (A8.8)
Threads of mounting holes: M6x10

1	Mounting surface with sealing rings
2	Locking ring with standard manual override integrated in the tube
3	Coil
4	Coil removal space
5	EN 175301-803 (ex DIN 43650) electrical connector
6	Connector removal space

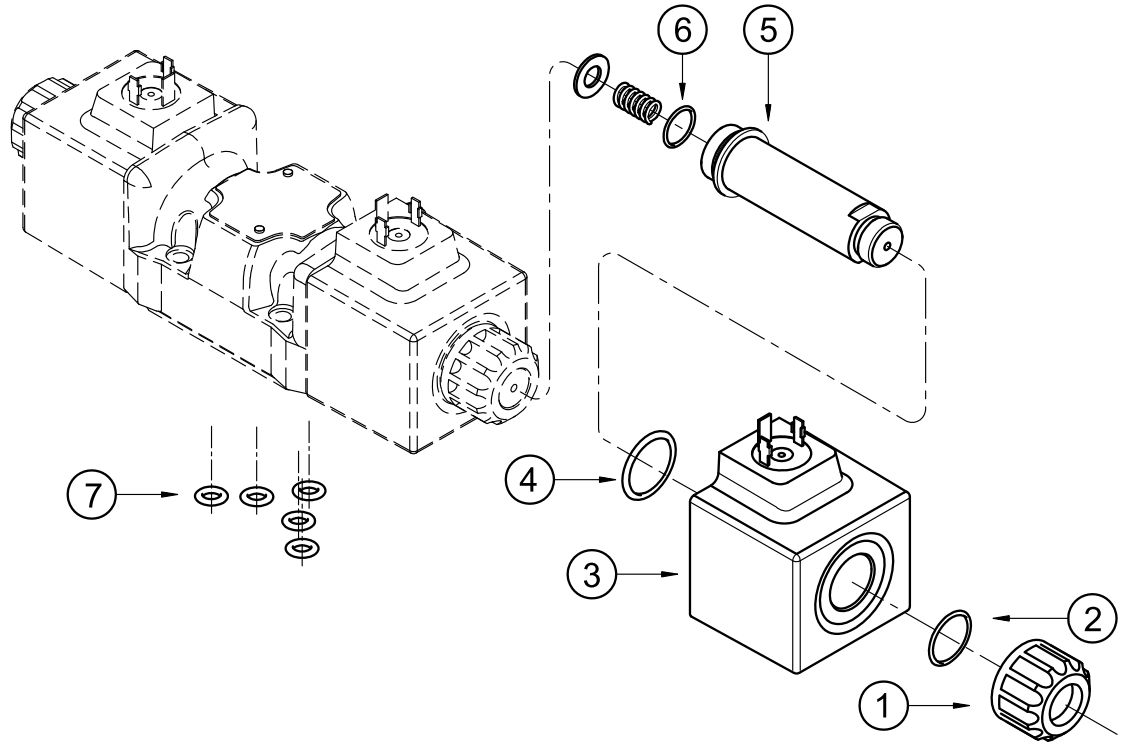
12 - MANUAL OVERRIDE

12.1 - Boot protected manual override (only for DC solenoid valve)

It can be ordered by entering the code **CM** in the identification code at point 1, or is available as option to be ordered separately:
code **3401150006**.



13 - SPARE PARTS FOR DC SOLENOID VALVE



IDENTIFICATION CODE FOR DC AND RC COILS

C	22	L5	-		K1	/	10

Supply voltage
D12 = 12 V
D24 = 24 V

Series no.:
(the overall and mounting dimensions remain unchanged from 10 to 19)

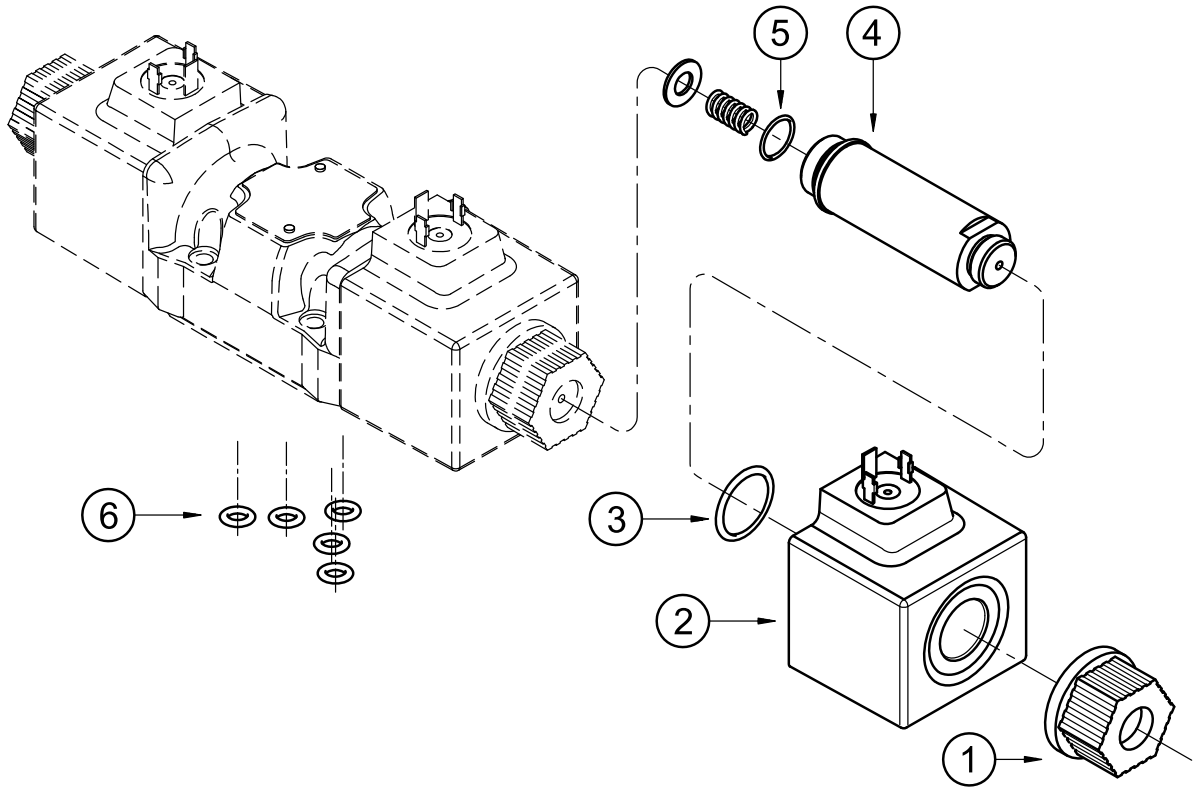
Coil electrical connection:
plug for connector type
EN 175301-803 (ex DIN 43650)

1	Coil locking ring - code 0119412
2	ORM-0220-20 - 70 shore
3	Coil (see identification code)
4	ORM-0296-24 (29.6x2.4) - 70 shore
5	Solenoid tube: TDM22-DL5/10N (NBR seals) TDM22-DL5/10V (FPM seals) (OR n° 6 included)
6	OR type 3.910 (19.18x2.46) - 70 shore
7	N. 5 OR type 2050 (12.42x1.78) - 90 Shore

SEAL KIT

The codes included the OR n° 2, 4, 6 and 7.
Cod. 1985447 NBR seals
Cod. 1985448 FPM seals

14 - SPARE PARTS FOR AC SOLENOID VALVE



IDENTIFICATION CODE FOR AC COILS

C	26	L5	-		K1	/	10

Series no.:
(the overall and mounting dimensions remain unchanged from 10 to 19)

Coil electrical connection:
plug for connector type
EN 175301-803 (ex DIN 43650)

Supply voltage
A24 = 24 V - 50 Hz
A48 = 48 V - 50 Hz
A110 = 110 V - 50 Hz / 120 V - 60 Hz
A230 = 230 V - 50 Hz / 240 V - 60 Hz

1	Coil locking ring - code. 0119480
2	Coil (see identification code)
3	ORM-0296-24 (29.6x2.4) - 70 shore
4	Solenoid tube: TA26-DL5/10N (NBR seals) TA26-DL5/10V (FPM seals) (OR n° 5 included)
5	OR type 3.910 (19.18x2.46) - 70 shore
6	N. 5 OR type 2050 (12.42x1.78) - 90 Shore

SEAL KIT

The codes included the OR n° 3, 5 and 6.
Cod. 1985449 NBR seals
Cod. 1985450 FPM seals

15 - SUBPLATES

(see catalogue 51 000)

Type PMD4-AI4G with rear ports - port threading: 3/4” BSP
Type PMD4-AL4G with side ports - port threading: 1/2” BSP

DUPLOMATIC MOTION SOLUTIONS

DUPLOMATIC MS Spa
via Mario Re Depaolini, 24 | 20015 Parabiago (MI) | Italy
T +39 0331 895111 | E vendite.ita@duplomatic.com | sales.exp@duplomatic.com
duplomaticmotionsolutions.com

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DL5B

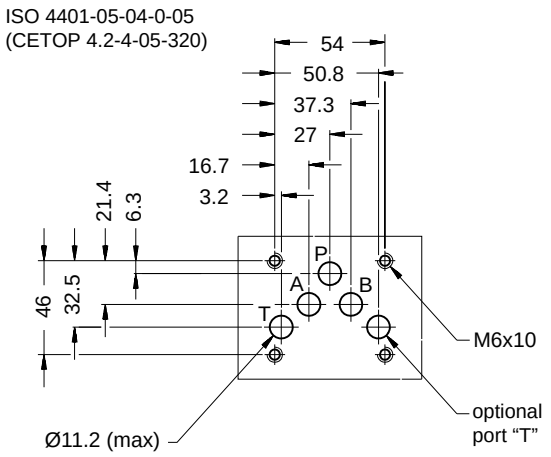
SOLENOID OPERATED DIRECTIONAL VALVE COMPACT VERSION

SERIES 10

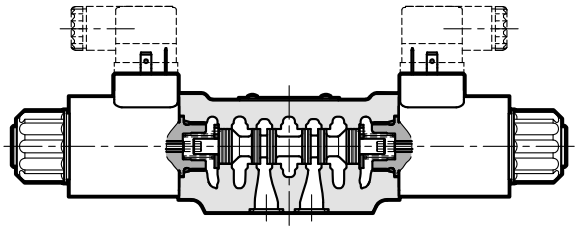
SUBPLATE MOUNTING ISO 4401-05

p max **320** bar
Q max **125** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



— Direct acting, directional control valve for subplate mounting, with mounting surface according to ISO 4401 standards.

— The valve is suitable for special applications, guaranteed by the reduced solenoid dimensions.

— The valve body is made with high strength iron castings provided with wide internal passages in order to minimize the flow pressure drop. Wet armature solenoids with interchangeable coils are used (for further information on solenoids see point 7).

— The valve is supplied with 3 or 4 way designs, and several types of spools.

— The valve is available with DC current solenoids only.

— The valve is also available with zinc-nickel coating that ensures a salt spray resistance up to 600 hours.

— Alternative to the standard manual override there are push, boot, knob and mechanical detent devices.

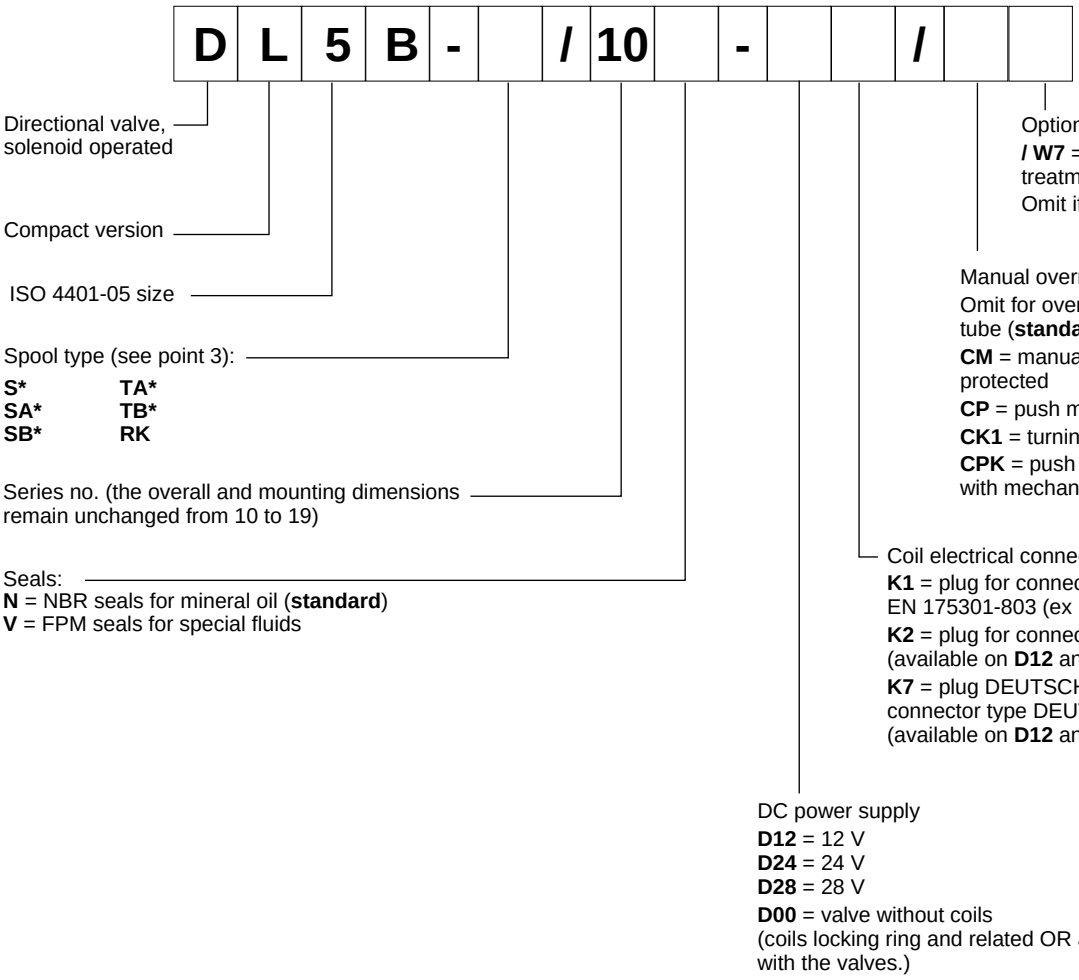
PERFORMANCES

(with mineral oil of viscosity of 36 cSt at 50°C)

Maximum operating pressure: - ports P - A - B - port T	bar	 320 210
Maximum flow rate	l/min	125
Pressure drop Δp-Q	see point 4	
Operating limits	see point 6	
Electrical features	see point 7	
Electrical connections	see point 9	
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	according to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Masse: single solenoid valve double solenoid valve	kg	2,1 2,7

1 - IDENTIFICATION CODE

1.1 - Standard version



NOTE: The standard valve is supplied with surface treatment of phosphating black.

The zinc-nickel finishing on the valve body makes the valve suitable to ensure a salt spray resistance up to **240** hours.
For a salt spray resistance up to **600** hours refer to **point 13**.

(test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

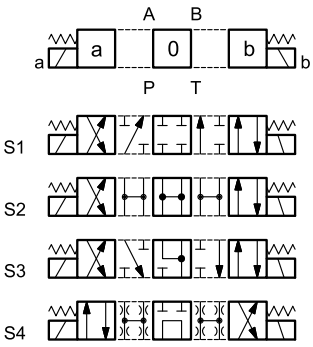
2 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

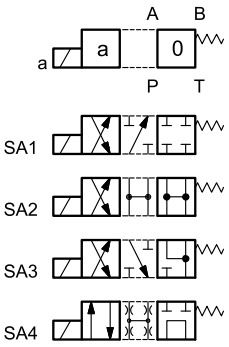
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

3 - SPOOL TYPE

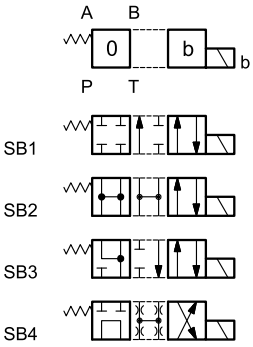
Type **S***:
2 solenoids - 3 positions
with spring centering



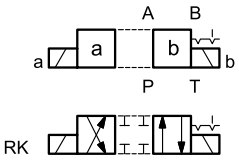
Type **SA***:
1 solenoid side A
2 positions (central + external)
with spring return



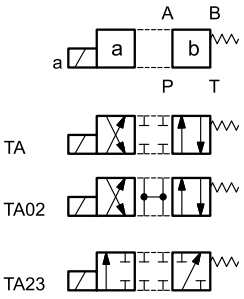
Type **SB***:
1 solenoid side B
2 positions (central + external)
with spring return



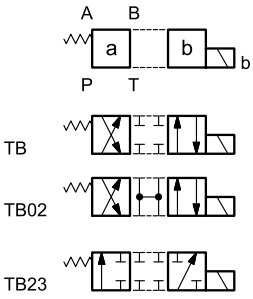
Type **RK**:
2 solenoids - 2 positions
with mechanical retention



Type **TA**:
1 solenoid side A
2 external positions
with spring return



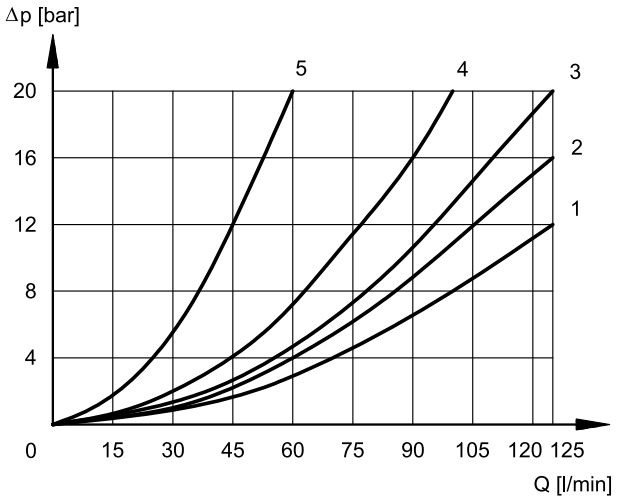
Type **TB**:
1 solenoid side B
2 external positions
with spring return



NOTE: Further spools available on request only.

4 - PRESSURE DROPS Δp-Q

(obtained with viscosity of 36 cSt at 50 °C)



ENERGIZED VALVE

SPOOL	FLOW DIRECTIONS			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPHS			
S1	1	1	2	2
S2	1	1	1	1
S3	1	1	1	1
S4	4	4	4	4
RK	2	2	2	2
TA	2	2	3	3
TA02	2	2	1	1
TA23	3	3	-	-

DE-ENERGIZED VALVE

SPOOL	FLOW DIRECTIONS		
	A→T	B→T	P→T
	CURVES ON GRAPHS		
S2	-	-	1
S3	5	5	-
S4	-	-	1

5 - SWITCHING TIMES

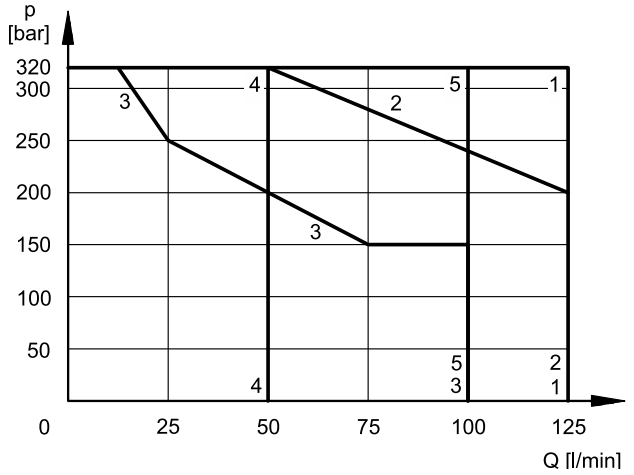
The values indicated are obtained with spool S1, according to ISO 6403 standard, with mineral oil viscosity 36 cSt at 50°C.

SUPPLY	TIMES (±10%) [ms]	
	ENERGIZING	DE-ENERGIZING
DC	70 ÷ 100	15 ÷ 20

6 - OPERATING LIMITS

The curves define the flow rate operating fields according to the valve pressure of the different versions. The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage. The value have been obtained with mineral oil, viscosity 36 cSt, temperature 50 °C and filtration according to ISO 4406:1999 class 18/16/13.

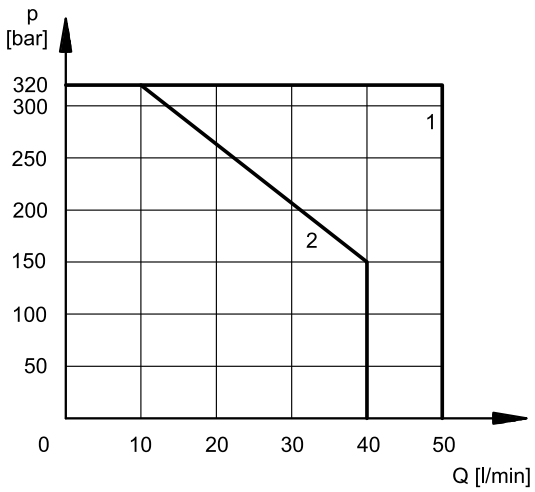
Limits of TA02 and TA spools refer to the 4-port operation. The operating limits of a 4-port valve that operates as 3-port valve, or with port A or B plugged or without flow, are shown in the chart on the next page.



SPOOL	CURVE
S1, S2, RK	1
TA02	2
S3	3
S4	4
TA, TA23	5

6.1 - 4-port valve in 3-port operation

Operating limits of a 4-port valve in 3-port operation or with port A or B plugged or without flow.



SPOOL	CURVE
TA	1
TA02	2

7 - ELECTRICAL FEATURES

7.1 - Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation.

The coil is fastened to the tube by a threaded ring. The coils are interchangeable.

Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree, correctly connected and installed.

electric connection	electric connection protection	whole valve protection
K1 EN 175301-803 (ex DIN 43650)	IP65	IP65
K2 AMP JUNIOR	IP65/67	
K7 DEUTSCH DT04 male	IP65/67	

SUPPLY VOLTAGE FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY	10.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	In compliance with 2014/30/EU
LOW VOLTAGE (NOTE)	In compliance with 2014/35/EU
CLASS OF PROTECTION Coil insulation (VDE 0580) Impregnation	 class H class F

NOTE: In order to further reduce the emissions, use of type H connectors is recommended, because of they prevent voltage peaks at the opening of the coil supply electrical circuit (see cat. 49 000).

7.2 - Coils current and power consumption

The table below shows the consumption values relating to the various types of coils for direct current power supply.

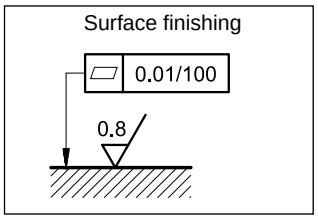
(values ±10%)

	Nominal voltage [V]	Resistance at 20°C [Ω]	Current consumption [A]	Power consumption [W]	Coil code K1	Coil code K2	Coil code K7
D12	12	4,4	2,72	32,7	1903080	1903100	1902940
D24	24	18,6	1,29	31	1903081	1903101	1902941
D28	28	26	1,11	31	1903082		-

8 - INSTALLATION

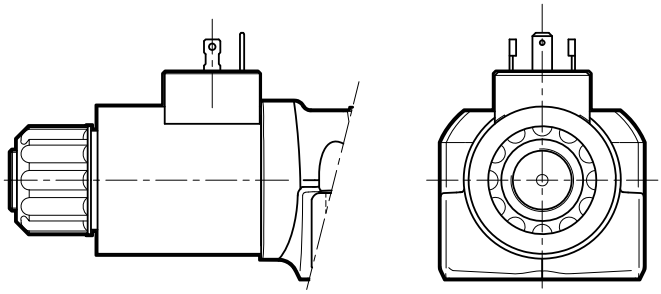
The configuration with centreing and return springs can be mounted in any position.

Valve fitting takes place by means of screws or tie rods, fixing the valve on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing. If the minimum values of planarity or smoothness are not met, fluid leakages between valve and mounting surface can easily occur.

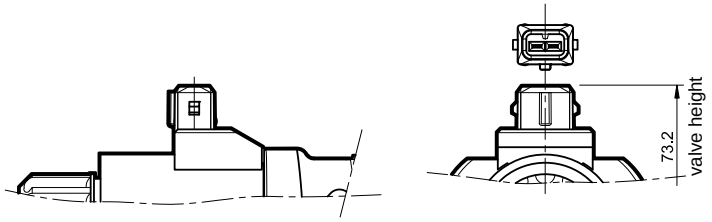


9 - ELECTRIC CONNECTIONS

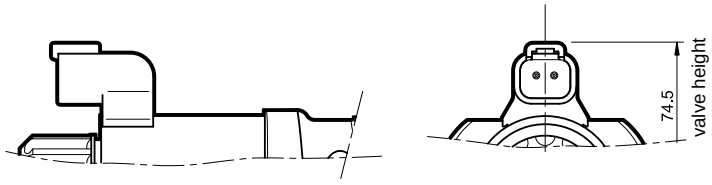
connection for EN 175301-803
(ex DIN 43650) connector
code **K1** (**standard**)
code **WK1** (W7 version only)



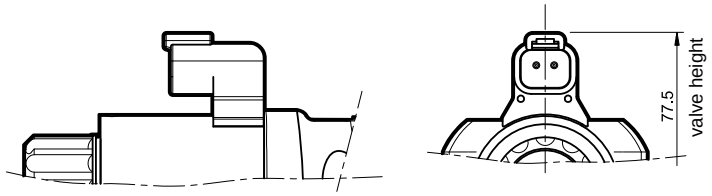
connection for AMP JUNIOR
connector
code **K2**



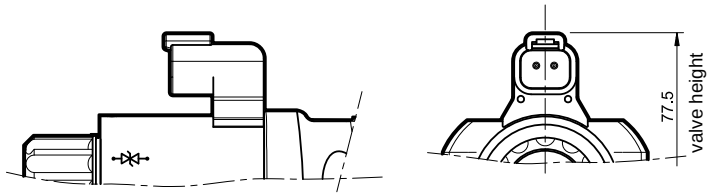
connection for
DEUTSCH DT06-2S male connector
code **K7**



connection for
DEUTSCH DT06-2S male
connector
code **WK7** (W7 version only)



connection for
DEUTSCH DT06-2S male
connector - coil with diode
code **WK7D** (W7 version only)



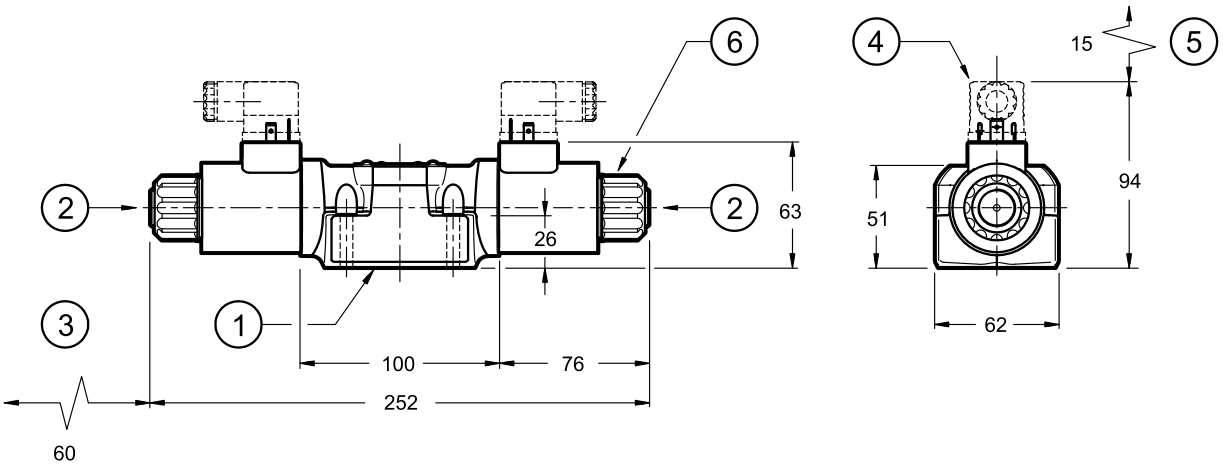
10 - ELECTRIC CONNECTORS

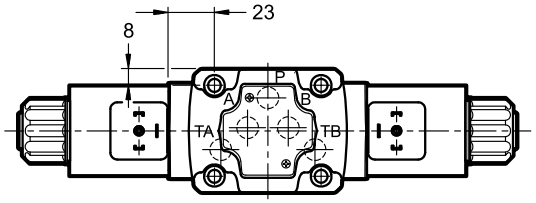
Solenoid operated valves are delivered without connectors. Connectors type EN 175301-803 (ex DIN 43650) for K1 and WK1 connections can be ordered separately. See catalogue 49 000.

11 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

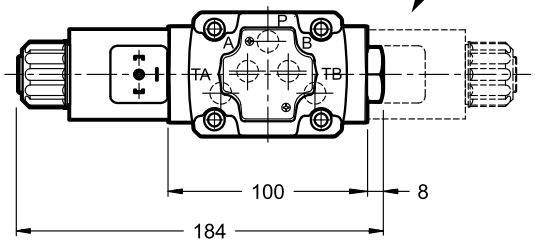
DL5B-S*





DL5B-TA, DL5B-SA*

solenoid position for versions type TB* - SB*

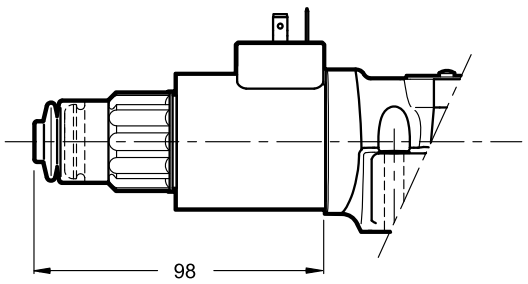


Valve fastening: 4 SHC screws ISO 6742 M6x35
Tightening torque: 8 Nm (A8.8)
Threads of mounting holes: M6x10

1	Mounting surface with sealing rings: 5 OR type 2050 (12.42x1.78) - 90 Shore
2	Locking ring with standard manual override integrated in the tube
3	Coil removal space
4	EN 175301-803 (ex DIN 43650) electrical connector (representation with K1 standard connection)
5	Connector removal space
6	Locking ring: tightening torque: 5 ± 0.5 Nm

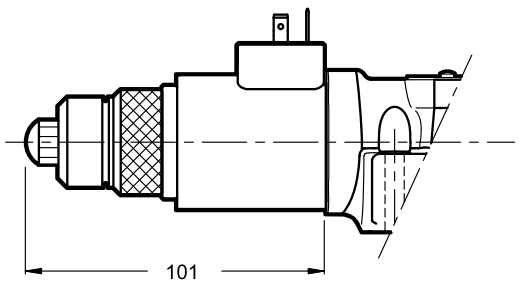
12 - MANUAL OVERRIDES

12.1 - CM Manual override, boot protected



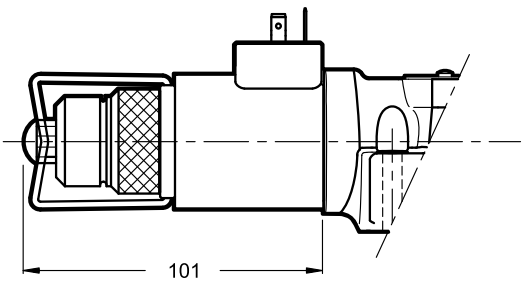
Code: 3401150006

12.2 - CP Push manual override



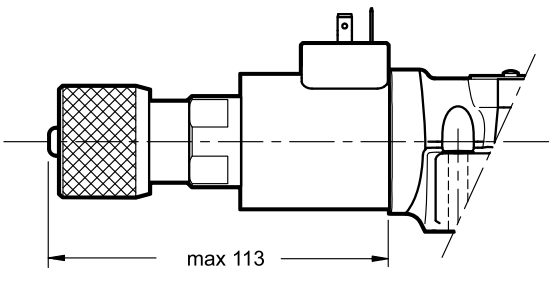
Code: 3401150005

12.3 - CPK Push manual override with mechanical retention



Code: 3401150004

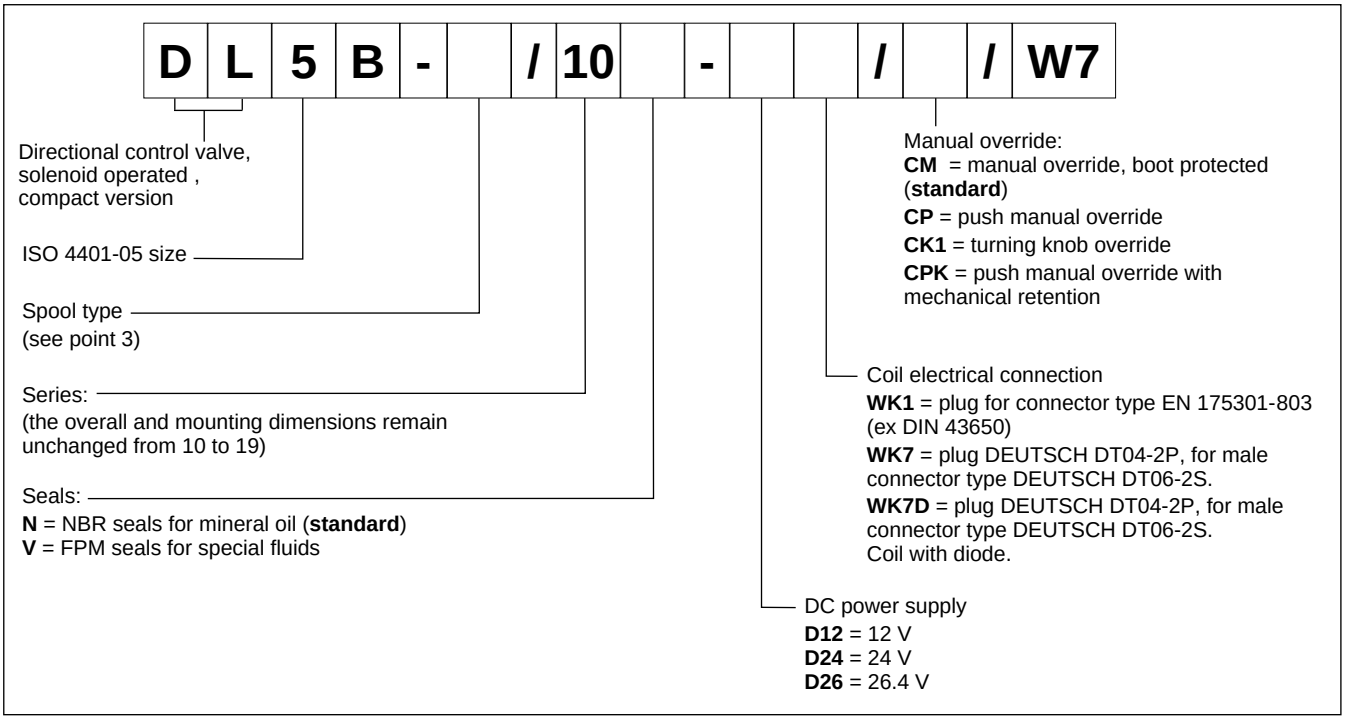
12.4 - CK1 Turning knob override



Code: 3403350004

13 - HIGH IP AND CORROSION RESISTANCE VERSION

13.1 - Identification code



13.2 - Corrosion resistance

This version features the zinc-nickel coating on all exposed metal parts of the valve, making it resistant to exposure to the salt spray for **600** hours (test performed according to UNI EN ISO 9227 and assessment test performed according to UNI EN ISO 10289).

13.3 - DC coils

The coils feature a zinc-nickel surface treatment.

The WK7D coil includes a suppressor diode of pulses for protection from voltage peaks during switching. During the switching the diode significantly reduces the energy released by the winding, by limiting the voltage to 31.4V in the D12 coil and to 58.9 V in the D24 coil.

(values ±10%)

	Nominal voltage [V]	Resistance at 20°C [Ω]	Current consumpt. [A]	Power consumpt [W]	Coil code		
					WK1	WK7	WK7D
D12	12	4,4	2,72	32,7	1903590	1903580	1903600
D24	24	18,6	1,29	31	1903591	1903581	1903601
D26	26,4	21,8	1,21	32	1903599	1903589	-

13.4 - Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree, correctly connected and installed.

electric connection	electric connection protection	whole valve protection
WK1 EN 175301-803 (ex DIN 43650)	IP66	IP66
WK7 DEUTSCH DT04 male	IP66/IP68/IP69 IP69K*	IP66/IP68/IP69 IP69K*
WK7D DEUTSCH DT04 male	IP66/IP68/IP69 IP69K*	IP66/IP68/IP69 IP69K*

(*) The IP69K protection degree is not taken into account in IEC 60529 but it is included in ISO 20653.

NOTE: As regards the liquid ingress protection (second digit), there are three means of protection.

Codes from 1 to 6 are related to water jets.

Rates 7 and 8 are related to immersion.

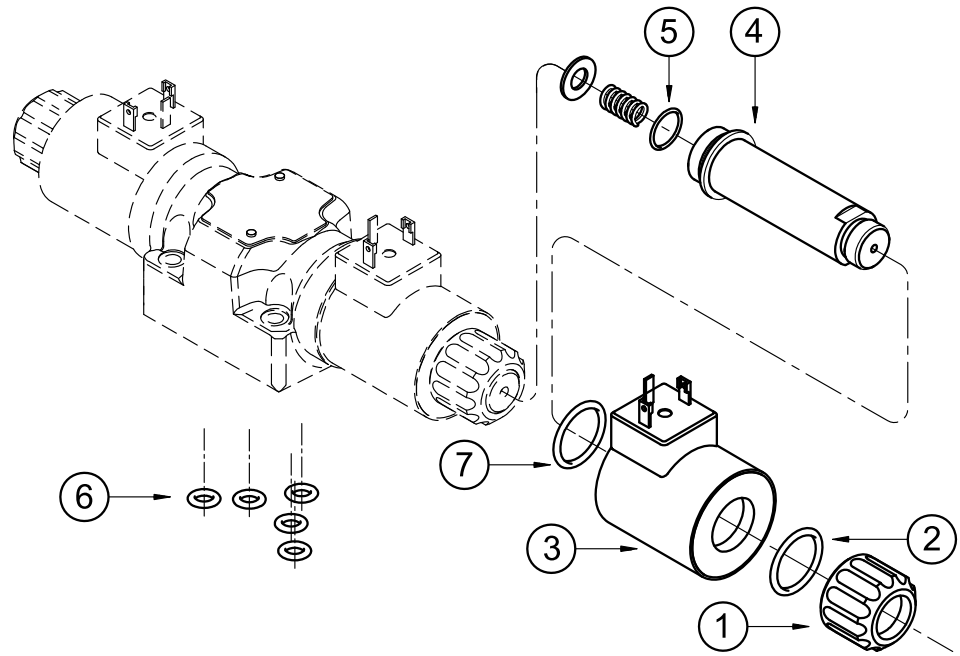
Rate 9 is reserved for high pressure and temperature water jets.

This means that IPX6 covers all the lower steps, rate IPX8 covers IPX7 but not IPX6 and lower, instead IPX9 does not cover any of them.

Whether a device meets two types of protection requirements it must be indicated by listing both the tests separated by a slash.

(E.g. a marking of an equipment covered both by temporary immersion and water jets is IP66/IP68).

14 - SPARE PARTS



IDENTIFICATION CODE FOR DC COILS

C	22	S3	-			/	

Supply voltage
D12 = 12 V
D24 = 24 V
D26 = 26.4 V
D28 = 28 V

Series no.:
10 = for K7 and WK7
11 = for K1 and K2
12 = for WK1 and WK7D

Coil electrical connection (see point 9):
K1 = plug for connector EN 175301-803 (ex DIN 43650)

for coils **D12**, **D24** and **D26**:
WK1 = plug for connector EN 175301-803 (ex DIN 43650)
WK7 = plug DEUTSCH DT04-2P, for male connector type DEUTSCH DT06-2S.

Only for **D12** and **D24**:
K2 = plug for connector AMP JUNIOR
K7 = plug DEUTSCH DT04-2P, for male connector type DEUTSCH DT06-2S.
WK7D = plug DEUTSCH DT04-2P, for male connector type DEUTSCH DT06-2S.
Coil with diode.

1	Coil locking ring - code 0119412 tightening torque: 5 ±0.5 Nm
2	ORM-0220-20 - 70 shore
3	Coil (see identification code)
4	Solenoid tube: TDM22-DL5/10N (NBR seals) TDM22-DL5/10V (FPM seals) (OR n° 5 included)
5	OR type 3.910 (19.18x2.46) - 70 shore
6	N. 5 OR type 2050 (12.42x1.78) - 90 Shore
7	Only for coil series 12: ORM-0220-20 - MVQ

SEAL KIT

The codes included the OR n° 2, 5, 6 and 7.
Cod. 1985461 NBR seals
Cod. 1985462 FPM seals

NOTE: You can also order coils using the coil codes at points 7.2 and 13.3.

15 - SUBPLATES

(See catalogue 51 000)

Type PMD4-AI4G with rear ports - threading: 3/4" BSP
Type PMD4-AL4G with side ports - threading: 1/2" BSP

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MDS5

SOLENOID OPERATED SWITCHING VALVE

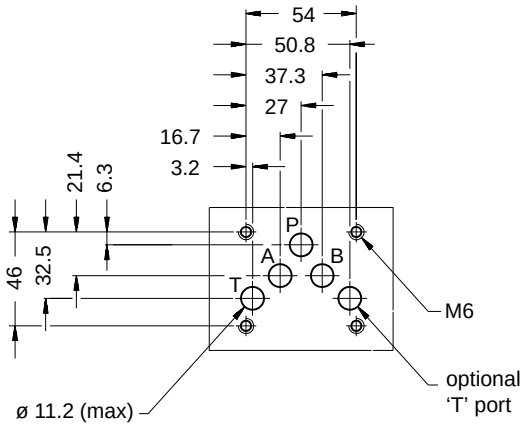
SERIES 10

MODULAR VERSION
ISO 4401-05

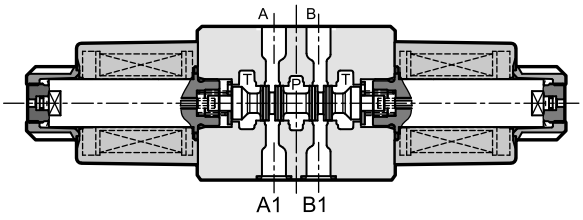
p max **350** bar
Q max **100** l/min

MOUNTING INTERFACE

ISO 4401-05-04-0-05
(CETOP 4.2-4-05-350)



OPERATING PRINCIPLE



— The MDS5 valve is used to switch multiple flow directions, or to select pressure values. See application example here below.

— The flow paths pass right through the entire valve body and due to this particular design, the MDS5 can be assembled with all ISO 4401-05 modular valves.

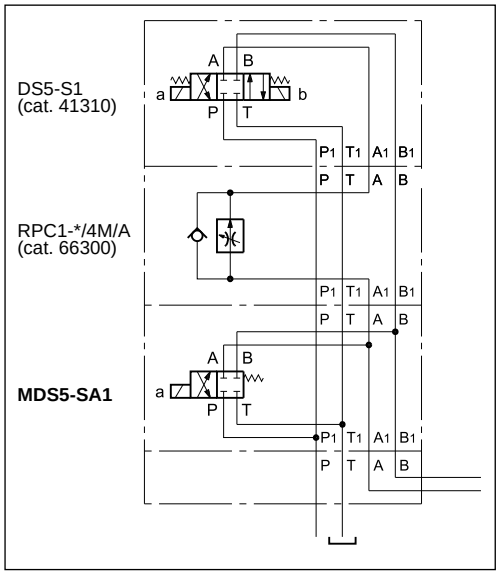
— The special connection of the valve in parallel to the P - T A - B lines of the circuit allows easy construction of different hydraulic configurations, reducing the pressure drops to a minimum.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50 °C)

Max operating pressure: P - A - B ports T port (DC version) T port (AC version)	bar	 350 210 160
Maximum flow on P - A - B ports	l/min	100
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass: double solenoid single solenoid	kg	4,6 3,7

APPLICATION EXAMPLE



1 - IDENTIFICATION CODE

MDS	5	-		/	10		-		K1	/	

Modular switching valve

Size: ISO 4401-05

Spools (see point 2):

S1 **SA1** **SB1**
TA **TB**

Series no.: (the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
N = NBR seals for mineral oils (**standard**)
V = FPM seals for special fluids

Option: manual override
Omit for override integrated in the tube (**standard**)
For DC version only:
CM = boot protected.
Details in catalogue 41 330.

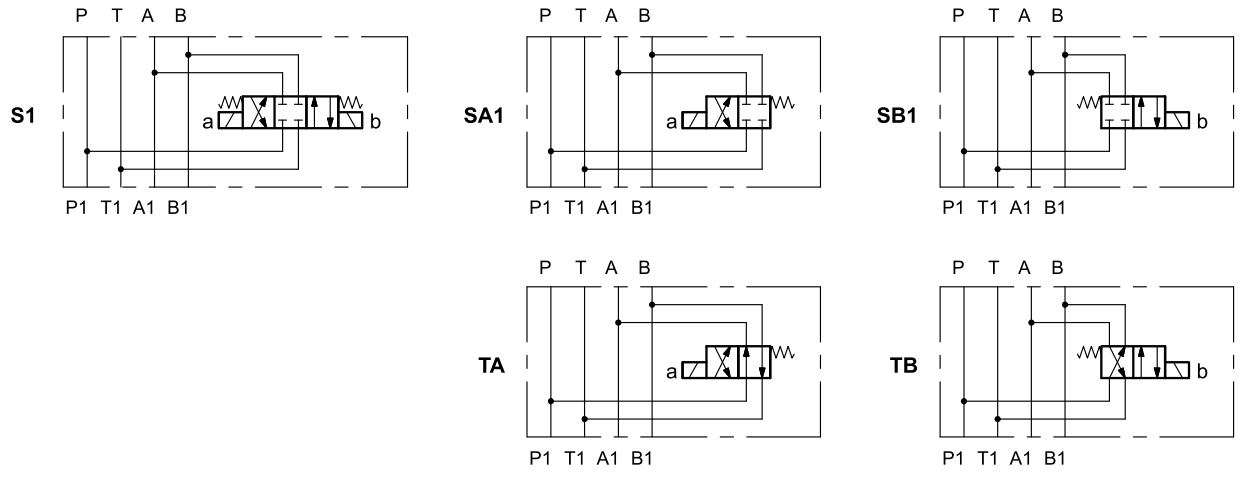
Coil electrical connection
plug for connector type EN 175301-803 (ex DIN 43650)

Power supply:
Details of electrical features are in catalogue 41 330.

DC power supply
D12 = 12 V
D24 = 24 V

AC power supply
A24 = 24 V - 50 Hz
A48 = 48 V - 50 Hz
A110 = 110 V - 50 Hz / 120 V - 60 Hz
A230 = 230 V - 50 Hz / 240 V - 60 Hz

2 - SPOOLS



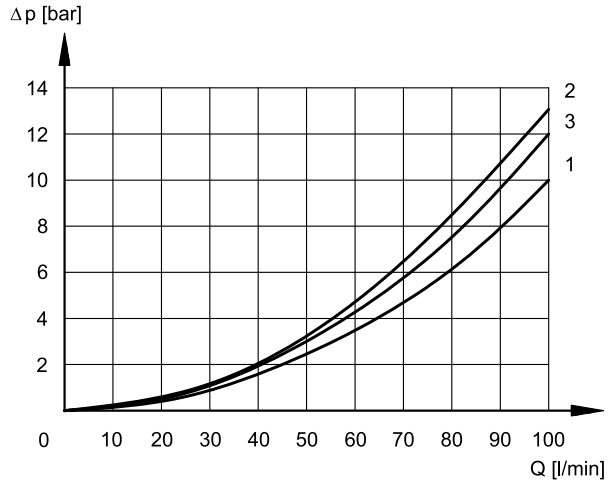
3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

4 - PRESSURE DROPS ΔP-Q

(obtained with viscosity of 36 cSt at 50 °C)



ENERGIZED VALVE

SPOOL	FLOW DIRECTIONS			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPHS			
S1	3	2	1	1

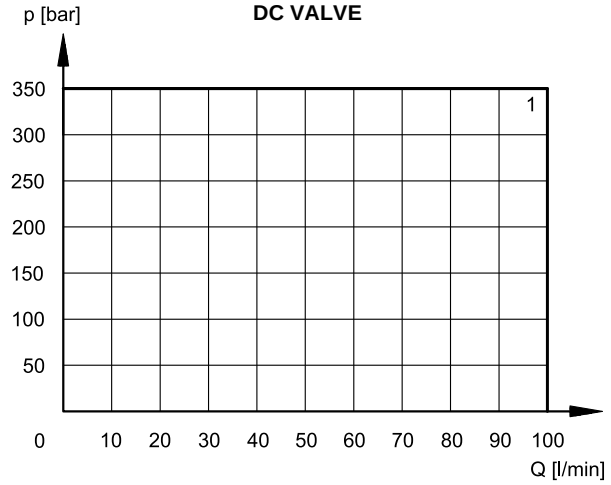
5 - OPERATING LIMITS

The curves define the flow rate operating fields according to the valve pressure of the different versions. The values indicated in the graphs are relevant to the standard solenoid valve.

The operating limits can be considerably reduced if a 4-port valve is used as 3-port valve with port A or B plugged or without flow.

The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage. The value have been obtained with mineral oil, viscosity 36 cSt, temperature 50 °C and filtration according to ISO 4406:1999 class 18/16/13.

DC VALVE



SPOOL	CURVE
S1, TA	1

6 - SWITCHING TIMES

The values indicated are obtained with spool S1, according to ISO 6403 standard, with mineral oil viscosity 36 cSt at 50°C.

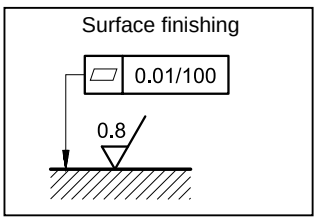
SUPPLY	TIMES (±10%) [ms]	
	ENERGIZING	DE-ENERGIZING
DC	40 ÷ 90	20 ÷ 50
AC	15 ÷ 30	20 ÷ 50

7 - INSTALLATION

The valve can be mounted in any position.

Valve fixing takes place by means of screws or tie rods, with the valve mounted on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing.

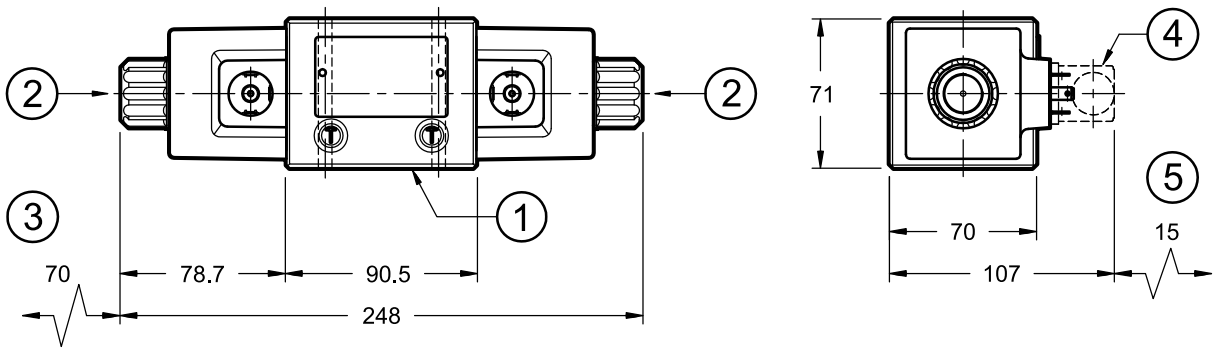
If the minimum values of planarity and/or smoothness are not met, fluid leakages between valve and mounting surface can easily occur.



8 - OVERALL AND MOUNTING DIMENSIONS

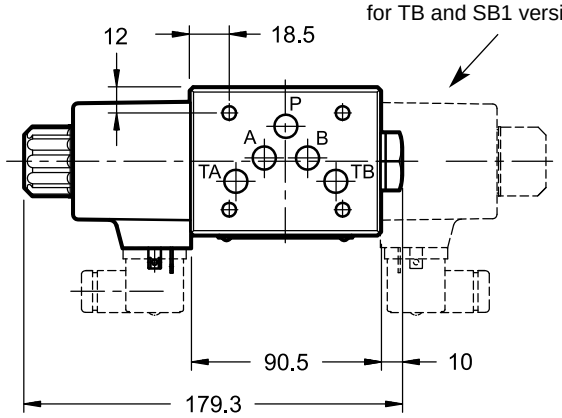
dimensions in mm

MDS5 - S1/10* - D*

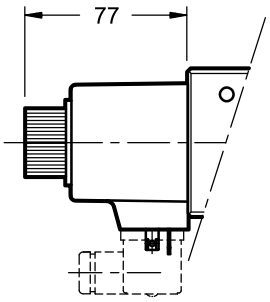


MDS5-TA/10* - D*

solenoid position
for TB and SB1 versions



MDS5 - */10* - A*



1	Mounting surface with sealing rings: N° 5 OR 2050 (12.42x1.78) - 90 Shore
2	Standard manual override included in the solenoid tube
3	Coil removal space
4	EN 175301-803 (ex DIN 43650) electrical connector to be ordered separately (see cat. 49 000)
5	Connector removal space

DUPLOMATIC MOTION SOLUTIONS

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DSP5

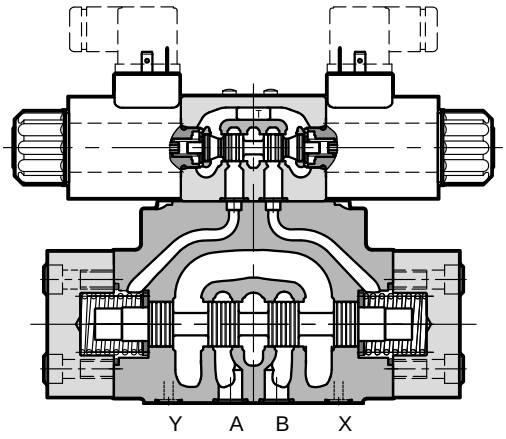
DIRECTIONAL VALVES PILOT OPERATED, SOLENOID OR HYDRAULIC (DSC5) ACTUATED

SERIES 10

SUBPLATE MOUNTING
ISO 4401-05
CETOP P05

p max **350** bar
Q max **150** l/min

OPERATING PRINCIPLE



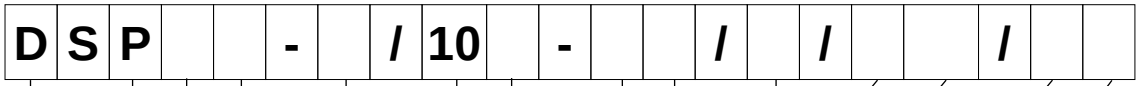
— The DSP5 and DSP5R are 4-ports directional valves, pilot operated, solenoid actuated, with mounting surface according to ISO 4401-05 standards.
— DSC5 are the hydraulic actuated versions.
— A high pressure version (H) is available.
— These valves are available with different spool types (see points 2 and 3), with some options for the opening control.
— They are available also with zinc-nickel surface treatments, that ensure a salt spray resistance up to 600 hours.

PERFORMANCES

(obtained with mineral oil of viscosity of 36 cSt at 50 °C)

		DSP5	DSP5H
Maximum operating pressure - ports P - A - B - port T (external drainage) - port T (internal drainage)	bar	 350 250 210 (DC) / 160 (AC)	 420 350 210 (DC) / 160 (AC)
Maximum flow rate from port P to A - B - T	l/min	150	
Ambient temperature range	°C	-20 / +50	
Fluid temperature range	°C	-20 / +80	
Fluid viscosity range	cSt	10 ÷ 400	
Fluid contamination degree		according to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25	
Mass: DSP5-S, RK DSP5-T*, SA*, SB* DSC5	kg	6.4 5.9 5.4	

1 - IDENTIFICATION CODE FOR SOLENOID ACTUATED DIRECTIONAL VALVES



Directional valve, pilot operated, solenoid actuated

Size:
5 = CETOP P05
5R = 4401-05-05-0-05

Option:
(omit for standard version)
H = high pressure p_{max} 420 bar

Spool type (see point 2)
S* **SA*** **SB***
RK **TA** **TB**

Series: (the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Pilot supply (see points 8 and 9):
E = external
I = Internal (not available for spools S2 - S4 - S7 - S8 - TA02 - TB02 RK02 - S*2 - S*4)
Z = Internal pilot supply with 30 bar pressure reducing valve, fixed adjustment

Drainage (see point 9):
I = Internal
E = External

Control options (see point 10):
C = Main spool stroke control
D = Main spool switching speed control
P08 = Subplate placed under the pilot stage with restrictor of Ø0.8 on port P
S2 = Pilot stage with S2 spool type (available only with pilot supply E)

Some combined options are also available:
C-D = Main spool stroke and switching speed control
C-P08 = Main spool stroke and subplate with restrictor
Contact us for further needs.

Power supply (see point 11)

direct current

D12 = 12 V
D24 = 24 V
D48 = 48 V

D110 = 110 V
D220 = 220 V

D00 = valve without coils (see **NOTE 1**)

alternate current

A24 = 24 V - 50 Hz
A48 = 48 V - 50 Hz

A110 = 110 V - 50 Hz / 120 V - 60 Hz
A230 = 230 V - 50 Hz / 240 V - 60 Hz

A00 = valve without coils (see **NOTE 1**)

F110 = 110 V - 60 Hz
F220 = 220 V - 60 Hz

Coil electrical connection (see point 15):

K1 = plug for connector type EN 175301-803 (ex DIN 43650) (**standard**)

K2 = plug for connector type AMP JUNIOR (available on **D12** and **D24** coils only)

K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S (available on **D12** and **D24** coils only)

Manual override:

Omit for override integrated in the tube (**standard**)

CM = manual override, boot protected (see point 17)

Option:

/ W7 = Zinc-nickel surface treatment (see **NOTE 2**)

Not available for AC valves.

Omit if not required

NOTE 1: Coils locking ring and related OR are supplied together with valves.

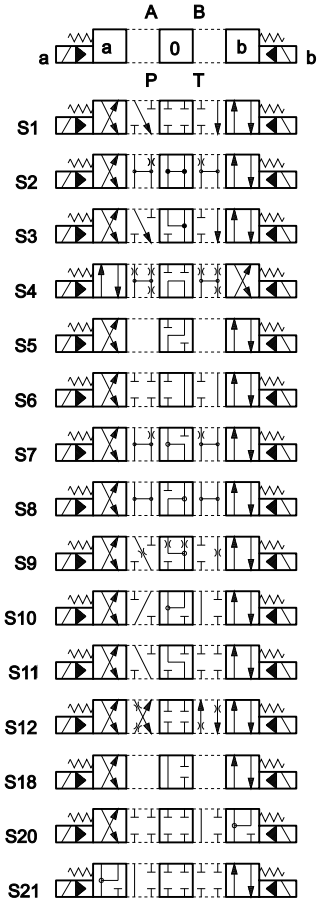
NOTE 2: The standard valve is supplied with surface treatment of phosphating black.

The zinc-nickel finishing on the valve body (both main and pilot) makes the valve suitable to ensure a salt spray resistance up to **240** hours (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

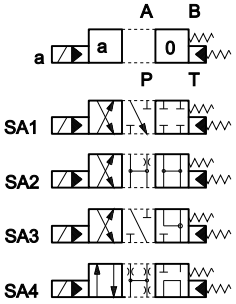
For a salt spray resistance up to **600** hours refer to point 18

2 - DSP5 SPOOL TYPES

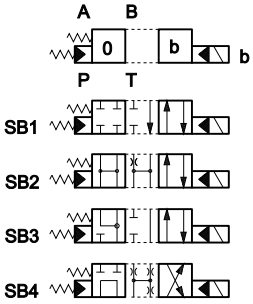
Type **S***:
2 solenoids - 3 positions
with spring centring



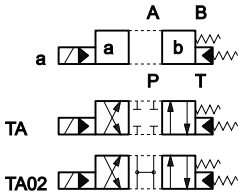
Type **SA***:
1 solenoid side A
2 positions (central + external)
with spring centring



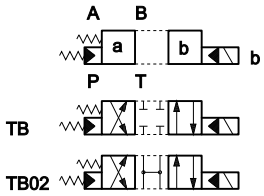
Type **SB***:
1 solenoid side B
2 positions (central + external)
with spring centring



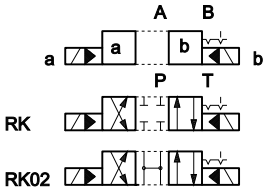
Type **TA**:
1 solenoid side A
2 external positions
with return spring



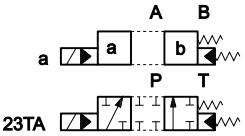
Type **TB**:
1 solenoid side B
2 external positions
with return spring

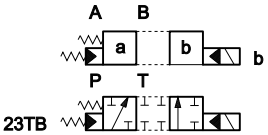


Type **RK**:
2 solenoids - 2 positions
with mechanical retention



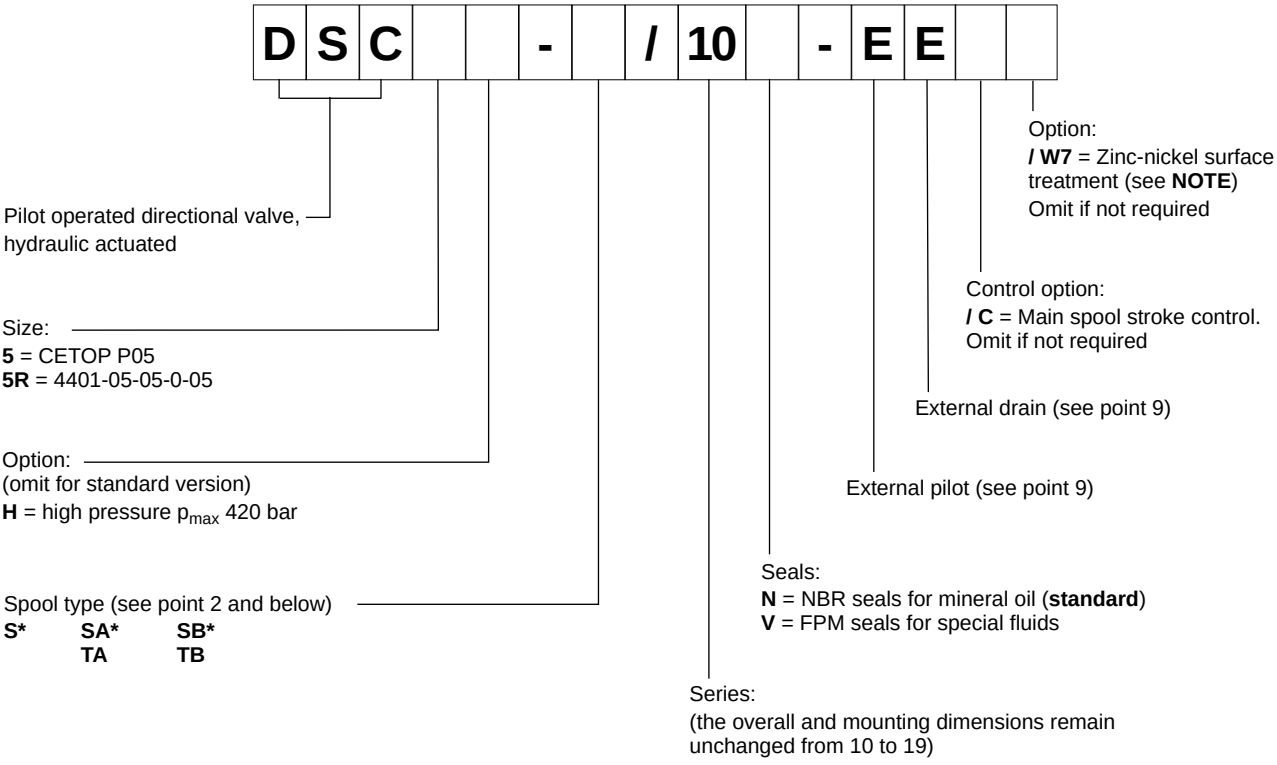
Type **23TA / 23TB**
three-way valve - 1 solenoid - 2 external positions, return spring





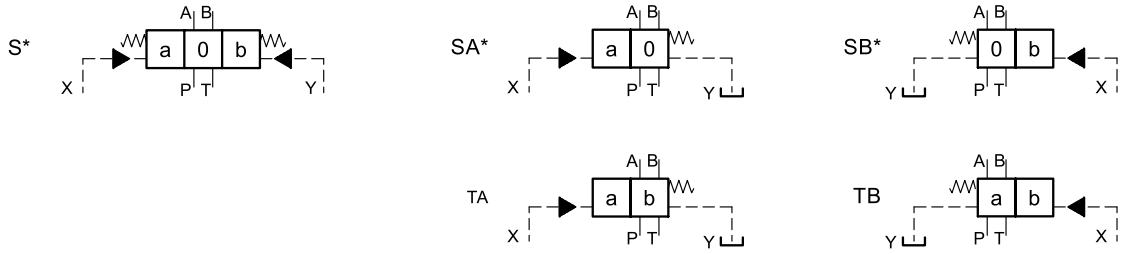
Special versions are available in addition to these spools : consult our technical dept. for their identification, feasibility and operating limits.

3 - IDENTIFICATION CODE FOR HYDRAULIC ACTUATED DIRECTIONAL VALVES



Spool types

DSC5 valves are delivered with short-circuit subplate.
The hydraulic actuation take place by pressurization in X and Y ports.



NOTE : The standard valve is supplied with surface treatment of phosphating black.

The zinc-nickel finishing makes the valve suitable to ensure a salt spray resistance up to **600** hours. (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

4 - HYDRAULIC FLUIDS

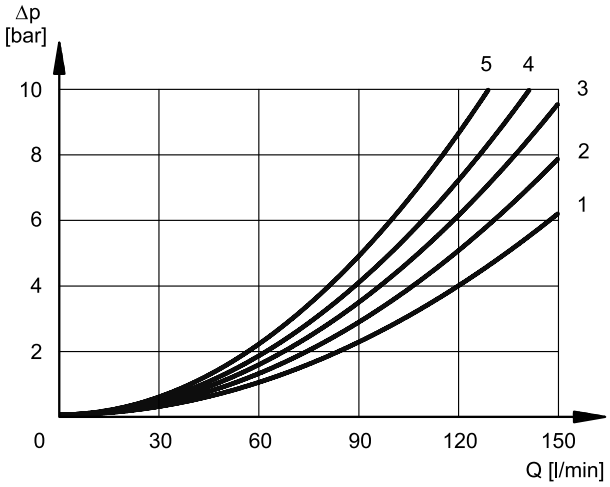
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V).

For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

5 - DSP5 PRESSURE DROPS Δp-Q

(values obtained with viscosity 36 cSt at 50 °C and optional discharge port closed)



ACTUATED POSITION

SPOOL	FLOW DIRECTIONS			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPH			
S1, SA1, SB1	2	2	2	3
S2, SA2, SB2	3	3	1	2
S3, SA3, SB3	2	2	1	2
S4, SA4, SB4	2	2	2	4
S6				
S7				
S8				
S9				
S10				
S11				
S12	2	2	2	3
S20				
S21				
TA, TB	3	3	3	4
TA02, TB02				
RK				

NORMAL POSITION

SPOOL	FLOW DIRECTIONS				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S2, SA2, SB2	-	-	2	2	3
S3, SA3, SB3			5	5	
S4, SA4, SB4					5
S6					
S7					
S8					
S10					
S11					
TA					

6 - OPERATING LIMITS

The values have been obtained with mineral oil, viscosity 36 cSt at 50 °C, and filtration ISO 4406:1999 class 18/16/13.

MAXIMUM FLOW RATES [l/min]		
	at 210 bar	at 350 bar
S4, S7, S8	120	100
All the other spools	150	120

7 - SWITCHING TIMES

The values indicated refer to a solenoid valve working with piloting pressure of 100 bar, with mineral oil at a temperature of 50 °C, at viscosity of 36 cSt and with P→A / B→T connections.

The energizing and de-energizing times are obtained at the pressure variation which occurs on the lines.

TIMES (± 10%) [ms]	ENERGIZED		DE-ENERGIZED	
	2 Pos	3 Pos	2 Pos	3 Pos
AC solenoid	35	25	35	25
DC solenoid	60	50	50	40

8 - PERFORMANCE CHARACTERISTICS

PRESSURES [bar]	**DSP5**	**DSP5H**	**DSC5**	**DSC5H**
Max pressure in P, A, B ports	350	420	350	420
Max pressure in T line with external drain	250	350	250	350
Max pressure in T line with internal drain	210 (DC) 160 (AC)	210 (DC) 160 (AC)	-	-
Max pressure in Y line with external drain	210 (DC) 160 (AC)	210 (DC) 160 (AC)	-	-
Minimum pilot supply pressure:	5 ÷ 12 (**NOTE 1)**			
Maximum pilot supply pressure (**NOTE 2)**	210	350	210	420

NOTE 1:The minimum piloting pressure can be the lower range value at low flows rates, but with higher flow rates the higher value is needed.

NOTE 2: If the working pressure is higher than these rated limits, then provide an external pilot line with p_{max} within the rated limits and purchase the valve with E type pilot supply.

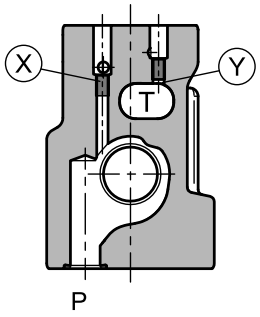
For DSP5 and DSP5H valves, if the external pilot line is not possible, you must opt for the version with Z type pilot supply (see point 9.2), providing max 350 bar at inlet pressure P.

9 - PILOT AND DRAIN

Valves with electro-hydraulic actuation (DSP) are available with both pilot supply and drain internal or external type. The version with external drain allows a higher back pressure on the return line.

The valves with hydraulic actuation (DSC) are available with both pilot supply and pilot return external only.

NOTE: The pilot supply and drainage configuration must be chosen when ordering. Subsequent modification is only permitted by authorized experienced operators or at the factory.



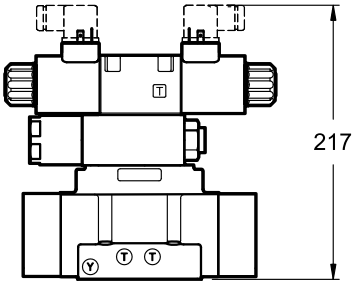
X: plug M6x8 for external pilot
Y: plug M6x8 for external drain

TYPE OF VALVE		Plug assembly	
		X	Y
IE	internal pilot and external drain	NO	YES
II	internal pilot and internal drain	NO	NO
EE	external pilot and external drain	YES	YES
EI	external pilot and internal drain	YES	NO

9.1 - Z type pilot supply: internal pilot supply with pressure reducing valve

The Z type pilot supply consists of an arrangement with internal pilot and 30 bar supply pressure to the pilot stage by means of a fixed adjustment pressure reducing valve placed between the main stage and the pilot valve.

DSP5-*/Z*



10 - OPTIONS

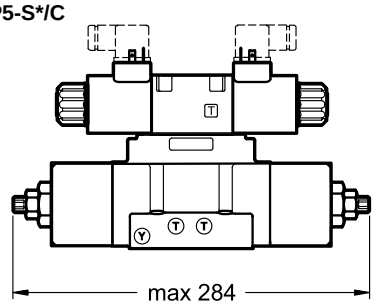
10.1 - Control of the main spool stroke: C

Stroke control for the main spool is possible by means of special side covers so as to vary the maximum clearance opening.

This solution allows control of the flow rate from the pump to the actuator and from the actuator to the outlet, obtaining a double adjustable control on the actuator.

Add the letter **C** in the identification code to order this version (see point 1).

DSP5-S*/C

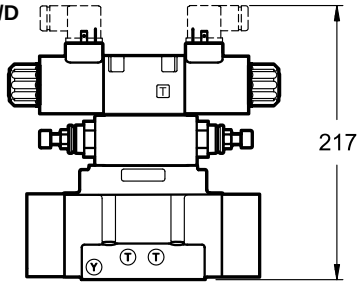


10.2 - Control of the main spool shifting speed: D

By placing a double flow control valve (QTM3 type) between the pilot solenoid valve and the main stage, the pilot supply flow can be adjusted and therefore the changeover smoothness can be varied.

Add the letter **D** in the identification code to order this version (see point 1).

DSP5-S*/D

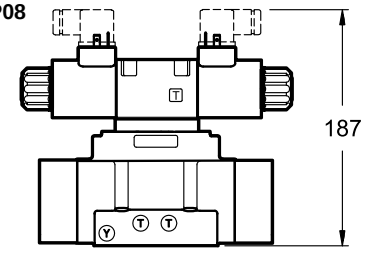


10.3 - Subplate with throttle on line P

It is possible to introduce a subplate with a restrictor of Ø0.8 in line P between the pilot solenoid valve and the main stage. Subplate width 10 mm.

Add **P08** in the identification code to order this version (see point 1).

DSP5-S*/P08



10.4 - Pilot stage with S2 spool

This version is used in association with the external type pilot to allow the pilot line to be unloaded when the valve is in the normal position.

The pilot supply must be external type (E).

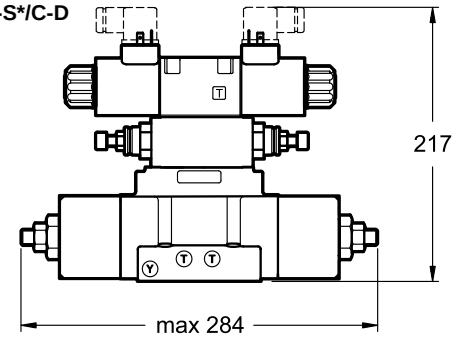
Add **S2** to the identification code to order this option (see point 1).

10.5 - Control of the main spool stroke and of the shifting speed: C-D

It is possible to have the valve fitted with both the main spool stroke control (C option) and the main spool shifting speed control (D option)

Add **C-D** in the identification code to order this version (see point 1).

DSP5-S*/C-D



11 - ELECTRICAL FEATURES

11.1 - Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation. The coil is fastened to the tube by a threaded ring, and can be rotated 360°, to suit the available space.

Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree, correctly connected and installed.

electric connection	electric connection protection	whole valve protection
K1	IP65	IP65
K2	IP65/67	
K7	IP65/67	

SUPPLY VOLTAGE FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY	10.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC) (NOTE)	In compliance with 2014/30/EU
LOW VOLTAGE	In compliance with 2014/35/EU
CLASS OF PROTECTION Coil insulation (VDE 0580) Impregnation: DC valve AC valve	 class H class F class H

NOTE: In order to further reduce the emissions. with DC supply, use of type H connectors is recommended. These prevent voltage peaks on opening of the coil supply electrical circuit (see cat. 49 000).

11.2 - Current and absorbed power for DC solenoid valve

The table shows current and power consumption values of the DC coils.

Using connectors type ‘D’ or ‘D1’(see cat. 49 000) with embedded bridge rectifier it is possible to feed DC coils with alternating current (50 or 60 Hz), considering a reduction of the operating limits (see point 6).

Coils for direct current (values ±10%)

	Nominal voltage [V]	Resistance at 20°C [Ω]	Current consumpt. [A]	Power consumpt [W]	Coil code K1	K2	K7
D12	12	4,4	2,72	32,7	1903080	1903100	1902940
D24	24	18,6	1,29	31	1903081	1903101	1902941
D48	48	78,6	0,61	29,5	1903083		
D110	110	423	0,26	28,2	1903464		
D220	220	1692	0,13	28,2	1903465		

11.3 - Current and absorbed power for AC solenoid valve

The table shows current and power consumption values at inrush and at holding, for AC coils.

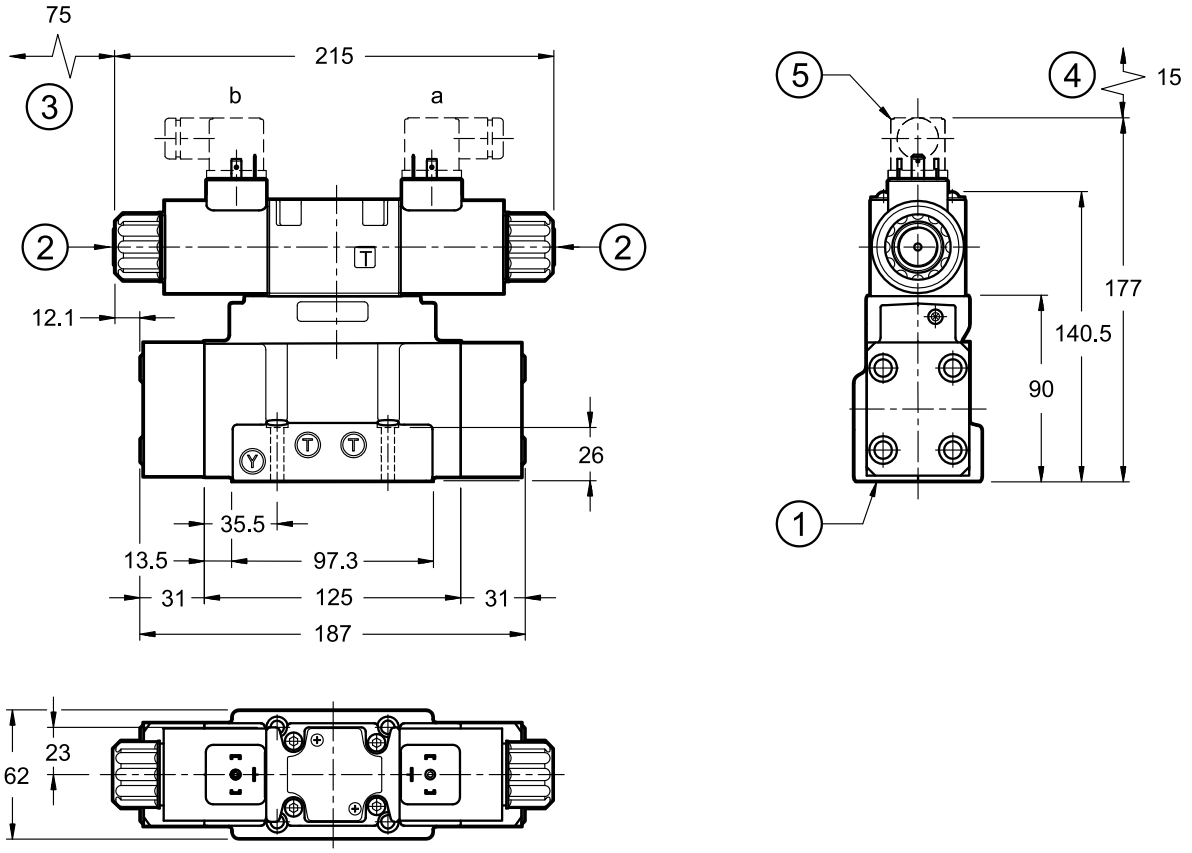
Coils for alternating current (values ± 5%)

Suffix	Nominal Voltage [V]	Freq. [Hz]	Resistance at 20°C [Ω]	Current consumption at inrush [A]	Current consumption at holding [A]	Power consumption at inrush [VA]	Power consumption at holding [VA]	Coil availability K1
A24	24	50	1.69	5.81	1.32	139	32	1902830
A48	48		6.02	3.78	0.86	182	41	1902831
A110	110V-50Hz 120V-60Hz	50/60	33	1.76	0.40	194	44	1902832
				1.54	0.35	185	42	
A230	230V-50Hz 240V-60Hz		135	0.92	0.21	213	48	1902833
				0.79	0.18	190	43	
F110	110	60	28.5	1.45	0.33	160	36	1902834
F220	220		103	0.92	0.21	203	46	1902835

12 - DSP5 OVERALL AND MOUNTING DIMENSIONS

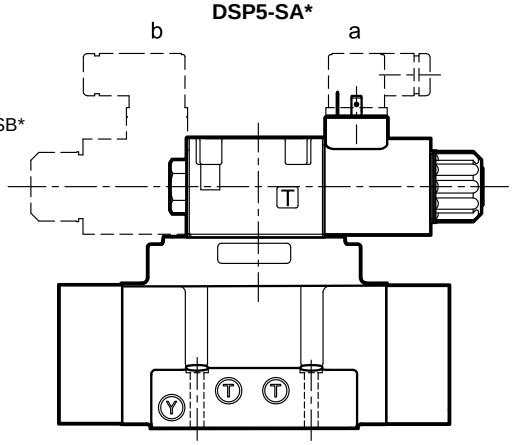
dimensions in mm

DSP5-S
DSP5-RK



DSP5-TA
DSP5-SA*

solenoid position
configuration TB/SB*



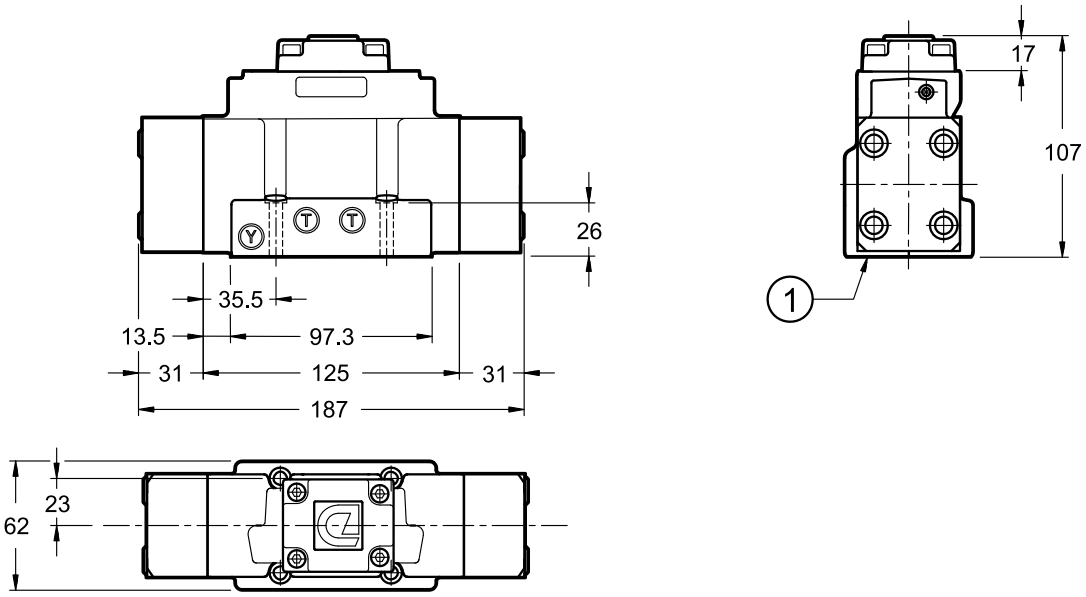
NOTE: For DS*5H valves (high pressure versions) fastening, A10.9 class screws are required.

Valve fastening: N. 4 SHC screws - ISO 4762 M6x35
Tightening torque: 8 Nm (A8.8) - 12 Nm (A10.9)
Thread of mounting holes: M6x10

1	Mounting surface with sealing rings N. 5 OR type 2050 (12.42x1.78) - 90 Shore N. 2 OR type 2037 (9.25x1.78) - 90 Shore
2	Manual override
3	Coil removal space
4	Connector removal space
5	Electric connector to be ordered separately (see cat. 49 000)

13 - DSC5 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



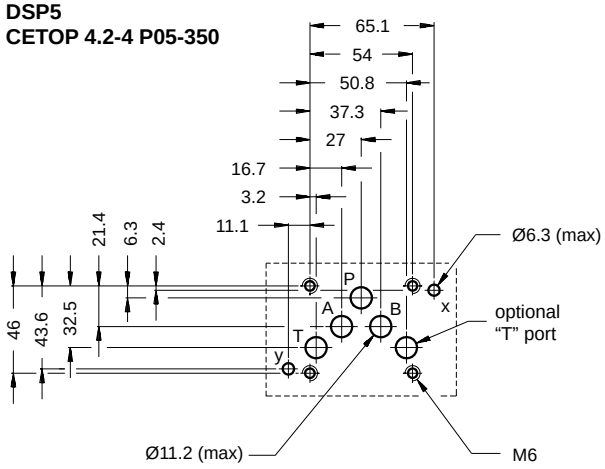
NOTE: For DS*5H valves (high pressure versions) fastening, A10.9 class screws are required.

Valve fastening: N. 4 SHC screws - ISO 4762 M6x35
Tightening torque: 8 Nm (A8.8) - 12 Nm (A10.9)
Thread of mounting holes: M6x10

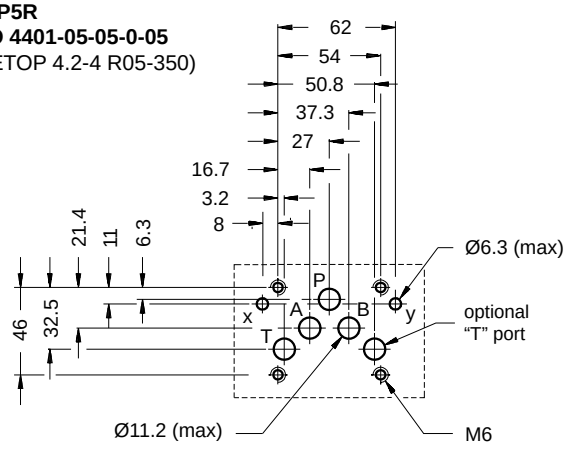
1	Mounting surface with sealing rings N. 5 OR type 2050 (12.42x1.78) - 90 Shore N. 2 OR type 2037 (9.25x1.78) - 90 Shore
2	Short-circuit subplate

14 - MOUNTING INTERFACES

DSP5
CETOP 4.2-4 P05-350



DSP5R
ISO 4401-05-05-0-05
(CETOP 4.2-4 R05-350)

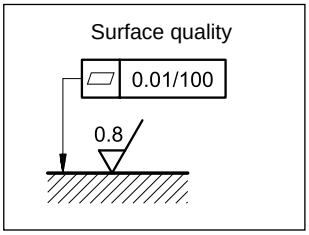


15 - INSTALLATION

Configurations with centring and recall springs can be mounted in any position; type RK valves - without springs and with mechanical detent - must be mounted with the longitudinal axis horizontal.

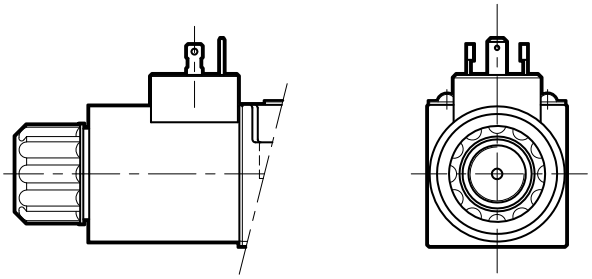
Valve fastening takes place by means of screws or tie rods, laying the valve on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing. If the minimum values of planarity or smoothness are not met, fluid leakages between valve and mounting surface can easily occur.

NOTE: DS*5H valves (high pressure versions) need screws class A 10.9 for fastening.

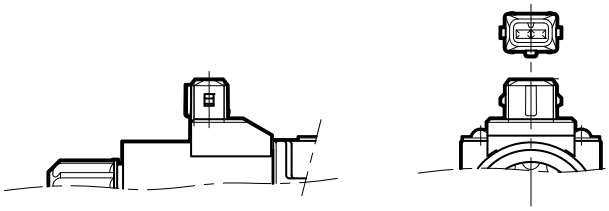


16 - ELECTRIC CONNECTIONS

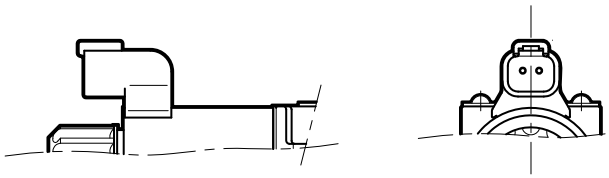
connection for EN 175301-803
(ex DIN 43650) connector
code **K1** (**standard**)
code **WK1** (W7 version only)



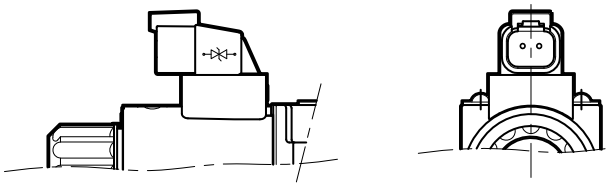
connection for AMP JUNIOR
connector
code **K2**



connection for
DEUTSCH DT06-2S male connector
code **K7**



connection for
DEUTSCH DT06-2S male connector
code **WK7** (W7 version only)
code **WK7D** (W7 version only - coil
with diode)



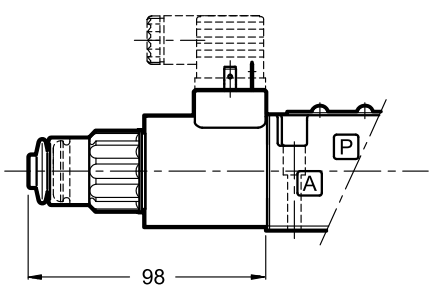
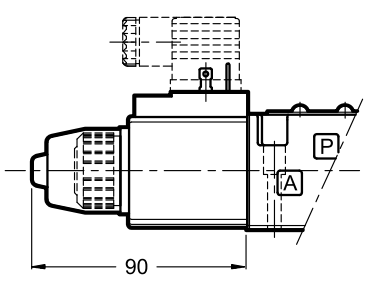
17 - ELECTRIC CONNECTORS

Solenoid operated valves are delivered without connectors. Connectors type EN 175301-803 (ex DIN 43650) for K1 connections can be ordered separately. See catalogue 49 000.

18 - MANUAL OVERRIDE

Whenever the solenoid valve installation may involve exposure to atmospheric agents or use in tropical climates, a boot protected manual override is recommended.

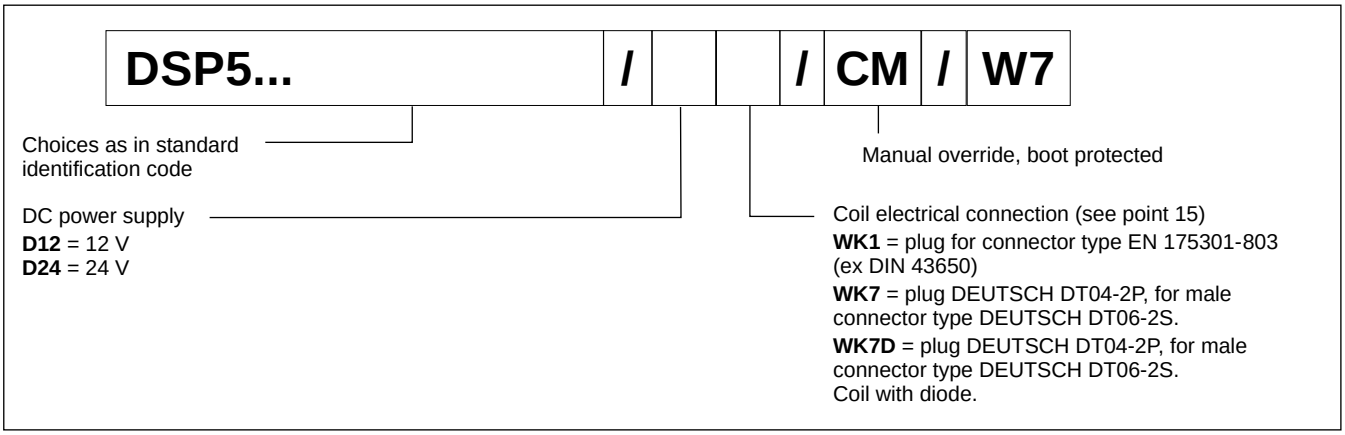
Add **/CM** at the end of the identification code to order this version (see point 1).

DC valve	**AC valve**
	
Code: 3401150006	Code: 0269201

19 - HIGH IP DEGREE AND CORROSION RESISTANCE VERSION

These versions are available for the basic valve (without control options of par. 10, with the exception of S2 option) only. The boot manual override (CM) is installed as standard in order to protect the solenoid tube.

19.1 - Identification code



19.2 - Corrosion resistance

This version features the zinc-nickel coating on all exposed metal parts of the valve, making it resistant to exposure to the salt spray for **600** hours (test performed according to UNI EN ISO 9227 and assessment test performed according to UNI EN ISO 10289).

19.3 - DC coils

The coils feature a zinc-nickel surface treatment.

The WK7D coil includes a suppressor diode of pulses for protection from voltage peaks during switching. During the switching the diode significantly reduces the energy released by the winding, by limiting the voltage to 31.4V in the D12 coil and to 58.9 V in the D24 coil.

(values ±10%)

	Nominal voltage [V]	Resistance at 20°C [Ω]	Current consumpt. [A]	Power consumpt [W]	Coil code		
					WK1	WK7	WK7D
D12	12	4.4	2.72	32.7	3984000001	3984000101	3984000111
D24	24	18.6	1.29	31	3984000002	3984000102	3984000112

19.4 - Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree, correctly connected and installed.

electric connection	electric connection protection	whole valve protection
WK1	IP66	IP66
WK7	IP66/IP68/IP69 IP69K*	IP66/IP68/IP69 IP69K*
WK7D	IP66/IP68/IP69 IP69K*	IP66/IP68/IP69 IP69K*

(*****) The IP69K protection degree is not taken into account in IEC 60529 but it is included in ISO 20653.

NOTE: As regards the liquid ingress protection (second digit), there are three means of protection.

Codes from 1 to 6 are related to water jets.

Rates 7 and 8 are related to immersion.

Rate 9 is reserved for high pressure and temperature water jets.

This means that IPX6 covers all the lower steps, rate IPX8 covers IPX7 but not IPX6 and lower, instead IPX9 does not cover any of them.

Whether a device meets two types of protection requirements it must be indicated by listing both the tests separated by a slash.

(E.g. a marking of an equipment covered both by temporary immersion and water jets is IP66/IP68).

20 - SUBPLATES

(see catalogue 51 000)

Subplates are supplied with phosphating black surface treatment. These suplates are not suitable for DS*5H high pressure valves.

Type with rear ports	PME4-AI5G
Type with side ports	PME4-AL5G
P, T, A, B port dimensions	3/4” BSP
X, Y port dimensions	1/4” BSP

DUPLOMATIC MOTION SOLUTIONS
a member of DAIKIN group

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T +39 0331 895111 | E vendite.ita@duplomatic.com | sales.exp@duplomatic.com
duplomaticmotionsolutions.com

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WWW.SUMY.IR



DSP7

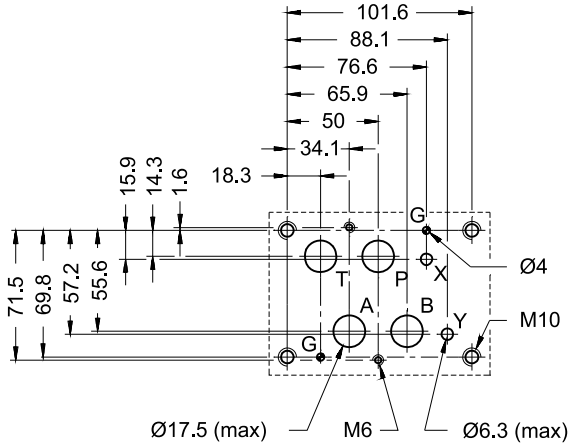
DIRECTIONAL VALVES PILOT OPERATED, SOLENOID OR HYDRAULIC (DSC7) ACTUATED

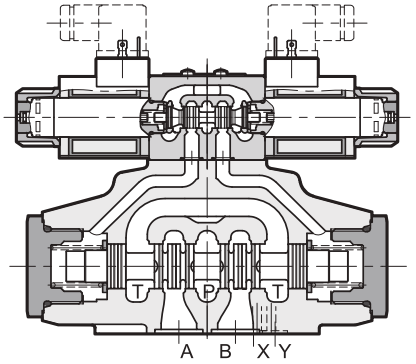
SUBPLATE MOUNTING ISO 4401-07

p max **350** bar
Q max **300** l/min

MOUNTING SURFACE

ISO 4401-07-07-0-05
(CETOP 4.2-4-07-350)





— The DSP7 pilot operated valve is made up of a 4-way hydro-piloted distributor with mounting surface according to ISO 4401-07 standards, operated by an ISO 4401-03 solenoid directional valve.

— It is available with different spool types (see p. 2), with some options for the opening control.

— It is available with both the solenoid and the hydraulic control from the X and Y ways.

— A version for high pressures (H) is available.

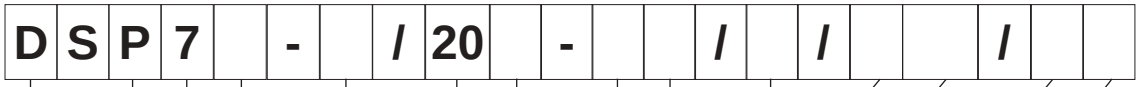
— It is available also with zinc-nickel surface treatments, that ensures a salt spray resistance up to 600 hours.

PERFORMANCES

(obtained with mineral oil of viscosity of 36 cSt at 50°C)

		DSP7	DSP7H
Maximum operating pressure - ports P - A - B - port T (external drainage) - port T (internal drainage)	bar	 350 250 210 (DC) / 160 (AC)	 420 350 210 (DC) / 160 (AC)
Maximum flow rate from port P to A - B - T	l/min	300	
Ambient temperature range	°C	-20 / +50	
Fluid temperature range	°C	-20 / +80	
Fluid viscosity range	cSt	10 ÷ 400	
Fluid contamination degree		according to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25	
Mass: DSP7-S, RK DSP7-T*, SA*, SB* DSC7	kg	8.6 8.0 6.6	

1 - IDENTIFICATION CODE FOR DSP7 SOLENOID ACTUATED DIRECTIONAL VALVES



Directional valve, solenoid actuated, pilot operated

Size: ISO 4401-07

Option:
(omit for standard version)
H = high pressure version
pmax = 420 bar

Spool type (see point 2)

S*	**TA**
SA*	**TB**
SB*	**RK**

Series: (the overall and mounting dimensions remain unchanged from 20 to 29)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Pilot supply (see point 9):
E = external
I = internal (not available for spools S2 - S4 - S7 - S8 - TA02 - TB02 RK02 - S*2 - S*4)
Z = internal pilot supply with 30 bar pressure reducing valve, fixed adjustment (see point 8) (not available for spools S2 - S4 - S7 - S8 TA02 - TB02 - RK02 - S*2 - S*4)
Alternative options for spool types S2 - S4 - S7 - S8 - TA02 - TB02 - RK02 - S*2 - S*4:
C = internal pilot supply with backpressure valve in P port
CZ = internal pilot supply with 30 bar pressure reducing valve, fixed adjustment, and with backpressure valve in P port

Drain (see point 9):
E = external
I = internal

Control options (see point 11):
C = Main spool stroke control
D = Main spool switching speed control
P08 = Subplate placed under solenoid valve with restrictor of Ø0.8 on port P
S2 = Pilot stage with S2 spool type (available only with pilot supply E)

Power supply (see point 11)

direct current

D12 = 12 V
D24 = 24 V
D48 = 48 V
D110 = 110 V
D220 = 220 V
D00 = valve without coils (see **NOTE 1**)

alternate current

A24 = 24 V - 50 Hz
A48 = 48 V - 50 Hz
A110 = 110 V - 50 Hz / 120 V - 60 Hz
A230 = 230 V - 50 Hz / 240 V - 60 Hz
A00 = valve without coils (see **NOTE 1**)
F110 = 110 V - 60 Hz
F220 = 220 V - 60 Hz

Coil electrical connection (see p. 15):
K1 = plug for connector type EN 175301-803 (ex DIN 43650) (**standard**)
K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S (available on D12 and D24 coils only)

Manual override:
omit for override integrated in the tube (standard)
CM = manual override, boot protected (see point **17**)

Option:
/ W7 = Zinc-nickel surface treatment (see **NOTE 2**)
Omit if not required

NOTE 1: Coils locking ring and related OR are supplied together with valves.

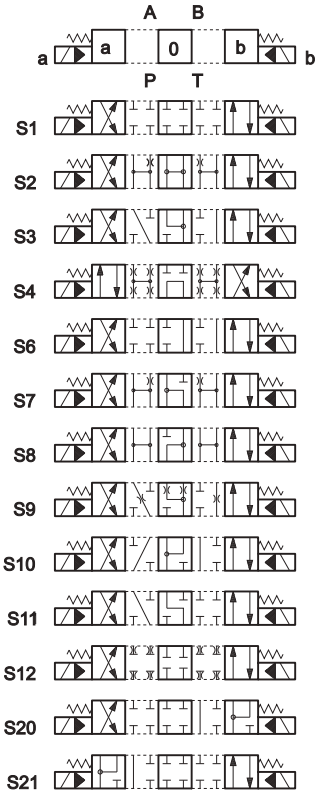
NOTE 2: The standard valve is supplied with surface treatment of phosphating black.

The zinc-nickel finishing on the valve body (both main and pilot) makes the valve suitable to ensure a salt spray resistance up to **240** hours (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

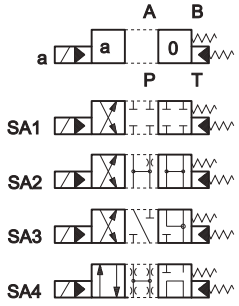
For a salt spray resistance up to **600** hours refer to point 18.

2 - DSP7 SPOOL TYPES

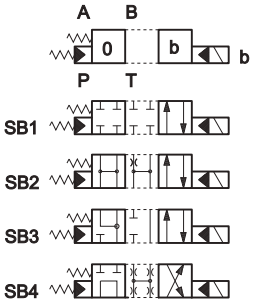
Type **S***:
2 solenoids - 3 positions
with spring centring



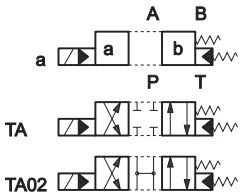
Type **SA***:
1 solenoid side A
2 positions (central + external)
with spring centring



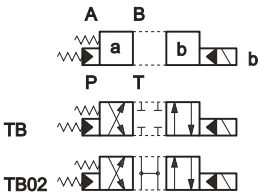
Type **SB***:
1 solenoid side B
2 positions (central + external)
with spring centring



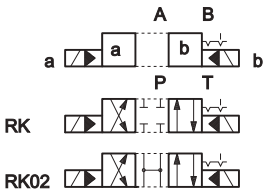
Type **TA**:
1 solenoid side A
2 external positions
with return spring



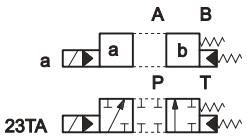
Type **TB**:
1 solenoid side B
2 external positions
with return spring

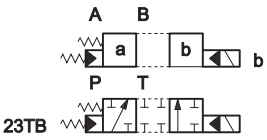


Type **RK**:
2 solenoids - 2 positions
with mechanical retention



Type **23TA / 23TB**
three-way valve - 1 solenoid - 2 external positions, return spring





Besides the diagrams shown, special versions are available: consult our technical dept. for their identification, feasibility and operating limits.

3 - IDENTIFICATION CODE FOR DSC7 HYDRAULIC ACTUATED DIRECTIONAL VALVE

D	S	C	7		-		/	10		-	E	E	

Directional valve, hydraulic actuated pilot operated through X and Y ports.

Size: ISO 4401-07

Option:
(omit for standard version)
H = high pressure version
p_{max} = 420 bar

Spool type (see point 2 and below)
S* **TA**
SA* **TB**
SB* **R**

Series: (the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

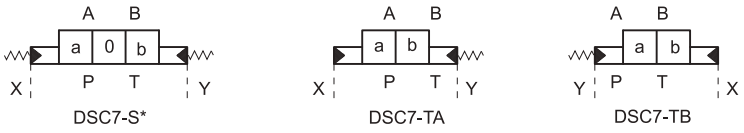
External pilot (see p. 9)

External drain (see p. 9)

Option:
/ W7 = Zinc-nickel surface treatment (see **NOTE**)
Omit if not required

Spool types

The distributor is delivered with short-circuit subplate. The X and Y ports are used for the hydraulic control of the valve.



DSC7-S* DSC7-TA DSC7-TB

NOTE: The standard valve is supplied with surface treatment of phosphating black.

The zinc-nickel finishing makes the valve suitable to ensure a salt spray resistance up to **600** hours. (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

4 - HYDRAULIC FLUIDS

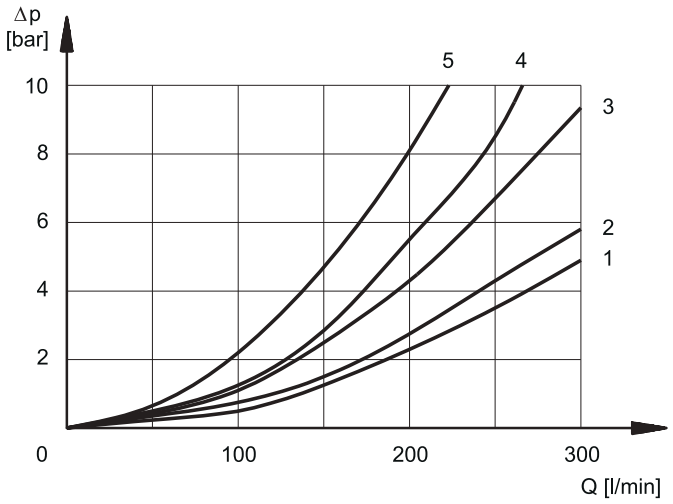
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V).

For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

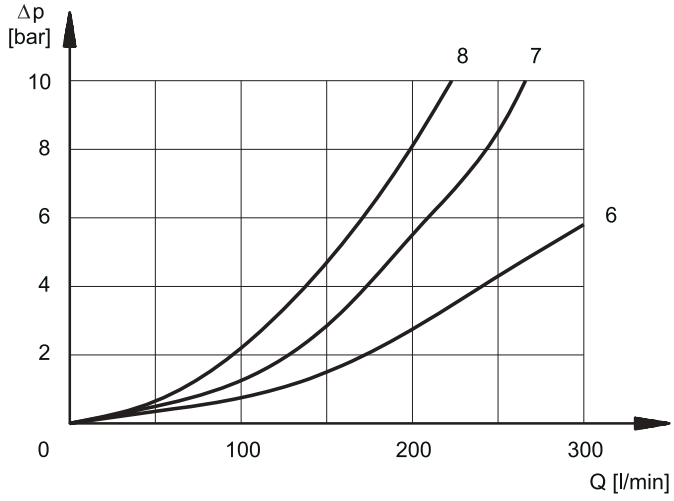
5 - PRESSURE DROPS ΔP-Q

(values obtained with viscosity 36 cSt at 50 °C)



PRESSURE DROPS WITH VALVE ENERGIZED

SPOOL TYPE	FLOW DIRECTION			
	P-A	P-B	A-T	B-T
	CURVES ON GRAPH			
S1, SA1, SB1	1	1	3	4
S2, SA2, SB2	1	1	4	4
S3, SA3, SB3	1	1	4	4
S4, SA4, SB4	2	2	4	5
S6	1	1	3	4
S7	1	1	4	4
S8	1	1	3	4
S9	1	1	3	4
S10	1	1	3	4
S11	1	1	3	4
S12	1	1	3	4
S20	1	1	3	4
S21	1	1	4	4
TA, TB	1	1	3	4
TA02, TB 02	1	1	4	4
RK	1	1	3	4



PRESSURE DROPS WITH VALVE IN DE-ENERGIZED POSITION

SPOOL TYPE	FLOW DIRECTION				
	P-A	P-B	A-T	B-T	P-T
	CURVES ON GRAPH				
S2, SA2, SB2					6
S3, SA3, SB3			7	7	
S4, SA4, SB4					7
S6				7	
S7					8
S8					8
S10			7	7	
S11			7		

6 - SWITCHING TIMES

The values indicated refer to a solenoid valve working with piloting pressure of 100 bar, with mineral oil at a temperature of 50°C, at viscosity of 36 cSt and with PA and BT connections.

The energizing and de-energizing times are obtained at the pressure variation which occurs on the lines.

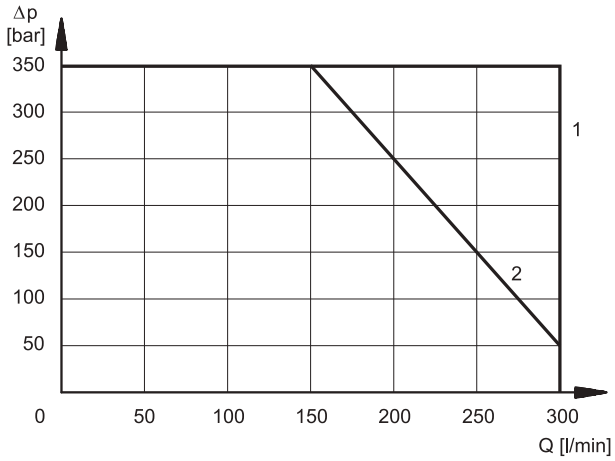
TIMES (± 10%) [ms]	ENERGIZED		DE-ENERGIZED	
	2 Pos.	3 Pos.	2 Pos.	3 Pos.
AC solenoid	45	30	45	30
DC solenoid	75	60	60	45

7 - OPERATING LIMITS

The curves define the flow rate operating fields according to the valve pressure for the different spool types.

The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage.

The values have been obtained with mineral oil, viscosity 36 cSt at 50 °C, and filtration ISO 4406:1999 class 18/16/13.



SPOOL	CURVE	
	P→A	P→B
S1,SA1,SB1	1	1
S2, SA2, SB2	1	1
S3, SA3, SB3	1	1
S4, SA4, SB4	2	2
S6	1	1
S7	2	2
S8	2	2
S9	1	1
S10	1	1
S11	1	1
S12	1	1
S20	1	1
S21	1	1

SPOOL	CURVE	
	P→A	P→B
TA, TB	1	1
TA02, TB02	1	1
23TA, 23TB	1	1
RK	1	1

8 - PERFORMANCE CHARACTERISTICS

PRESSURES [bar]	DSP7	DSP7H	DSC7	DSC7H
Max pressure in P, A, B ports	350	420	350	420
Max pressure in T line with external drainage	250	350	250	350
Max pressure in T line with internal drainage	210 (DC) 160 (AC)	210 (DC) 160 (AC)	-	-
Max pressure in Y line with external drainage	210 (DC) 160 (AC)	210 (DC) 160 (AC)	-	-
Min piloting pressure **NOTE 1**	5 ÷ 12			
Max piloting pressure **NOTE 2**	210	350	210	420

NOTE 1:The minimum piloting pressure can be the lower range value at low flows rates, but with higher flow rates the higher value is needed.

NOTE 2: If the working pressure is higher than these rated limits, then provide an external pilot line with p_{max} within the rated limits and purchase the valve with E type pilot supply.

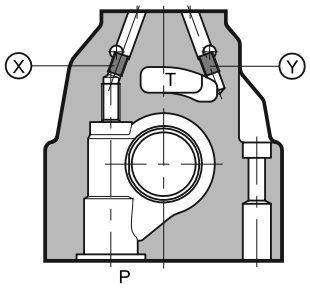
For DSP7 and DSP7H valves, if the external pilot line is not possible, you must opt for the version with Z type pilot supply (see identification code), providing max 350 bar at inlet pressure P.

9 - PILOT AND DRAIN

Valves with electro-hydraulic actuation (DSP) are available with both pilot supply and drain internal or external type. The version with external drain allows a higher back pressure on the return line.

The valves with hydraulic actuation (DSC) are available with both pilot supply and pilot return external only.

NOTE: The pilot supply and drainage configuration must be chosen when ordering. Subsequent modification is only permitted by authorized experienced operators or at the factory.



X: plug M5x6 for external pilot
Y: plug M5x6 for external drain

TYPE OF VALVE		Plug assembly	
		X	Y
IE	internal pilot and external drain	NO	YES
II	internal pilot and internal drain	NO	NO
EE	external pilot and external drain	YES	YES
EI	external pilot and internal drain	YES	NO

9.1 - Backpressure valve incorporated on line P

Valves DSP7 are available upon request with backpressure valve incorporated on line P. This is necessary to obtain the piloting pressure when the control valve, in rest position, has the line P connected to the T port (spools S2, S4, S7, S8, S*2, S*4, TA02, TB02, RK02).

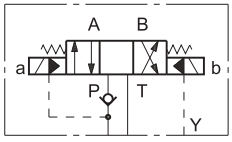
The cracking pressure is of 5 bar with a minimum flow rate of 15 l/min.

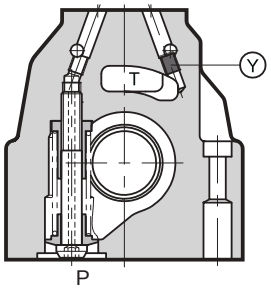
Add **C** to the identification code for this request (see point 1).

The pilot supply can be only internal.

The backpressure valve can be also delivered separately and it can be easily mounted on line P of the main control valve. Specify the code **0266577** to order the backpressure valve separately.

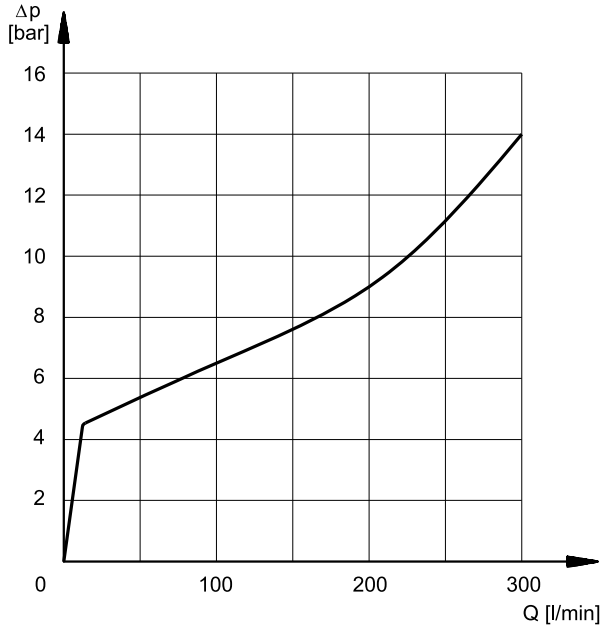
DSP7-C





pilot supply always internal
Y: plug M5x6 for external drain

NOTE: the backpressure valve can't be used as check valve because it doesn't assure the seal.



The curve refers to the pressure drop (body part only) with backpressure valve energized to which the pressure drop of the reference spool must be added. (see point 5)

10 - OPTIONS

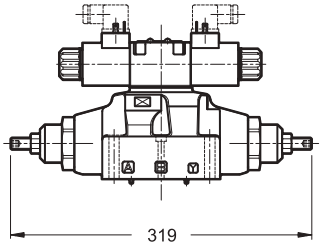
10.1 - Control of the main spool stroke: C

Stroke control for the main spool is possible by means of special side covers so as to vary the maximum clearance opening.

This solution allows control of the flow rate from the pump to the actuator and from the actuator to the outlet, obtaining a double adjustable control on the actuator.

Add the letter **C** in the identification code to order this version (see point 1).

DSP7-S*/C

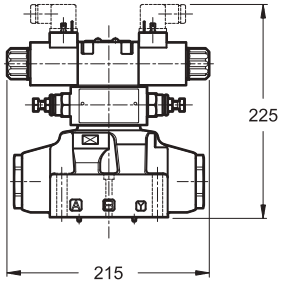


10.2 - Control of the main spool shifting speed: D

By placing a double flow control valve (QTM3 type) between the pilot solenoid valve and the main stage, the pilot supply flow can be adjusted and therefore the changeover smoothness can be varied.

Add the letter **D** in the identification code to order this version (see point 1).

DSP7-S*/D

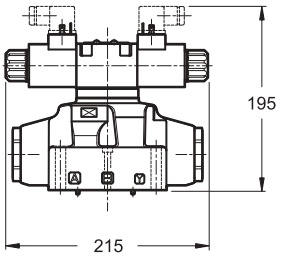


10.3 - Subplate with throttle on line P

It is possible to introduce a subplate with a restrictor of Ø0.8 in line P between the pilot solenoid valve and the main stage. Subplate width 10 mm.

Add **P08** in the identification code to order this version (see point 1).

DSP7-S*/P08



10.4 - Pilot stage with S2 spool

This version is used in association with the external type pilot to allow the pilot line to be unloaded when the valve is in the normal position.

The pilot supply must be external type (E).

Add **S2** to the identification code to order this option (see point 1).

10.5 - Control of the main spool stroke and of the shifting speed: C-D

It is possible to have the valve fitted with both the main spool stroke control (C option) and the main spool shifting speed control (D option)

Add **C-D** in the identification code to order this version (see point 1).

11 - ELECTRICAL FEATURES

11.1 - Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation.

The coil is fastened to the tube by a threaded ring, and can be rotated 360°, to suit the available space.

Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree, correctly connected and installed.

electric connection	electric connection protection	whole valve protection
K1	IP65	IP65
K7	IP65/67	

SUPPLY VOLTAGE FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY	10.000 ins/hour
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC) (NOTE)	In compliance with 2014/30/EU
LOW VOLTAGE	In compliance with 2014/35/EU
CLASS OF PROTECTION Coil insulation (VDE 0580) Impregnation: DC valve AC valve	 class H class F class H

NOTE: In order to further reduce the emissions with DC supply, the use of type H connectors is recommended. These prevent voltage peaks on opening of the coil supply electrical circuit (see cat. 49 000).

11.2 - DC coils

In direct current energizing, current consumption stays at fairly constant values, essentially determined by Ohm's law: V = R x I.

The WK1 and WK7D are coils specific for the high corrosion resistance version of the valve.

The WK7D coil includes a suppressor diode of pulses for protection from voltage peaks during switching. During the switching the diode significantly reduces the energy released by the winding, by limiting the voltage to 31.4V in the D12 coil and to 58.9 V in the D24 coil.

Using connectors type 'D' or 'D1'(see cat. 49 000) with embedded bridge rectifier it is possible to feed DC coils with alternating current (50 or 60 Hz), considering a reduction of the operating limits (see point 6).

The table shows current and power consumption values for DC coils.

(values ±10%)

	Nominal voltage [V]	Resistance at 20°C [Ω]	Current consumption [A]	Power consumption [W]	Coil code K1	Coil code K7
D12	12	4,4	2,72	32,7	1903080	1902940
D24	24	18,6	1,29	31	1903081	1902941
D48	48	78,6	0,61	29,5	1903083	
D110	110	436	0,26	28,2	1903464	
D220	220	1758	0,13	28,2	1903465	

11.3 - AC coils

The table shows current and power consumption values at inrush and at holding, relevant to the different coil types for AC current.

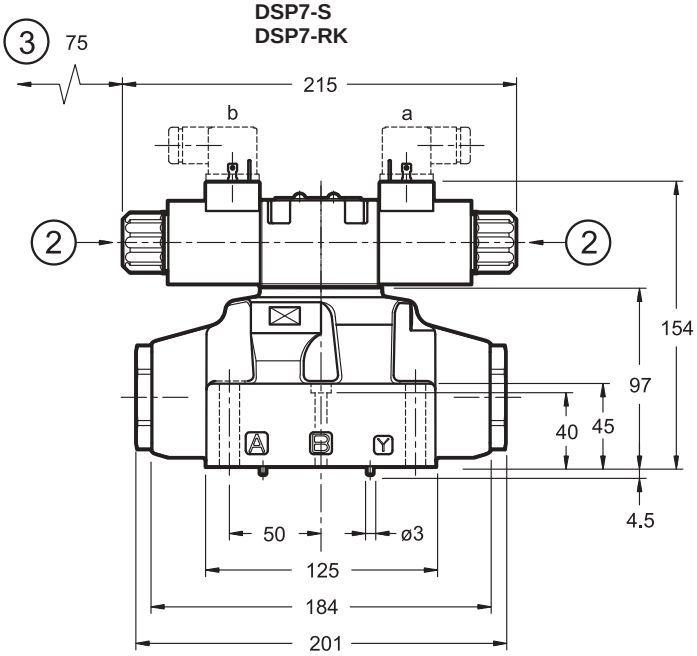
Coils for alternating current (values ± 5%)

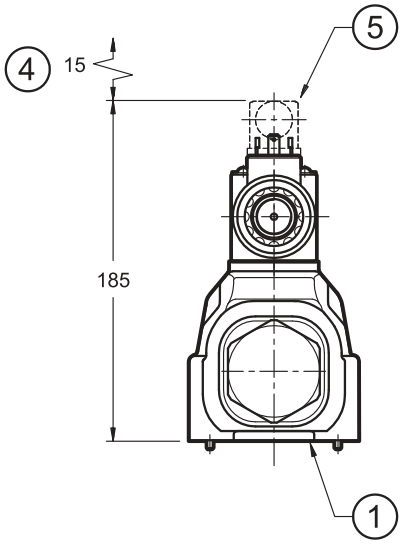
Suffix	Nominal Voltage [V]	Freq. [Hz]	Resistance at 20°C [Ω]	Current consumption at inrush [A]	Current consumption at holding [A]	Power consumption at inrush [VA]	Power consumption at holding [VA]	Coil availability K1
A24	24	50	1.69	5.81	1.32	139	32	1902830
A48	48		6.02	3.78	0.86	182	41	1902831
A110	110V-50Hz 120V-60Hz	50/60	33	1.76	0.40	194	44	1902832
				1.54	0.35	185	42	
A230	230V-50Hz 240V-60Hz		135	0.92	0.21	213	48	1902833
				0.79	0.18	190	43	
F110	110	60	28.5	1.45	0.33	160	36	1902834
F220	220		103	0.92	0.21	203	46	1902835

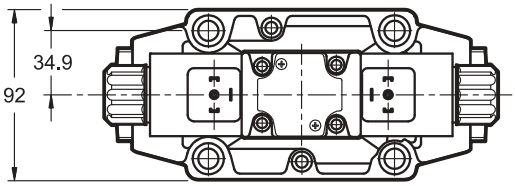
12 - DSP7 OVERALL AND MOUNTING DIMENSIONS FOR SOLENOID DISTRIBUTOR

dimensions in mm

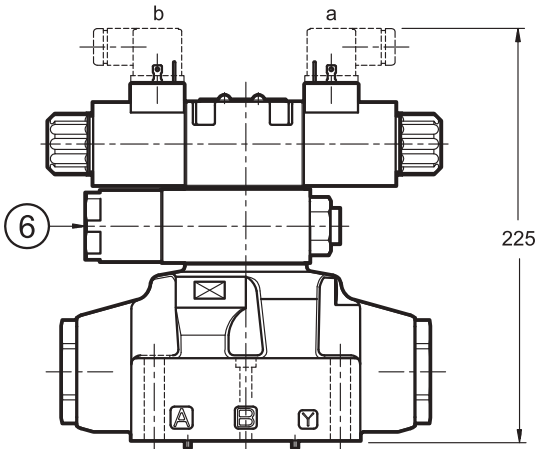
DSP7-S
DSP7-RK





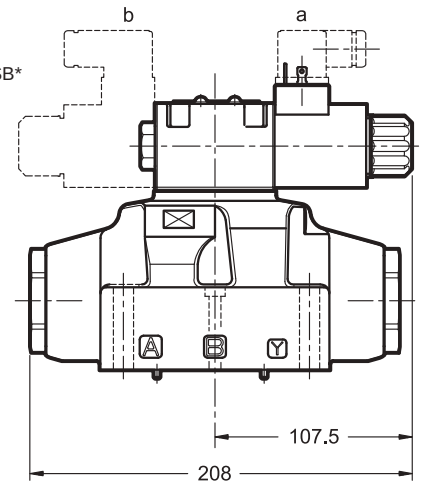


DSP7-*/20*-Z*



DSP7-TA
DSP7-SA*

solenoid position
configuration TB/SB*



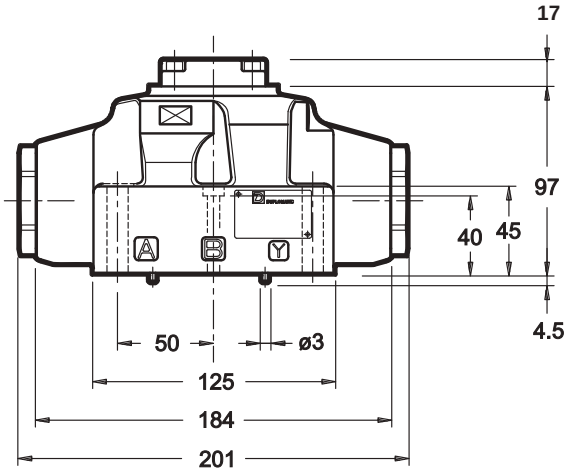
NOTE: Use of fastening screws class A10.9 is recommended for valves in version **H** (high pressure)

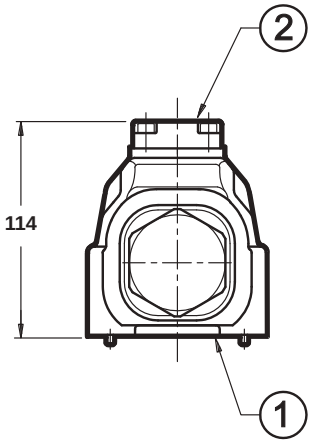
Fastening of single valve:	4 SHC screws ISO 4762 M10x60 2 SHC screws ISO 4762 M6x50
Tightening torque:	M10x60: 40 Nm (A8.8) - 57 Nm (A10.9) M6x50: 8 Nm (A8.8) - 12 Nm (A10.9)
Threads of mounting holes: M6x12; M10x18	

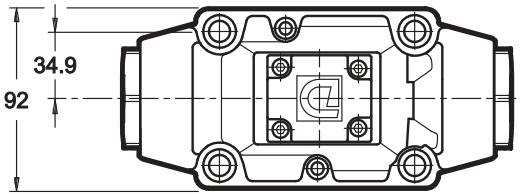
1	Mounting surface with sealing rings 4 OR type 130 (22.22X2.62) - 90 Shore 2 OR type 2043 (10.82x1.78) - 90 Shore
2	Manual override
3	Coil removal space
4	Connector removal space
5	Electric connector to be ordered separately (see cat. 49 000)
6	Reducing valve with fixed adjustment 30 bar

13 - DSC7 OVERALL AND MOUNTING DIMENSIONS FOR HYDRAULIC DISTRIBUTOR DSC7

dimensions in mm







NOTE: Use of fastening screws class A10.9 is recommended for valves in version **H** (high pressure)

Fastening of single valve:	4 SHC screws ISO 4762 M10x60 2 SHC screws ISO 4762 M6x50
Tightening torque:	M10x60: 40 Nm (A8.8) - 57 Nm (A10.9) M6x50: 8 Nm (A8.8) - 12 Nm (A10.9)
Threads of mounting holes: M6x12; M10x18	

1	Mounting surface with sealing rings: 4 OR type 130 (22.22X2.62) - 90 Shore 2 OR type 2043 (10.82x1.78) - 90 Shore
2	Short-circuit subplate

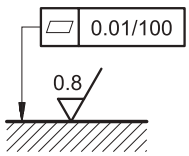
14 - INSTALLATION

Configurations with centring and recall springs can be mounted in any position; type RK valves - without springs and with mechanical detent - must be mounted with the longitudinal axis horizontal.

Valve fastening takes place by means of screws or tie rods, laying the valve on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing. If the minimum values of planarity or smoothness are not met, fluid leakages between valve and mounting surface can easily occur.

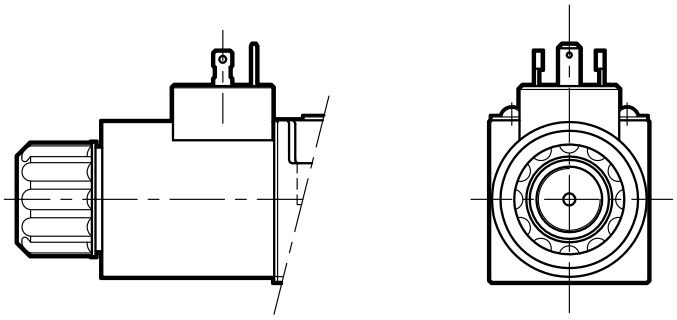
NOTE: Use of fastening screws class 10.9 is recommended for valves in version **H** (high pressure).

Surface quality

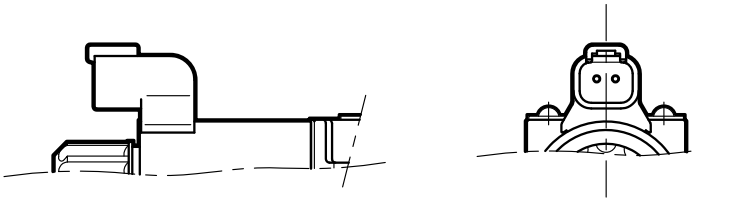


15 - ELECTRIC CONNECTIONS

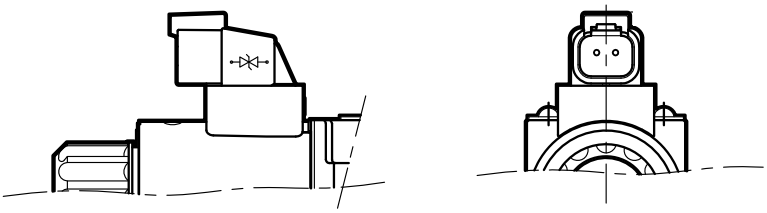
connection for EN 175301-803
(ex DIN 43650) connector
code **K1** (**standard**)
code **WK1** (W7 version only)



connection for
DEUTSCH DT06-2S male
connector type
code **K7**



connection for
DEUTSCH DT06-2S male connector
code **WK7** (W7 version only)
code **WK7D** (W7 version only - coil
with diode)



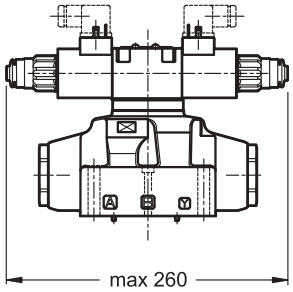
16 - ELECTRIC CONNECTORS

Solenoid valves are delivered without connectors. Connectors type EN 175301-803 (ex DIN 43650) for K1 and WK1 connections can be ordered separately. See catalogue 49 000.

17 - MANUAL OVERRIDE

Whenever the solenoid valve installation may involve exposure to atmospheric agents or use in tropical climates, the manual override, boot protection is recommended.

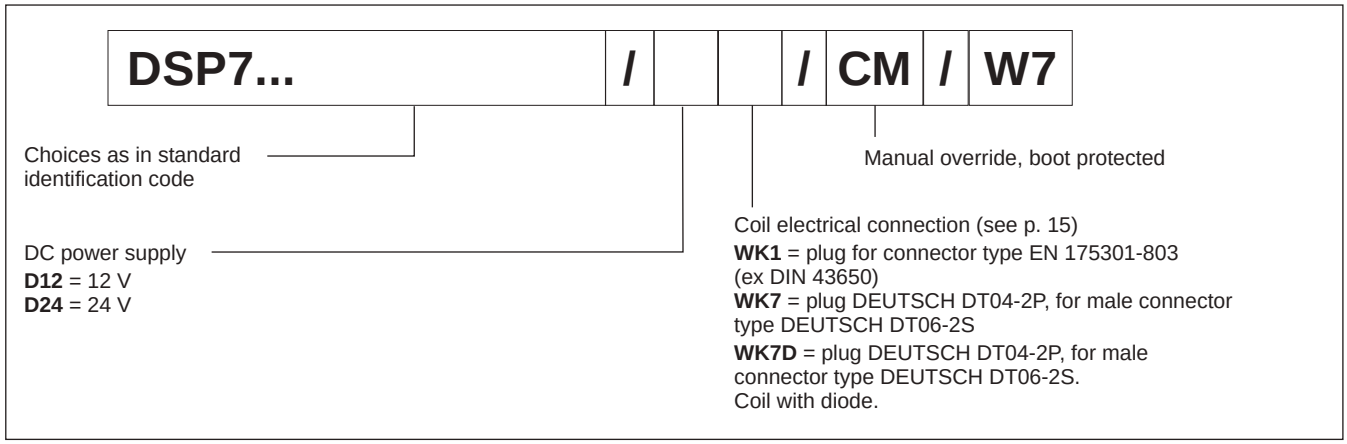
Add the suffix **CM** to request this device (see point 1).



18 - HIGH IP DEGREE AND CORROSION RESISTANCE VERSION

These versions are available only for the basic valve and for the valves with D and S2 control options (see point 10). The boot manual override (CM) is installed as standard in order to protect the solenoid tube.

18.1 - Identification code



18.2 - Corrosion resistance

This version features the zinc-nickel coating on all exposed metal parts of the valve, making it resistant to exposure to the salt spray for **600** hours (test performed according to UNI EN ISO 9227 and assessment test performed according to UNI EN ISO 10289).

18.3 - DC coils

The coils feature a zinc-nickel surface treatment.

The WK7D coil includes a suppressor diode of pulses for protection from voltage peaks during switching. During the switching the diode significantly reduces the energy released by the winding, by limiting the voltage to 31.4V in the D12 coil and to 58.9 V in the D24 coil.

(values ±10%)

	Nominal voltage [V]	Resistance at 20°C [Ω]	Current consumpt. [A]	Power consumpt [W]	Coil code		
					WK1	WK7	WK7D
D12	12	4.4	2.72	32.7	3984000001	3984000101	3984000111
D24	24	18.6	1.29	31	3984000002	3984000102	3984000112

18.4 - Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree, correctly connected and installed.

electric connection	electric connection protection	whole valve protection
WK1	IP66	IP66
WK7	IP66/IP68/IP69 IP69K*	IP66/IP68/IP69 IP69K*
WK7D	IP66/IP68/IP69 IP69K*	IP66/IP68/IP69 IP69K*

(*****) The IP69K protection degree is not taken into account in IEC 60529 but it is included in ISO 20653.

NOTE: As regards the liquid ingress protection (second digit), there are three means of protection.

Codes from 1 to 6 are related to water jets.

Rates 7 and 8 are related to immersion.

Rate 9 is reserved for high pressure and temperature water jets.

This means that IPX6 covers all the lower steps, rate IPX8 covers IPX7 but not IPX6 and lower, instead IPX9 does not cover any of them.

Whether a device meets two types of protection requirements it must be indicated by listing both the tests separated by a slash.

(E.g. a marking of an equipment covered both by temporary immersion and water jets is IP66/IP68).

18 - SUBPLATES

(see catalogue 51 000)

These suplates are not suitable for DS*7H high pressure valves.

Type with rear ports	PME07-AI6G
Type with side ports	PME07-AL6G
P, T, A, B, port dimensions X, Y; L port dimensions	1” BSP 1/4” BSP

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duplomaticmotionsolutions.com

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DSP8

DIRECTIONAL VALVES PILOT OPERATED, SOLENOID OR HYDRAULIC (DSC8) ACTUATED

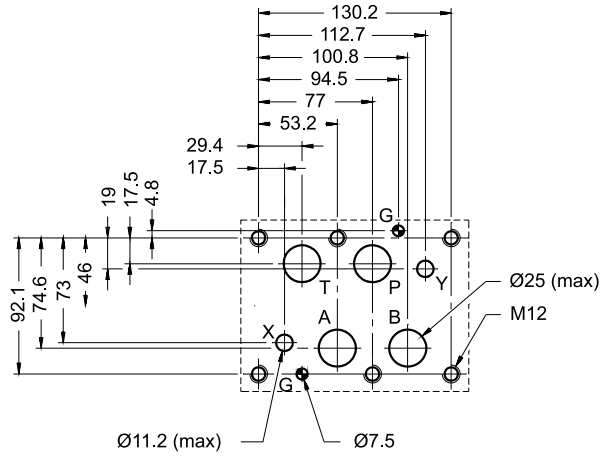
SERIES 10

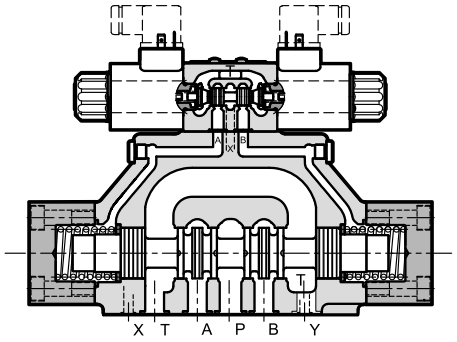
SUBPLATE MOUNTING ISO 4401-08

p max **350** bar
Q max **600** l/min

MOUNTING INTERFACE

ISO 4401-08-08-0-05
(CETOP 4.2-4-08-350)





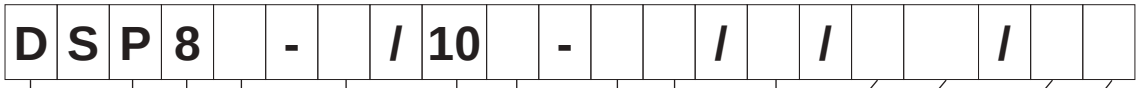
— The DSP8 are 4-ports directional valves, pilot operated, solenoid actuated, with mounting surface according to ISO 4401-08 standards.
— DSC8 are the hydraulic actuated versions.
— A high pressure version (H) is available.
— These valves are available with different spool types (see points 2 and 3), with some options for the opening control.
— They are available also with zinc-nickel surface treatments, that ensure a salt spray resistance up to 600 hours.

PERFORMANCES

(obtained with mineral oil of viscosity of 36 cSt at 50 °C)

		DSP8	DSP8H
Maximum operating pressure - ports P - A - B - port T (external drainage) - port T (internal drainage)	bar	 350 250 210 (DC) / 160 (AC)	 420 350 210 (DC) / 160 (AC)
Maximum flow rate from port P to A - B - T	l/min	600	
Ambient temperature range	°C	-20 / +50	
Fluid temperature range	°C	-20 / +80	
Fluid viscosity range	cSt	10 ÷ 400	
Fluid contamination degree		according to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25	
Mass: DSP8-S, RK DSP8-T*, SA*, SB* DSC8	kg	14.5 13 12.5	

1 - IDENTIFICATION CODE FOR SOLENOID ACTUATED DIRECTIONAL VALVES



Directional valve, pilot operated, solenoid actuated

Size ISO 4401-08

Option:
(omit for standard version)
H = high pressure p_{max} 420 bar

Spool type (see point 2)

S*	**SA***	**SB***
RK	**TA**	**TB**

Series: (the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Pilot supply (see point 9):
E = external
I = internal (not available for spools S2 - S4 - S7 - S8 - TA02 - TB02 RK02 - S*2 - S*4)
Z = internal pilot supply with 30 bar pressure reducing valve, fixed adjustment (see point 8) (not available for spools S2 - S4 - S7 - S8 TA02 - TB02 - RK02 - S*2 - S*4)
Alternative options for spool types S2 - S4 - S7 - S8 - TA02 - TB02 - RK02 - S*2 - S*4:
C = internal pilot supply with backpressure valve in P port
CZ = internal pilot supply with 30 bar pressure reducing valve, fixed adjustment, and with backpressure valve in P Port

Drain (see point 9):
E = external
I = internal

Control options (see point 10):
C = Main spool stroke control
D = Main spool switching speed control
P08 = Subplate placed under the pilot stage with restrictor of Ø0.8 on port P
S2 = Pilot stage with S2 spool type (available only with pilot supply E)

Some combined options are also available:
C-D = Main spool stroke and switching speed control
C-P08 = Main spool stroke and subplate with restrictor
Contact us for further needs.

Power supply (see point 11)

direct current

D12 = 12 V
D24 = 24 V
D48 = 48 V
D110 = 110 V
D220 = 220 V
D00 = valve without coils (see **NOTE 1**)

alternate current

A24 = 24 V - 50 Hz
A48 = 48 V - 50 Hz
A110 = 110 V - 50 Hz / 120 V - 60 Hz
A230 = 230 V - 50 Hz / 240 V - 60 Hz
A00 = valve without coils (see **NOTE 1**)
F110 = 110 V - 60 Hz
F220 = 220 V - 60 Hz

Coil electrical connection (see point 15):
K1 = plug for connector type EN 175301-803 (ex DIN 43650) (**standard**)
K2 = plug for connector type AMP JUNIOR (available on **D12** and **D24** coils only)
K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S (available on **D12** and **D24** coils only)

Manual override:
Omit for override integrated in the tube (**standard**)
CM = manual override, boot protected (see point 17)

Option:
/ W7 = Zinc-nickel surface treatment (see **NOTE 2**)
Not available for CA valves.
Omit if not required

NOTE 1: Coils locking ring and related OR are supplied together with valves.

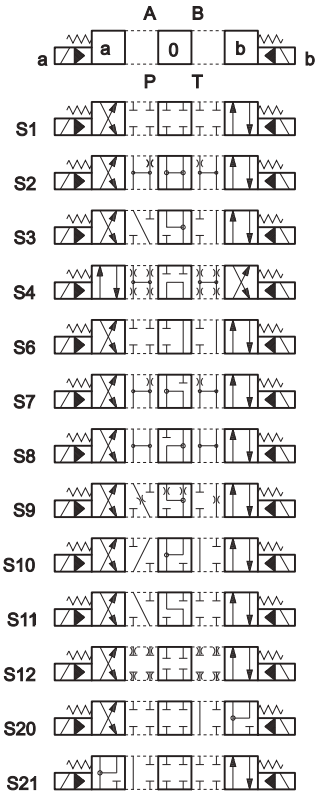
NOTE 2: The standard valve is supplied with surface treatment of phosphating black.

The zinc-nickel finishing on the valve body (both main and pilot) makes the valve suitable to ensure a salt spray resistance up to **240** hours (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

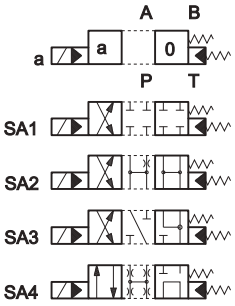
For a salt spray resistance up to **600** hours refer to point 18

2 - DSP8 SPOOL TYPES

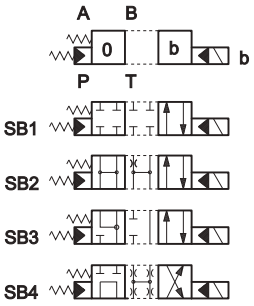
Type **S***:
2 solenoids - 3 positions
with spring centring



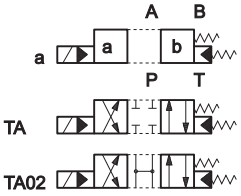
Type **SA***:
1 solenoid side A
2 positions (central + external)
with spring centring



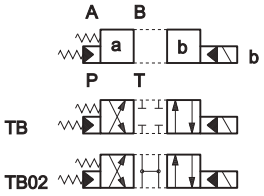
Type **SB***:
1 solenoid side B
2 positions (central + external)
with spring centring



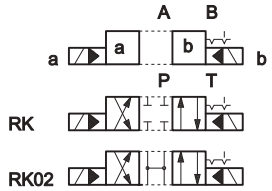
Type **TA**:
1 solenoid side A
2 external positions
with return spring



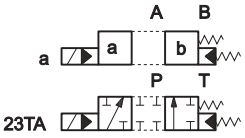
Type **TB**:
1 solenoid side B
2 external positions
with return spring

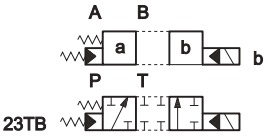


Type **RK**:
2 solenoids - 2 positions
with mechanical retention



Type **23TA / 23TB**
three-way valve - 1 solenoid - 2 external positions, return spring





Besides the diagrams shown, special versions are available: consult our technical dept. for their identification, feasibility and operating limits.

3 - IDENTIFICATION CODE FOR HYDRAULIC ACTUATED DIRECTIONAL VALVES

D	S	C	8		-		/	10		-	E	E	

Pilot operated directional valve, hydraulic actuated

Size: ISO 4401-08

Option:
(omit for standard version)
H = high pressure p_{max} 420 bar

Spool type (see point 2 and below)
S* **SA*** **SB***
TA **TB**

Series:
(the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

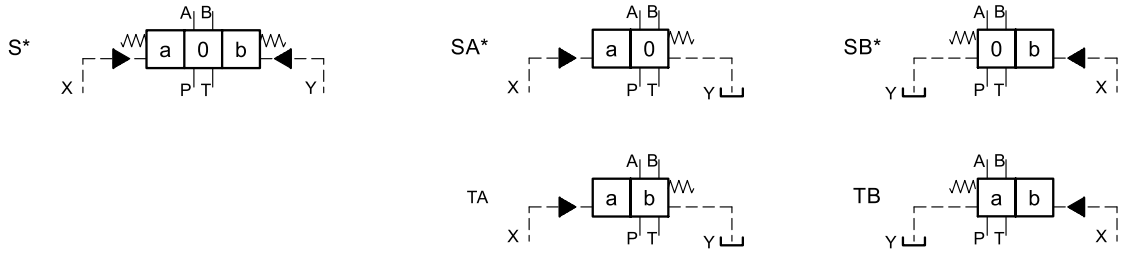
External pilot (see point 9)

External drain (see point 9)

Option:
/ W7 = Zinc-nickel surface treatment (see **NOTE**)
Omit if not required

Spool types

DSC8 valves are delivered with short-circuit subplate.
The hydraulic actuation take place by pressurization in X and Y ports.



NOTE : The standard valve is supplied with surface treatment of phosphating black.

The zinc-nickel finishing makes the valve suitable to ensure a salt spray resistance up to **600** hours. (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

4 - HYDRAULIC FLUIDS

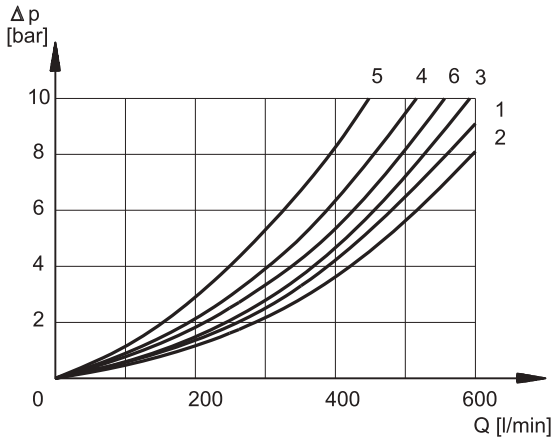
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V).

For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

5 - DSP8 PRESSURE DROPS Δp-Q

(values obtained with viscosity 36 cSt at 50 °C)



ACTUATED POSITION

SPOOL	FLOW DIRECTIONS			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPH			
S1, SA1, SB1	1	1	2	3
S2, SA2, SB2	2	2	1	2
S3, SA3, SB3	1	1	1	2
S4, SA4, SB4	6	6	3	4
S6	1	1	2	2
S7	6	6	3	4
S8	6	6	4	3
S9	1	1	2	3
S10	2	2	2	3
S11	1	1	1	3
S12	1	1	2	3
S20	1	1	2	
S21	1	1		3
TA, TB	1	1	2	2
TA02, TB02	1	1	1	1
RK	1	1	2	3

NORMAL POSITION

SPOOL	FLOW DIRECTIONS				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S2, SA2, SB2					6○
S3, SA3, SB3			4●	4▼	
S4, SA4, SB4					5
S6				4	
S7					5▼
S8					5●
S10	4●	4▼			
S11			3		
TA	1			3	

○ A-B closed ● B closed ▼ A closed

6 - OPERATING LIMITS

The values have been obtained with mineral oil, viscosity 36 cSt at 50 °C, and filtration ISO 4406:1999 class 18/16/13.

MAXIMUM FLOW RATES [l/min]		
	at 210 bar	at 350 bar
S4, S7, S8	500	450
All the other spools	600	500

7 - SWITCHING TIMES

The values indicated refer to a solenoid valve working with piloting pressure of 100 bar, with mineral oil at a temperature of 50 °C, at viscosity of 36 cSt and with P→A / B→T connections.

The energizing and de-energizing times are obtained at the pressure variation which occurs on the lines.

TIMES (± 10%) [ms]	ENERGIZED		DE-ENERGIZED	
	2 Pos	3 Pos	2 Pos	3 Pos
AC solenoid	70	40	70	40
DC solenoid	100	70	80	50

8 - PERFORMANCE CHARACTERISTICS

PRESSURES [bar]	**DSP8**	**DSP8H**	**DSC8**	**DSC8H**
Max pressure in P, A, B ports	350	420	350	420
Max pressure in T line with external drain	250	350	250	350
Max pressure in T line with internal drain	210 (DC) 160 (AC)	210 (DC) 160 (AC)	-	-
Max pressure in Y line with external drain	210 (DC) 160 (AC)	210 (DC) 160 (AC)	-	-
Minimum pilot supply pressure:	5 ÷ 12 (**NOTE 1)**			
Maximum pilot supply pressure (**NOTE 2)**	210	350	210	420

NOTE 1:The minimum piloting pressure can be the lower range value at low flows rates, but with higher flow rates the higher value is needed.

NOTE 2: If the working pressure is higher than these rated limits, then provide an external pilot line with p_{max} within the rated limits and purchase the valve with E type pilot supply.

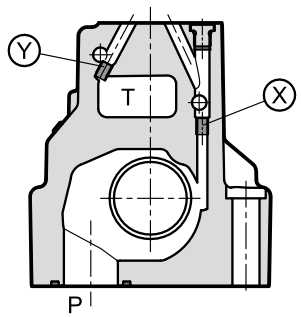
For DSP8 and DSP8H valves, if the external pilot line is not possible, you must opt for the version with Z type pilot supply (see point 9.2), providing max 350 bar at inlet pressure P.

9 - PILOT AND DRAIN

Valves with electro-hydraulic actuation (DSP) are available with both pilot supply and drain internal or external type. The version with external drain allows a higher back pressure on the return line.

The valves with hydraulic actuation (DSC) are available with both pilot supply and pilot return external only.

NOTE: The pilot supply and drainage configuration must be chosen when ordering. Subsequent modification is only permitted by authorized experienced operators or at the factory.



X: plug M6x8 for external pilot
Y: plug M6x8 for external drain

TYPE OF VALVE		Plug assembly	
		X	Y
IE	internal pilot and external drain	NO	YES
II	internal pilot and internal drain	NO	NO
EE	external pilot and external drain	YES	YES
EI	external pilot and internal drain	YES	NO

9.1 - C type pilot supply: internal pilot supply with backpressure valve in P port

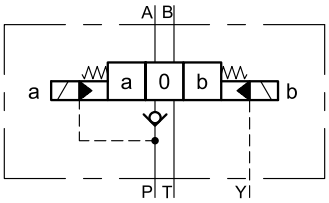
DSP8 valves are available with incorporated backpressure valve in the P port.

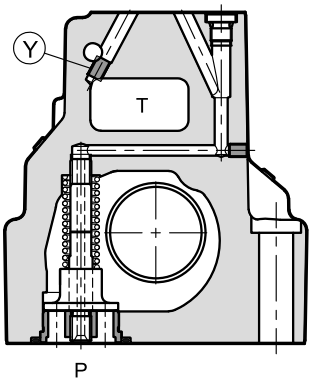
This is in order to reach the minimum pilot supply pressure at normal position in valves in which the inlet port (P) and the return port (T) are connected (spools S2, S4, S7, S8, S*2, S*4, TA02, TB02, RK02).

The pressure differential of the backpressure valve is to be added to that of the main valve, showed at page 5.

The cracking pressure is approx 6 bar at 15 l/min.

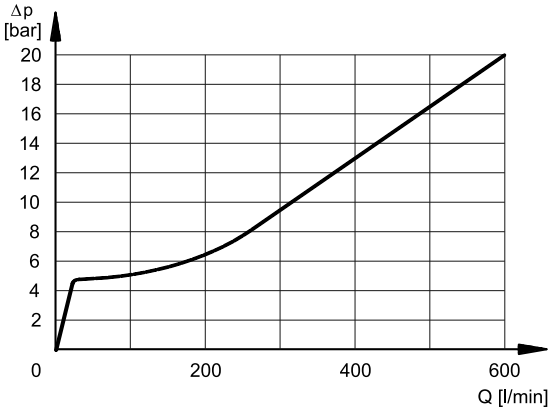
NOTE: The backpressure valve doesn't assure the seal so it has not be intended as a check valve.





Y: plug M6x8 for external drain

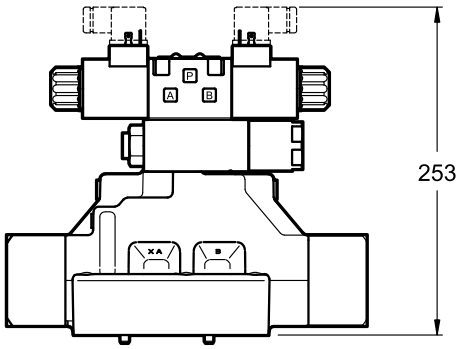
Pressure drops of the backpressure valve



9.2 - Z type pilot supply: internal pilot supply with pressure reducing valve

The Z type pilot supply consists of an arrangement with internal pilot and 30 bar supply pressure to the pilot stage by means of a fixed adjustment pressure reducing valve placed between the main stage and the pilot valve.

DSP8-*/Z*



10 - OPTIONS

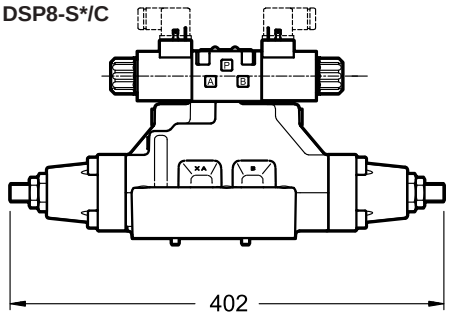
10.1 - Control of the main spool stroke: C

Stroke control for the main spool is possible by means of special side covers so as to vary the maximum clearance opening.

This solution allows control of the flow rate from the pump to the actuator and from the actuator to the outlet, obtaining a double adjustable control on the actuator.

Add the letter **C** in the identification code to order this version (see point 1).

DSP8-S*/C

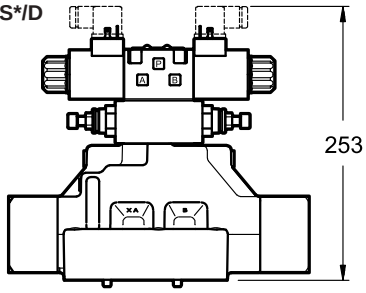


10.2 - Control of the main spool shifting speed: D

By placing a double flow control valve (QTM3 type) between the pilot solenoid valve and the main stage, the pilot supply flow can be adjusted and therefore the changeover smoothness can be varied.

Add the letter **D** in the identification code to order this version (see point 1).

DSP8-S*/D

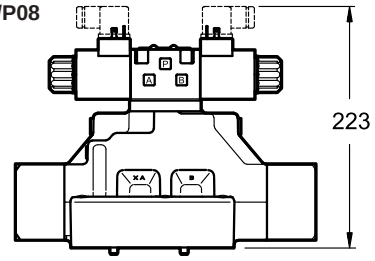


10.3 - Subplate with throttle on line P

It is possible to introduce a subplate with a restrictor of Ø0.8 in line P between the pilot solenoid valve and the main stage. Subplate width 10 mm.

Add **P08** in the identification code to order this version (see point 1).

DSP8-S*/P08



10.4 - Pilot stage with S2 spool

This version is used in association with the external type pilot to allow the pilot line to be unloaded when the valve is in the normal position.

The pilot supply must be external type (E).

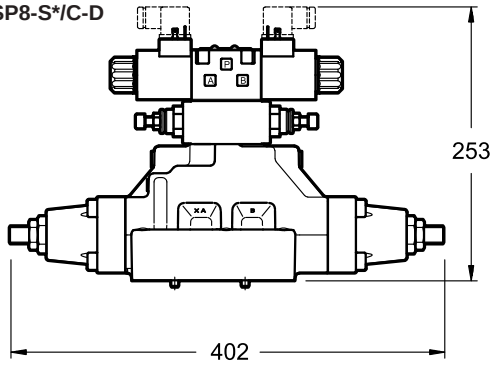
Add **S2** to the identification code to order this option (see point 1).

10.5 - Control of the main spool stroke and of the shifting speed: C-D

It is possible to have the valve fitted with both the main spool stroke control (C option) and the main spool shifting speed control (D option)

Add **C-D** in the identification code to order this version (see point 1).

DSP8-S*/C-D



11 - ELECTRICAL FEATURES

11.1 - Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation. The coil is fastened to the tube by a threaded ring, and can be rotated 360°, to suit the available space.

Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree, correctly connected and installed.

electric connection	electric connection protection	whole valve protection
K1	IP65	IP65
K2	IP65/67	
K7	IP65/67	

SUPPLY VOLTAGE FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY	8.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC) (NOTE)	In compliance with 2014/30/EU
LOW VOLTAGE	In compliance with 2014/35/EU
CLASS OF PROTECTION Coil insulation (VDE 0580) Impregnation: DC valve AC valve	 class H class F class H

NOTE: In order to further reduce the emissions with DC supply, the use of type H connectors is recommended. These prevent voltage peaks on opening of the coil supply electrical circuit (see cat. 49 000).

11.2 - Current and absorbed power for DC solenoid valve

The table shows current and power consumption values of the DC coils.

Using connectors type ‘D’ or ‘D1’(see cat. 49 000) with embedded bridge rectifier it is possible to feed DC coils with alternating current (50 or 60 Hz), considering a reduction of the operating limits (see point 6).

Coils for direct current (values ±10%)

	Nominal voltage [V]	Resistance at 20°C [Ω]	Current consumpt. [A]	Power consumpt. [W]	Coil code K1	K2	K7
D12	12	4,4	2,72	32,7	1903080	1903100	1902940
D24	24	18,6	1,29	31	1903081	1903101	1902941
D48	48	78,6	0,61	29,5	1903083		
D110	110	423	0,26	28,2	1903464		
D220	220	1692	0,13	28,2	1903465		

11.3 - Current and absorbed power for AC solenoid valve

The table shows current and power consumption values at inrush and at holding, for AC coils.

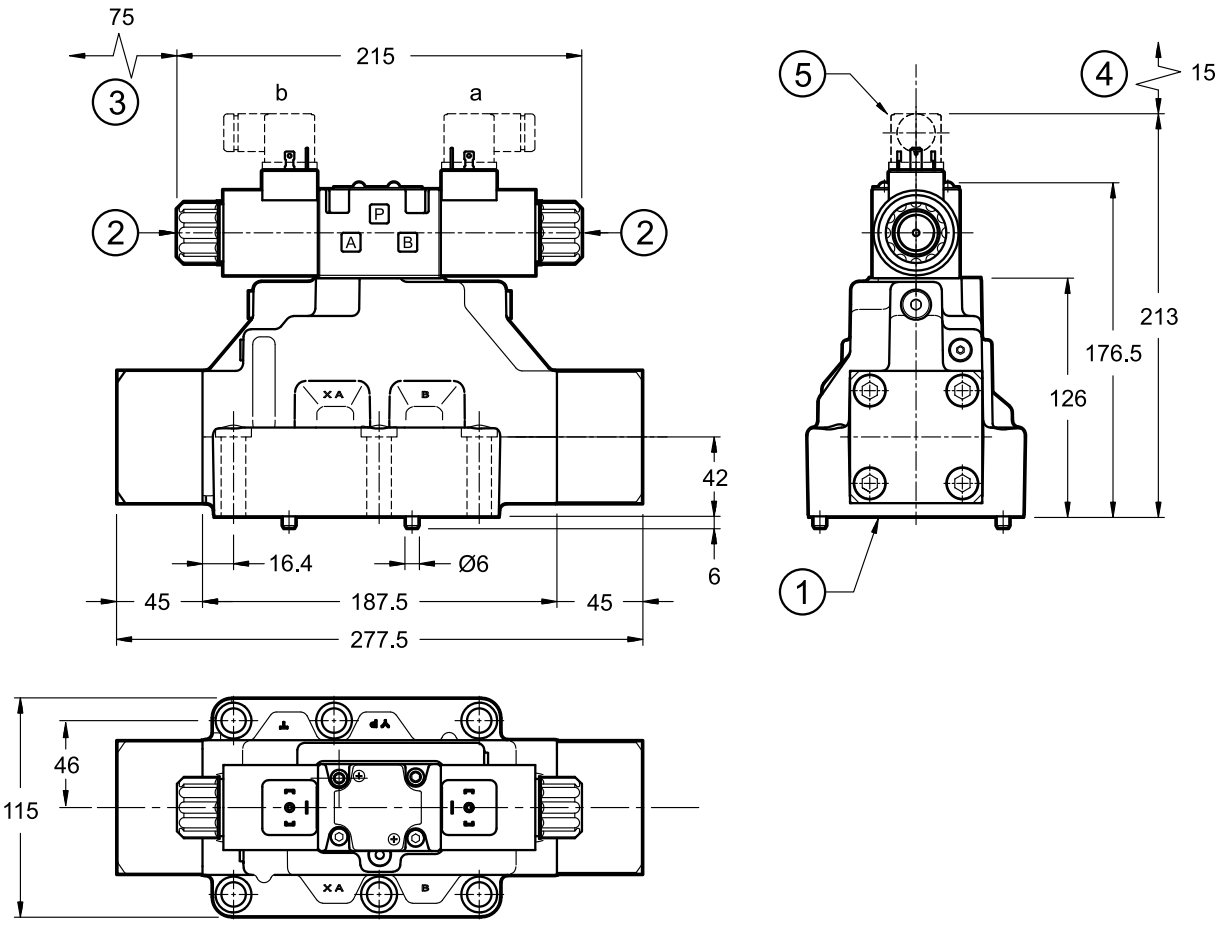
Coils for alternating current (values ± 5%)

Suffix	Nominal Voltage [V]	Freq. [Hz]	Resistance at 20°C [Ω]	Current consumption at inrush [A]	Current consumption at holding [A]	Power consumption at inrush [VA]	Power consumption at holding [VA]	Coil availability K1
A24	24	50	1.69	5.81	1.32	139	32	1902830
A48	48		6.02	3.78	0.86	182	41	1902831
A110	110V-50Hz 120V-60Hz	50/60	33	1.76	0.40	194	44	1902832
				1.54	0.35	185	42	
A230	230V-50Hz 240V-60Hz		135	0.92	0.21	213	48	1902833
				0.79	0.18	190	43	
F110	110	60	28.5	1.45	0.33	160	36	1902834
F220	220		103	0.92	0.21	203	46	1902835

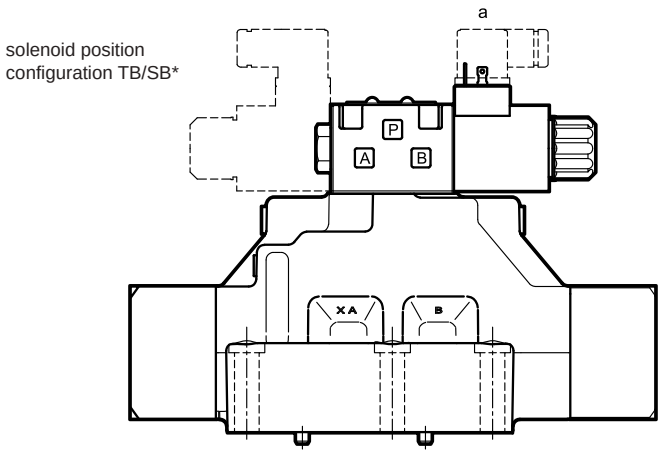
12 - DSP8 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

DSP8-S
DSP8-RK



DSP8-TA
DSP8-SA*



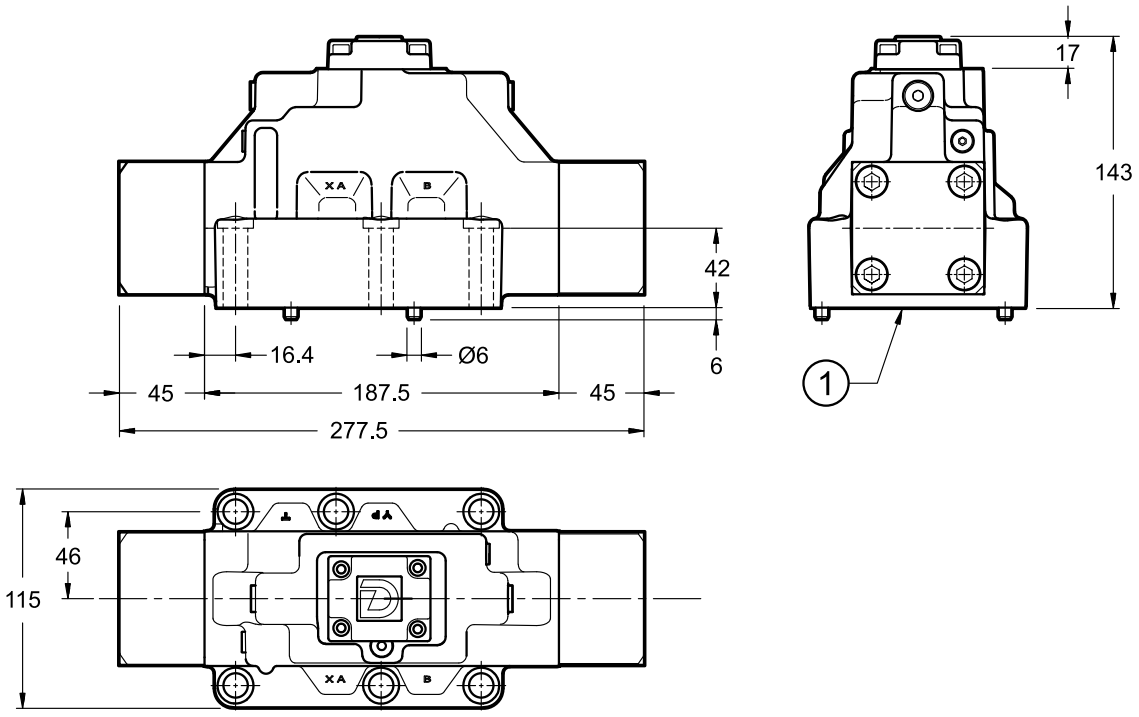
NOTE: fastening screws of class A 10.9 are prescribed for the DS*8H valves for high pressure.

Valve fastening: N. 6 SHC M12x60 bolts - ISO 4762
Tightening torque: 69 Nm (A 8.8 bolts) - 96 Nm (A 10.9 bolts)
Thread of mounting holes: M12x20

1	Mounting surface with sealing rings N. 4 OR type 3131 (32.99x2.62) - 90 Shore N. 2 OR type 3087 (21.89x2.62) - 90 Shore
2	Manual override
3	Coil removal space
4	Connector removal space
5	Electric connector to be ordered separately (see cat. 49 000)

13 - DSC8 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



NOTE: fastening screws of class A 10.9 are prescribed for the DS*8H valves for high pressure.

Valve fastening: N. 6 SHC M12x60 bolts - ISO 4762
Tightening torque: 69 Nm (A 8.8 bolts) - 96 Nm (A 10.9 bolts)
Thread of mounting holes: M12x20

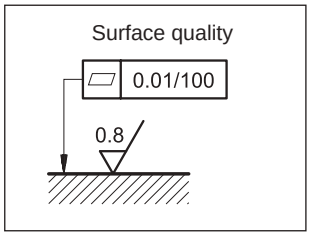
1	Mounting surface with sealing rings N. 4 OR type 3131 (32.99x2.62) - 90 Shore N. 2 OR type 3087 (21.89x2.62) - 90 Shore
2	Short-circuit subplate

14 - INSTALLATION

Configurations with centring and recall springs can be mounted in any position; type RK valves - without springs and with mechanical detent - must be mounted with the longitudinal axis horizontal.

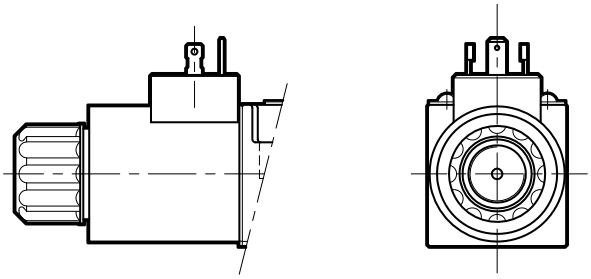
Valve fastening takes place by means of screws or tie rods, laying the valve on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing. If the minimum values of planarity or smoothness are not met, fluid leakages between valve and mounting surface can easily occur.

NOTE: fastening screws of class A 10.9 are prescribed for the DS*8H valves for high pressure.

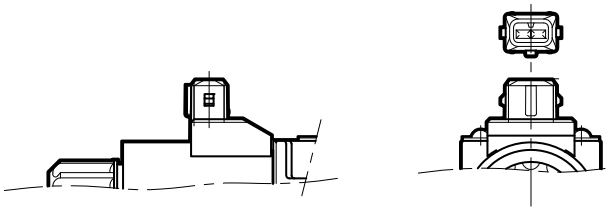


15 - ELECTRIC CONNECTIONS

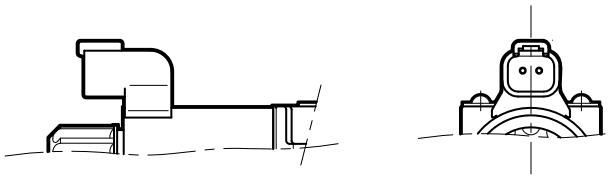
connection for EN 175301-803
(ex DIN 43650) connector
code **K1** (**standard**)
code **WK1** (W7 version only)



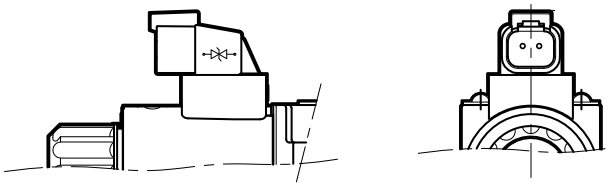
connection for AMP JUNIOR
connector
code **K2**



connection for
DEUTSCH DT06-2S male connector
code **K7**



connection for
DEUTSCH DT06-2S male connector
code **WK7** (W7 version only)
code **WK7D** (W7 version only - coil
with diode)



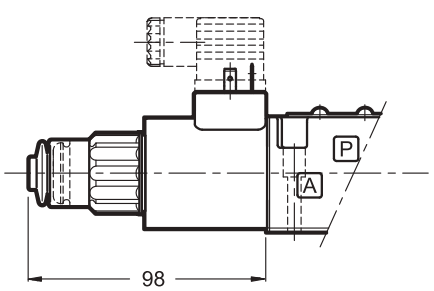
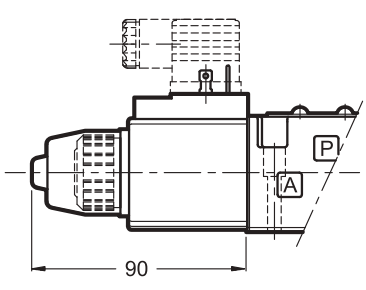
16 - ELECTRIC CONNECTORS

Solenoid operated valves are delivered without connectors. Connectors type EN 175301-803 (ex DIN 43650) for K1 connections can be ordered separately. See catalogue 49 000.

17 - MANUAL OVERRIDE

Whenever the solenoid valve installation may involve exposure to atmospheric agents or use in tropical climates, a boot protected manual override is recommended.

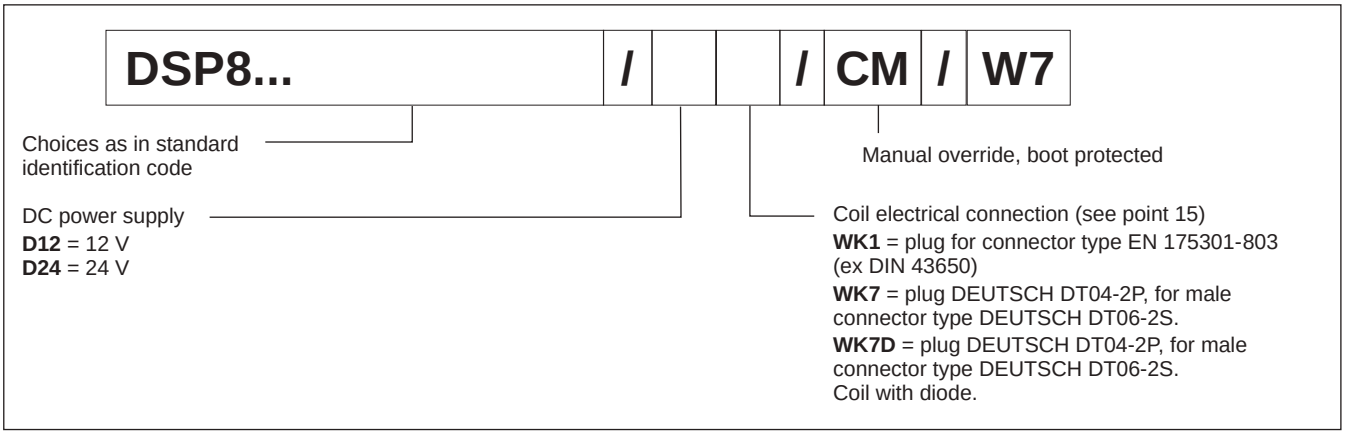
Add **/CM** at the end of the identification code to order this version (see point 1).

DC valve	**AC valve**
	
Code: 3401150006	Code: 0269201

18 - HIGH IP DEGREE AND CORROSION RESISTANCE VERSION

These versions are available only for the basic valve and for the valves with D and S2 control options (see point 10). The boot manual override (CM) is installed as standard in order to protect the solenoid tube.

18.1 - Identification code



18.2 - Corrosion resistance

This version features the zinc-nickel coating on all exposed metal parts of the valve, making it resistant to exposure to the salt spray for **600** hours (test performed according to UNI EN ISO 9227 and assessment test performed according to UNI EN ISO 10289).

18.3 - DC coils

The coils feature a zinc-nickel surface treatment.

The WK7D coil includes a suppressor diode of pulses for protection from voltage peaks during switching. During the switching the diode significantly reduces the energy released by the winding, by limiting the voltage to 31.4V in the D12 coil and to 58.9 V in the D24 coil.

(values ±10%)

	Nominal voltage [V]	Resistance at 20°C [Ω]	Current consumpt. [A]	Power consumpt [W]	Coil code		
					WK1	WK7	WK7D
D12	12	4.4	2.72	32.7	3984000001	3984000101	3984000111
D24	24	18.6	1.29	31	3984000002	3984000102	3984000112

18.4 - Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree, correctly connected and installed.

electric connection	electric connection protection	whole valve protection
WK1	IP66	IP66
WK7	IP66/IP68/IP69 IP69K*	IP66/IP68/IP69 IP69K*
WK7D	IP66/IP68/IP69 IP69K*	IP66/IP68/IP69 IP69K*

(*****) The IP69K protection degree is not taken into account in IEC 60529 but it is included in ISO 20653.

NOTE: As regards the liquid ingress protection (second digit), there are three means of protection.

Codes from 1 to 6 are related to water jets.

Rates 7 and 8 are related to immersion.

Rate 9 is reserved for high pressure and temperature water jets.

This means that IPX6 covers all the lower steps, rate IPX8 covers IPX7 but not IPX6 and lower, instead IPX9 does not cover any of them.

Whether a device meets two types of protection requirements it must be indicated by listing both the tests separated by a slash.

(E.g. a marking of an equipment covered both by temporary immersion and water jets is IP66/IP68).

19 - SUBPLATES

(see catalogue 51 000)

Subplates are supplied with phosphating black surface treatment. The suplate is not suitable for DS*8H high pressure valves.

Type with rear ports	-
Type with side ports	PME5-AL8G
P, T, A, B port dimensions	1 1/2” BSP
X, Y port dimensions	1/4” BSP

DUPLOMATIC MOTION SOLUTIONS
a member of DAIKIN group

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duplomaticmotionsolutions.com

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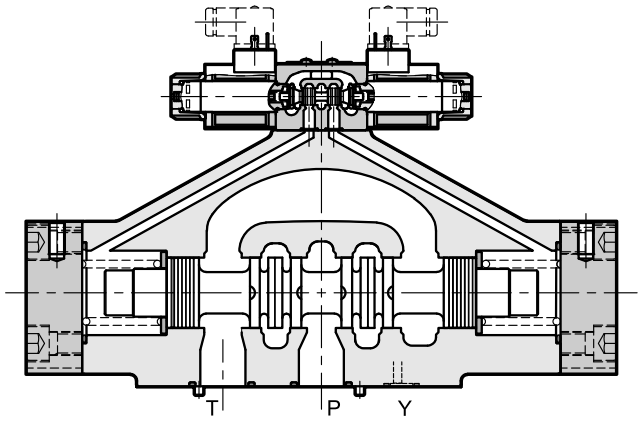
DSP1*

DIRECTIONAL VALVES, PILOT OPERATED, SOLENOID OR HYDRAULIC (DSC1*) ACTUATED

SUBPLATE MOUNTING
DS*10 ISO 4401-10
DS*11 ISO 4401-10 oversize ports

p max **350** bar
Q max **1600** l/min

OPERATING PRINCIPLE



— The DSP10 and DSP11 are 4-ports directional valves, pilot operated, solenoid actuated, with mounting surface according to ISO 4401-10 standards.
The DS*11 valves have ports Ø48.

— The directional valves DSC10 and DSC11 are the versions with hydraulic actuation.

— They are available with different spool types (see point 2) and with some options for the opening control.

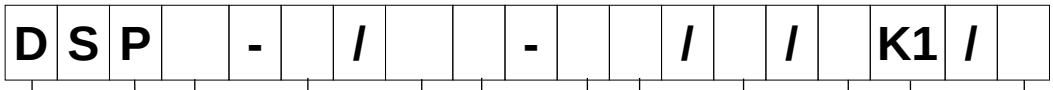
— The DSP* valves are available with internal or external pilot supply and internal or external drain. A version with internal pilot supply with fixed pressure reducing valve is also available.

PERFORMANCES

(obtained with mineral oil of viscosity of 36 cSt at 50°C)

		DS*10	DS*11
Maximum operating pressure - ports P - A - B (standard version) - port T (external drainage) - port T (internal drainage)	bar	350 300 210 (DC) / 160 (AC)	350 300 210 (DC) / 160 (AC)
Maximum flow rate from port P to A - B - T	l/min	1100	1600
Ambient temperature range	°C	-20 / +50	
Fluid temperature range	°C	-20 / +80	
Fluid viscosity range	cSt	10 ÷ 400	
Fluid contamination degree	according to ISO 4406:1999 class 20/18/15		
Recommended viscosity	cSt	25	
Mass: DSP DSC	kg	40.8 39.5	38 36.7

1 - IDENTIFICATION CODE FOR SOLENOID ACTUATED DIRECTIONAL VALVES



Pilot operated directional valve, solenoid actuated

10 = ISO 4401-10 size
11 = ISO 4401-10 with oversize ports

Spool type (see point 2)
S* **TA**
SA* **TB**
SB* **RK***

Series:
21 = for DSP10
12 = for DSP11
(the overall dimensions do not change within the same ten)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Pilot supply (see points 10 and 11):
I = Internal (not available for spools S2 - S4 - TA02 - TB02 - RK02 - S*2 - S*4)
E = External
Z = Internal pilot supply with 30 bar pressure reducing valve, fixed adjustment.

Drainage (see points 10 and 11):
I = Internal
E = External

Controls (see point 16):
Omit if not required.
C = Main spool stroke control
D = Main spool switching speed control
P15 = Subplate placed under the pilot stage with restrictor of Ø1.5 in P port

NOTE: The locking rings of the coils and the relevant O-rings are supplied.

Power supply (see point 8)

Direct current

D12 = 12 V
D24 = 24 V
D48 = 48 V

D110 = 110 V
D220 = 220 V

D00 = Valve without coils (see **NOTE**)

Alternate current

A24 = 24 V - 50 Hz
A48 = 48 V - 50 Hz

A110 = 110 V - 50 Hz / 120 V - 60 Hz
A230 = 230 V - 50 Hz / 240 V - 60 Hz

A00 = Valve without coils (see **NOTE**)

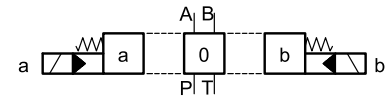
F110 = 110 V - 60 Hz
F220 = 220 V - 60 Hz

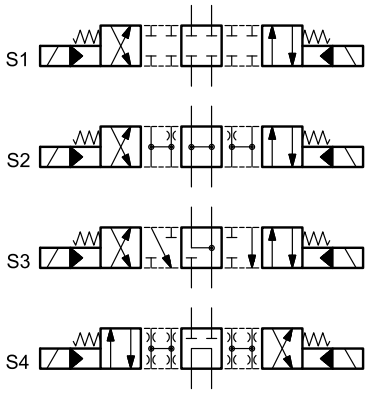
Coil electrical connection:
plug for connector
type EN 175301-803
(ex DIN 43650)

Manual override:
Omit for override integrated in the tube (**standard**)
CM = Manual override, boot protected (see point 17)

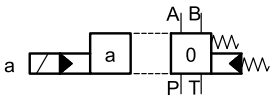
2 - DSP10 AND DSP11 SPOOLS TYPES

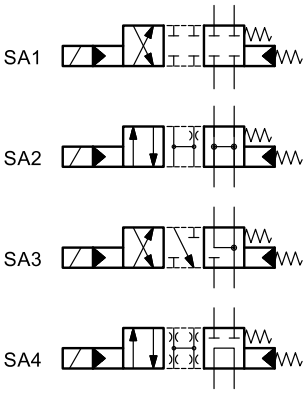
Type **S***:
2 solenoids - 3 positions
with spring centering



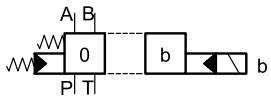


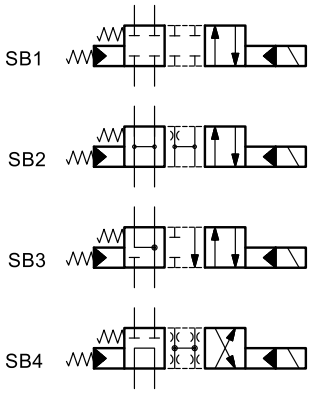
Type **SA***:
1 solenoid side A
2 positions (central + external)
with spring centering



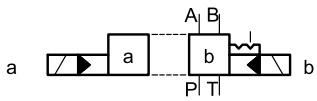


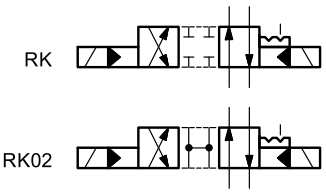
Type **SB***:
1 solenoid side B
2 positions (central + external)
with spring centering



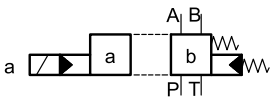


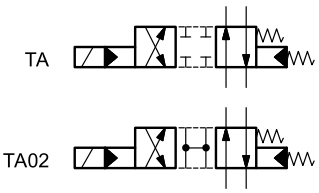
Type **RK**:
2 solenoids - 2 positions
with mechanical retention



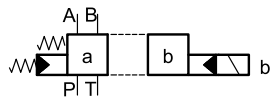


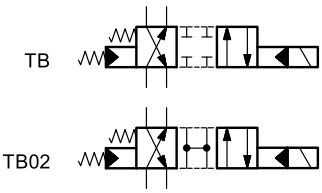
Type **TA**:
1 solenoid side A
2 external positions
with return spring





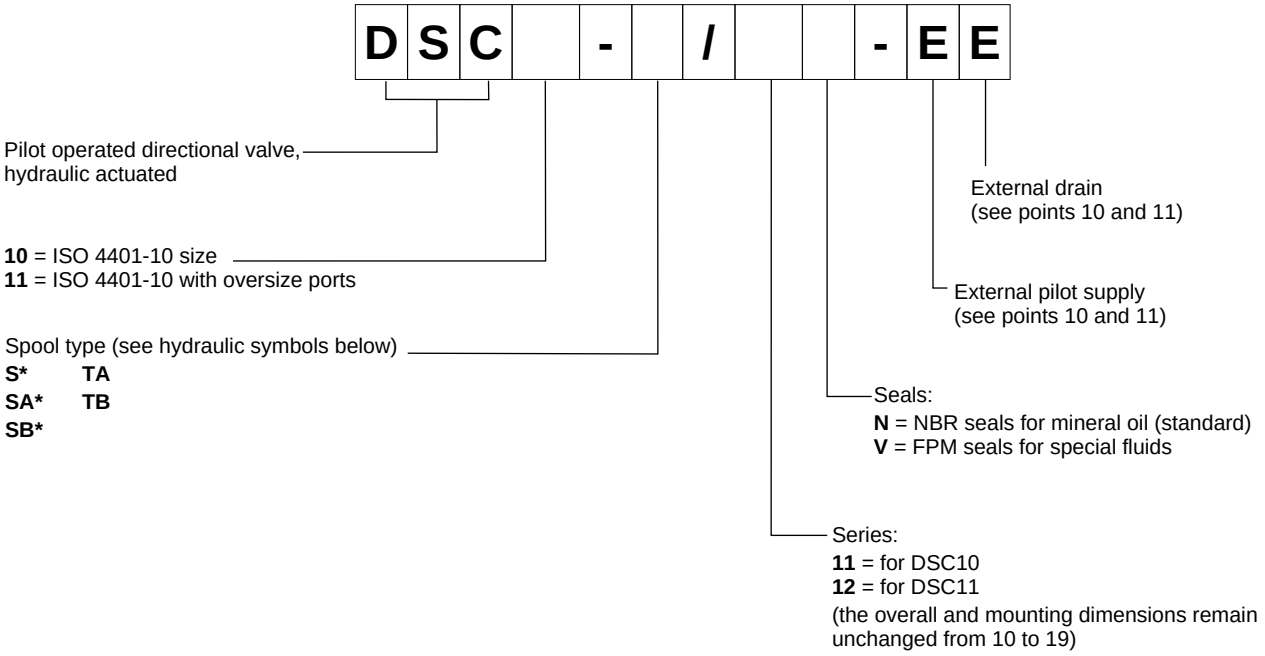
Type **TB**:
1 solenoid side B
2 external positions
with return spring





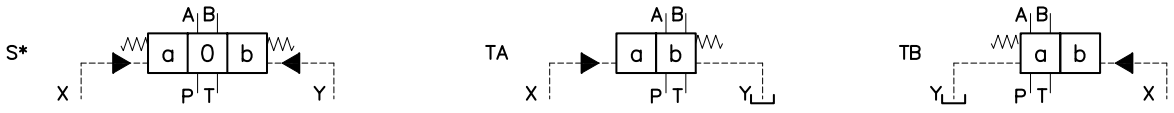
Please consult our Technical Department for other types of spools.

3 - IDENTIFICATION CODE FOR HYDRAULIC ACTUATED DIRECTIONAL VALVES



Spool type

DSC* valves are delivered with short-circuit subplate. The hydraulic actuation take place by pressurization in X and Y ports.



4 - HYDRAULIC FLUIDS

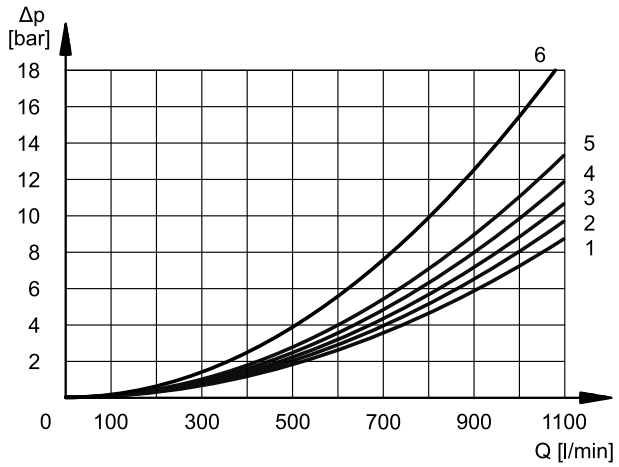
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code V). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

5 - PRESSURE DROPS Δp-Q

(values obtained with viscosity 36 cSt at 50 °C)

5.1 - DSP10 pressure drops



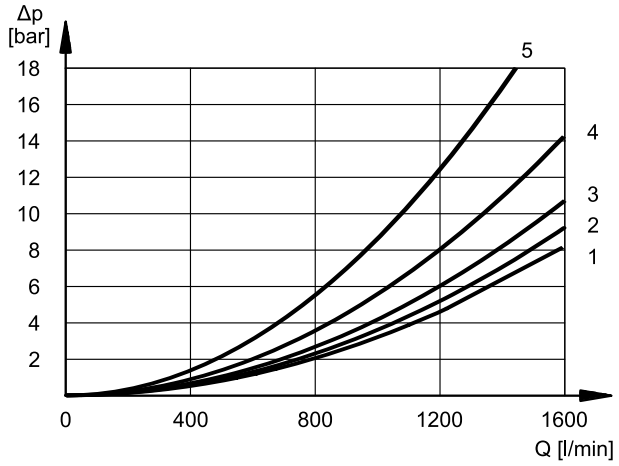
ACTUATED VALVE

SPOOL	FLOW DIRECTIONS				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S1, SA1, SB1	1	1	1	2	
S2, SA2, SB2	2	2	3	4	
S3, SA3, SB3	1	1	3	4	
S4, SA4, SB4	1	1	2	4	
TA, TB	1	1	1	2	
TA02, TB02	2	2	3	4	
RK	1	1	1	2	

NORMAL POSITION

SPOOL	FLOW DIRECTIONS				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S2			3	4	3
S3			4	5	
S4					6

5.2 - DSP11 pressure drops



ACTUATED VALVE

SPOOL	FLOW DIRECTIONS				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S1, SA1, SB1	1	1	1	2	
S2, SA2, SB2	1	1	1	3	
S3, SA3, SB3	1	1	1	3	
S4, SA4, SB4	1	1	1	3	
TA, TB	1	1	1	2	
TA02, TB02	1	1	1	3	
RK	1	1	1	2	

NORMAL POSITION

SPOOL	FLOW DIRECTIONS				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S2			2	2	2
S3			4	4	
S4					5

6 - SWITCHING TIMES

The values indicated refer to a solenoid valve working with piloting pressure of 100 bar, with mineral oil at a temperature of 50°C, at viscosity of 36 cSt and with P→A / B→T connections.

The energizing and de-energizing times are obtained at the pressure variation which occurs on the lines.

TIMES (± 10%)	ENERGIZED		DE-ENERGIZED	
[ms]	2 Pos	3 Pos	2 Pos	3 Pos
AC solenoid	90	60	90	60
DC solenoid	130	100	90	60

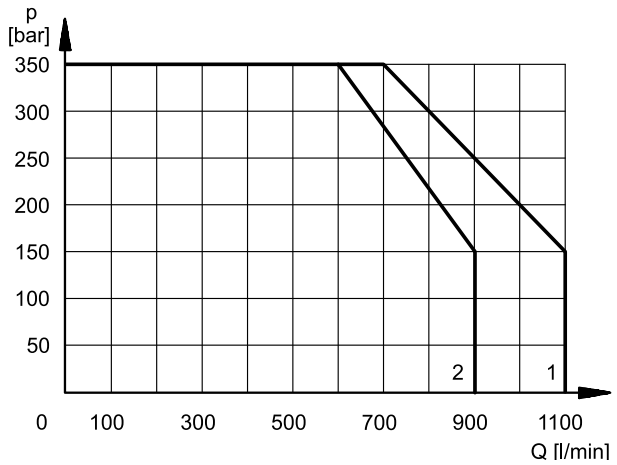
7 - OPERATING LIMITS

The curves define the flow rate operating fields according to the valve pressure of the different versions. The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage, with pilot supply pressure of 10 bar

The value have been obtained with mineral oil, viscosity 36 cSt, temperature 50 °C and filtration according to ISO 4406.1999 class 18/16/13.

Limits refer to the 4-port operation. The operating limits of a 4-port valve in 3-port operation, or with port A or B plugged, or without flow may reduce considerably.

7.1 - DSP10

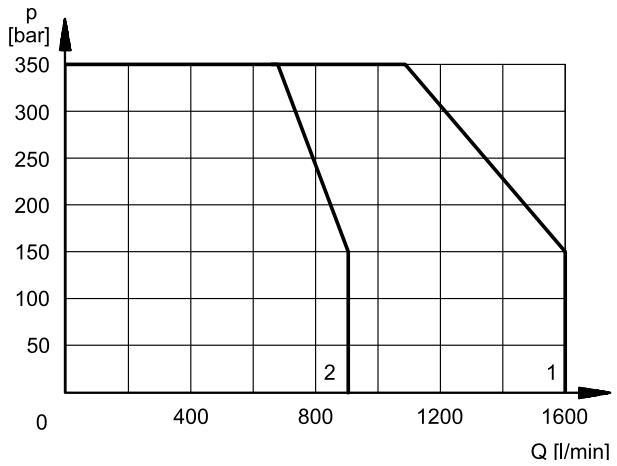


DC SOLENOID VALVE

SPOOL	CURVE	
	P→A	P→B
S1, SA1, SB1	1	1
S2, SA2, SB2	2	2
S3, SA3, SB3	1	1
S4, SA4, SB4	2	2
TA, TB	1	1
TA02, TB02	1	1
RK	1	1

NOTE: Limits showed for S1, S3, TA / TB and RK spools are determined by the value of the piloting pressure (10 bar).

7.1 - DSP11



8 - ELECTRICAL FEATURES

8.1 - Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation.

The coil is fastened to the tube by a threaded ring, and can be rotated 360°, to suit the available space.

NOTE 1: In order to further reduce the emissions, use of type H connectors is recommended. These prevent voltage peaks on opening of the coil supply electrical circuit (see cat. 49 000).

NOTE 2: The IP65 protection degree is guaranteed only with the connector correctly connected and installed.

VOLTAGE SUPPLY FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY	6.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC) (NOTE 1)	In compliance with 2014/30/EU
LOW VOLTAGE	In compliance with 2014/35/EU
CLASS OF PROTECTION Atmospheric agents (IEC 60529) Coil insulation (VDE 0580) Impregnation: DC valve AC valve	 IP 65 (**NOTE 2**) class H class F class H

8.2 - Current and absorbed power for DC solenoid valve

The table shows current and power consumption values of the DC coils.

Using connectors type "D" (see cat. 49 000) with embedded bridge rectifier it is possible to feed DC coils (starting from 48V voltage) with alternating current (50 or 60 Hz), considering a reduction of the operating limits by 5 ÷ 10% approx.

(values ± 10%)

	Resistance at 20°C [Ω]	Current consumption [A]	Power consumption [W]	Coil code K1
D12	4.4	2.72	32.7	1903080
D24	18.6	1.29	31	1903081
D48	78.6	0.61	29.5	1903083
D110	436	0.26	28.2	1903464
D220	1758	0.13	28.2	1903465

8.3 - Current and absorbed power for AC solenoid valve

The table shows current and power consumption values at inrush and at holding, relevant to the different coil types for AC current.

(values ± 5%)

Suffix	Nominal Voltage [V]	Freq. [Hz]	Resistance at 20°C [Ω]	Current consumption at inrush [A]	Current consumption at holding [A]	Power consumption at inrush [VA]	Power consumption at holding [VA]	Coil Code K1
A24	24	50	1,69	5,81	1,32	139	32	1902830
A48	48		6,02	3,78	0,86	182	41	1902831
A110	110V-50Hz 120V-60Hz	50/60	33	1,76	0,40	194	44	1902832
				1,54	0,35	185	42	
A230	230V-50Hz 240V-60Hz		135	0,92	0,21	213	48	1902833
				0,79	0,18	190	43	
F110	110	60	28,5	1,45	0,33	160	36	1902834
F220	220		103	0,92	0,21	203	46	1902835

9 - ELECTRIC CONNECTORS

Solenoid valves are delivered without connectors. Connectors can be ordered separately. See catalogue 49 000.

10 - MAX PRESSURES

Max pressure in P, A, B ports	bar	350
Minimum pilot supply pressure **NOTE**		10
Max pressure in T line with external drain		300
Max pressure in Y line with external drain		210 (DC) / 160 (AC)
Max pressure in T line with internal drain		210 (DC) / 160 (AC)

NOTE: The valve needs a difference of at least +10 bar between the pilot pressure and the discharge/drainage pressure In order to work correctly.

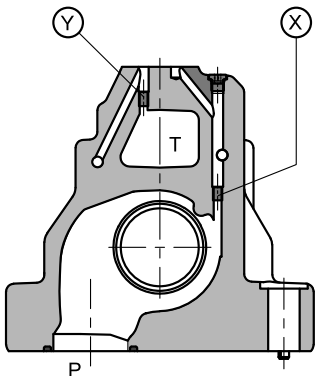
11 - PILOT AND DRAIN

The valves with electro-hydraulic actuation (DSP) are available with both pilot supply and drain internal or external. The version with external drain allows a higher back pressure on the return line.

The pilot supply Z type consists of an arrangement with internal piloting and 30 bar supply pressure for the pilot stage by means of a fixed adjustment pressure reducing valve .

The valves with hydraulic actuation (DSC) are available with external pilot supply and external drain only.

NOTE: The pilot supply and drainage configuration must be chosen when ordering. Subsequent modification is only permitted by authorized experienced operators or at the factory.



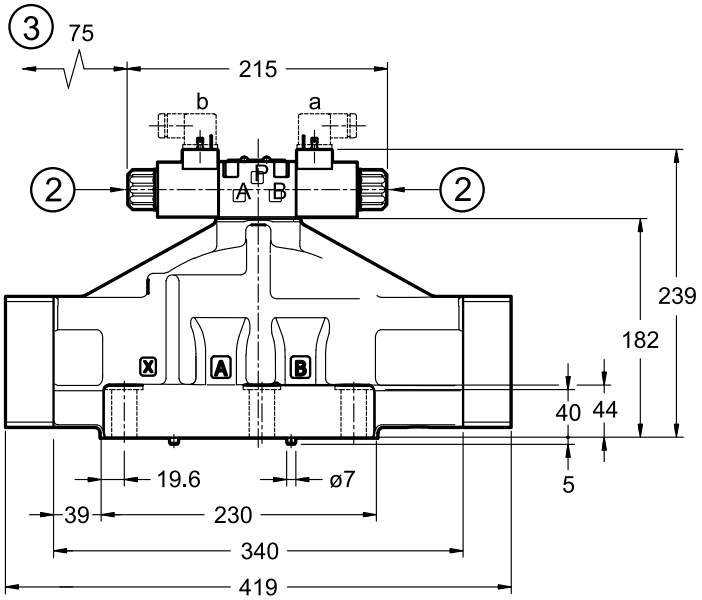
X: plug M6x8 for external pilot
Y: plug M6x8 for external drain

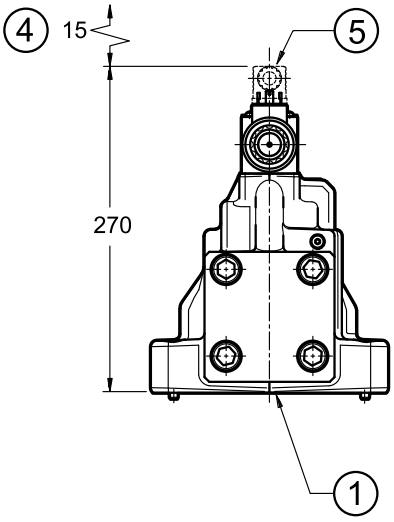
TYPE OF VALVE		Plug assembly	
		X	Y
IE	internal pilot and external drain	NO	YES
II	internal pilot and internal drain	NO	NO
EE	external pilot and external drain	YES	YES
EI	external pilot and internal drain	YES	NO

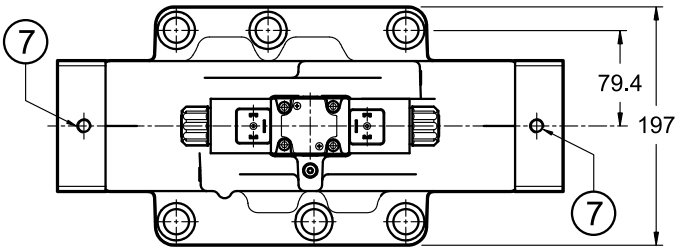
12 - OVERALL AND MOUNTING DIMENSIONS FOR DSP10 AND DSP11

dimensions in mm

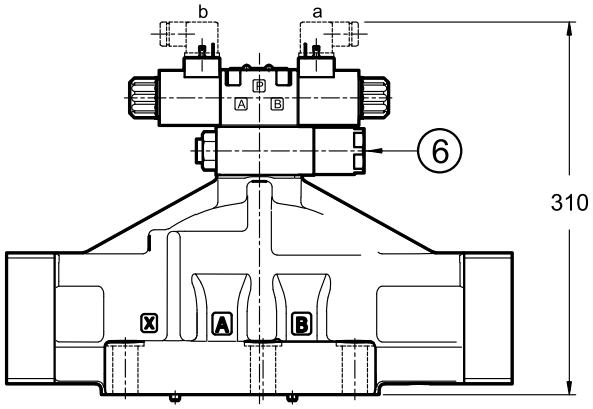
DSP1*-S DSP1*-RK



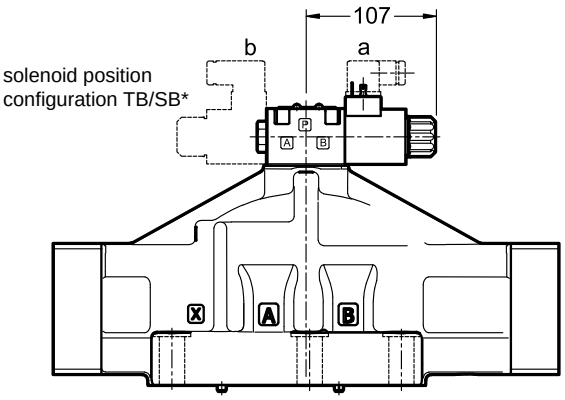




DSP1*-*Z



DSP1*-TA DSP1*-SA*

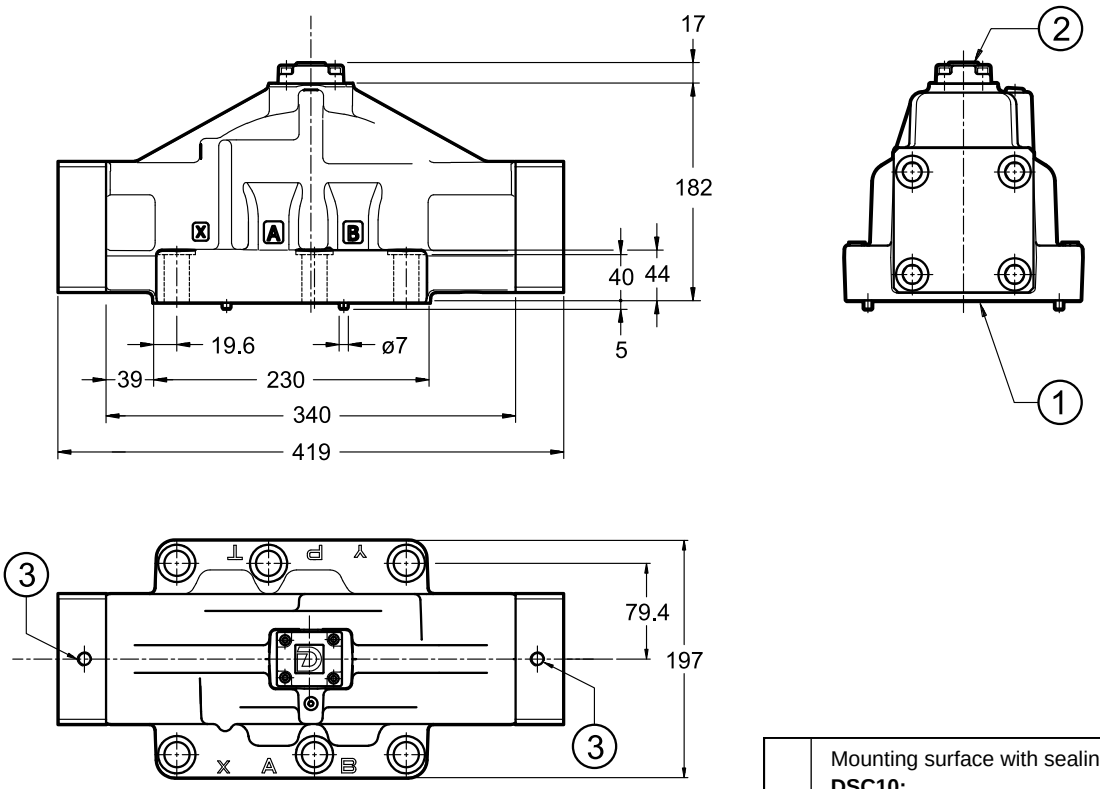


1	Mounting surface with sealing rings: **DSP10:** 4 OR type 4162 (40.86 x 3.53) - 90 shore 2 OR type 3081 (20.24 x 2.62) - 90 shore **DSP11**: 4 OR type 4212 (53.57 x 3.53) - 90 shore 2 OR type 3081 (20.24 x 2.62) - 90 shore
2	Manual override
3	Coil removal space
4	Connector removal space
5	Electric connector to be ordered separately (see cat. 49 000)
6	Pressure reducing valve with fixed adj.30 bar
7	M12 eyebolt seat for safe lift

Fastening of single valve: 6 SHC screws ISO 4762 M20x70
Tightening torque: 330 Nm (A 8.8) - 470 Nm (bolt A10.9)
Threads of mounting holes: M20x40

13 - OVERALL AND MOUNTING DIMENSIONS FOR DSC10 AND DSC11

dimensions in mm

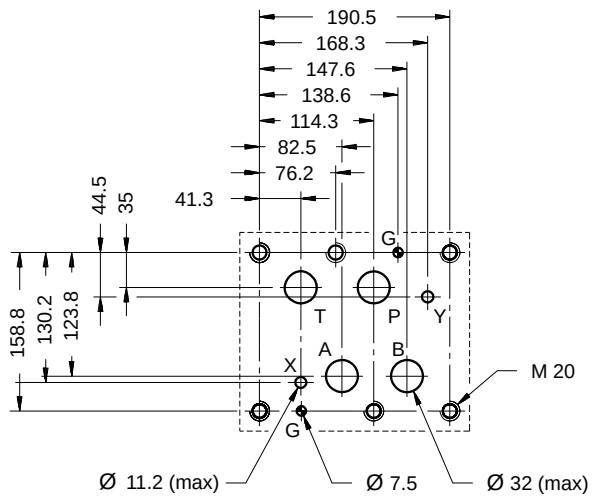


Fastening of single valve: 6 SHC screws ISO 4762 M20x70	
Tightening torque: 330 Nm (A 8.8) - 470 Nm (bolts A10.9)	
Threads of mounting holes: M20x40	

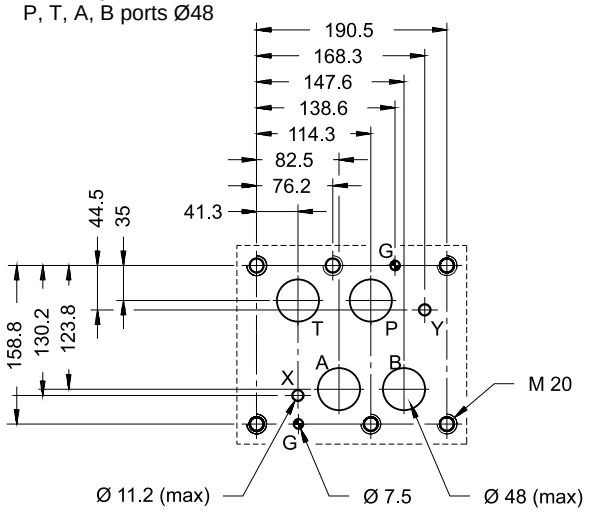
1	Mounting surface with sealing rings **DSC10:** 4 OR type 4162 (40.86 x 3.53) - 90 shore 2 OR type 3081 (20.24 x 2.62) - 90 shore **DSC11**: 4 OR type 4212 (53.57 x 3.53) - 90 shore 2 OR type 3081 (20.24 x 2.62) - 90 shore
2	Short-circuit subplate
3	M12 eyebolt seat for safe lift

14 - MOUNTING INTERFACES

DS*10
ISO 4401-10-09-0-05
(CETOP 4.2-4-10-350)



DS*11
ISO 4401-10-09-0-05
(CETOP 4.2-4-10-350)
deviating from standard:
P, T, A, B ports Ø48

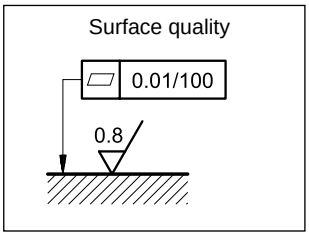


15 - INSTALLATION

Configurations with centering and recall springs can be mounted in any position; type RK valves - without springs and with mechanical detent - must be mounted with the longitudinal axis horizontal.

Valve fastening takes place by means of screws or tie rods, laying the valve on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing.

If the minimum values of planarity or smoothness are not met, fluid leakages between valve and mounting surface can easily occur.



16 - OPTIONS

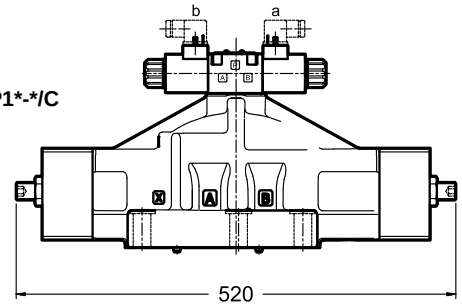
16.1 - Control of the main spool stroke: C

Stroke control for the main spool is possible by means of special side covers so as to vary the maximum clearance opening.

This solution allows control of the flow rate from the pump to the actuator and from the actuator to the outlet, obtaining a double adjustable control on the actuator.

Add the letter **C** in the identification code to order this version (see point 1).

DSP1*-*/C

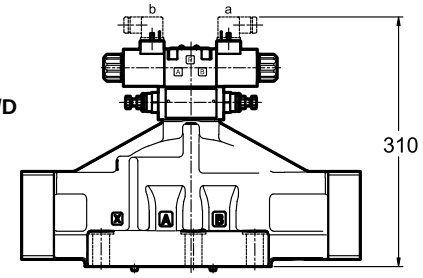


16.2 - Control of the main spool shifting speed: D

By placing a double flow control valve (MERS type) between the pilot solenoid valve and the main stage, the pilot supply flow can be adjusted and therefore the changeover smoothness can be varied.

Add the letter **D** in the identification code to order this version (see point 1).

DSP1*-*/D

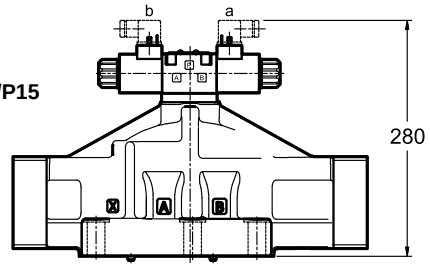


16.3 - Subplate with throttle on line P

It is possible to introduce a subplate with a restrictor of Ø1.5 on line P between the pilot solenoid valve and the main stage.

Add **P15** in the identification code to order this version (see point 1).

DSP1*-*/P15

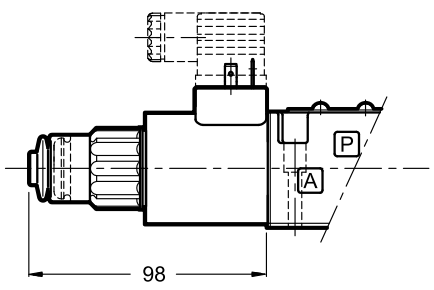


17 - MANUAL OVERRIDE

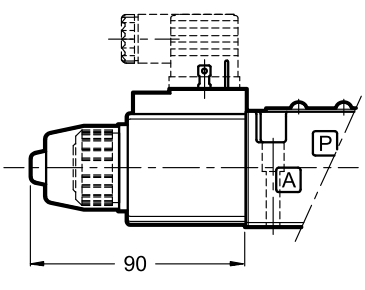
Whenever the solenoid valve installation may involve exposure to atmospheric agents or use in tropical climates, a boot protected manual override is recommended.

Add **/CM** at the end of the identification code to order this version (see point 1).

DC valve



AC valve



DUPLOMATIC MOTION SOLUTIONS
a member of DAIKIN group

DUPLOMATIC MS Spa
via Mario Re Depaolini, 24 | 20015 Parabiago (MI) | Italy
T +39 0331 895111 | E vendite.ita@duplomatic.com | sales.exp@duplomatic.com
duplomaticmotionsolutions.com

REPRODUCTION IS FORBIDDEN. THE COMPANY RESERVES THE RIGHT TO APPLY ANY MODIFICATIONS

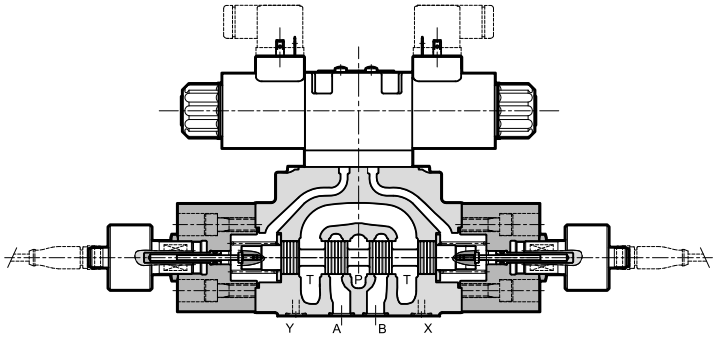


DS(P)*M

DIRECTIONAL VALVES WITH SPOOL POSITION MONITORING

DS3M	**ISO 4401-03**
DS5M	**ISO 4401-05**
DSP5RM	**ISO 4401-05**
DSP5M	**CETOP P05**
DSP7M	**ISO 4401-07**
DSP8M	**ISO 4401-08**
DSP10M	**ISO 4401-10**

OPERATING PRINCIPLE



— These solenoid operated directional valves are equipped with position sensors that monitor the main spool position. The switching position is indicated by a binary signal.

— TÜV certification body certifies the compliance of DS(P)*M valves with safety standards (see point 1).

— The valves are available in direct current versions only (see point 9).

— These valves do not have a manual override and can not be disassembled, because of their characteristics and their possible use on machinery subject to safety requirements. Moreover, their components are not interchangeable.

Read the *Use and Maintenance Manual* for instructions on operation, safe use, and repair of the product.

PERFORMANCES

(working with mineral oil of viscosity of 36 cSt at 50°C)

		DS3M	DS5M	DSP5M DSP5RM	DSP7M	DSP8M	DSP10M
Maximum operating pressure: P - A - B ports T port (external drain)	bar	350 210	320	350 250	350	350	350 300
Maximum flow rate from P to A - B - T	l/min	80	120	150	300	600	1100
Ambient temperature range	°C	-20 / +50					
Fluid temperature range	°C	-20 / +80					
Fluid viscosity range	cSt	10 ÷ 400					
Fluid contamination degree		According to ISO 4406:1999 class 20/18/15					
Recommended viscosity	cSt	25					
Mass: single solenoid valve double solenoid valve	kg	1,8 2,2	5 -	6,3 7,5	8,7 9,6	15,0 15,9	40,1 41,0

1 - TÜV CERTIFICATION

The product conformity of the solenoid actuated directional hydraulic valves (direct-acting or pilot-operated) of the DS(P)*M family has been verified by TÜV Italia S.r.l. - TÜV SÜD Group:

These components bear the CE marking as they comply with the essential requirements of the Machinery Directive 2006/42/EC.

More specifically, they comply with the following EU Directives and harmonised standards:

- Machinery Directive 2006/42/EC: EN ISO 12100:2010 (Risk assessment and risk reduction); EN ISO 13849-2:2012 (Validation, Tables C.1 and C.2); EN ISO 4413:2010 (Requirements for hydraulic fluid power systems).
- Electromagnetic Compatibility Directive 2014/30/EU.

NOTE: Components may be considered 'well-tried' if they comply with the basic safety principles and the 'well-tried' safety principles specified in Tables C.1 and C.2 of EN ISO 13849-2:2012, depending on the specific application.

Products in the DS(P)*M family may be used in safety-related parts of control systems in Category 1 (or higher), as specified in standard EN ISO 13849-1:2023.

Certificate: **TÜV IT 26 MAC 540**

2 - IDENTIFICATION OF SOLENOID VALVES, DIRECT OPERATED

2.1 - Identification code

D	S		M	-		/	21		-		K1	/		

Directional control valve solenoid operated

3 = ISO 4401-03 size
5 = ISO 4401-05 size

Monitoring of the spool position

Spool type (see p. 2.2)

S1	**SA1**	**SB1**	**TA**	**TB**
S3			**TA02**	**TB02**
S4	**SA4**	**SB4**	**TA100**	**TB100**

Series No.
(the overall and mounting dimensions remain unchanged from 20 to 29)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

DC power supply
D12 = 12 V
D24 = 24 V
D110 = 110 V
D220 = 220 V

Coil electrical connection:
plug for connector type
EN 175301-803 (ex DIN 43650)

Monitored position:
(see p. 17 for switching logic)
R0 = monitored rest position
MA = monitored position 'a'
MB = monitored position 'b'

Position sensor supply voltage:
Omit for 24V
12 = 12 V
(only available for monitored position type M *)

NOTE: To comply with EN 693:2011, the valves are not equipped with manual override.

NOTE: Verify spool and sensor type availability in the tables below

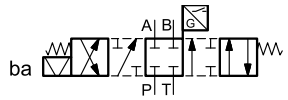
DS3		SPOOLS				
		S*	**SA***	**SB***	**TA TA100**	**TB TB100**
SENSOR TYPE	**R0**	x				
	MA		x	x	x	x
	MB		x	x	x	x

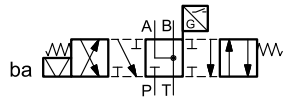
DS5		SPOOLS					
		S*	**SA***	**SB***	**TA TA100**	**TA02 TB02**	**TB TB100**
SENSOR TYPE	**R0**	x					
	MA		x	x	x	x	x
	MB		x	x	x	x	x

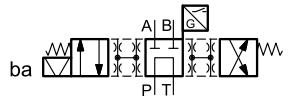
2.2 - Spool types for DS3M and DS5M

Type **DS3M-S***:
2 solenoids - 3 positions
with spring centring

Sensor **R0**

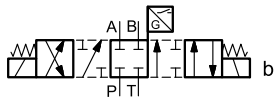
S1 

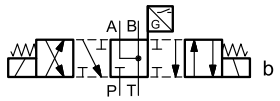
S3 

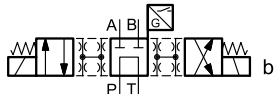
S4 

Type **DS5M-S***:
2 solenoids - 3 positions
with spring centring

Sensor **R0**

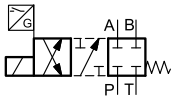
S1 

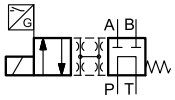
S3 

S4 

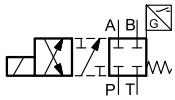
Type **SA***:
1 solenoid side A
2 positions (central + external) with return spring

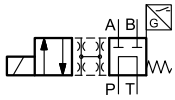
Sensor **MA**

SA1 

SA4 

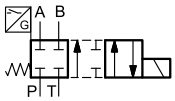
Sensor **MB**

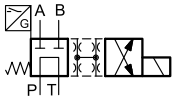
SA1 

SA4 

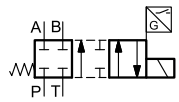
Type **SB***:
1 solenoid side B
2 positions (central + external) with return spring

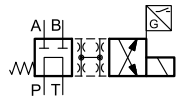
Sensor **MA**

SB1 

SB4 

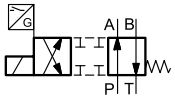
Sensor **MB**

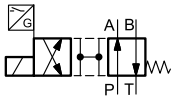
SB1 

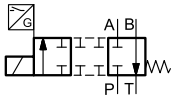
SB4 

Type **TA**:
1 solenoid side A
2 external positions with return spring

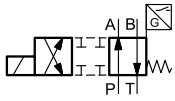
Sensor **MA**

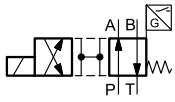
TA 

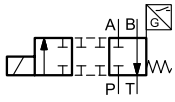
TA02 

TA100 

Sensor **MB**

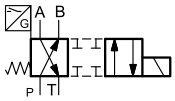
TA 

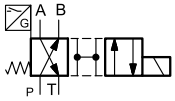
TA02 

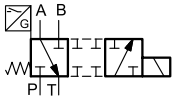
TA100 

Type **TB**:
1 solenoid side B
2 external positions with return spring

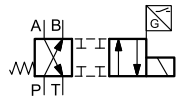
Sensor **MA**

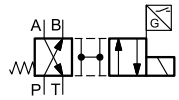
TB 

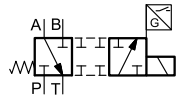
TB02 

TB100 

Sensor **MB**

TB 

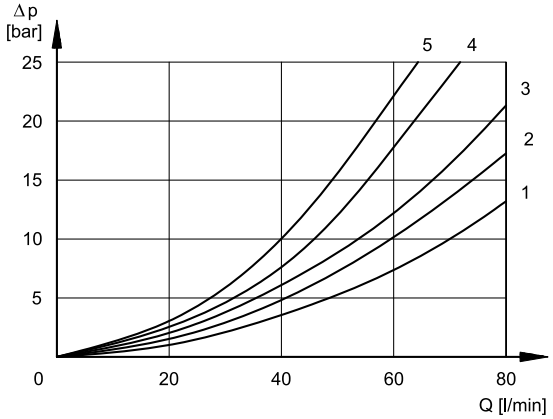
TB02 

TB100 

3 - CHARACTERISTIC CURVES OF DIRECT OPERATED SOLENOID VALVES

(obtained with viscosity 36 cSt at 50 °C)

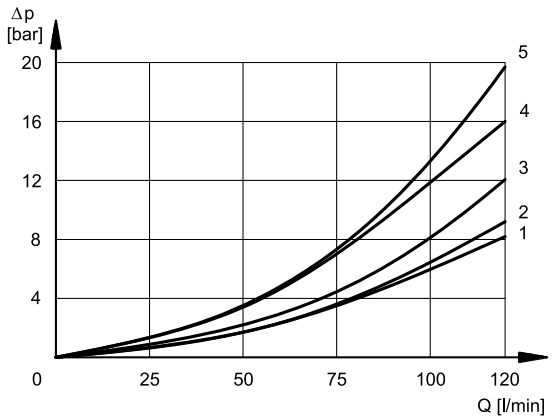
3.1 - DS3M - Pressure drops ∆p-Q



SPOOL TYPE	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S1, SA1; SB1	2	2	3	3	-
S3	3	3	1	1	-
S4, SA4	5	5	5	5	3
TA, TB	2	2	2	2	-
TA100, TB100	4	4	4	4	-

For S3 in central position B→T refer to curve 3.

3.2 - DS5M - Pressure drops ∆p-Q



SPOOL TYPE	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S1, SA1, SB1	2	2	1	1	
S3	2	1	2	3	
S4, SA4, SB4	1	1	2	2	4
TA, TB, TA02, TB02	3	3	2	2	-
TA100, TB100	2	2	2	2	-

For S3 in central position B→T refer to curve 5.

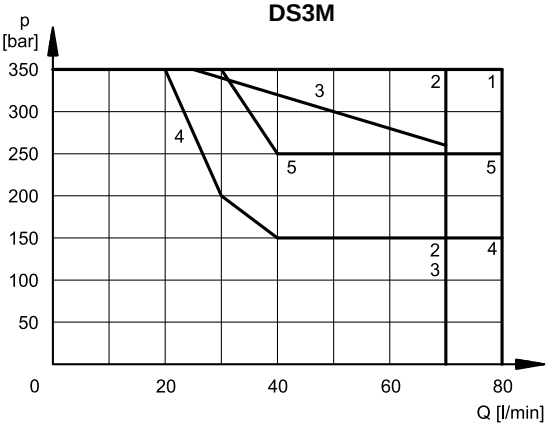
3.3 - Performance limits for DS3M and DS5M solenoid valves

The curves define the flow rate operating fields according to the valve pressure of the different versions.

The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage. The values have been obtained with mineral oil, viscosity 36 cSt, temperature 50 °C and filtration according to ISO 4406:1999 class 18/16/13.

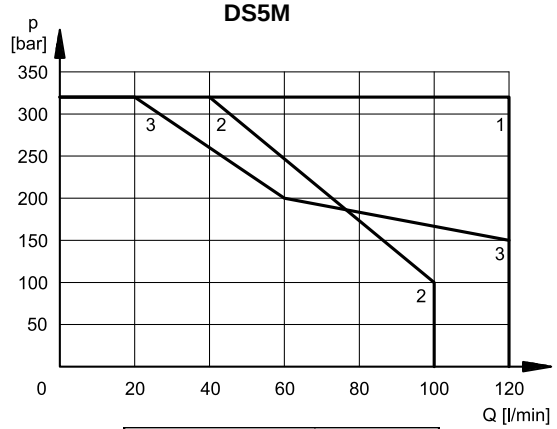
The operating limits can be considerably reduced if a 4-way valve is used as 3-way valve with port A or B plugged or without flow.

DS3M



SPOOL	CURVE	
	P→A	P→B
S1,SA1	1	1
S3,	4	4
S4, SA4	2	2
TA, TB	5	5
TA100, TB100	3	3

DS5M



SPOOL	CURVE	
	P→A	P→B
S1	1	1
S3	3	3
S4	2	2
TA02	1	1
TA, TA100	1	1

3.4 - Switching times

The indicated values had obtained according to ISO 6403 standards, using mineral oil with viscosity 36 cSt at 50 °C.

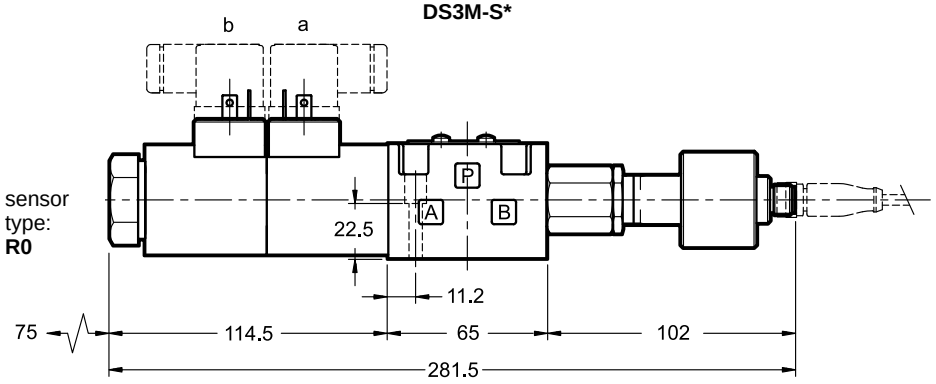
TIMES [ms]	ENERGIZING	DE-ENERGIZING
DS3M	25 ÷ 75	15 ÷ 25

TIMES [ms]	ENERGIZING	DE-ENERGIZING
DS5M	100 ÷ 150	20 ÷ 50

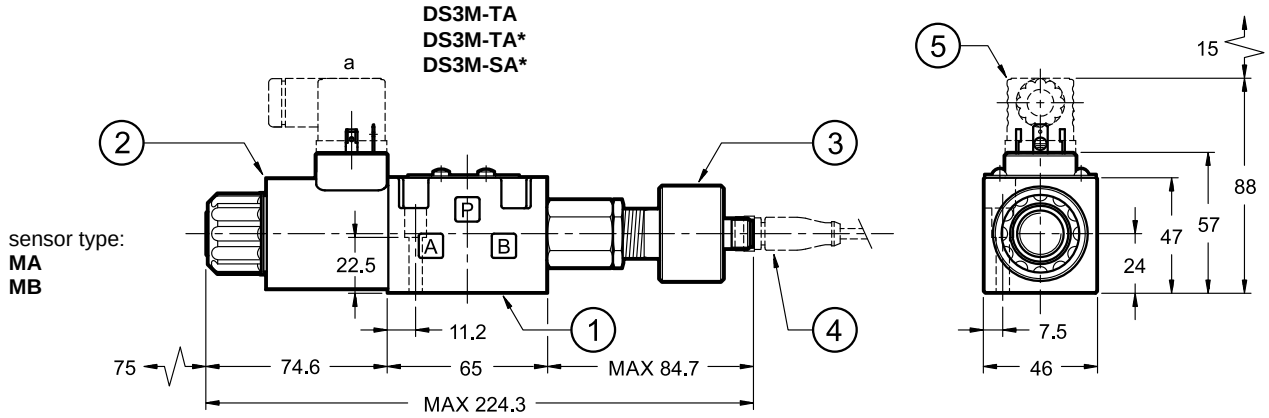
4 - OVERALL AND MOUNTING DIMENSIONS FOR DIRECT OPERATED VALVES

dimensions in mm

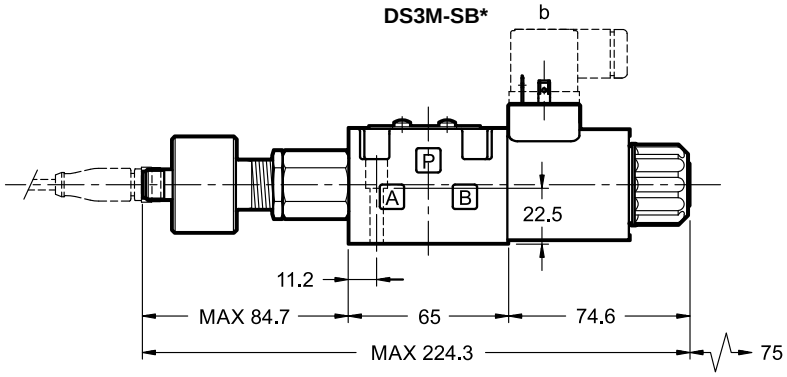
DS3M-S*



DS3M-TA
DS3M-TA*
DS3M-SA*



DS3M-TB
DS3M-TB*
DS3M-SB*

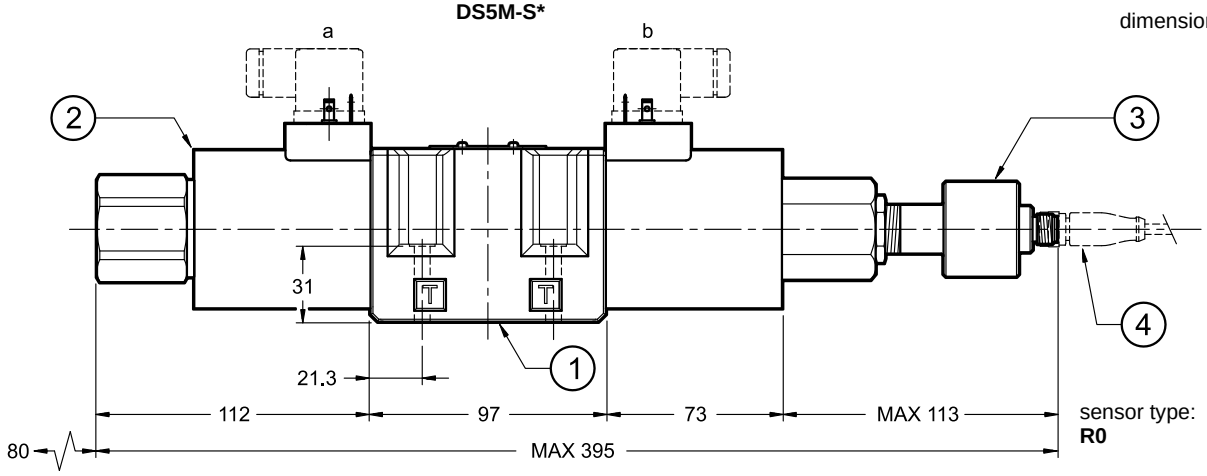


Valve fastening: 4 SHC screws ISO 4762 M5x30	
Tightening torque: 5 Nm (A8.8)	
Threads of mounting holes: M5x10	

1	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) 90 Shore
2	Coil rotating 360°
3	Position sensor: setting sealed at factory, do not tamper.
4	Connector for Position sensor type straight, moulded. To be ordered separately, see p.20
5	Coil electric connector EN 175301-803 (ex DIN 43650) to be ordered separately cat. 49 000

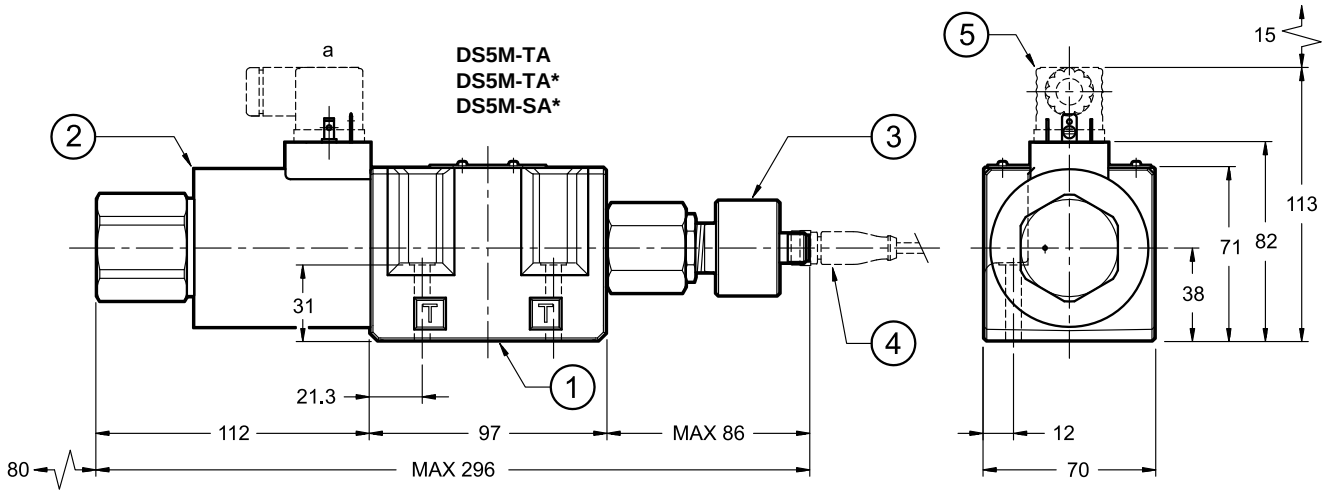
DS5M-S*

dimensions in mm

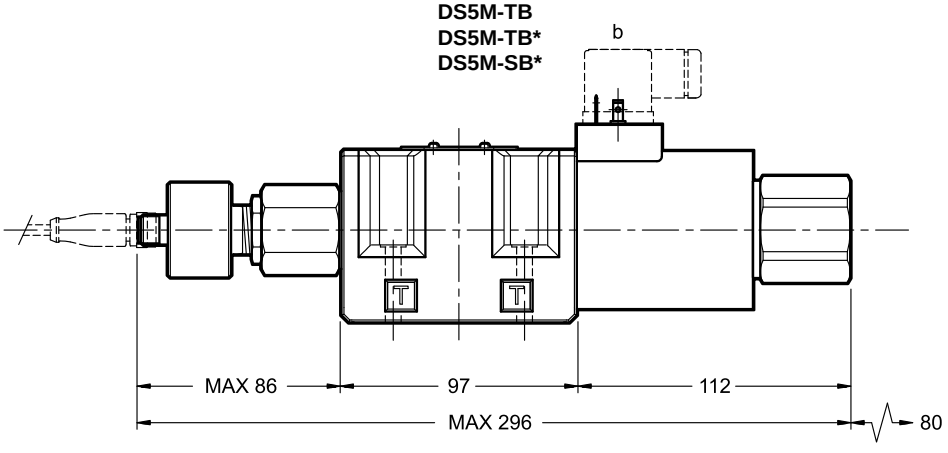


sensor type:
R0

DS5M-TA
DS5M-TA*
DS5M-SA*



DS5M-TB
DS5M-TB*
DS5M-SB*



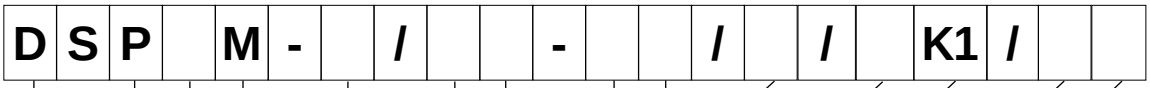
sensor type:
MA
MB

1	Mounting surface with sealing rings. 5 OR type 2050 (12.42x1.78) - 90 Shore
2	Coil rotating 360°
3	Position sensor: setting sealed at factory, do not tamper.
4	Connector for position sensor type straight, moulded. To be ordered separately, see p. 20
5	Coil electric connector EN 175301-803 (ex DIN 43650) to be ordered separately cat. 49 000

Valve fastening: 4 SHC screws ISO 4762 M6x40
Tightening torque: 8 Nm
Threads of mounting holes: M6x10

5 - IDENTIFICATION OF PILOT OPERATED SOLENOID VALVES

5.1 - Identification code



Directional valve, pilot operated by solenoid actuation

Size:
5R = ISO 4401-05
5 = CETOP P05
7 = ISO 4401-07
8 = ISO 4401-08
10 = ISO 4401-10 (**NOTE 2**)

Monitoring of the spool position

Spool type (see point 5.2)
S1 **SA1** **SB1** **TA** **TB**
S3 **TA100** **TB100**
S4
RK

Series:
20 = for DSP5M, DSP5RM, DSP7M and DSP8M
32 = for DSP10M
(the overall and mounting dimensions within the same ten remain unchanged)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Pilot supply (see point 7):
E = external
I = internal (not available for S4 spool)
Z = internal pilot supply with 30 bar pressure reducing valve, fixed adjustment (see p. 6.5) (not available for S4 spool)
Alternative options for valve sizes 7 and 8 only, spool type S4:
C = internal pilot supply and backpressure valve in P port
CZ = internal pilot supply with 30 bar pressure reducing valve, fixed adjustment, and with backpressure valve in P port

Position sensor supply voltage:
Omit for 24V
12 = 12 V
(only available for monitored position type M*)

Monitored position:
(see p. 17 for switching logic)
1 position sensor
R0 = rest position monitored
MA = position ‘a’ monitored
MB = position ‘b’ monitored
2 position sensors
M0 = rest position monitored
MAB = ‘a’ and ‘b’ positions monitored

Coil electrical connection:
plug for connector type DIN 43650

DC power supply
D12 = 12 V **D110** = 110 V
D24 = 24 V **D220** = 220 V

P = Orifice plate on P port (mandatory), mounted under the pilot valve.
Omit for valves with pilot supply type Z and for valves with option D - Main spool switching speed control
D = Main spool switching speed control (see p. 8)

Drain (see point 6):
I = Internal
E = External

NOTE 1: Check availability of the spool / sensor type.

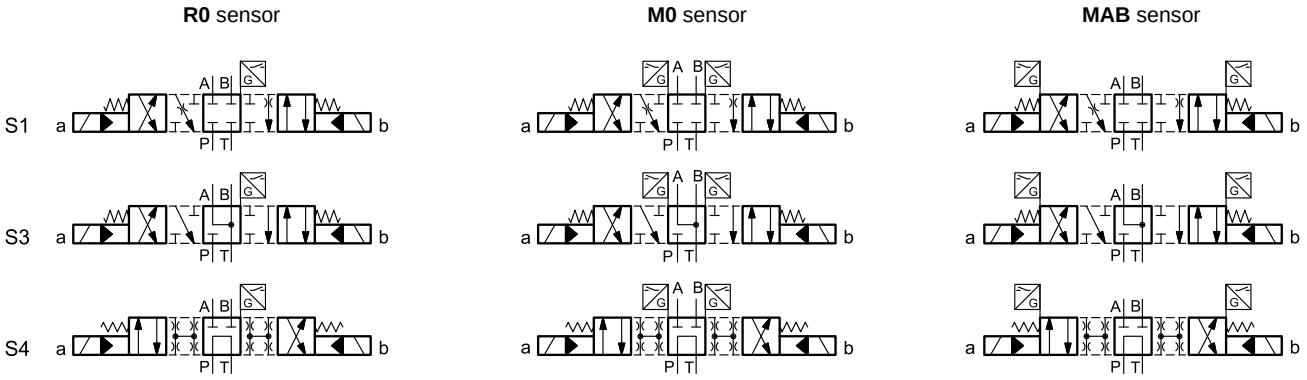
		SPOOLS				
		S*	**SA* SB***	**TA TB**	**TA100 TB100**	**RK**
SENSOR TYPE	**R0**	x				
	MA		x	x	x	x
	MB		x	x	x	x
	M0	x				
	MAB	x	x	x	x	x

NOTE 2: DSP10M valves are available only with S1 or S3 spool, with monitored position type MAB or M0.

NOTE: To comply with EN 693:2011, the valves are not equipped with manual override.

5.2 - Spool types for DSP5M, DSP5RM, DSP7M and DSP8M

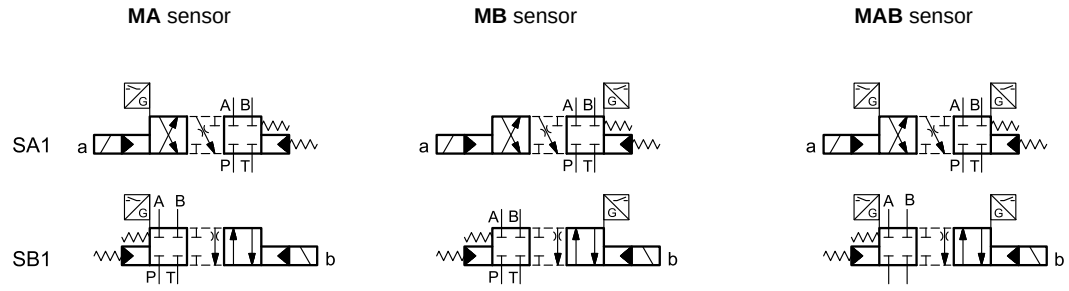
Type **S***:
2 solenoids - 3 positions with spring centring



Type **SA***:
1 solenoid side A

Type **SB***:
1 solenoid side B

2 positions
(central + external)
with spring centring

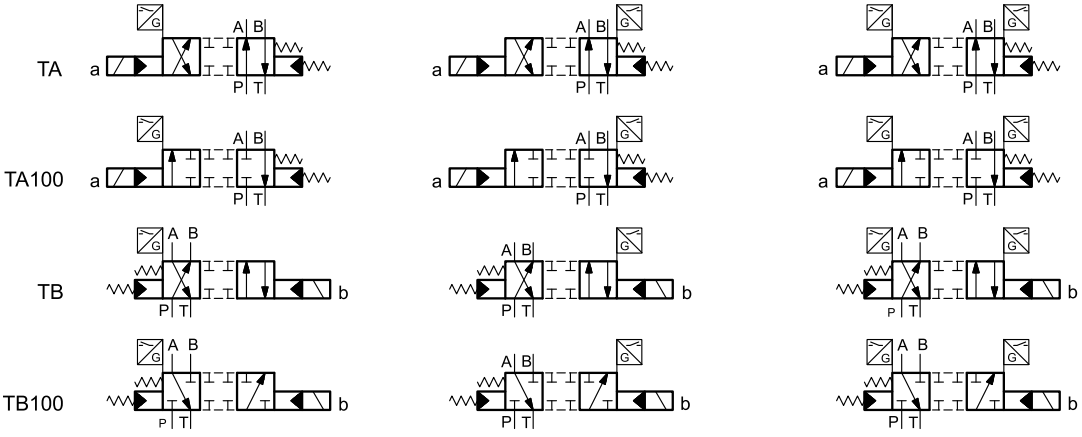


Type **TA**:
1 solenoid side A

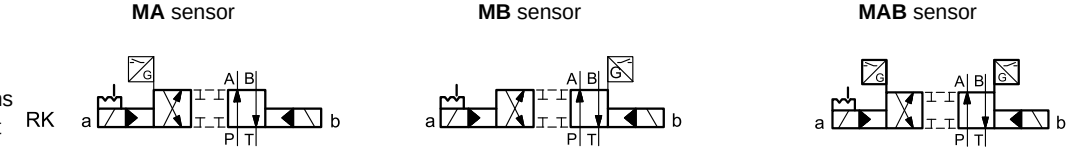
2 external positions
with return spring

Type **TB**:
1 solenoid side B

2 external positions
with return spring



Type **RK**:
2 solenoids - 2 positions
with mechanical detent

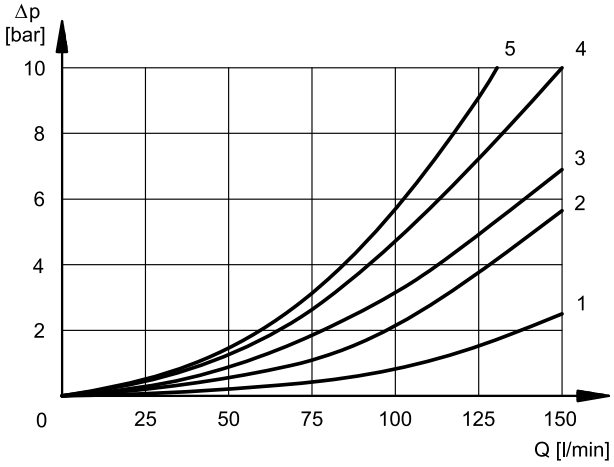


NOTE: DSP10M valves are available only with S1 or S3 spool, with monitored position type MAB or M0.

6 - CHARACTERISTIC CURVES AND PERFORMANCES

(values obtained with viscosity 36 cSt at 50 °C)

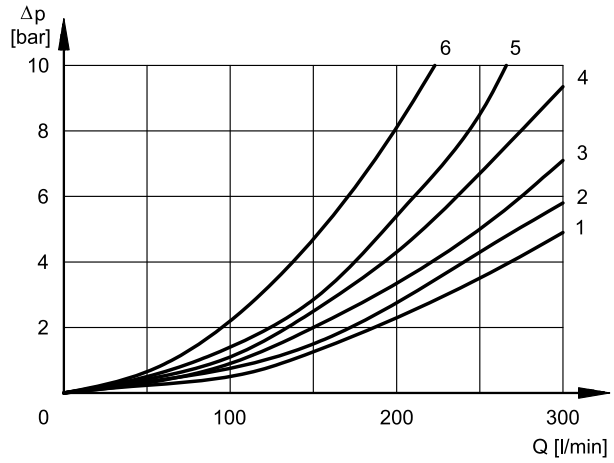
6.1 - DSP5M and DSP5RM - Pressure drops Δp-Q



SPOOL TYPE	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S1, SA1	4	4	1	1	-
S3	4	4	1	1	-
S4	5	5	2	3	5
TA, TB	4	4	1	1	-
TA100, TB100	3	3	1	1	-
RK	4	4	1	1	-

For pressure drops of the S3 spool in central position refer to the curve 4.

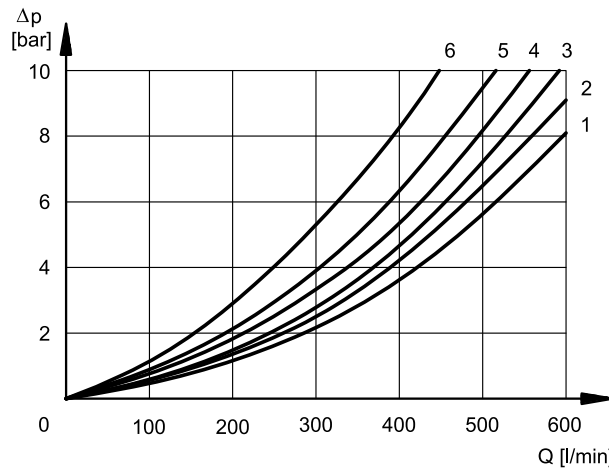
6.2 - DSP7M - Pressure drops Δp-Q



SPOOL TYPE	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S1, SA1	1	1	4	5	-
S3	1	1	5	5	-
S4	2	2	5	6	5
TA, TB	1	1	4	5	-
TA100, TB100	3	3	3	5	-
RK	1	1	4	5	-

For pressure drops of the S3 spool in central position refer to the curve 5.

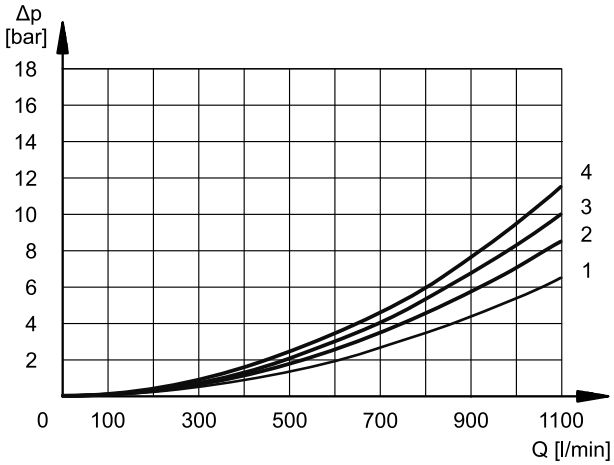
6.3 - DSP8M - Pressure drops Δp-Q



SPOOL TYPE	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S1, SA1	2	2	3	3	-
S3	2	2	2	1	-
S4	4	4	3	5	6
TA, TB	2	2	3	3	-
TA100, TB100	5	5	5	5	-
RK	2	2	3	3	-

For pressure drops of the S3 spool in central position refer to the curve 4.

6.4 - DSP10M - Pressure drops ∆p-Q



SPOOL TYPE	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S1	3	3	1	2	-
S3	3	3	2	4	-

6.5 - Performance limits for pilot operated valves

PRESSURES	**DSP5M DSP5RM**	**DSP7M**	**DSP8M**	**DSP10M**
Max pressure in P, A, B ports	350	350	350	350
Max pressure in T line with internal drain	250	250	250	300
Max pressure in Y line	210	210	210	210
Min pilot supply pressure **NOTE 1**	5 ÷ 12	5 ÷ 12	5 ÷ 12	6 ÷ 12
Max pilot supply pressure **NOTE 2**	210	210	210	280

NOTE 1: The minimum pilot pressure can be the lower value of the range at low flow rates, but at higher flow rates the higher value is required.

NOTE 2: If the working pressure is higher than these rated limits, then provide an external pilot line with p_{max} within the rated limits and purchase the valve with E type pilot supply. .

For DSP7M and DSP8M valves, if the external pilot line is not possible, you must opt for the version with Z type pilot supply (see point 7.2), providing max 350 bar at inlet pressure P.

MAXIMUM FLOW RATES		**DSP5M DSP5RM**		**DSP7M**		**DSP8M**		**DSP10M**	
Spool type		PRESSURES 210 bar	350 bar	210 bar	350 bar	210 bar	350 bar	210 bar	350 bar
S4 - TA100	[l/min]	120	100	200	150	500	450	-	-
S1 - S3 - TA - RK		150	120	300	300	600	500	900	700

6.6 - Switching times

The values indicated refer to a solenoid valve working with a pilot pressure of 100 bar, with mineral oil at a temperature of 50 °C, a viscosity of 36 cSt, and P>A and B>T connections.

The energizing and de-energizing times are measured based on the pressure variation occurring in the lines.

TIMES (± 10%) [ms]	ENERGIZING		DE-ENERGIZING	
	2 Pos.	3 Pos.	2 Pos.	3 Pos.
DSP5M - DSP5RM	60	50	50	40
DSP7M	75	60	60	45
DSP8M	100	70	80	50
DSP10M	-	100	-	140

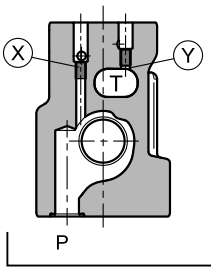
7 - PILOT AND DRAIN

These valves are available with both pilot supply and drain internal or external type. The version with external drain allows a higher back pressure on the return line.

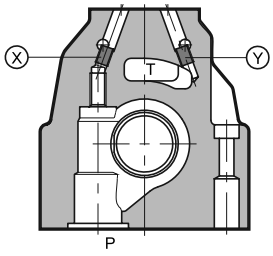
NOTE: The pilot supply and drain configuration must be chosen when ordering. Subsequent modification is only permitted by authorized experienced operators or at the factory.

TYPE OF VALVE		Plug assembly X	Plug assembly Y
IE	internal pilot and external drain	NO	YES
II	Internal pilot and internal drain	NO	NO
EE	external pilot and external drain	YES	YES
EI	external pilot and internal drain	YES	NO

DSP5M
DSP5RM

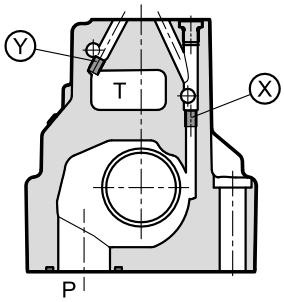


DSP7M

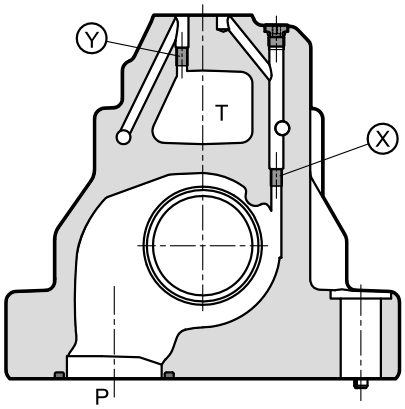


X: plug M5x6 for external pilot
Y: plug M5x6 for external drain

DSP8M



DSP10M



X: plug M6x8 for external pilot
Y: plug M6x8 for external drain

7.1 - C type pilot supply: internal pilot supply with backpressure valve in P port

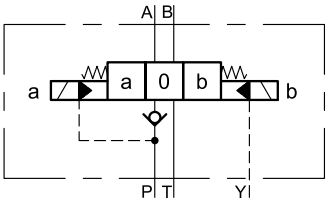
DSP7M and DSP8M valves are available with an incorporated backpressure valve in the P port.

This ensures the minimum pilot supply pressure in the normal position of valves where the inlet port (P) and the return port (T) are connected (spool S4).

The pressure differential of the backpressure valve must be added to that of the main valve, shown on page 9.

The cracking pressure is approx. 5 bar for DSP7M and 6 bar for DSP8M at 15 l/min.

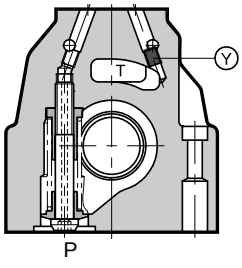
NOTE: The backpressure valve does not ensure sealing, and therefore, should not be considered a check valve.



Add the letter 'C' to the identification code for this request (see point 5.1).

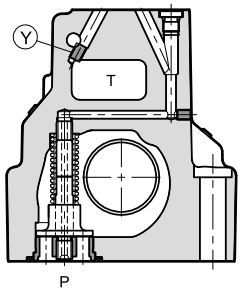
For DSP7M only, the backpressure valve can also be supplied separately and can be easily mounted in the P line of the main control valve. To order the backpressure valve, request code **0266577.**

DSP7M

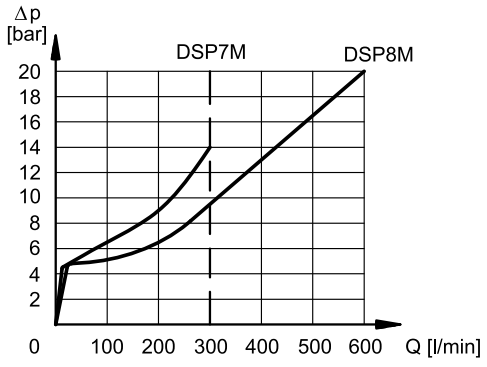


pilot supply always internal
Y: plug M5x6 for external drain

DSP8M



pilot supply always internal
Y: plug M6x8 for external drain

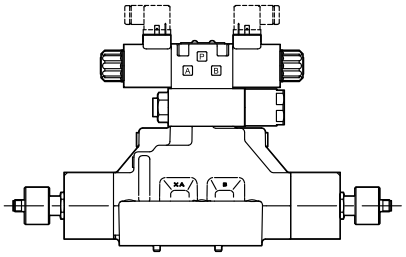


The curve relates to the pressure drop of the body only, with the backpressure valve installed, to which the pressure drop of the reference spool must be added (see p. 6)

7.2 - Z type pilot supply: internal pilot supply with pressure reducing valve

The Z type pilot supply consists of an arrangement with internal pilot and 30 bar supply pressure to the pilot stage by means of a fixed adjustment pressure reducing valve placed between the main stage and the pilot valve.

Consider an increase of 30 mm in height for valves ordered with Z option.

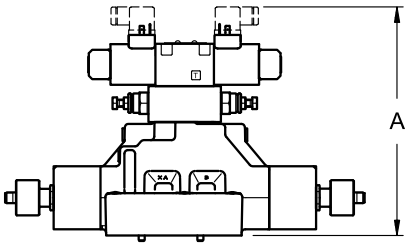


8 - OPTIONS

8.1 - Option D: control of the main spool shifting speed

By placing a double flow control valve (QTM3 type) between the pilot solenoid valve and the main stage, the pilot supply flow can be adjusted and therefore the changeover smoothness can be varied.

Add the letter **D** in the identification code to order this version (see point 5.1).



dimensions in mm

	DSP5M DSP5RM	DSP7M	DSP8M	DSP10M
A	218	225	254	307

9 - ELECTRICAL FEATURES

9.1 - Solenoids

These are essentially made up of two parts: the tube and the coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation.

The coil is fastened to the tube by a threaded ring, and can be rotated and locked to suit the available space.

NOTE 1 : In order to further reduce the emissions, use of type H connectors is recommended. These prevent voltage peaks on opening of the coil supply electrical circuit (see catalogue 49 000).

NOTE 2: The IP65 protection degree is intended for the whole valve. It is guaranteed only with valve and connectors correctly connected and installed.

VOLTAGE SUPPLY FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY DS3M DS5M DSP5M - DSP5RM DSP7M DSP8M DSP10M	 15.000 ops/h 13.000 ops/h 5.000 ops/h 5.000 ops/h 4.000 ops/h 3.000 ops/h
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC) (NOTE 1)	in compliance with 2014/30/EU
LOW VOLTAGE	in compliance with 2014/35/EU
CLASS OF PROTECTION Atmospheric agents (IEC 60529) Coil insulation (VDE 0580) Impregnation	 IP65 (**NOTE 2**) class H class F

9.2 - Current and absorbed power

The tables shows current and power consumption values relevant to the different coil types for DC.

DS3M, DSP5M, DSP5RM, DSP7M, DSP8M and DSP10M
(values ± 10%)

Suffix	Nominal voltage [V]	Resistance at 20°C [Ω]	Current consumpt. [A]	Power consumpt [W]
D12	12	4,4	2,72	32,7
D24	24	18,6	1,29	31
D110	110	436	0,26	28,2
D220	220	1758	0,13	28,2

DS5M (values ± 5%)

Suffix	Nominal voltage [V]	Resistance at 20°C [Ω]	Current consumpt. [A]	Power consumpt [W]
D12	12	3	4	48
D24	24	12	2	48
D110	110	252	0,44	48
D220	220	1010	0,22	48

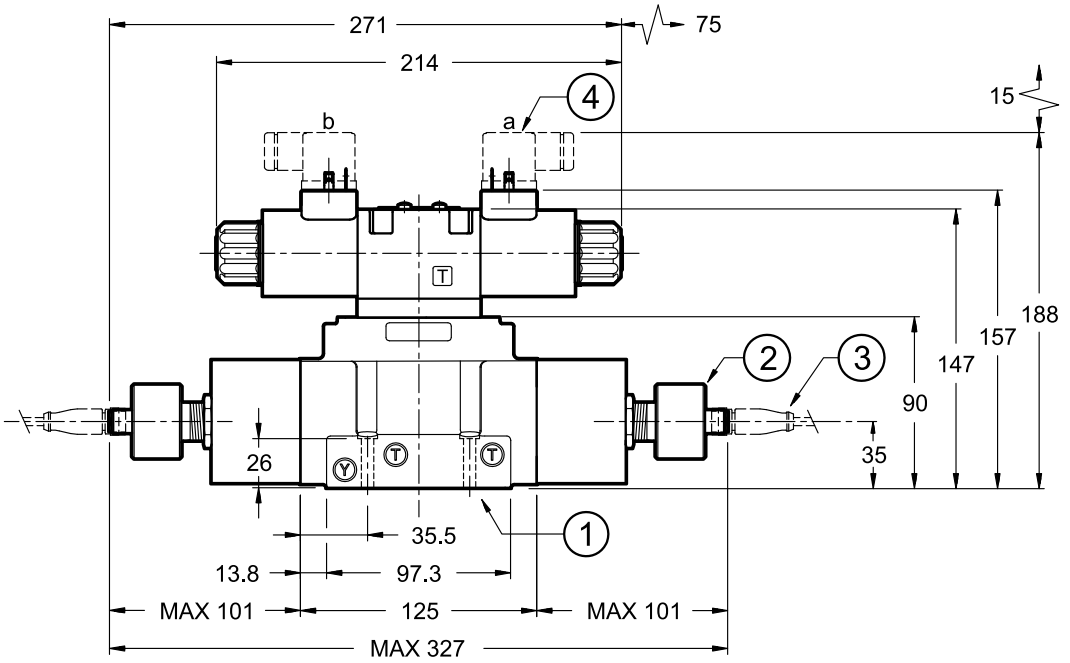
10 - COIL CONNECTORS

The solenoid valves are supplied without connectors. EN 175301-803 (formerly DIN 43650) connectors for K1 electrical connection can be ordered separately; see catalogue 49 000.

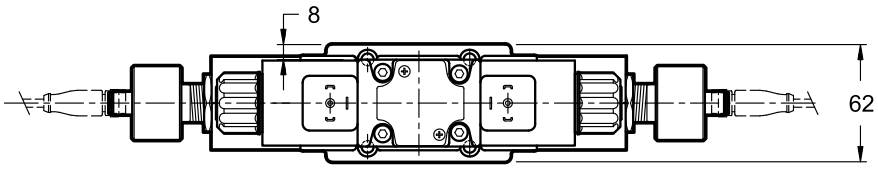
11 - DSP5M AND DSP5RM OVERALL AND MOUNTING DIMENSIONS

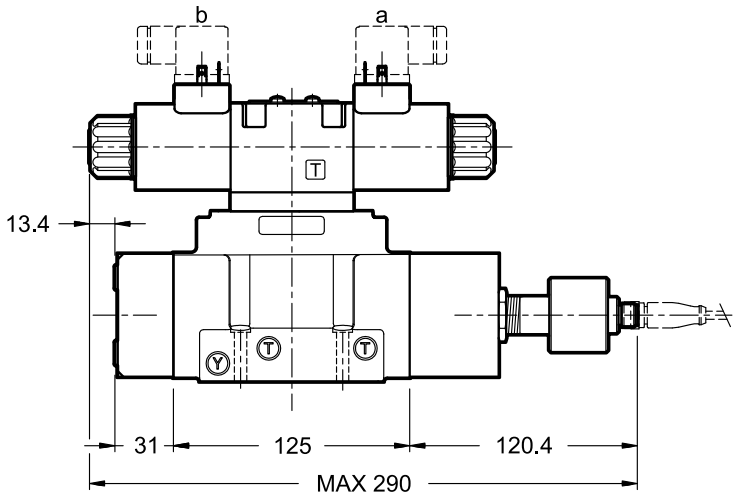
dimensions in mm

DSP5M-S*
DSP5RM-S*



sensor type:
M0
MAB





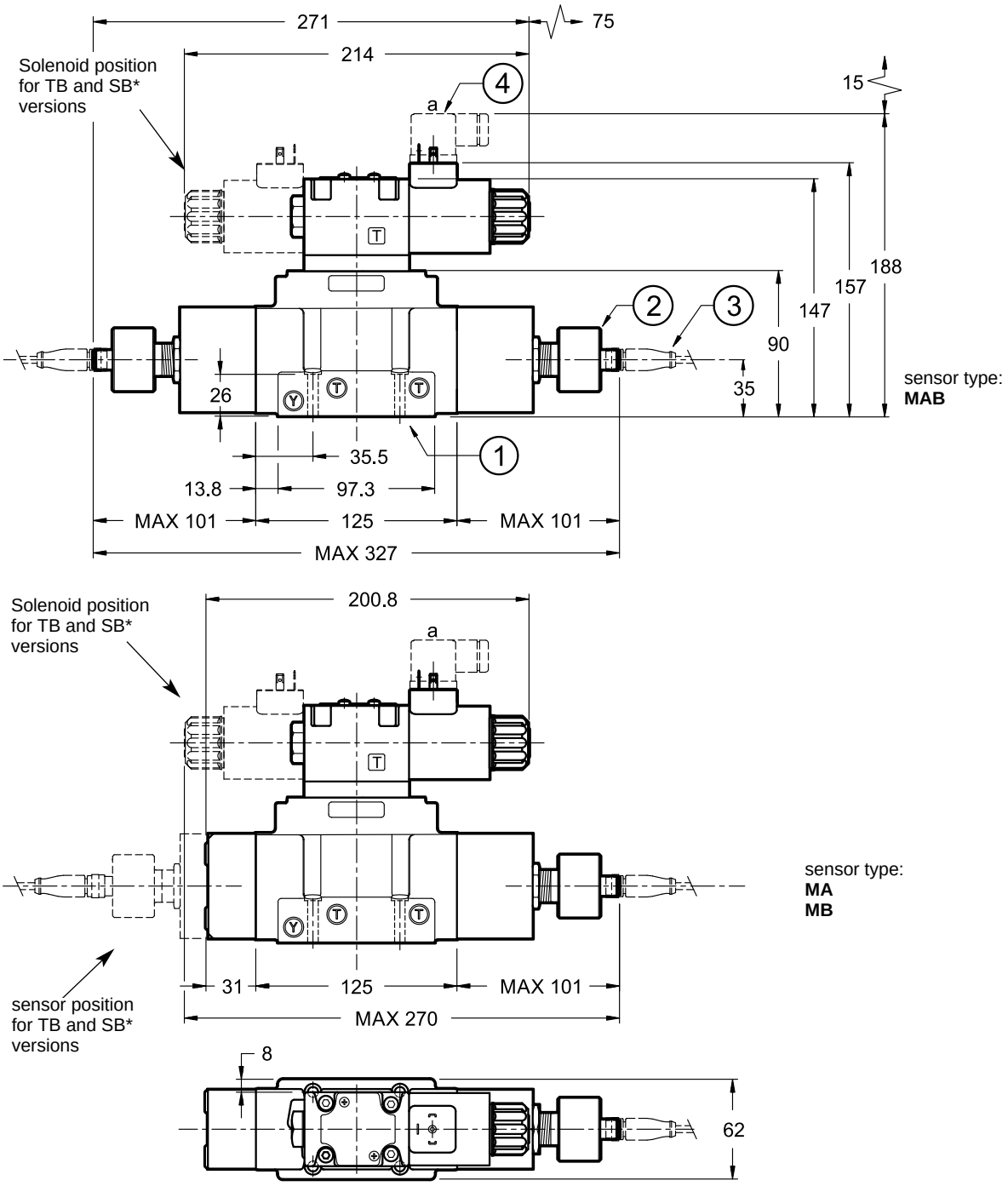
sensor type:
R0

1	Mounting surface with sealing rings 5 OR type 2050 (12.42x1.78) - 90 Shore 2 OR type 2037 (9.25x1.78) - 90 Shore
2	Position sensor: set and sealed at factory. Do not tamper.
3	Connector for position sensor, type straight, moulded. To be ordered separately, see p. 20
4	Coil electric connector EN 175301-803 (ex DIN 43650) type. To be ordered separately see cat. 49 000

Valve fastening: 4 SHC screws ISO 4762 M6x35
Tightening torque: 8 Nm (screws A 8.8)
Threads of mounting holes: M6x10

DSP5M-TA, TA100, SA1
DSP5RM-TA, TA100, SA1

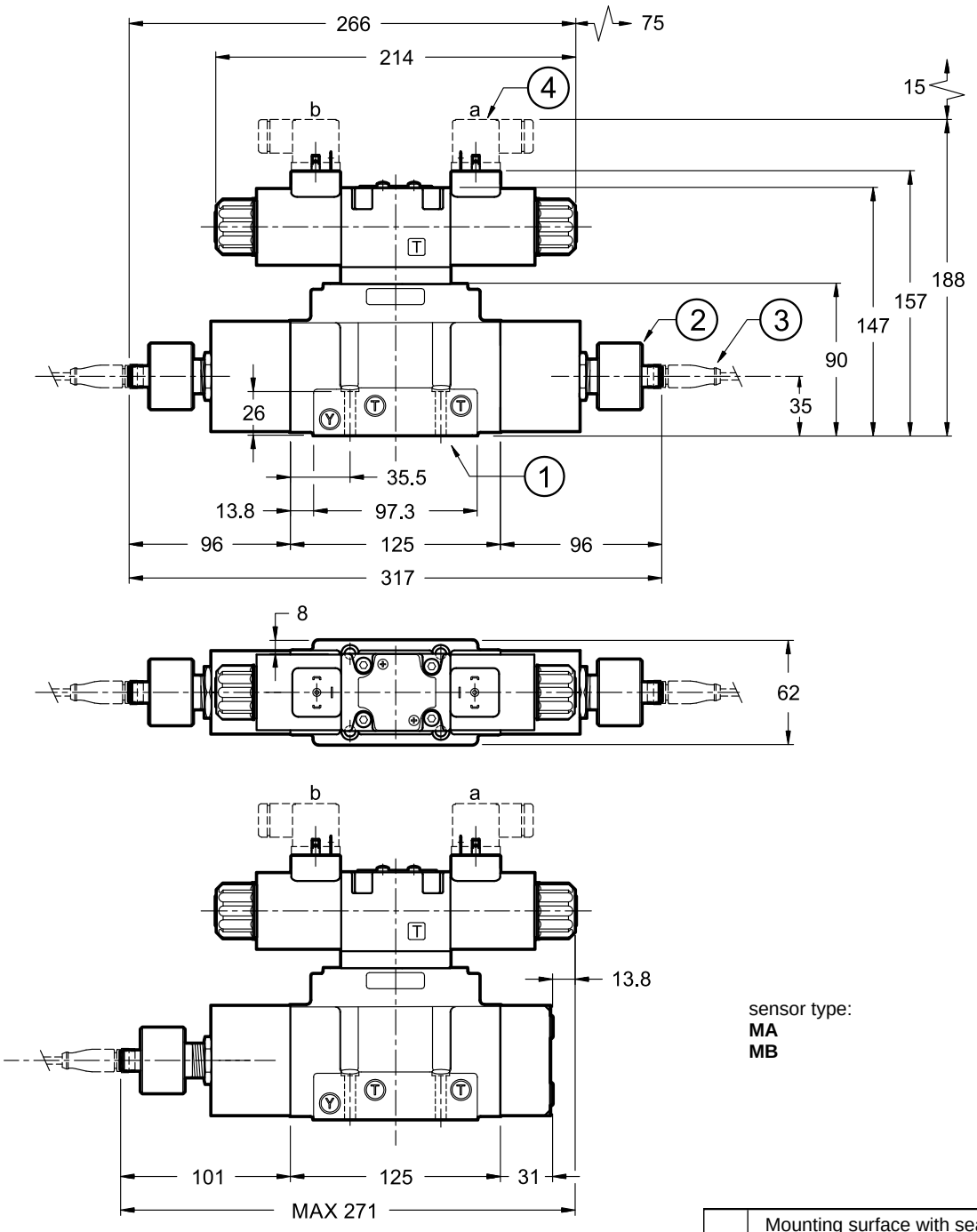
dimensions in mm



1	Mounting surface with sealing rings 5 OR type 2050 (12.42x1.78) - 90 Shore 2 OR type 2037 (9.25x1.78) - 90 Shore
2	Position sensor: set and sealed at factory. Do not tamper.
3	Connector for position sensor, type straight, moulded. To be ordered separately, see p. 20
4	Coil electric connector EN 175301-803 (ex DIN 43650) type. To be ordered separately see cat. 49 000

dimensions in mm

DSP5M-RK
DSP5RM-RK



sensor type:
MAB

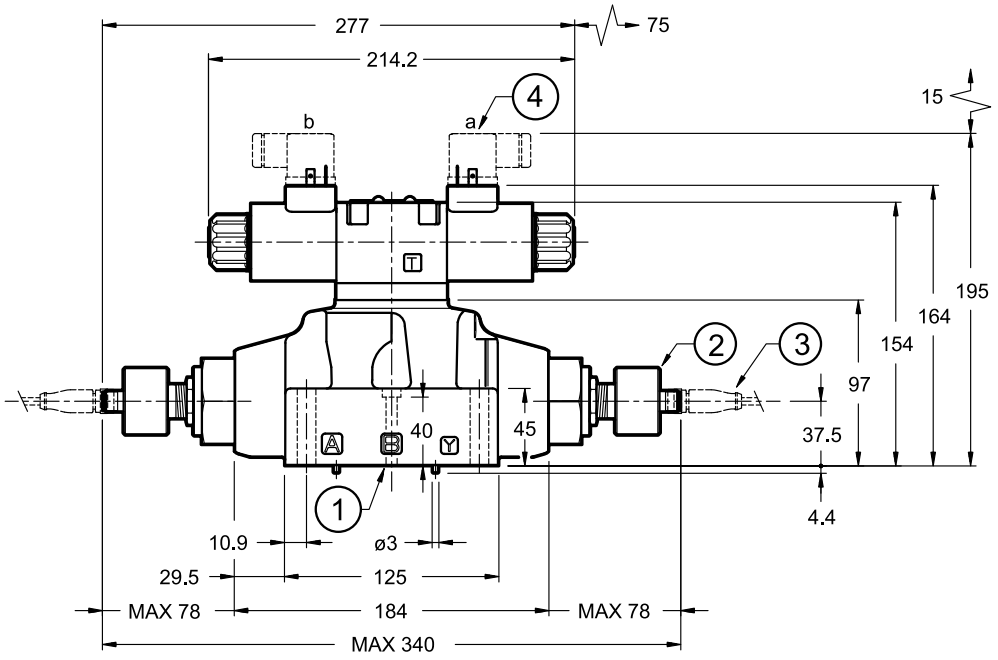
sensor type:
MA
MB

1	Mounting surface with sealing rings 5 OR type 2050 (12.42x1.78) - 90 Shore 2 OR type 2037 (9.25x1.78) - 90 Shore
2	Position sensor: set and sealed at factory. Do not tamper.
3	Connector for position sensor, type straight, moulded. To be ordered separately, see p. 20
4	Coil electric connector EN 175301-803 (ex DIN 43650) type. To be ordered separately see cat. 49 000

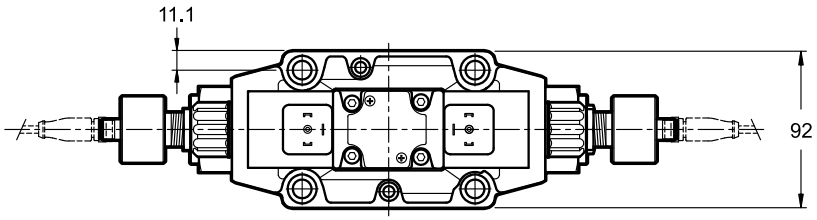
12 - DSP7M OVERALL AND MOUNTING DIMENSIONS

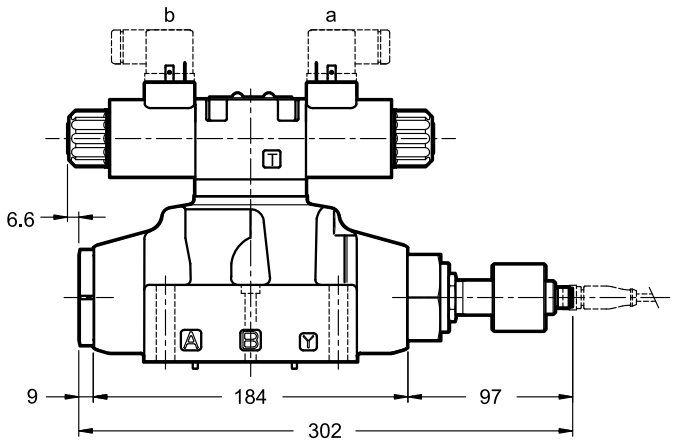
DSP7M-S*

dimensions in mm



sensor type:
M0
MAB





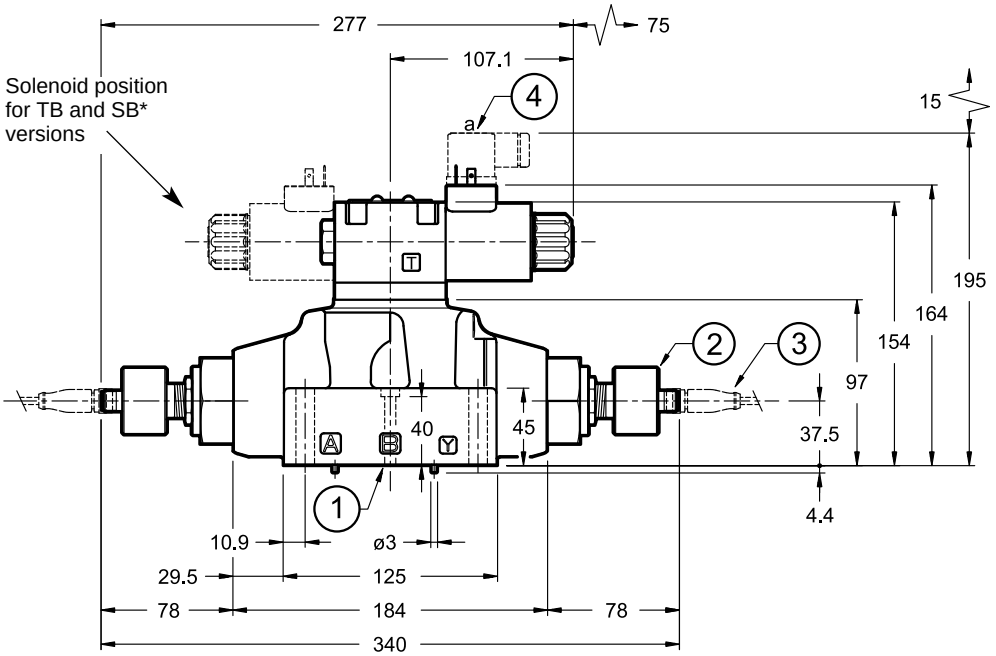
sensor type:
R0

Valve fastening:	4 SHC screws ISO 4762 M10x60 2 SHC screws ISO 4762 M6x50
Tightening torque:	M10x60: 40 Nm M6x50: 8 Nm
Threads of mounting holes: M6x18; M10x18	

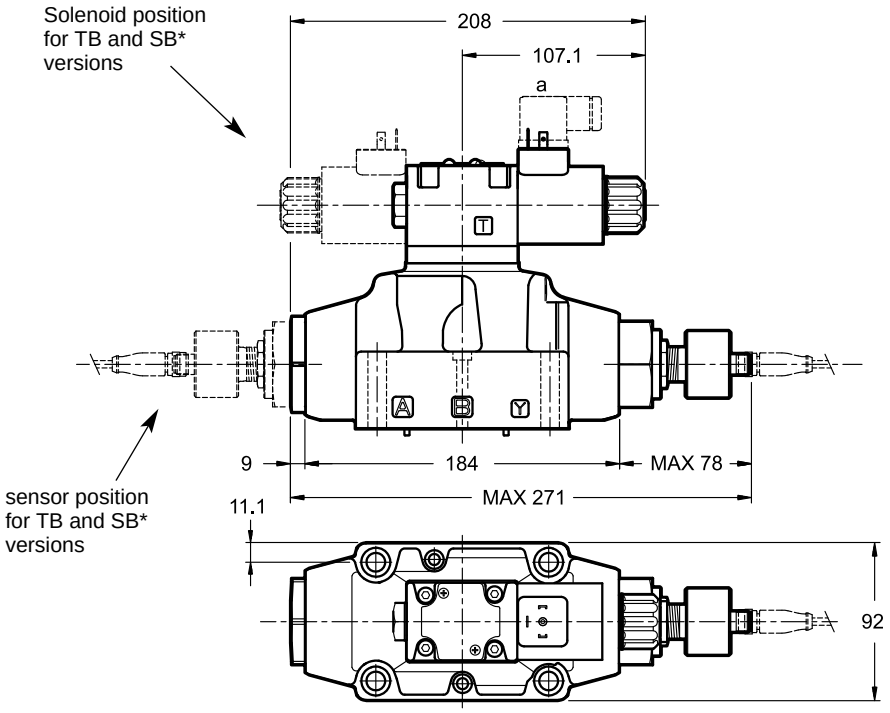
1	Mounting surface with sealing rings. 4 OR type 130 (22.22x2.62) - 90 Shore 2 OR type 2043 (10.82x1.78) - 90 Shore
2	Position sensor: set and sealed at factory. Do not tamper.
3	Connector for position sensor, type straight, moulded. To be ordered separately, see p. 20
4	Coil electric connector EN 175301-803 (ex DIN 43650) type. To be ordered separately see cat. 49 000

DSP7M-TA, TA100, SA1

dimensions in mm



sensor type:
MAB

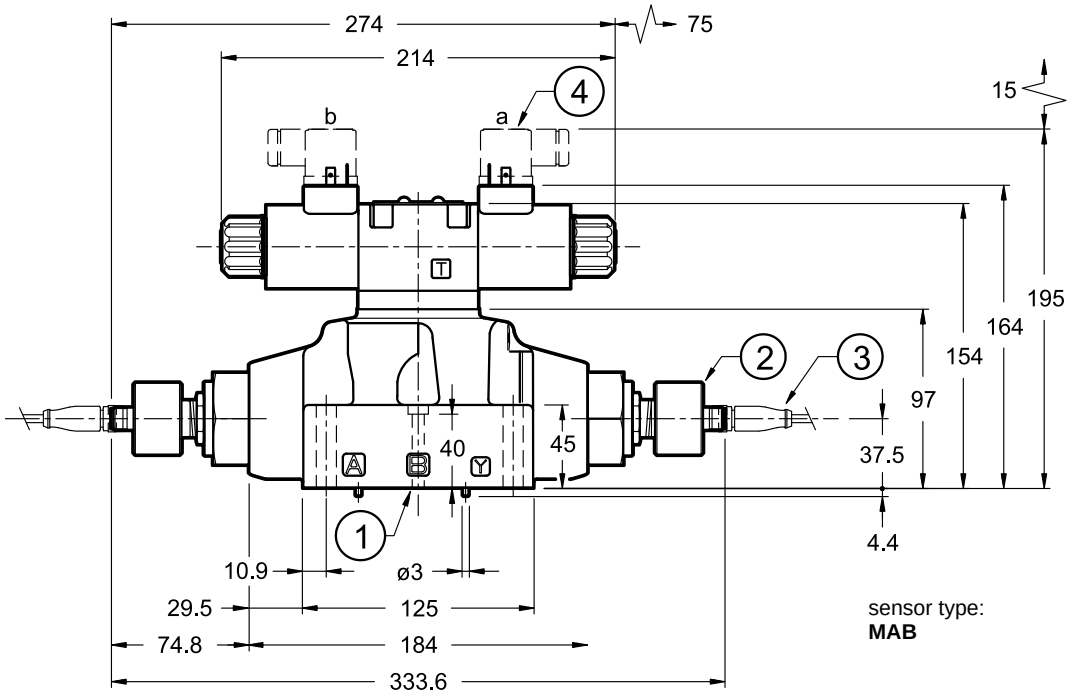


sensor type:
MA
MB

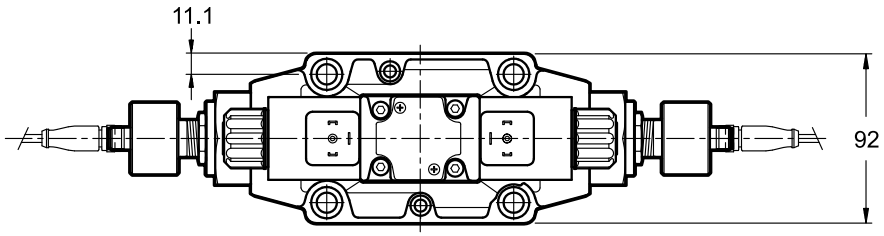
1	Mounting surface with sealing rings. 4 OR type 130 (22.22x2.62) - 90 Shore 2 OR type 2043 (10.82x1.78) - 90 Shore
2	Position sensor: set and sealed at factory. Do not tamper.
3	Connector for position sensor, type straight, moulded. To be ordered separately, see p. 20
4	Coil electric connector EN 175301-803 (ex DIN 43650) type. To be ordered separately see cat. 49 000

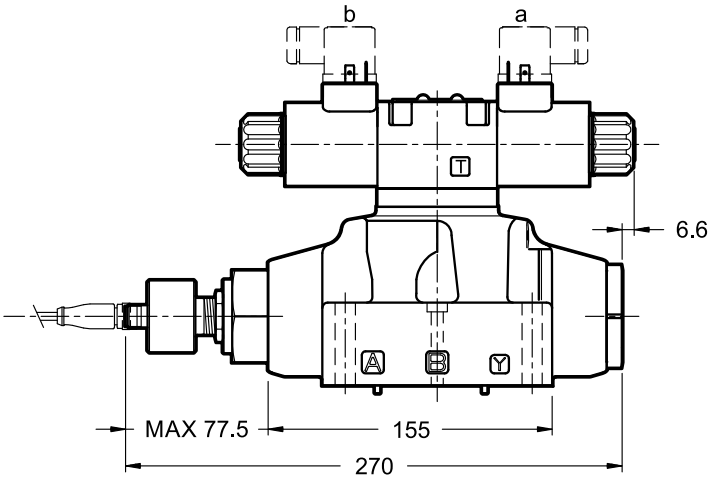
dimensions in mm

DSP7M-RK



sensor type:
MAB





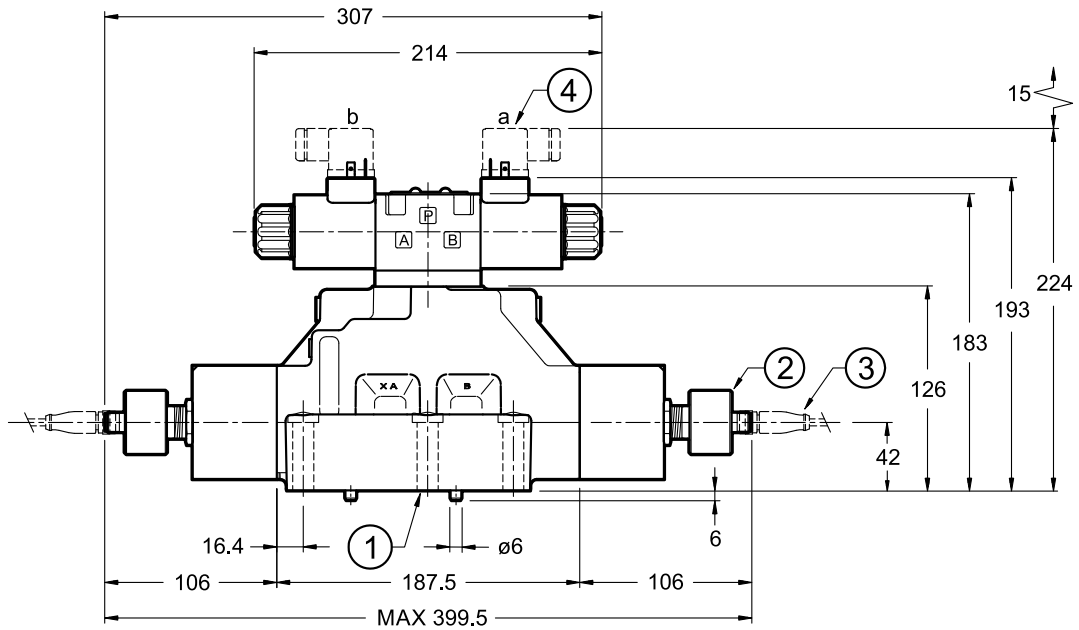
sensor type:
MA
MB

1	Mounting surface with sealing rings. 4 OR type 130 (22.22x2.62) - 90 Shore 2 OR type 2043 (10.82x1.78) - 90 Shore
2	Position sensor: set and sealed at factory. Do not tamper.
3	Connector for position sensor, type straight, moulded. To be ordered separately, see p. 20
4	Coil electric connector EN 175301-803 (ex DIN 43650) type. To be ordered separately see cat. 49 000

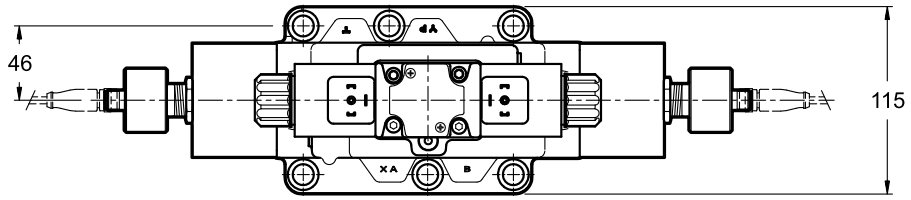
13 - DSP8M OVERALL AND MOUNTING DIMENSIONS

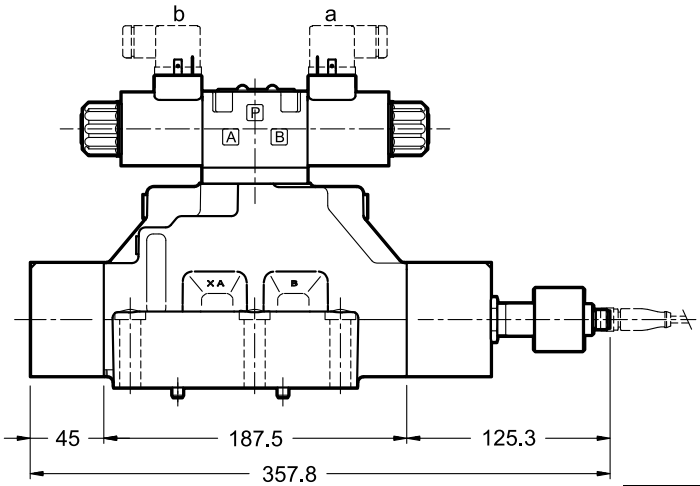
dimensions in mm

DSP8M-S*



sensor type:
M0
MAB





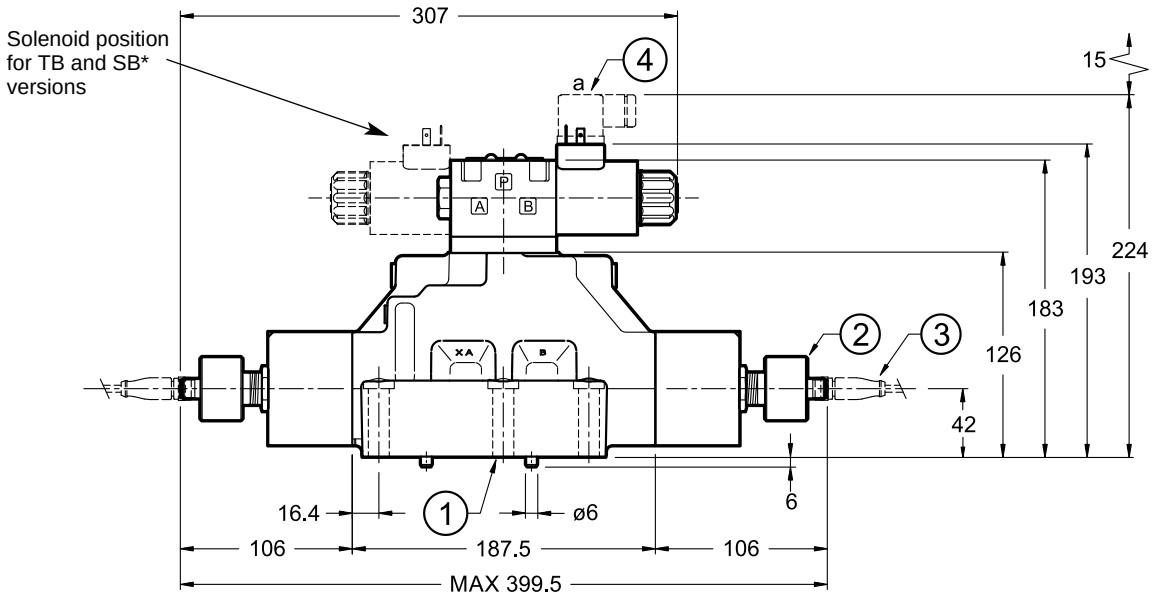
sensor type:
R0

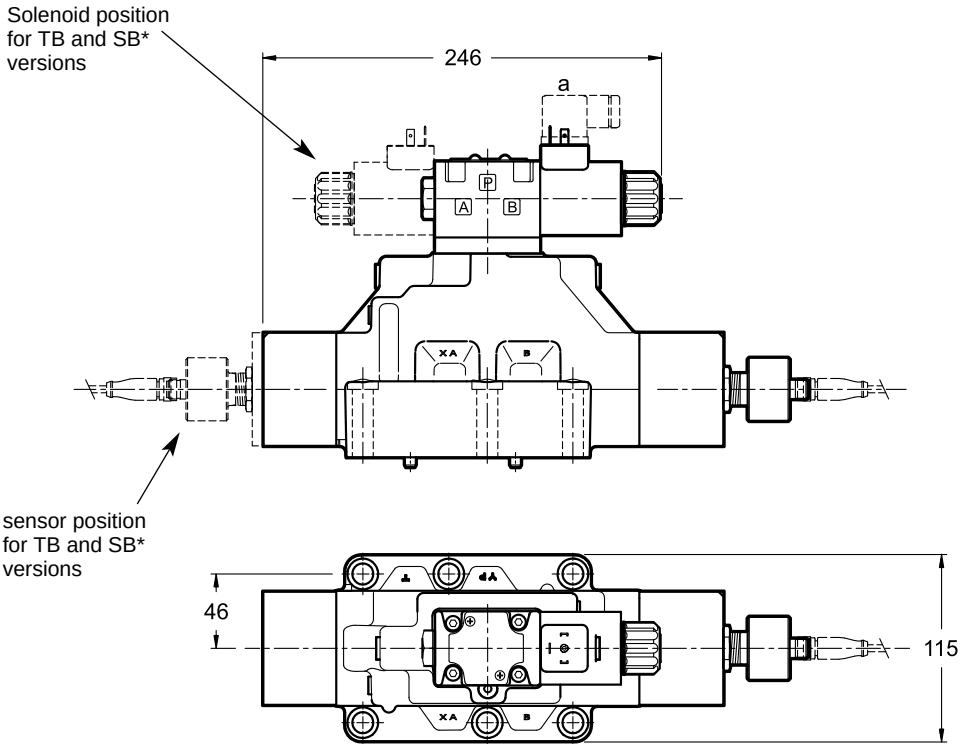
1	Mounting surface with sealing rings. 4 OR type 3131 (32.99x2.62) - 90 Shore 2 OR type 3087 (21.89x2.62) - 90 Shore
2	Position sensor: set and sealed at factory. Do not tamper.
3	Connector for position sensor, type straight, moulded. To be ordered separately, see p. 20
4	Coil electric connector EN 175301-803 (ex DIN 43650) type. To be ordered separately see cat. 49 000

Valve fastening: 6 SHC screws ISO 4762 M12x60
Tightening torque: 69 Nm (A 8.8 bolts)
Threads of mounting holes: M12x20

DSP8M-TA, TA100, SA1

dimensions in mm

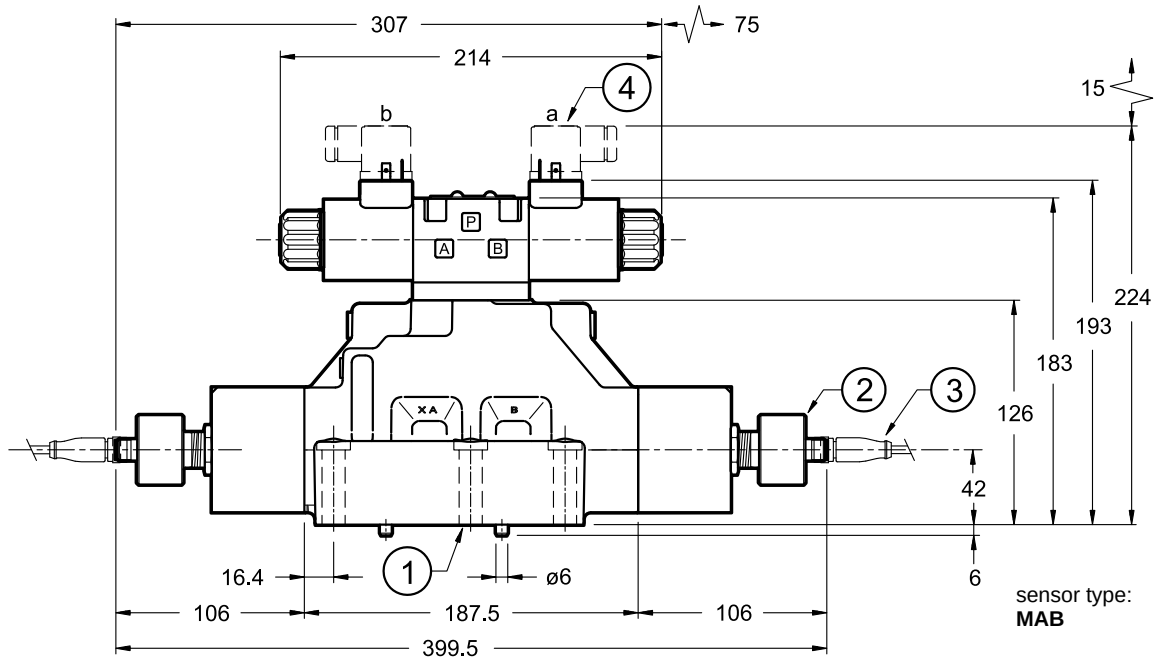




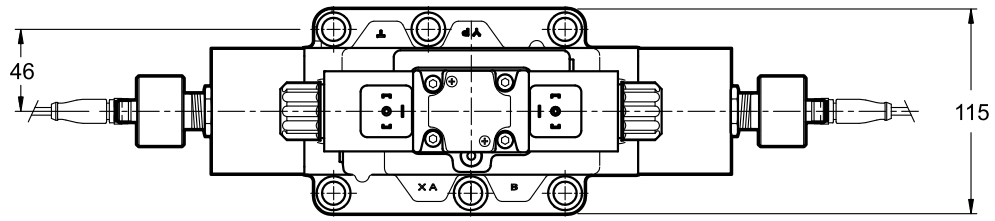
1	Mounting surface with sealing rings. 4 OR type 3131 (32.99x2.62) - 90 Shore 2 OR type 3087 (21.89x2.62) - 90 Shore
2	Position sensor: set and sealed at factory. Do not tamper.
3	Connector for position sensor, type straight, moulded. To be ordered separately, see p. 20
4	Coil electric connector EN 175301-803 (ex DIN 43650) type. To be ordered separately see cat. 49 000

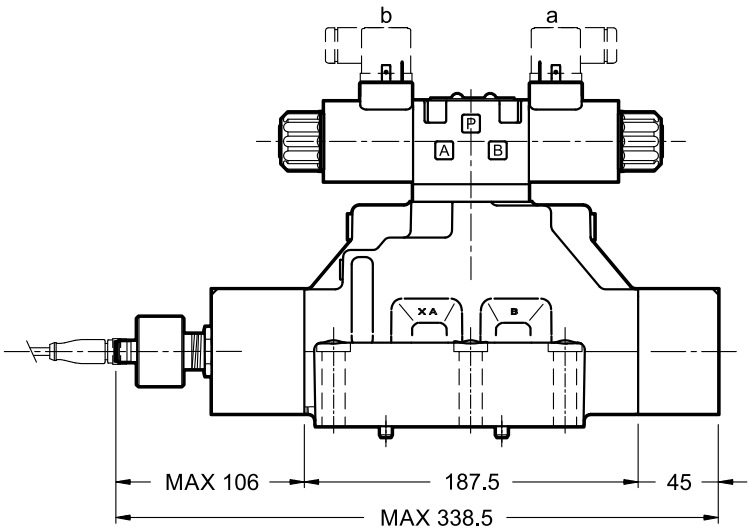
DSP8M-RK

dimensions in mm



sensor type:
MAB





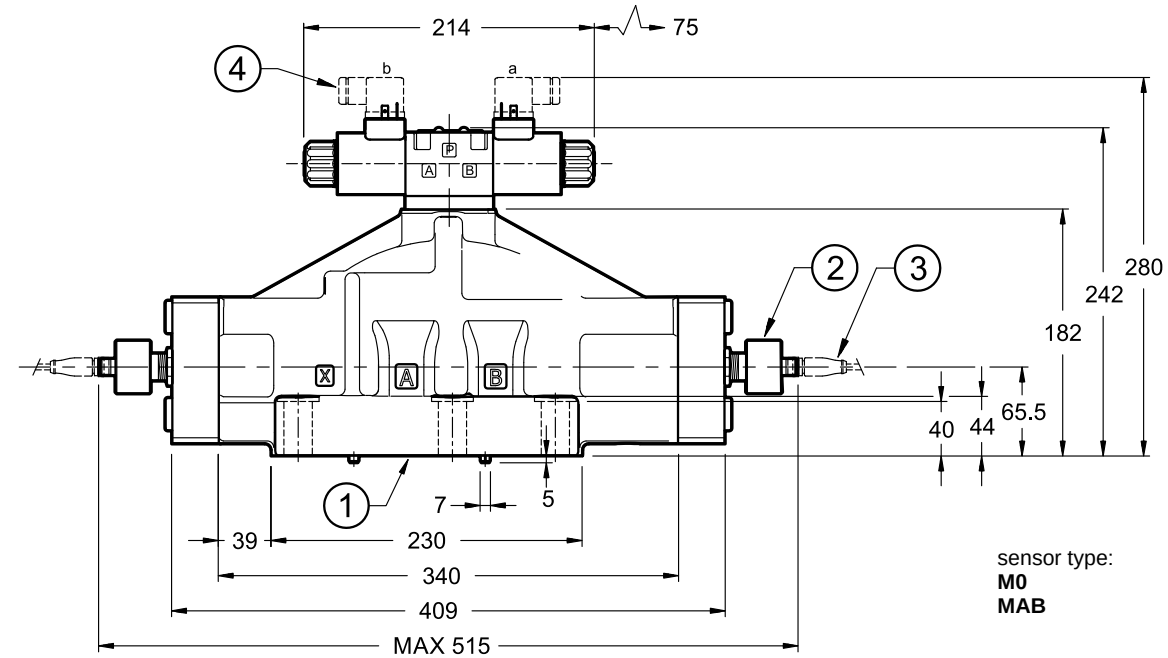
sensor type:
MA
MB

1	Mounting surface with sealing rings. 4 OR type 3131 (32.99x2.62) - 90 Shore 2 OR type 3087 (21.89x2.62) - 90 Shore
2	Position sensor: set and sealed at factory. Do not tamper.
3	Connector for position sensor, type straight, moulded. To be ordered separately, see p. 20
4	Coil electric connector EN 175301-803 (ex DIN 43650) type To be ordered separately see cat. 49 000

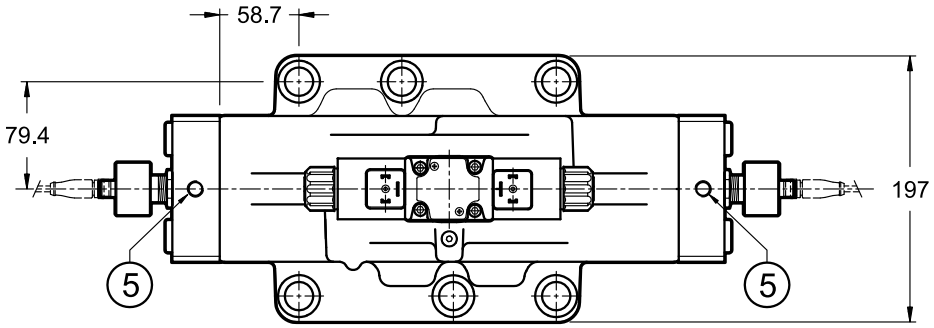
14 - DSP10M OVERALL AND MOUNTING DIMENSIONS

DSP10M-S*

dimensions in mm



sensor type:
M0
MAB

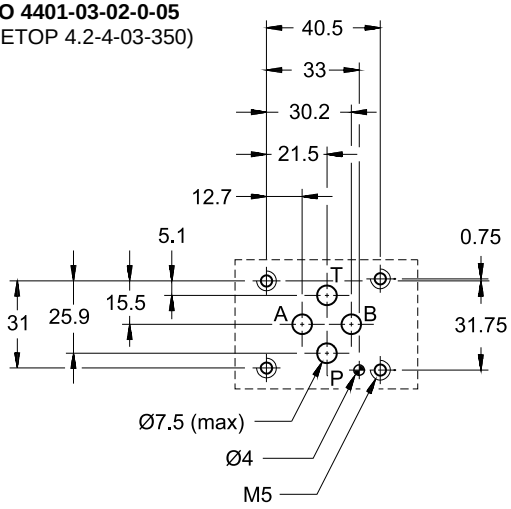


1	Mounting surface with sealing rings. 4 OR type 4162 (40.86x3.53) - 90 shore 2 OR type 3081 (20.24x2.62) - 90 shore
2	Position sensor: setting sealed at factory. Do not tamper.
3	Connector for position sensor, type straight, moulded. To be ordered separately, see p. 20
4	Coil connector EN 175301-803 (ex DIN 43650) type. - To be ordered separately - see cat. 49 000
5	M12 eyebolt seat for safe lift

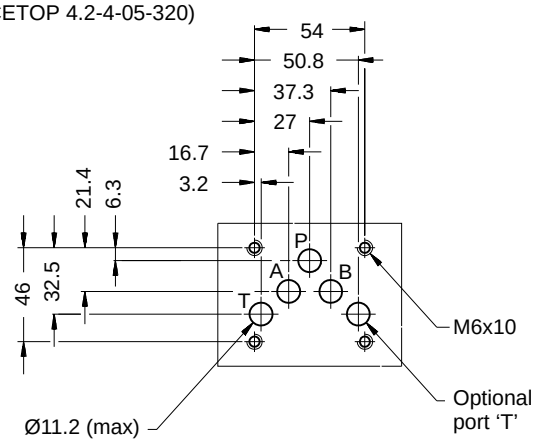
Valve fastening: 6 SHC screws ISO 4762 M20x70 (supplied)
Tightening torque: 470 Nm (A10.9 screws)
Threads of mounting holes: M20x40

15 - MOUNTING SURFACES

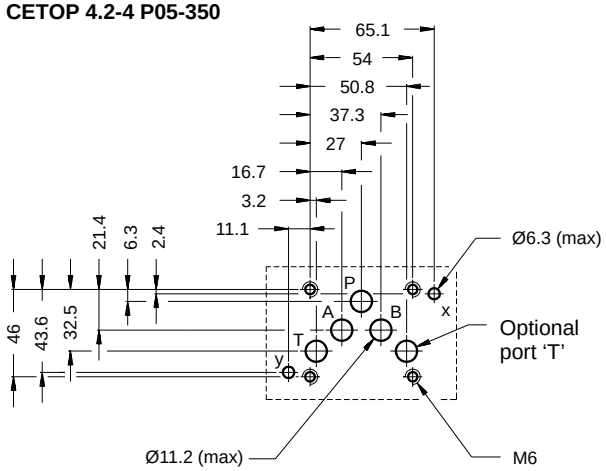
DS3M
ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)



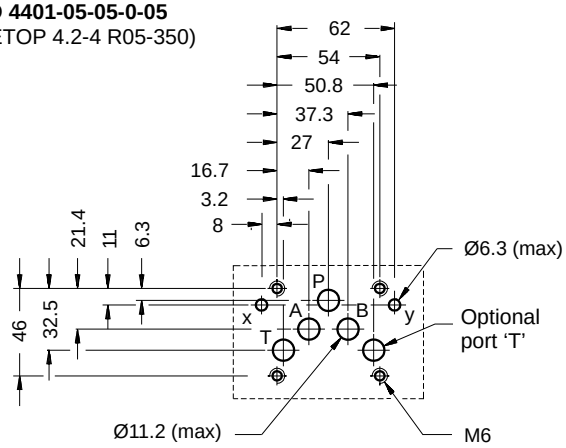
DS5M
ISO 4401-05-04-0-05
(CETOP 4.2-4-05-320)



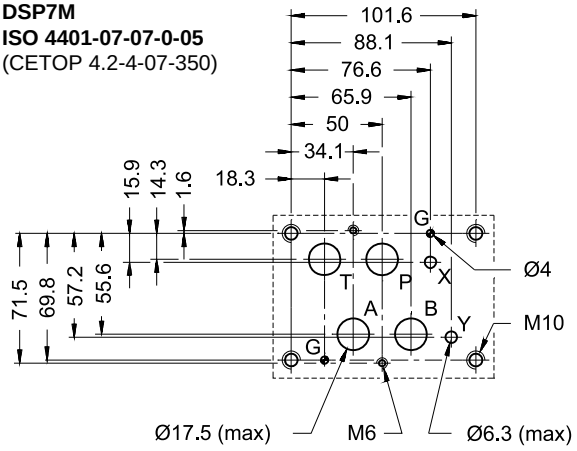
DSP5M
CETOP 4.2-4 P05-350



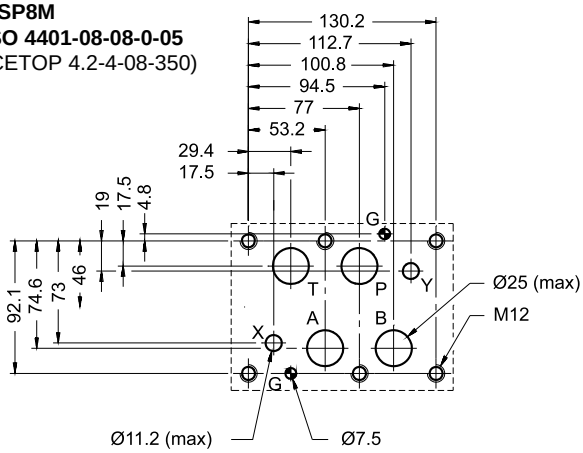
DSP5RM
ISO 4401-05-05-0-05
(CETOP 4.2-4 R05-350)



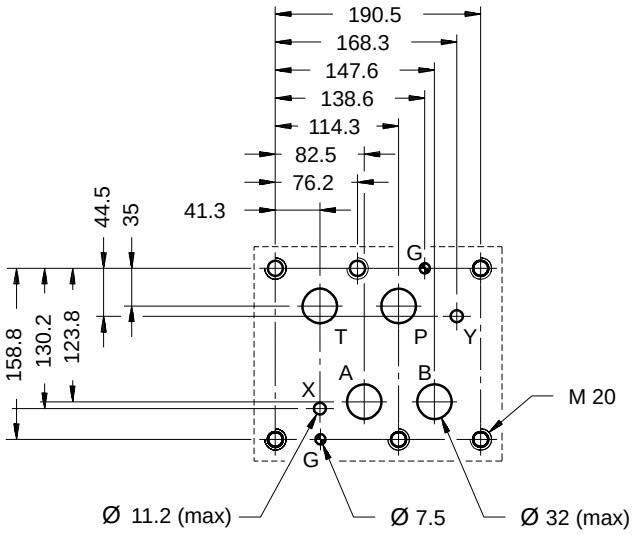
DSP7M
ISO 4401-07-07-0-05
(CETOP 4.2-4-07-350)



DSP8M
ISO 4401-08-08-0-05
(CETOP 4.2-4-08-350)



DSP10M
ISO 4401-10-09-0-05
(CETOP 4.2-4-10-350)

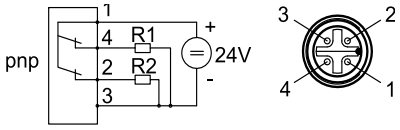


16 - POSITION SENSORS

WARNING! Disassembly of the valve is not permitted. The sensors must not be unscrewed or otherwise tampered with in any way.

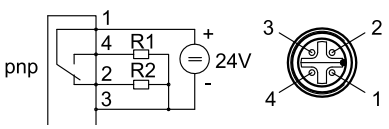
The M0 and MAB versions are equipped with two position sensors; the wiring diagram shown must be applied to each sensor.

R0 CONNECTION SCHEME



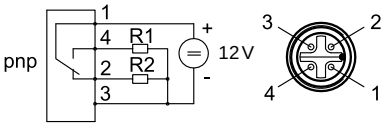
Pin	Values	Function
1	+24 V	Supply
2	NC	Normal Closed -
3	0 V	-
4	NC	Normal Closed +

M* CONNECTION SCHEME



Pin	Values	Function
1	+24 V	Supply
2	NC	Normal Closed
3	0 V	-
4	NO	Normal Open

M*12 CONNECTION SCHEME



Pin	Values	Function
1	+12 V	Supply
2	NC	Normal Closed
3	0 V	-
4	NO	Normal Open

ELECTRICAL CHARACTERISTICS		
Operating voltage range 24 V DC 12 V DC	V DC	 20 ÷ 32 10.5 ÷ 16
Absorbed current	A	0.4
Max output load	mA	400
Output		2 PNP
Electric protections		polarity inversion short circuit
Hysteresis	mm	≤ 0.1
Operating temperature range	°C	-25 / +80
Class of protection from atmospheric agents (IEC 60529)		IP65
EMC Electromagnetic compatibility		In compliance with 2014/30/EU

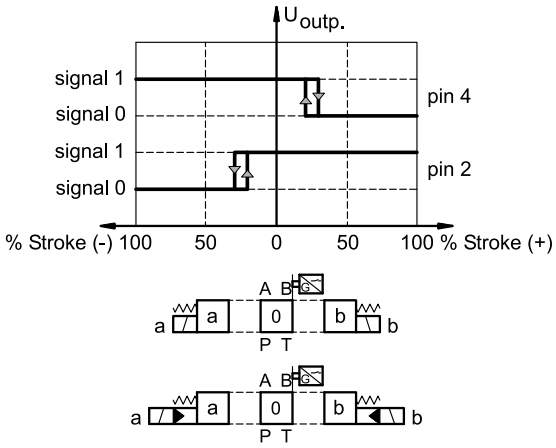
17 - SWITCHING LOGICS

Duplomatic offers a wide range of position monitoring options. For pilot-operated valves, monitoring with a redundant signal is also available.

17.1 - R0 monitoring

Central position monitored by one position sensor.

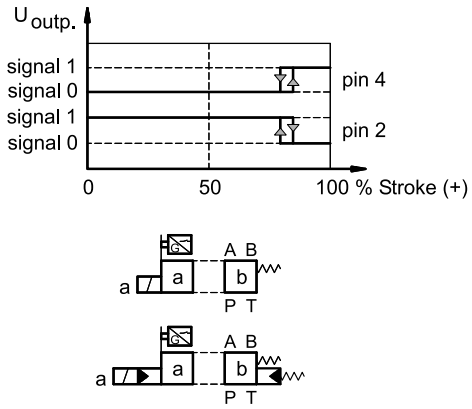
Available on both direct and pilot operated valves;
spool type S*



17.2 - MA monitoring

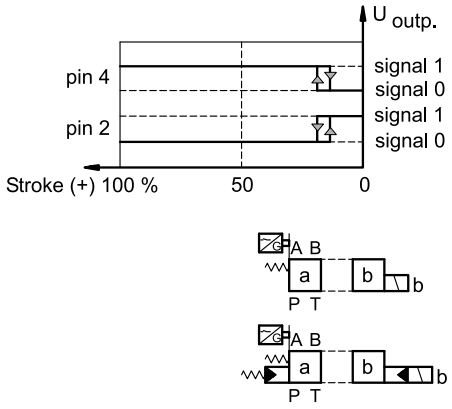
Energized position monitored by one position sensor.

Available on both direct and pilot operated valves;
spool type SA*, TA, TA02, TA100



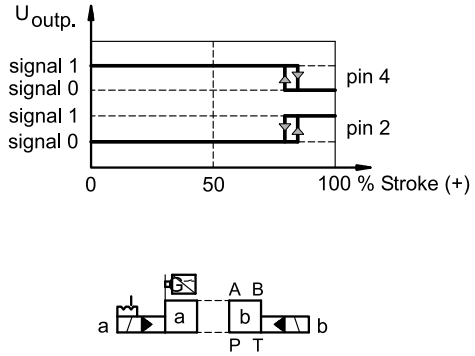
De-energized position monitored by one position sensor.

Available on both direct and pilot operated valves;
spool type SB*, TB, TB02, TB100



Position ‘a’ monitored by one position sensor.

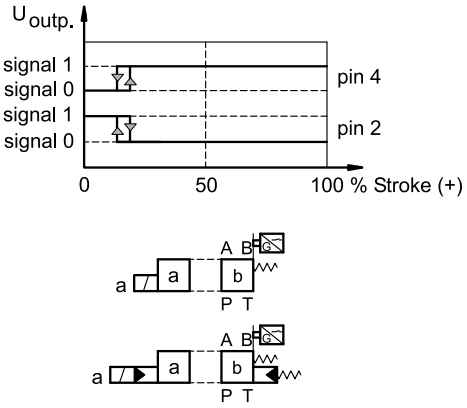
Available on pilot operated valves only;
spool type RK



17.3 - MB monitoring

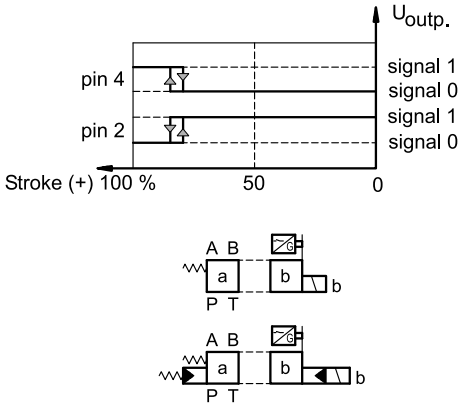
De-energized position monitored by one position sensor.

Available on both direct and pilot operated valves;
spool type SA*, TA, TA02, TA100



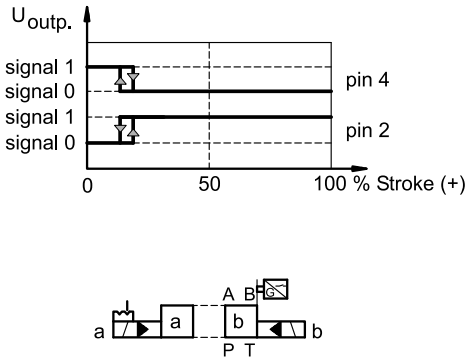
Energized position monitored by one position sensor.

Available on both direct and pilot operated valves;
spool type SB*, TB, TB02, TB100



Position ‘b’ monitored with one position sensor.

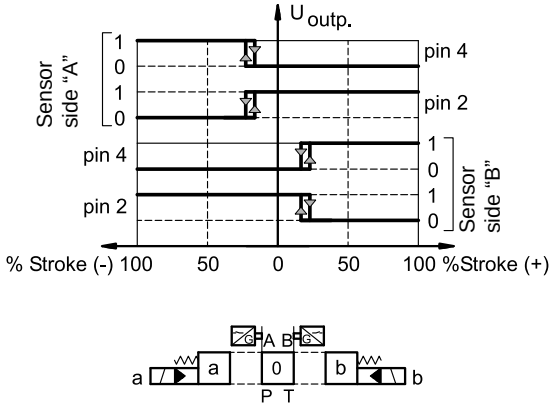
Available on pilot operated valves only;
spool type RK



17.4 - M0 monitoring

Central position monitored by two separate position sensors.

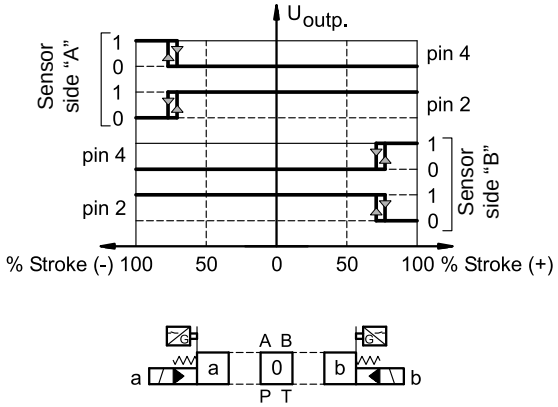
Available on pilot operated valves only;
spool type S*



17.5 - MAB monitoring

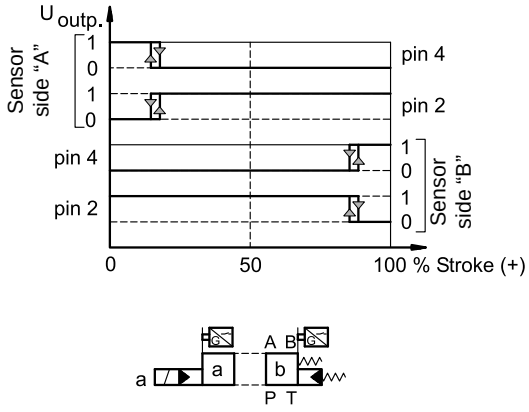
Both external positions monitored by two separate position sensors.

Available on pilot operated valves only;
spool type S*



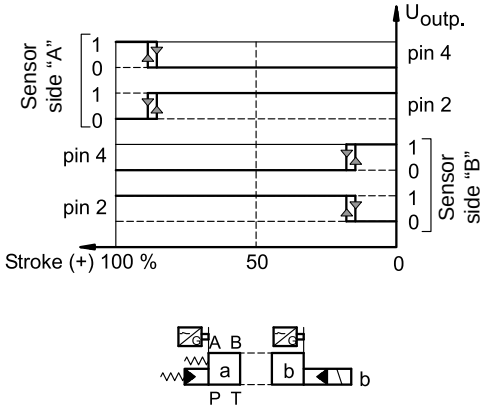
De-energized position monitored on side A.
Energized position monitored on side B.

Available on pilot operated valves only;
spool type SA1, TA, TA100



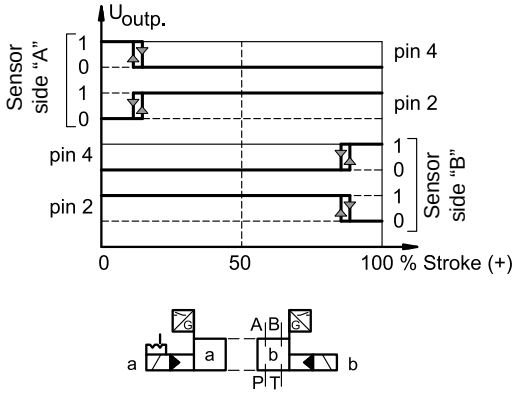
Energized position monitored on side A.
De-energized position monitored on side B.

Available on pilot operated valves only;
spool type SB1, TB, TB100



Energized position monitored.

Available on pilot operated valves only;
spool type RK



18 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

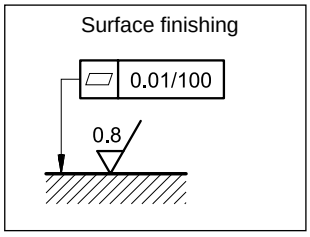
19 - INSTALLATION

WARNING ! These valves must be installed and commissioned by qualified personnel only. Before starting any installation, commissioning or maintenance is mandatory read the *manual of use and maintenance*, delivered together with the valve.

Configurations with centring and return springs can be mounted in any position; The RK versions, without springs and with mechanical detent, must be mounted with the longitudinal axis horizontal.

Valve fastening takes place by means of screws or tie rods, laying the valve on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing.

If the minimum values of planarity or smoothness are not met, fluid leakages between valve and mounting surface can easily occur.



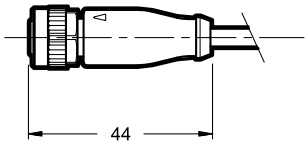
20 - SENSOR CONNECTORS

The female connectors for the position sensors can be ordered separately, according to the descriptions given below.The IP degree of protection indicated is valid only when the connector is correctly tightened onto the corresponding counterpart.

description: ECM4S/M12L/10/L5 code: 3491000008

right connector moulded cable pre-wired M12x1
4 poles, female, IP67, IP68, IP69K

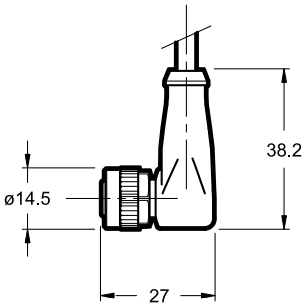
cable:	Ø 4.7 mm; lenght 5 mt;
conductor:	section 0.34 mm²
cable material	polyurethane resin (oil resistant)
LED	no



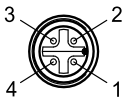
description : ECM4S/M12S/10/L5 code: 3491000009

angle connector pre-wired M12x1 with moulded cable
4 poles, female, IP67, IP68, IP69K

cable:	Ø 4.7 mm; lenght 5 mt;
conductor:	section 0.34 mm²
cable material	polyurethane resin (oil resistant)
LED	no



Wire colours for connectors ECM4*

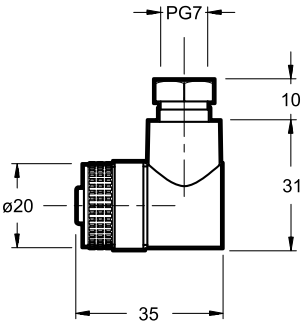


1	BN	brown
2	WH	white
3	BU	blue
4	Bk	black

description : EC4S/M12S/10 code: 3491001002

circular connector M12 with screw locking, angular, to wire.
4 poles, female, IP67

ref. norm:	IEC 61076-2-101 (Ed. 1) / IEC 60947-5-2
cable gland:	PG7
cable:	Ø 4 ÷ 6 mm
conductors:	max 0.75 mm²
contacts:	screw
Case material	polyamide (nylon)
LED	no



21 - SUBPLATES

(see catalogue 51 000)

	DS3M	DS5M	DSP5M	DSP7M	DSP8M
Type with rear ports	PMMD-AI3G	PMD4-AI4G	PME4-AI5G	PME07-AI6G	-
Type with side ports	PMMD-AL3G	PMD4-AL4G	PME4-AL5G	PME07-AL6G	PME5-AL8G
P, T, A, B ports dimensions	3/8” BSP	3/4” BSP (PMD4-AI4G) 1/2” BSP (PMD4-AL4G)	3/4” BSP	1” BSP	1 ½” BSP
X, Y ports dimensions	-	-	1/4” BSP	1/4” BSP	1/4” BSP

DUPLOMATIC MOTION SOLUTIONS
a member of DAIKIN group

DUPLOMATIC MS Spa
via Mario Re Depaolini, 24 | 20015 Parabiago (MI) | Italy
T +39 0331 895111 | E vendite.ita@duplomatic.com | sales.exp@duplomatic.com
duplomaticmotionsolutions.com

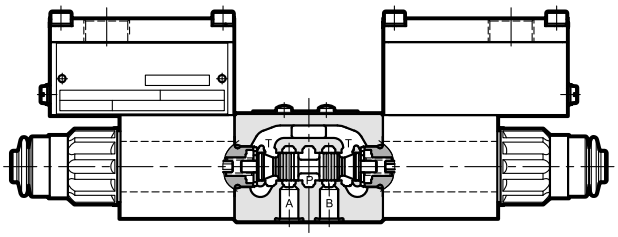
REPRODUCTION IS FORBIDDEN. THE COMPANY RESERVES THE RIGHT TO APPLY ANY MODIFICATIONS.



D*K*
EXPLOSION-PROOF DIRECTIONAL SOLENOID VALVES ATEX, IECEx, PESO

DS3K*	**ISO 4401-03**
DL5BK*	**ISO 4401-05**
DSP5K*	**CETOP P05**
DSP5RK*	**ISO 4401-05**
DSP7K*	**ISO 4401-07**
DSP8K*	**ISO 4401-08**
DSP10K*	**ISO 4401-10**

OPERATING PRINCIPLE



— The direct operated valves are available in ISO 4401-03 and ISO 4401-05 size. The pilot operated valves are available in CETOP P05, ISO 4401-05, ISO 4401-07, ISO 4401-08 and ISO 4401-10 size.

— The valves are compliant with ATEX, IECEx or PESO requirements. They are suitable for use in potentially explosive atmospheres, for surface plants or mines.

— A low temperature version (up to -40 °C) is also available.

— DS3K* and DL5BK* valves are supplied with a zinc-nickel finishing surface treatment that ensures a salt spray resistance up to 600h. This treatment is available upon request for DSP*K* valves.

— Details for classification, operating temperatures and electrical characteristics are in the technical data sheet 02 500 'Explosion proof classification'.

PERFORMANCES
(obtained with mineral oil with viscosity of 36 cSt at 50°C)

		DS3K*	DL5BK*	DSP5K* DSP5RK*	DSP7K*	DSP8K*	DSP10K*
Maximum operating pressure P - A - B ports T port	bar	350 210	320 210	350	350 see operating limits at point 7	350	350
Maximum flow from P port to A - B - T	l/min	80	125	150	300	600	1100
Operating temperatures (ambient and fluid)	°C	see data sheet 02 500					
Fluid viscosity range	cSt	10 ÷ 400					
Fluid contamination degree		according to ISO 4406:1999 class 20/18/15					
Recommended viscosity	cSt	25					
Mass single solenoid valve double solenoid valve	kg	1.8 3	2.7 3.8	6.2 7.2	8.6 9.8	14.4 15.4	41.9 43.1

1 - IDENTIFICATION OF DIRECT OPERATED SOLENOID VALVES

D			-		/	10		-		K9		/		

Direct operated solenoid valve

Size:
S3 = ISO 4401-03
L5B = ISO 4401-05

Explosion-proof certification:
See table 1.1

Spool type (see p. 1.2)

S*	**TA**	**TB**	**RK**
SA*	**TA02**	**TB02**	
SB*	**TA23**	**TB23**	

Series No.:
(the overall and mounting dimensions do not change from 10 to 19)

Seals:
For temperature range -20 / +80 °C
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

For temperature range -40 / +80 °C
NL = seal for low temperatures (for mineral oil)

Power supply:
Direct current (DC)
D12 = 12 V
D24 = 24 V
D48 = 48 V
D110 = 110 V
Alternate current with built-in rectifier bridge (RAC)
R120 = 120 V
R240 = 240 V

Coil electrical connection: junction box

Connection type for cable gland
upper connection:
T01 = M20x1.5 - ISO 261
T02 = Gk 1/2 - UNI EN 10226-2
T03 = 1/2" NPT - ANSI B1.20.1 (ex ANSI B2.1)
side connection:
S01 = M20x1.5 - ISO 261
S02 = Gk 1/2 - UNI EN 10226-2
S03 = 1/2" NPT - ANSI B1.20.1 (ex ANSI B2.1)
S04 = M16x1.5 - ISO 261

Manual override:
CM = boot protected
standard for both N and V seals
not available for NL seals
CB = blind ring nut
standard for NL seals
available upon request for both N and V seals
CK1 = knob manual override
(DC version only)
CH = lever manual override.
not available for DL5BK*
Dimensions for CB and CH at p. 18

Option: **/T5**
version in T5 temperature class.
Omit if not required.

NOTE: Valves are supplied with zinc-nickel surface treatment, that is suitable to ensure a salt spray resistance up to 600 h (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

Version with monobloc steel coil

Standard coils are made of zinc-nickel steel, with anodized aluminium junction box on it.

Monobloc coils **MD24K9S01** completely made of steel are available upon request. They have zinc-nickel treatment, power supply voltage D24 and cable gland connection type S01. Other variants for voltage and cable gland connection are available, always on request.

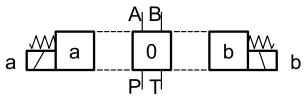
1.1 - Names of valves per certification

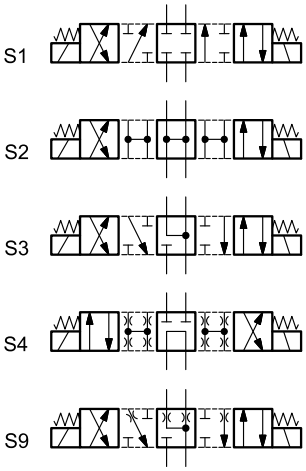
	ATEX		IECEx		PESO	
for gases for dusts	**KD2**	II 2GD	**KXD2**	IECEx Gb IECEx Db	**KPD2**	PESO Gb not applicable for dust
for mines	**KDM2**	I M2	**KXDM2**	IECEx Mb	not applicable for mines	

NOTE: Refer to the technical data sheet 02 500 for marking, operating temperatures and available versions.

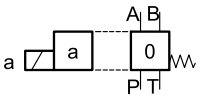
1.2 - Available spools

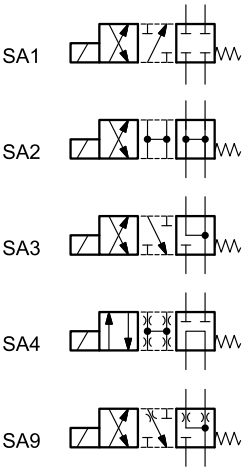
Version **S***:
2 solenoids - 3 positions
with spring centering



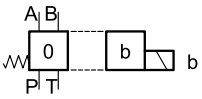


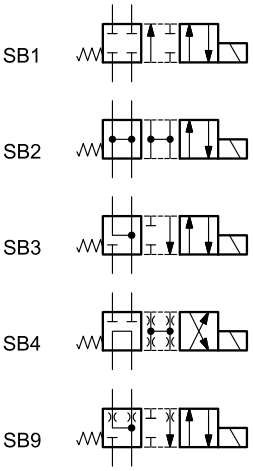
Version **SA***:
1 solenoid side A
2 positions (central + external)
with spring centering





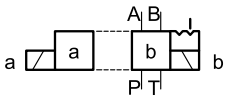
Version **SB***:
1 solenoid side B
2 positions (central + external)
with spring centering

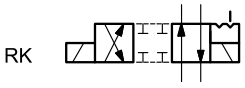




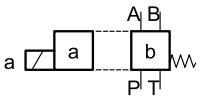
NOTE: S9, SA9 and SB9 spools are available for DS3K only.

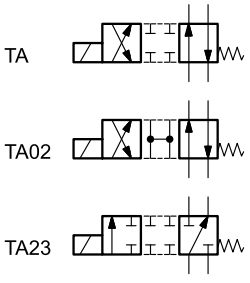
Version **RK**:
2 solenoids - 2 positions
with mechanical detent



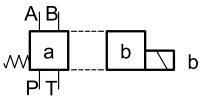


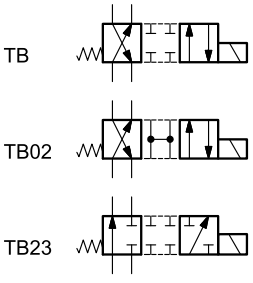
Version **TA**:
1 solenoid side A
2 external positions
with return spring





Version **TB**:
1 solenoid side B
2 external positions
with return spring





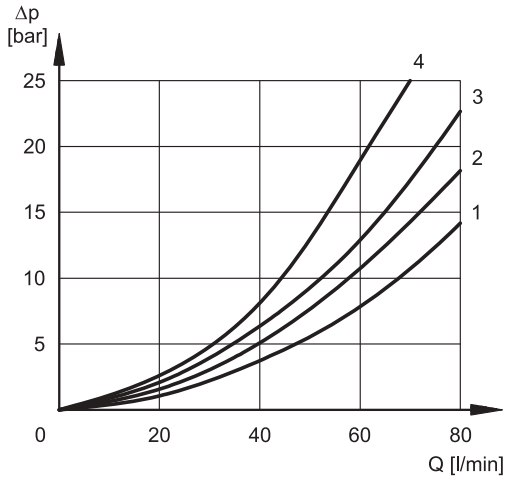
NOTE: TA02/TB02
spools are not available
for RAC solenoid valves.

2 - CHARACTERISTIC CURVES AND PERFORMANCES OF DIRECT OPERATED SOLENOID VALVES

2.1 - Pressure drops Δp-Q

(values obtained with viscosity 36 cSt at 50 °C)

DS3K*



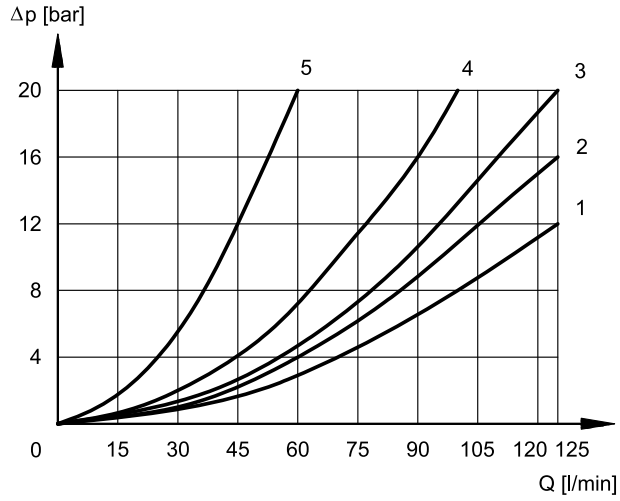
ENERGIZED VALVE

SPOOL	FLOW DIRECTION			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPH			
S1, SA1, SB2	2	2	3	3
S2, SA2, SB2	1	1	3	3
S3, SA3, SB3	3	3	1	1
S4, SA4, SB4	4	4	4	4
S9, SA9, SB9	2	2	3	3
TA, TB	3	3	3	3
TA02, TB02	2	2	2	2
TA23, TB23	3	3	-	-
RK	2	2	2	2

DE-ENERGIZED VALVE

SPOOL	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S2, SA2, SB2	-	-	-	-	2
S3, SA3, SB3	-	-	3	3	-
S4, SA4, SB4	-	-	-	-	3

DL5BK*



ENERGIZED VALVE

SPOOL	FLOW DIRECTIONS			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPHS			
S1	1	1	2	2
S2	1	1	1	1
S3	1	1	1	1
S4	4	4	4	4
RK	2	2	2	2
TA	2	2	3	3
TA02	2	2	1	1
TA23	3	3	-	-

DE-ENERGIZED VALVE

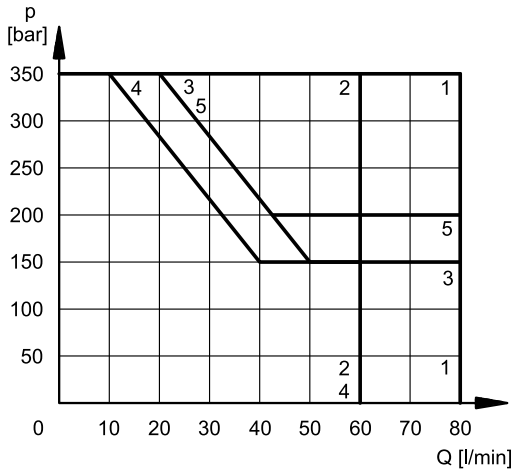
SPOOL	FLOW DIRECTIONS		
	A→T	B→T	P→T
	CURVES ON GRAPHS		
S2	-	-	1
S3	5	5	-
S4	-	-	1

2.2 - Performance limits

The curves define the flow rate operating fields according to the valve pressure of the different versions. The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage, with mineral oil with viscosity 36 cSt, temperature 50 °C and filtration according to ISO 4406:1999 class 18/16/13.

The operating limits can be considerably reduced if a 4-port valve operates as 3-port valve with port A or B plugged or without flow.

DS3K*



DC SOLENOID VALVE

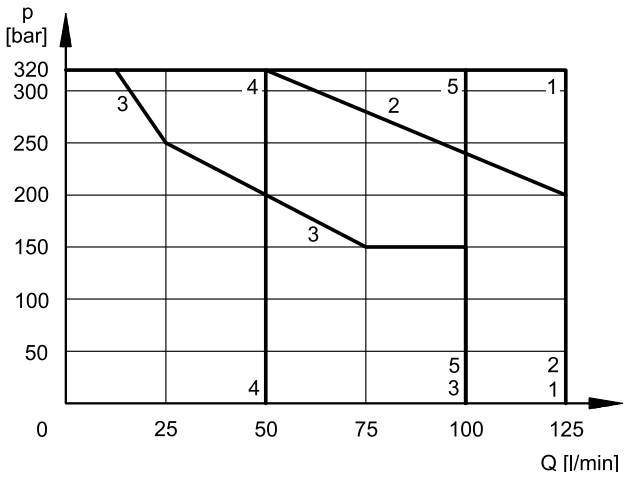
SPOOL	CURVE	
	P→A	P→B
S1,SA1,SB1	1	1
S2, SA2, SB2	2	2
S3, SA3, SB3	3	3
S4, SA4, SB4	2	2
S9, SA9, SB9	1	1
TA, TB	5	5
TA02, TB02	4	4
TA23, TB23	4	4
RK	1	1

RAC SOLENOID VALVE

SPOOL	CURVE	
	P→A	P→B
S1,SA1,SB1	1	1
S2, SA2, SB2	2	2
S3, SA3, SB3	3	3
S4, SA4, SB4	4	4
S9, SA9, SB9	1	1
TA, TB	4	4
TA02 *, TB02 *		
TA23, TB23	4	4
RK	1	1

* not available

DL5BK*



SPOOL	CURVE
S1, S2, RK	1
TA02	2
S3	3
S4	4
TA, TA23	5

2.3 - Switching times

The indicated values are obtained according to ISO 6403 standard, with mineral oil viscosity 36 cSt at 50°C.

	DS3K*		DL5BK*	
TIMES [ms]	ENERGIZING	DE-ENERGIZING	ENERGIZING	DE-ENERGIZING
DC	60	40	70 ÷ 100	15 ÷ 20
RAC	60	140	70 ÷ 100	140

3 - ELECTRICAL CHARACTERISTICS

(values ± 5%)

Coil type	Nominal voltage [V]	Resistance at 20°C [Ω]	Current consumpt. [A]	Power consumpt. [W]
D12	12	7,2	1,7	20
D24	24	28,7	0,83	20
D48	48	115	0,42	20
D110	110	549	0,2	22

Coil type (**NOTE**)	Nominal voltage [V]	Freq. [Hz]	Resistance at 20°C [Ω]	Current consumpt. [A]	Power consumpt. [VA]
R120	110V-50Hz 120V-60Hz	50/60	489,6	0,19	21
				0,21	25
R240	230V-50Hz 240V-60Hz		2067,7	0,098	22,5
				0,1	24

VOLTAGE SUPPLY FLUCTUATION (ripple included)	± 10% Vnom
MAX SWITCH ON FREQUENCY DS3K*, DL5BK* DSP5K*, DSP5RK* DSP7K* DSP8K* DSP10K*	 8.000 ins/hr 6.000 ins/hr 6.000 ins/hr 4.000 ins/hr 3.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2014/30/EU
CLASS OF PROTECTION: Atmospheric agents Coil insulation (VDE 0580)	 IP66/IP68 class H

NOTE: type R* coils are for alternating current supply for both 50 or 60 Hz. For R* coils the resistance can not be measured in the usual way because of the presence of diodes bridge inside the coil.

3.1 - Wiring

In order to realise the electrical connection of the coil, it is necessary to access the terminal block (1) unscrewing the 4 screws (2) that fasten the cover (3) with the box (4) that contains the terminal block.

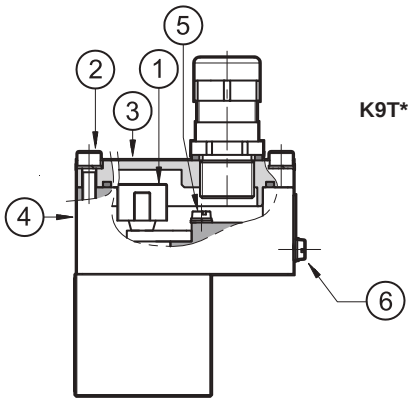
The electrical connection is polarity-independent.

By doing electrical connection it is important to connect also the grounding point (5) in the terminal block box (M4 screws), through suitable conductors with the general grounding line of the system.

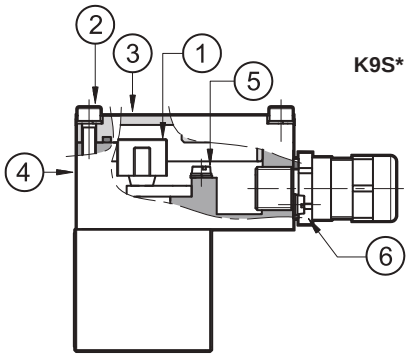
On the external body of the coil there is a grounding point (6) (M4 screw) that allow to ensure equipotentiality between the valve and the general grounding line of the system; connecting this point the regulation of the EN 13463-1 standard, that impose to verify the equipotentiality of the elements included in a potentially explosive environment (the maximum resistance between the elements must be 100 Ω), is guaranteed.

At the end of the electrical wiring, it is necessary to reassemble the cover (3) on the box (4), checking the correct positioning of the seal located in the cover seat and fastening the 4 M5 screws with a torque of 4.9÷6 Nm.

Electrical wiring must be done following in compliance with standards about protection against explosion hazards.



K9T*



K9S*

Characteristics of the cables connectable for wiring are indicated in the table below:

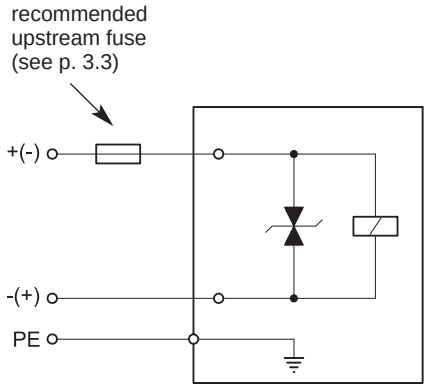
Function	Cable section
Operating voltage cables connection	max 2.5 mm²
Connection for internal grounding point	max 2.5 mm²
Connection for external equipotential grounding point	max 6 mm²

Cables for wiring must be non-armoured cables, with external covering sheath and must be suitable for use in environments with temperatures from - 20 °C to +110 °C (for valves either with N or V seals) or from - 40 °C to +110 °C (for valves with NL seals).

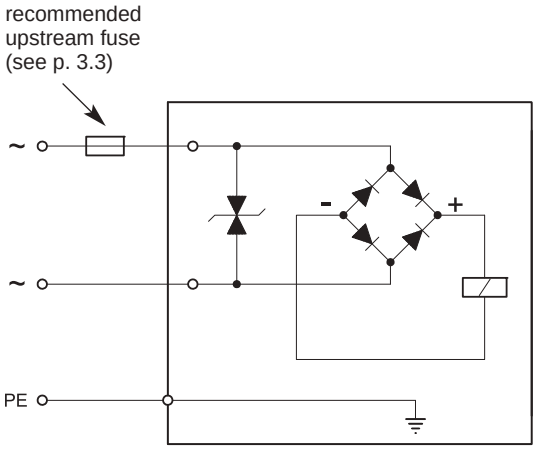
Cable glands (which must be ordered separately, see point 19) allow to use cables with external diameter between 8 and 10 mm.

3.2 - Electrical diagrams

DC coil



RAC coil



3.3 - Overcurrent fuse and switch-off voltage peak

Upstream of each valve, an appropriate fuse (max 3 x In according to IEC 60127) or a protective motor switch with short-circuit and thermal instantaneous tripping, as short-circuit protection, must be connected. The cut-off power of the fuse must correspond or exceed the short circuit current of the supply source. The breaking capacity of the fuse link shall be the same as or higher than the maximum short-circuit current expected to occur at the place of installation (normally 1500 A).

The fuse or the protective motor must be placed outside the dangerous area or they must be protected with an explosion-proof covering.

In order to safeguard the electronic device to which the valve is connected, there is a protection circuit in the coil, that reduces voltage peaks, which can occur when inductances are switched off.

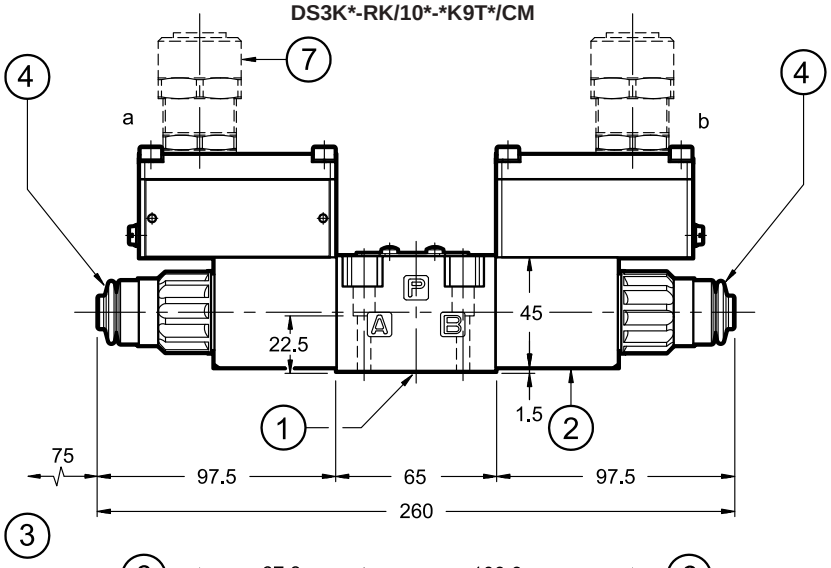
The table shows the type of fuse recommended according to the nominal voltage of the valve and to the value of the voltage peaks reduction.

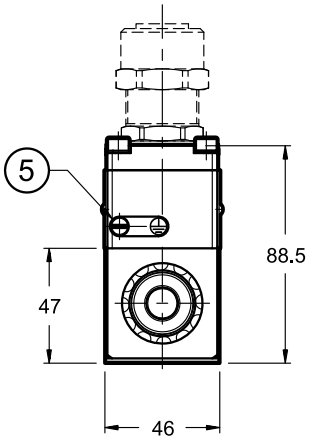
Coil type	Nominal voltage [V]	Rated current [A]	**Recommended pre-fuse characteristics medium time-lag according to DIN 41571 [A]**	Maximum voltage value upon switch off [V]	Suppressor circuit
D12	12	1,7	2,5	- 49	Transient voltage suppressor bidirectional
D24	24	0,83	1,25	- 49	
D48	48	0,42	0,6	- 81	
D110	110	0,2	0,3	- 309	
R120	120	0,21	0,3	- 3	
R240	240	0,1	0,15	- 3	

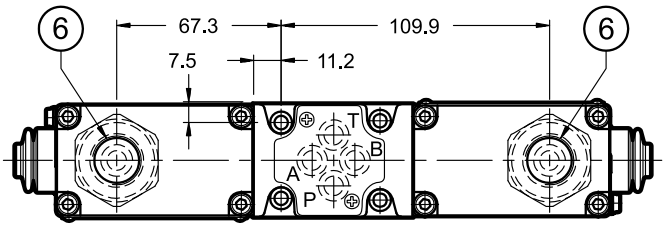
4 - OVERALL AND MOUNTING DIMENSIONS OF DIRECT OPERATED VALVES

dimensions in mm

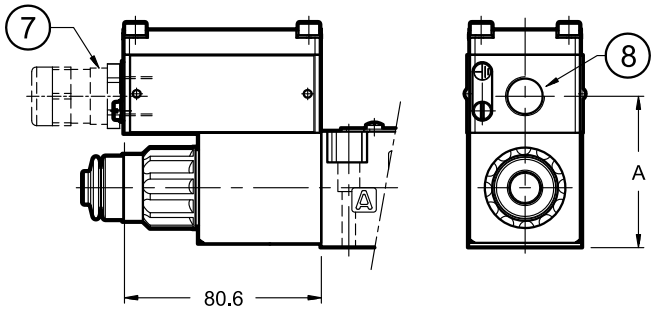
DS3K*-S*/10*-*K9T*/CM
DS3K*-RK/10*-*K9T*/CM





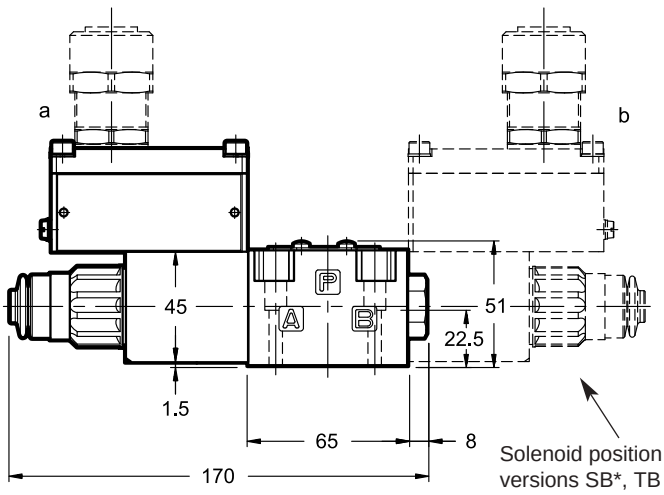


DS3K*-*/10*-*K9S*/CM



Side port type	A
S01, S04	60.5
S02, S03	60

DS3K*-SA*/10*-*K9T*/CM
DS3K*-TA/10*-*K9T*/CM
DS3K*-TA*/10*-*K9T*/CM

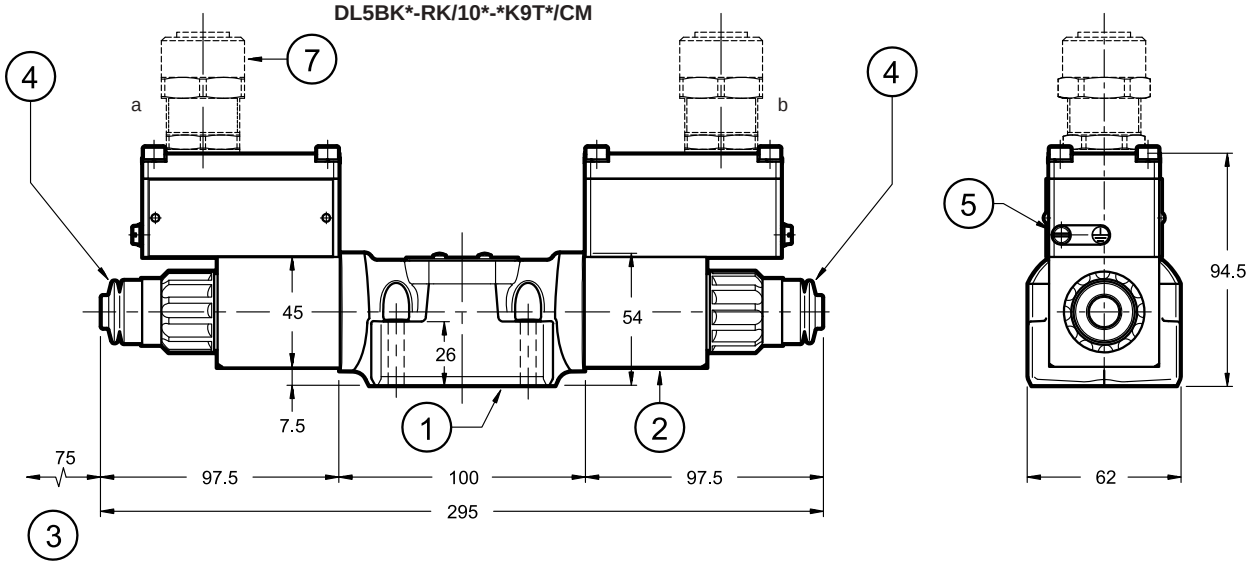


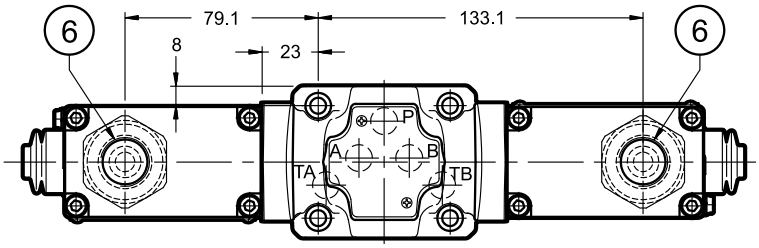
1	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) - 90 Shore
2	Explosion-proof coil
3	Minimum clear space required
4	Manual override, boot protected (**standard for both N and V seals**) - for blind ring nut dimensions (standard for NL seals) see p. 18
5	Terminal for supplementary GND connection
6	Upper port for cable gland
7	Cable gland. To be ordered separately, see point 19
8	Side port for cable gland

Valve fastening: 4 SHC screws ISO 4762 M5x30
Tightening torque: 5 Nm (A8.8 screws)
Threads of mounting holes: M5x10

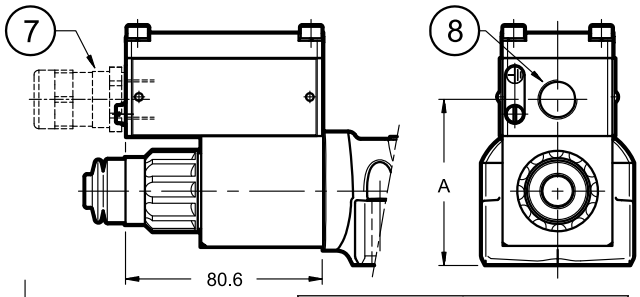
DL5BK*-S*/10*-*K9T*/CM
DL5BK*-RK/10*-*K9T*/CM

dimensions in mm



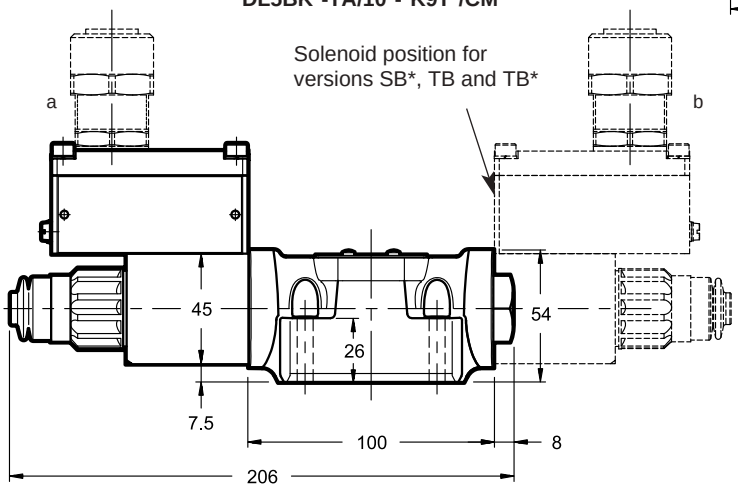


DL5BK*-*/10*-*K9S*/CM



Side port type	Dimension A
S01, S04	66.5
S02, S03	66

DL5BK*-SA*/10*-*K9T*/CM
DL5BK*-TA/10*-*K9T*/CM



1	Mounting surface with sealing rings: 5 OR type 2050 (12.42x1.78) - 90 Shore
2	Explosion-proof coil
3	Minimum clear space required
4	Manual override, boot protected (**standard for both N and V seals**) - for blind ring nut dimensions (standard for NL seals) see p. 18
5	Terminal for supplementary GND connection
6	Upper port for cable gland
7	Cable gland. To be ordered separately, see point 19
8	Side port for cable gland

Valve fastening: 4 SHC screws ISO 4762 M6x35
Tightening torque: 8 Nm (A8.8 screws)
Threads of mounting holes: M6x10

5 - IDENTIFICATION OF PILOT OPERATED SOLENOID VALVES



Pilot operated directional valve

Size:
5 = CETOP P05
5R = ISO 4401-05
7 = ISO 4401-07
8 = ISO 4401-08
10 = ISO 4401-10

Option:
(omit for standard version)
H = high pressure p_{max} 420 bar

Explosion-proof certification:
See table 1.1

Spool type (see p. 5.1)
S* **TA** **TB** **RK**
SA* **TA02** **TB02**
SB*

Series No.
20 = DSP5K*, DSP5RK* and DSP8K*
10 = DSP7K*
11 = DSP10K*

Seals:
For temperature range -20 / +80 °C
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

For temperature range -40 / +80 °C
NL = seal for low temperatures (for mineral oil)

Pilot supply:
E = external
I = internal (not available for S2, S4, TA02, TB02, S*2 and S*4 spools)
Z = internal pilot supply with 30 bar pressure reducing valve fixed adjustment (not available for S2, S4, TA02, TB02, S*2 and S*4 spools)

Alternative options for valves size 7 or 8 only, S2, S4, TA02, TB02, S*2 and S*4 spools :
C = internal pilot supply with backpressure valve in P port
CZ = internal pilot supply with 30 bar pressure reducing valve fixed adjustment, and with backpressure valve in P port.

Drain:
E = external
I = internal

Options:
C = main spool stroke control
D = main spool switching speed control
for DSP5 - DSP5R - DSP7 - DSP8 valves :
P08 = subplate with restrictor Ø0,8 on port P placed under the pilot stage
Only for DSP10 valves:
P15 = subplate with restrictor Ø1,5 on port P placed under the pilot stage

Power supply:
Direct current (DC)
D12 = 12 V
D24 = 24 V
D48 = 48 V
D110 = 110 V
Alternate current with built-in rectifier bridge (RAC)
R120 = 120 V
R240 = 240 V

Coil electrical connection: junction box

Connection type for cable gland
upper connection:
T01 = M20x1.5 - ISO 261
T02 = Gk 1/2 - UNI EN 10226-2
T03 = 1/2" NPT - ANSI B1.20.1 (ex ANSI B2.1)
side connection:
S01 = M20x1.5 - ISO 261
S02 = Gk 1/2 - UNI EN 10226-2
S03 = 1/2" NPT - ANSI B1.20.1 (ex ANSI B2.1)
S04 = M16x1.5 - ISO 261

Manual override:
CM = boot protected
standard for both N and V seals
not available for NL seals
CB = blind ring nut
standard for NL seals
available upon request for both N and V seals
see dimensions at point 16

Option: **/T5**
version in T5 temperature class.
Omit if not required.

Option:
surface treatment not standard.
Omit if not required
(see **NOTE**)

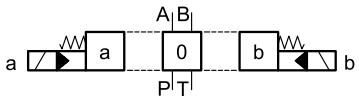
NOTE: Valves are supplied with standard surface treatment of black phosphating on the main body and zinc-nickel on the pilot body. The full zinc-nickel surface treatment is available upon request. This treatment ensures a salt spray resistance of up to 600 h(test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

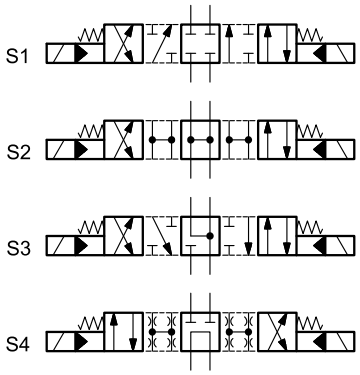
For full zinc-nickel surface treatment, add suffix **/W7** to the end of the identification code.

A version with monobloc coils made of steel is available. Please refer to details in page 2.

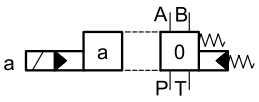
5.1 - Spool types

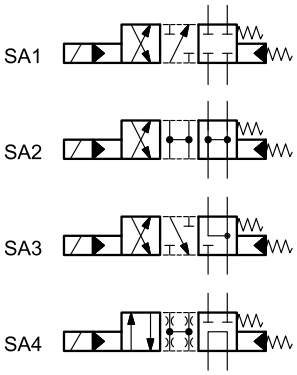
Version **S***:
2 solenoids - 3 positions
with spring centering



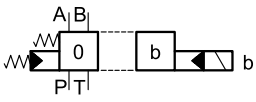


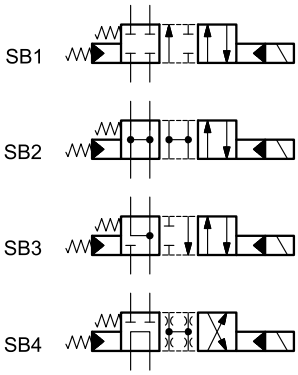
Version **SA***:
1 solenoid side A
2 positions (central + external)
with spring centering



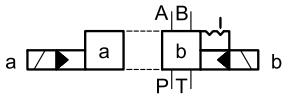


Version **SB***:
1 solenoid side B
2 positions (central + external)
with spring centering



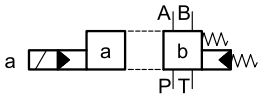


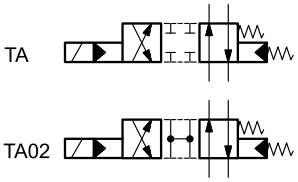
Version **RK**:
2 solenoids - 2 positions
with mechanical detent



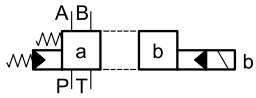


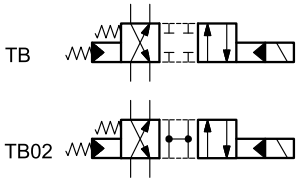
Version **TA**:
1 solenoid side A
2 external positions
with return spring





Version **TB**:
1 solenoid side B
2 external positions
with return spring



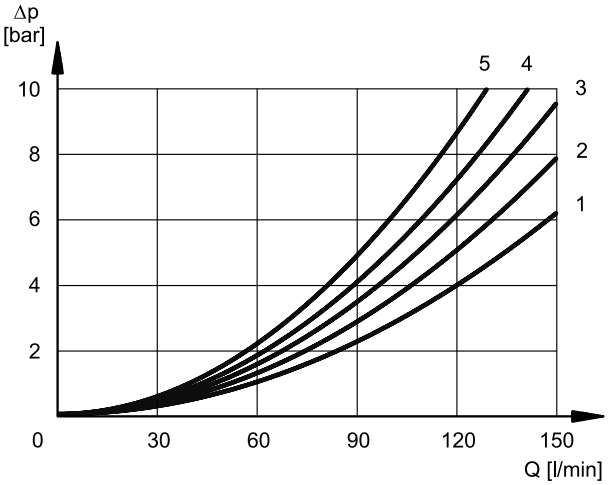


6 - CHARACTERISTIC CURVES AND PERFORMANCES OF PILOT OPERATED SOLENOID VALVES

6.1 - Pressure drops Δp-Q

(values obtained with viscosity 36 cSt at 50 °C)

DSP5K* - DSP5RK*



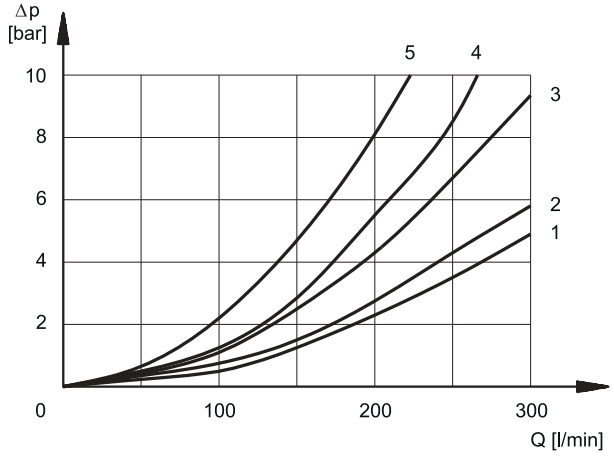
ENERGIZED POSITION

SPOOL	FLOW DIRECTION			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPH			
S1, SA1, SB1	2	2	2	3
S2, SA2, SB2	3	3	1	2
S3, SA3, SB3	2	2	1	2
S4, SA4, SB4	2	2	2	4
TA, TB	3	3	3	4
TA02, TB02	-	-	-	-
RK	-	-	-	-

DE-ENERGIZED POSITION

SPOOL	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S2, SA2, SB2	-	-	2	2	3
S3, SA3, SB3	-	-	5	5	-
S4, SA4, SB4	-	-	-	-	5

DSP7K*



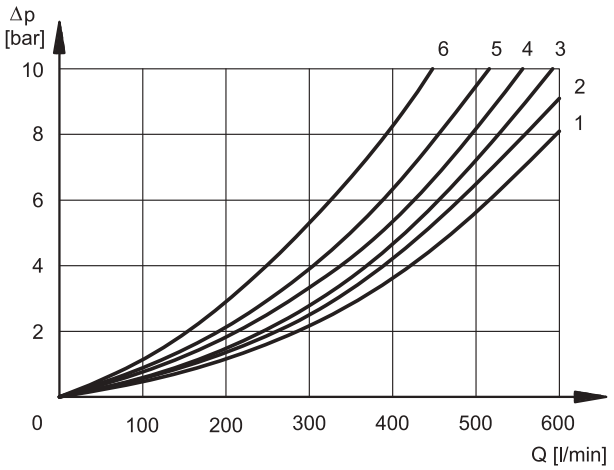
ENERGIZED POSITION

SPOOL	FLOW DIRECTION			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPH			
S1, SA1, SB1	1	1	3	4
S2, SA2, SB2	1	1	4	4
S3, SA3, SB3	1	1	4	4
S4, SA4, SB4	2	2	4	5
TA, TB	1	1	3	4
TA02, TB02	1	1	4	4
RK	1	1	3	4

DE-ENERGIZED POSITION

SPOOL	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S2, SA2, SB2	-	-	-	-	2
S3, SA3, SB3	-	-	4	4	-
S4, SA4, SB4	-	-	-	-	4

DSP8K*



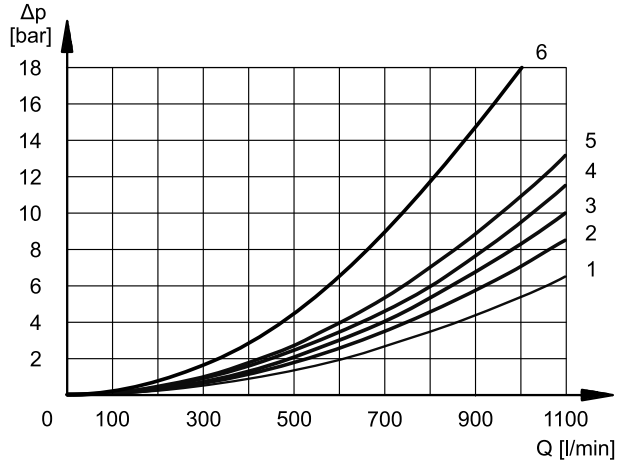
ENERGIZED POSITION

SPOOL	FLOW DIRECTION			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPH			
S1, SA1, SB1	2	2	3	3
S2, SA2, SB2	1	1	2	1
S3, SA3, SB3	2	2	2	1
S4, SA4, SB4	4	4	3	5
TA, TB	2	2	3	3
TA02, TB02	2	2	3	3
RK	2	2	3	3

DE-ENERGIZED POSITION

SPOOL	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S2, SA2, SB2	-	-	-	-	4
S3, SA3, SB3	-	-	4	4	-
S4, SA4, SB4	-	-	-	-	6

DSP10K*



ENERGIZED POSITION

SPOOL	FLOW DIRECTIONS				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S1, SA1, SB1	3	3	1	2	-
S2, SA2, SB2	4	4	2	4	-
S3, SA3, SB3	3	3	2	4	-
S4, SA4, SB4	3	3	2	4	-
TA, TB	3	3	1	2	-
TA02, TB02	4	4	2	4	-
RK	3	3	1	2	-

DE-ENERGIZED POSITION

SPOOL	FLOW DIRECTIONS				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S2	-	-	3	4	5
S3	-	-	5	5	-
S4, TA02	-	-	-	-	6

6.2 - Switching times

The values indicated refer to a solenoid valve working with pilot supply pressure of 100 bar, with mineral oil at a temperature of 50°C, at viscosity of 36 cSt and with PA and BT connections.

The energizing and de-energizing times are obtained at the pressure variation which occurs on the lines.

TIMES (± 10%) [ms]	ENERGIZING	DE- ENERGIZING	
	DC - RAC	DC	RAC
DSP5K* - DSP5RK*	70	60	160
DSP7K*	80	70	170
DSP8K*	90	70	170
DSP10K*	120	90	190

7 - HYDRAULIC CHARACTERISTICS

PRESSURES (bar)	**DSP5K* DSP5RK***	**DSP5HK* DSP5RHK***	**DSP7K***	**DSP7HK***	**DSP8K***	**DSP8HK***	**DSP10K***	**DSP10HK***
Max pressure in P, A, B ports	350	420	350	420	350	420	350	420
Max pressure in T line with external drain	250	350	250	350	250	350	300	350
Max pressure in T line with internal drain	210		210		210		210	
Max pressure in Y line with external drain	210		210		210		210	
Min pilot supply pressure **NOTE 1**	5 ÷ 12						10	
Max pilot supply pressure **NOTE 2**	210	350	210	350	210	350	280	350

NOTE 1: The valve needs a difference between the pilot pressure value and the discharge/drain pressure value in order to work correctly.

NOTE 2: If the working pressure is higher than these rated limits, then provide an external pilot line with p_{max} within the rated limits and order the valve with E type pilot supply.

If the external pilot line is not possible, you must opt for the version with Z type pilot supply (see point 8.2), providing max 350 bar at inlet pressure P.

MAXIMUM FLOW RATES		**DSP5K* DSP5RK***		**DSP7K***		**DSP8K***		**DSP10K***	
Spool type		PRESSURES							
		at 210 bar	at 350 bar	at 210 bar	at 350 bar	at 210 bar	at 350 bar	at 210 bar	at 350 bar
S4 - SA4 - SB4	[l/min]	120	100	200	150	500	450	800 (**NOTE**)	600 (**NOTE**)
Other spools		150	120	300	300	600	500	900	700

NOTE: for the DSP10K* valve these values are the same even for S2 - SA2 - SB2 spools.

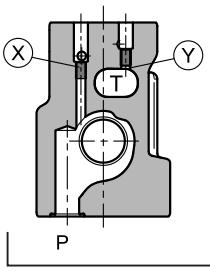
8 - PILOT AND DRAIN

DSP*K* valves are available with both pilot supply and drain internal or external type. The version with external drain allows a higher back pressure on the return line.

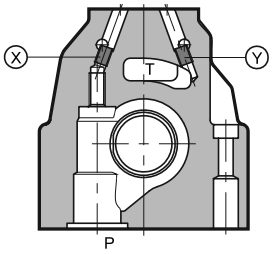
NOTE: The pilot supply and drain configuration must be chosen when ordering. Subsequent modification is only permitted by authorized experienced operators or at the factory.

TYPE OF VALVE		Plug assembly	
		X	Y
IE	internal pilot and external drain	NO	YES
II	internal pilot and internal drain	NO	NO
EE	external pilot and external drain	YES	YES
EI	external pilot and internal drain	YES	NO

DSP5K* / DSP5RK*

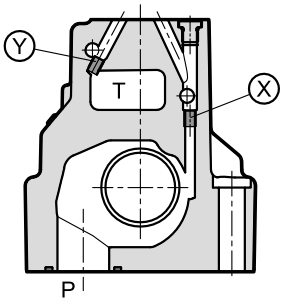


DSP7K*

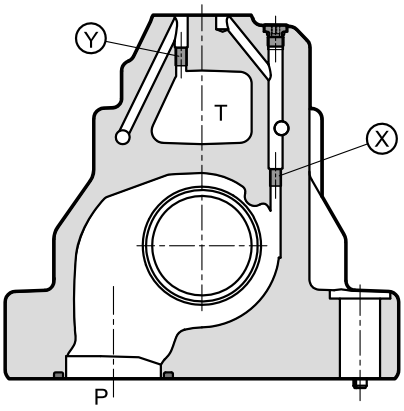


X: plug M5x6 for external pilot
Y: plug M5x6 for external drain

DSP8K*



DSP10K*



X: plug M6x8 for external pilot
Y: plug M6x8 for external drain

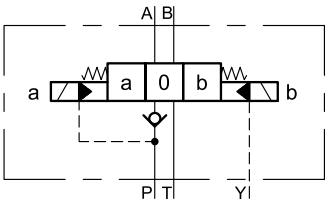
8.1 - C type pilot supply: internal pilot supply with backpressure valve in P port

DSP7K* and DSP8K* valves are available with incorporated backpressure valve in the P port. This is in order to reach the minimum pilot supply pressure at normal position in valves in which the inlet port (P) and the return port (T) are connected (spools S2, S4, S7, S8, S*2, S*4, T*02).

The pressure differential of the backpressure valve must be added to that of the main valve shown at point 6.

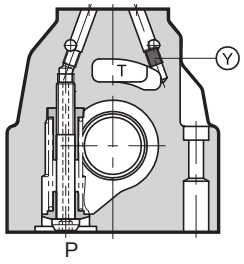
The cracking pressure is 5 bar (DSP7K*) and 6 bar (DSP8K*) with a minimum flow rate of 15 l/min.

NOTE: The backpressure valve doesn't assure the seal so it has not be intended as a check valve. Add **C** to the identification code for this request (see point 5).



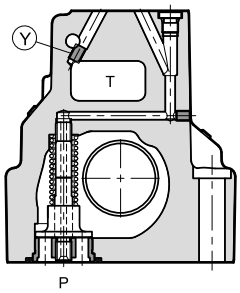
DSP7K* only: the backpressure valve can also be delivered separately. It can be easily mounted on the P port of the main control valve. Order code for the backpressure valve: **0266577**.

DSP7K*

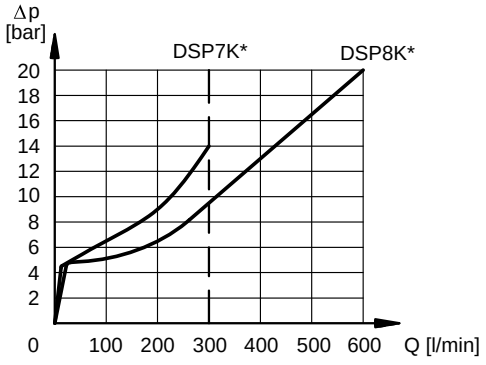


pilot supply always internal
Y: plug M5x6 for external drain

DSP8K*



pilot supply always internal
Y: plug M6x8 for external drain



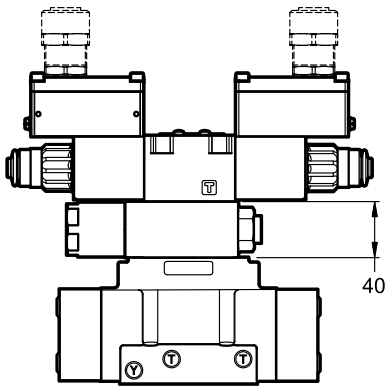
Pressure drops of the backpressure valve.

8.2 - Z type pilot supply: internal pilot supply with pressure reducing valve

The Z type pilot supply consists of an arrangement with internal pilot and 30 bar supply pressure to the pilot stage, by means of a fixed adjustment pressure reducing valve placed between the main stage and the pilot valve.

Consider an increase of 40 mm in height for valves ordered with Z option .

DSP*K*-*/Z*



9 - OPTIONS

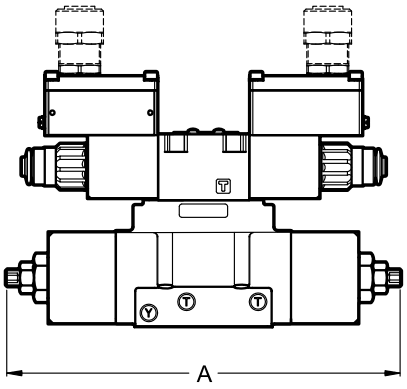
9.1 - Control of the main spool stroke: C

With the help of special side plugs, it is possible to introduce stroke controls in the heads of the piloted valve so as to vary the maximum spool clearance opening.

This solution allows control of the flow rate from the pump to the actuator and from the actuator to the outlet, obtaining a double adjustable control on the actuator.

Add the letter C in the identification code to order this version (see point 5).

DSP*K*-*/C



dimensions in mm

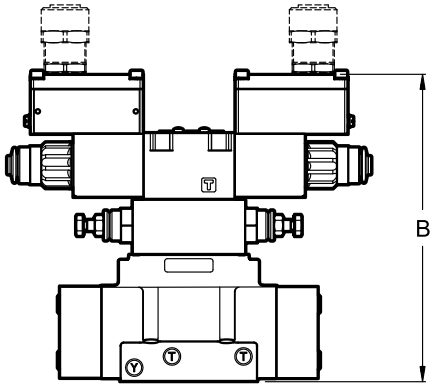
	DSP5K* DSP5RK*	DSP7K*	DSP8K*	DSP10K*
A	284	319	401.5	520

9.2 - Control of the main spool shifting speed: D

By placing a double flow control valve (QTM3 type) between the pilot solenoid valve and the main stage, the pilot supply flow can be adjusted and therefore the changeover smoothness can be varied..

Add the letter **D** in the identification code to order this version (see point 5).

DSP*K*-*/D



dimensions in mm

	DSP5K* DSP5RK*	DSP7K*	DSP8K*	DSP10K*
B	218.5	225.5	254.5	310.5

9.3 - Subplate with throttle on line P

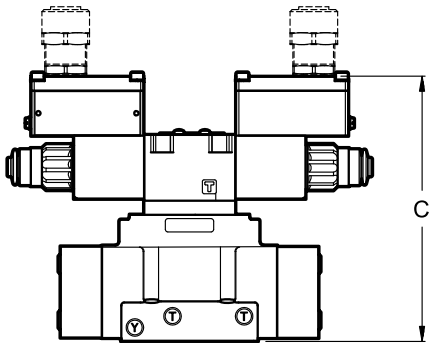
It is possible to introduce a subplate with a restrictor in line P between the pilot valve and the main stage. Subplate width 10 mm.

restrictor Ø0.8 for DSP5K*, DSP5RK*, DSP7K* and DSP8K*
restrictor Ø1.5 for DSP10K*:

To order include in the code (p. 5):

P08 for DSP5K*, DSP5RK*, DSP7K* and DSP8K*
P15 for DSP10K*

DSP*K*-*/P*



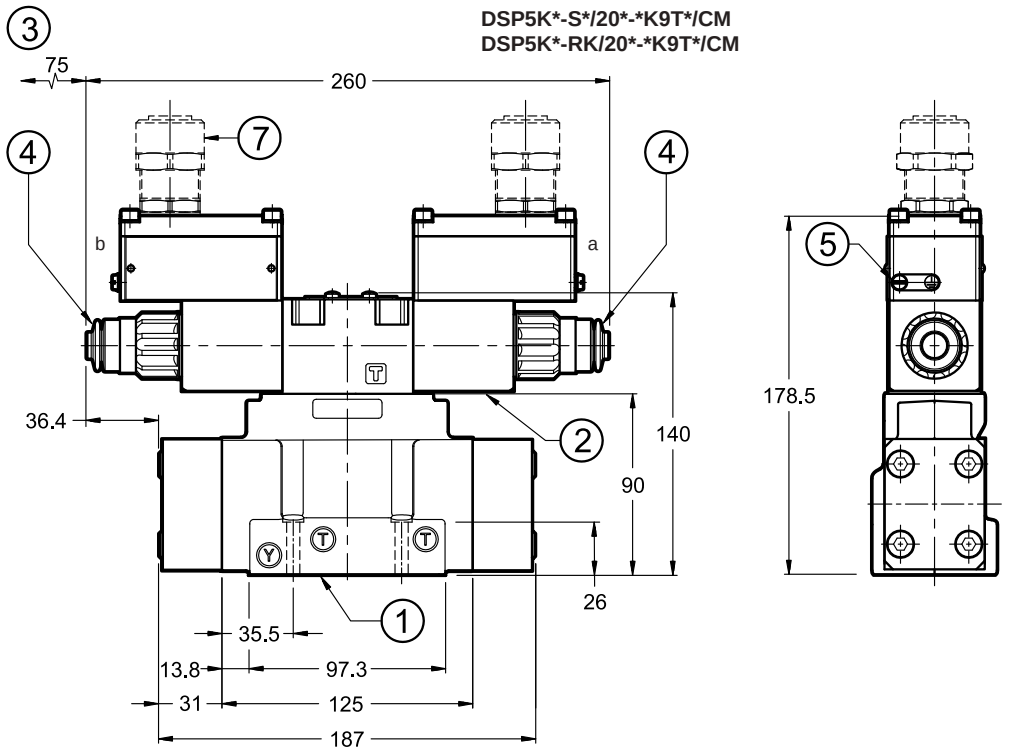
dimensions in mm

	DSP5K* DSP5RK*	DSP7K*	DSP8K*	DSP10K*
C	188.5	195.5	224.5	280.5

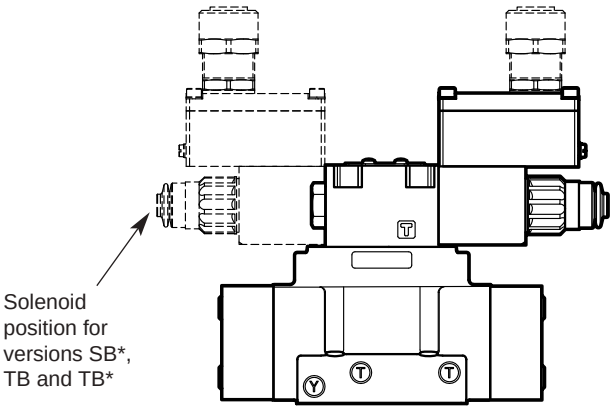
10 - DSP5K* AND DSP5RK* WITH UPPER CONNECTION - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

DSP5K*-S*/20*-*K9T*/CM
DSP5K*-RK/20*-*K9T*/CM



DSP5K*-SA*/20*-*K9T*/CM
DSP5K*-TA/20*-*K9T*/CM
DSP5K*-TA*/20*-*K9T*/CM



Solenoid position for versions SB*, TB and TB*

1	Mounting surface with sealing rings: 5 OR type 2050 (12.42x1.78) - 90 Shore 2 OR type 2037 (9.25x1.78) - 90 Shore
2	Explosion-proof coil
3	Minimum clear space required
4	Manual override, boot protected (**standard for both N and V seals**) - for blind ring nut dimensions (standard for NL seals) see p. 18
5	Terminal for supplementary GND connection
6	Upper port for cable gland
7	Cable gland. To be ordered separately, see point 19

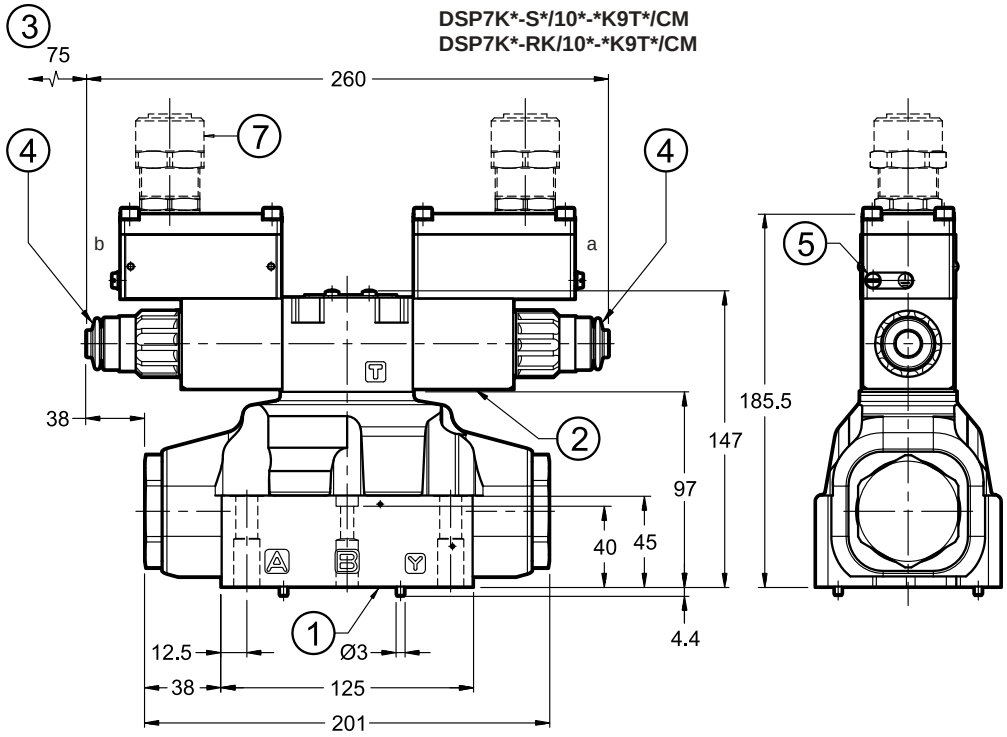
NOTE 1: See point 8.2. for overall dimensions with Z option (fixed adjustment pressure reducing valve)
NOTE 2: for side port cable gland see point 14.

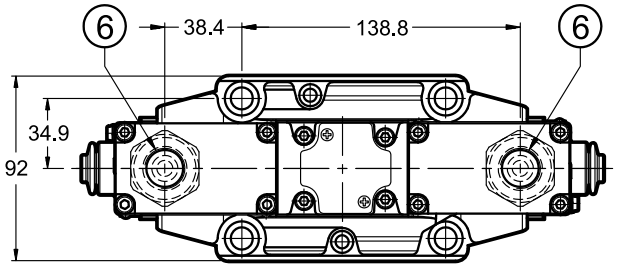
Valve fastening: 4 SHC screws ISO 4762 M6x35
Tightening torque: 8 Nm (A8.8 screws)
Threads of mounting holes: M6x10

11 - DSP7K* WITH UPPER CONNECTION - OVERALL AND MOUNTING DIMENSIONS

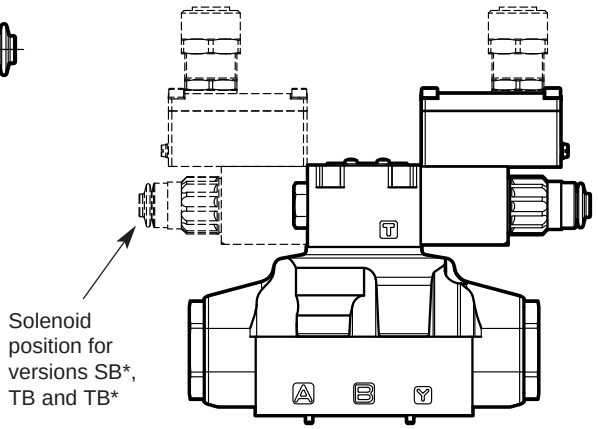
dimensions in mm

DSP7K*-S*/10*-*K9T*/CM
DSP7K*-RK/10*-*K9T*/CM





DSP7K*-SA*/10*-*K9T*/CM
DSP7K*-TA/10*-*K9T*/CM
DSP7K*-TA*/10*-*K9T*/CM



Solenoid position for versions SB*, TB and TB*

1	Mounting surface with sealing rings: 4 OR type 130 (22.22x2.62) - 90 Shore 2 OR type 2043 (10.82x1.78) - 90 Shore
2	Explosion-proof coil
3	Minimum clear space required
4	Manual override, boot protected (standard for both N and V seals) - for blind ring nut dimensions (standard for NL seals) see p. 18
5	Terminal for supplementary GND connection
6	Upper port for cable gland
7	Cable gland. To be ordered separately, see point 19

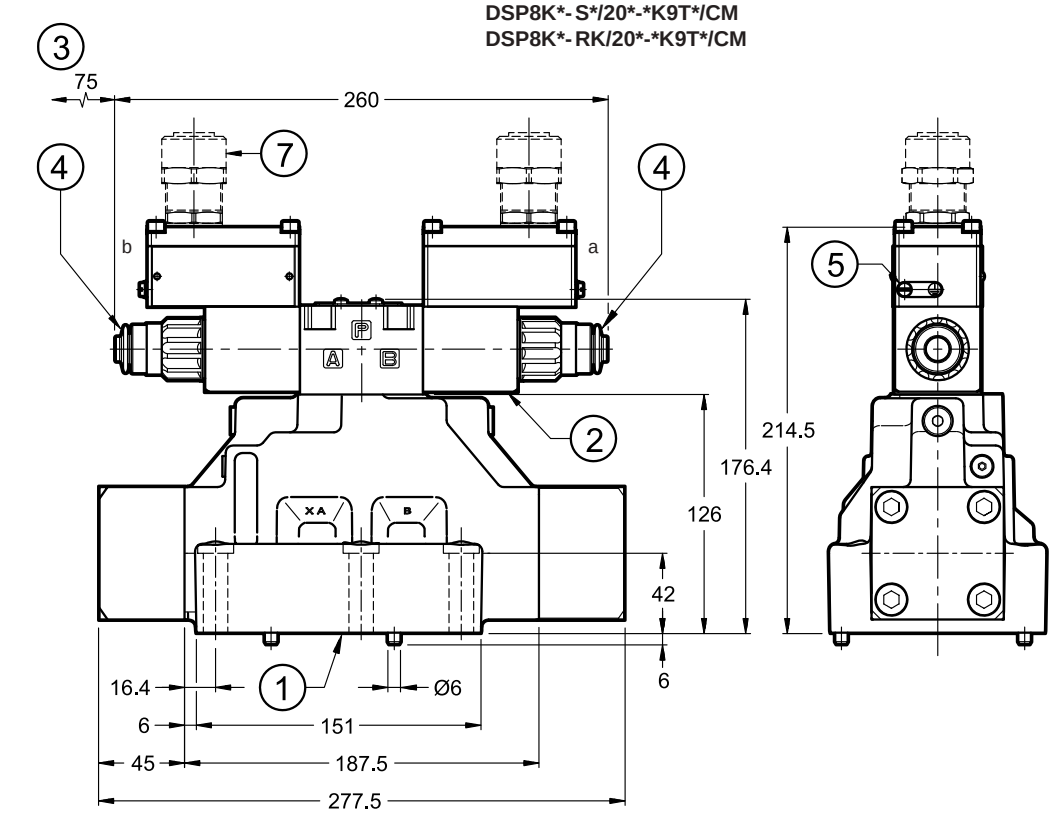
NOTE 1: for overall dimensions with Z option (fixed adjustment pressure reducing valve) see point 8.2.
NOTE 2: for side port cable gland see point 14.
NOTE 3: A10.9 fastening screws are recommended for high pressure valves (H versions).

Valve fastening: 4 SHC screws ISO 4762 M10x60 2 SHC screws ISO 4762 M6x50
Tightening torque: M10x60: 40 Nm (A8.8 screws) - 57 Nm (A10.9 screws) M6x50: 8 Nm (A8.8 screws) - 12 Nm (A10.9 screws)
Threads of mounting holes: M6x12; M10x18

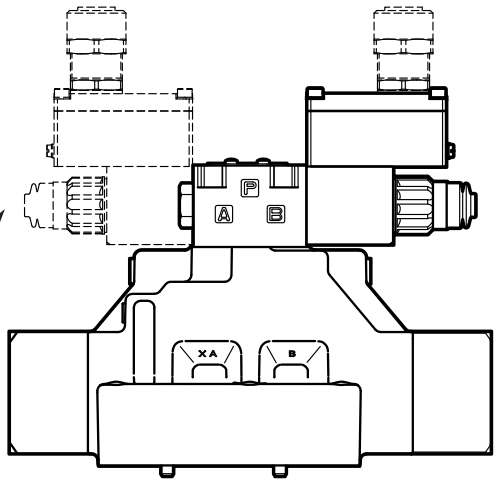
12 - DSP8K* WITH UPPER CONNECTION - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

DSP8K*- S*/20*-*K9T*/CM
DSP8K*- RK/20*-*K9T*/CM



DSP8K*-SA*/20*-*K9T*/CM
DSP8K*-TA/20*-*K9T*/CM
DSP8K*-TA*/20*-*K9T*/CM



Solenoid position for versions SB*, TB and TB*

1	Mounting surface with sealing rings: 4 OR type 3131 (32.99x2.62) - 90 Shore 2 OR type 3087 (21.89x2.62) - 90 Shore
2	Explosion-proof coil
3	Minimum clear space required
4	Manual override, boot protected (**standard for both N and V seals**) - for blind ring nut dimensions (standard for NL seals) see p. 18
5	Terminal for supplementary GND connection
6	Upper port for cable gland
7	Cable gland. To be ordered separately, see point 19

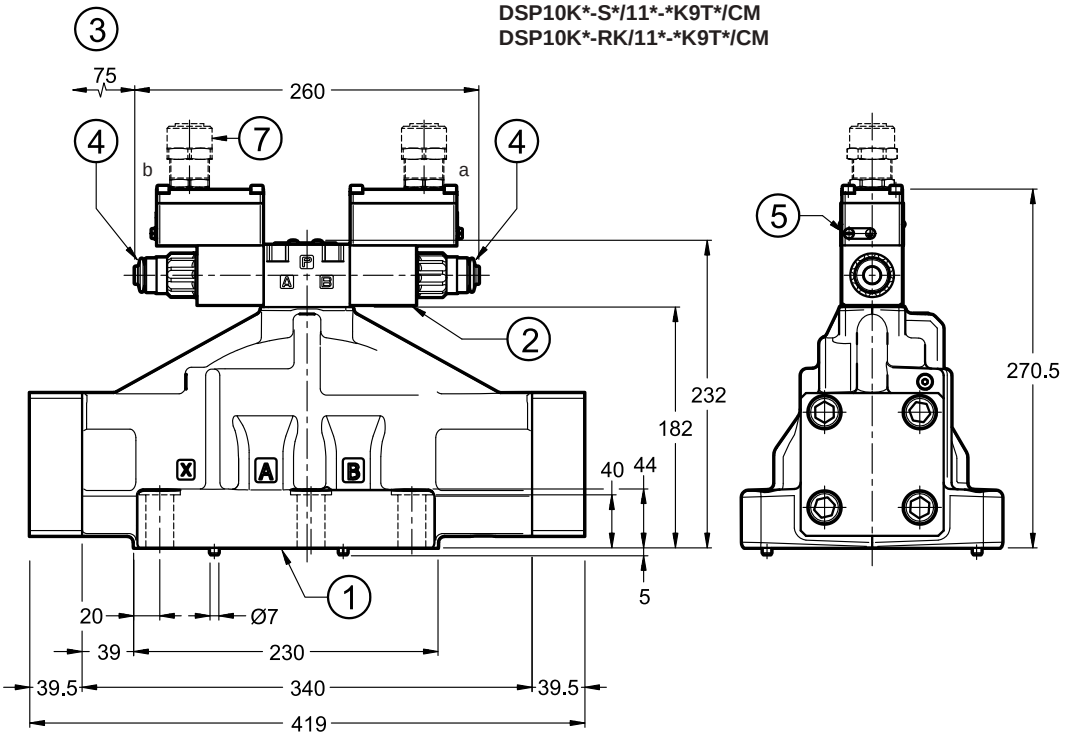
NOTE 1: for overall dimensions with Z option (fixed adjustment pressure reducing valve) see point 8.2.
NOTE 2: for side port cable gland see point 14.
NOTE 3: A10.9 fastening screws are recommended for high pressure valves (H versions).

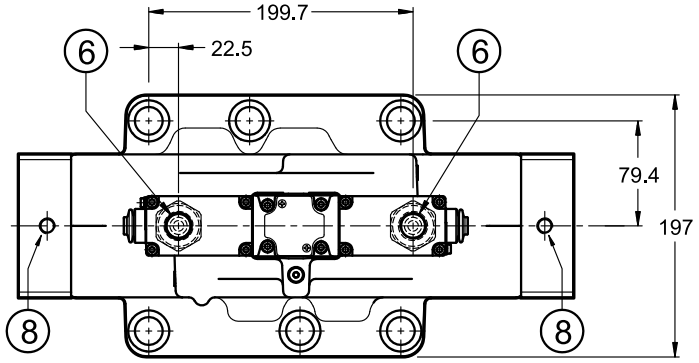
Valve fastening: 6 SHC screws ISO 4762 M12x60
Tightening torque: 69 Nm (A8.8 screws) - 96 Nm (A10.9 screws)
Threads of mounting holes: M12x20

13 - DSP10K* WITH UPPER CONNECTION - OVERALL AND MOUNTING DIMENSIONS

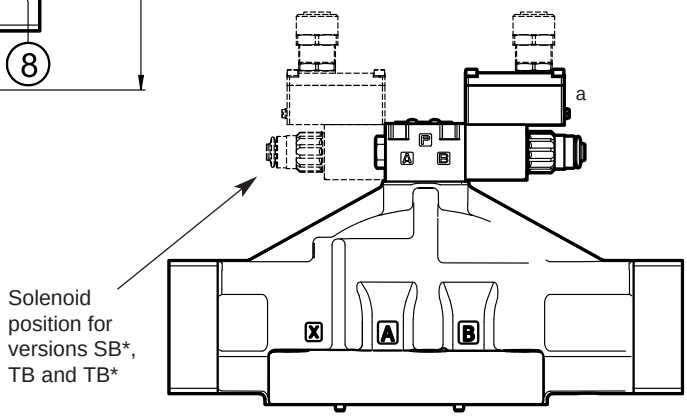
dimensions in mm

DSP10K*-S*/11*-*K9T*/CM
DSP10K*-RK/11*-*K9T*/CM





DSP10K*-SA*/11*-*K9T*/CM
DSP10K*-TA/11*-*K9T*/CM
DSP10K*-TA*/11*-*K9T*/CM



Solenoid position for versions SB*, TB and TB*

1	Mounting surface with sealing rings: 4 OR type 4162 (40.86x3.53) - 90 shore 2 OR type 3081 (20.24x2.62) - 90 shore
2	Explosion-proof coil
3	Minimum clear space required
4	Manual override, boot protected (**standard for both N and V seals**) - for blind ring nut dimensions (standard for NL seals) see p. 18
5	Terminal for supplementary GND connection
6	Upper port for cable gland
7	Cable gland. To be ordered separately, see point 19
8	M12 eyebolt seat for safe lift

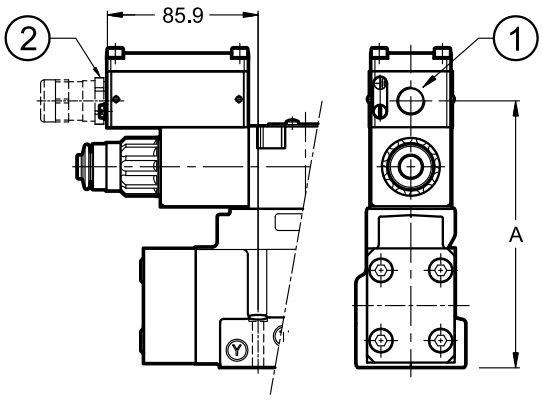
NOTE 1: for overall dimensions with Z option (fixed adjustment pressure reducing valve) see point 8.2.
NOTE 2: for side port cable gland see point 14.

Valve fastening: 6 SHC screws ISO 4762 M20x70 (supplied)
Tightening torque: 470 Nm (A10.9 screws)
Threads of mounting holes: M20x40

14 - DSP*K* WITH SIDE CONNECTIONS - OVERALL AND MOUNTING DIMENSIONS

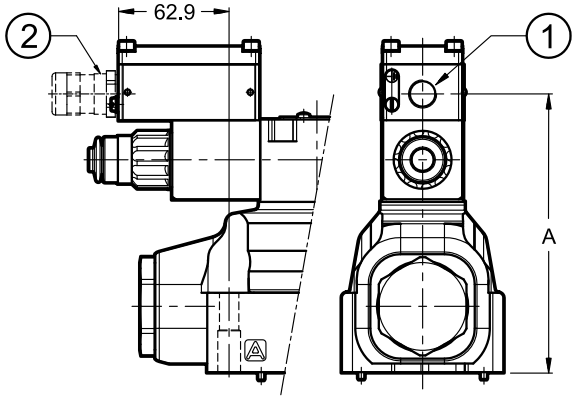
dimensions in mm

DSP5K*-*/20*-*K9S*/*
DSP5RK*-*/20*-*K9S*/*



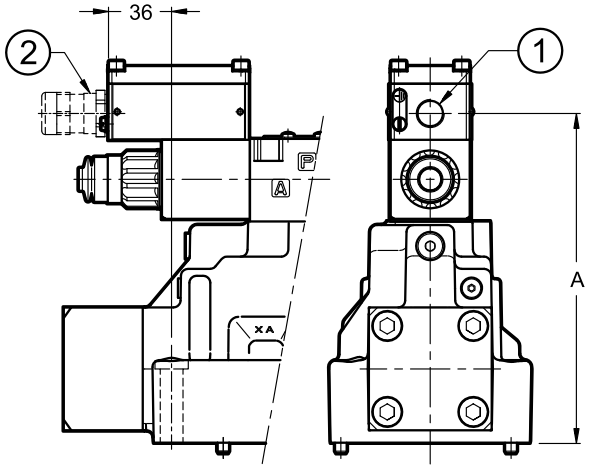
Side port type	A
S01, S04	150.5
S02, S03	150

DSP7K*-*/10*-*K9S*/*



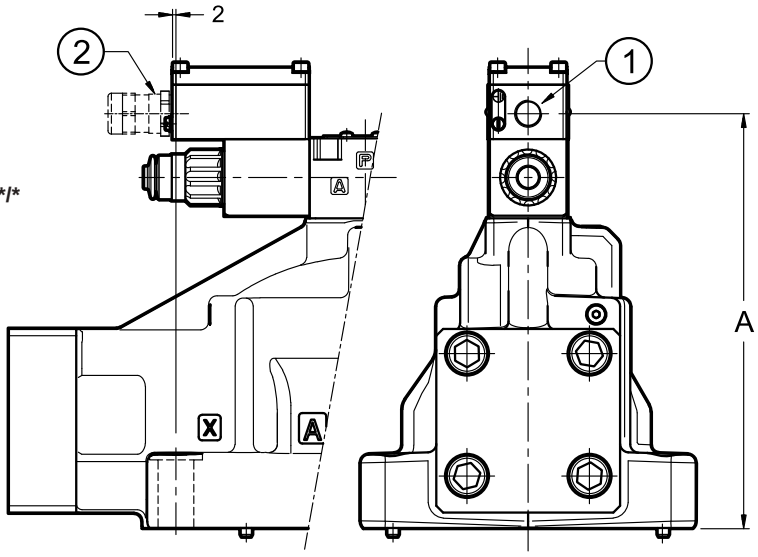
Side port type	A
S01, S04	157.5
S02, S03	157

DSP8K*-*/20*-*K9S*/*



Side port type	A
S01, S04	186.5
S02, S03	186

DSP10K*-*/11*-*K9S*/*

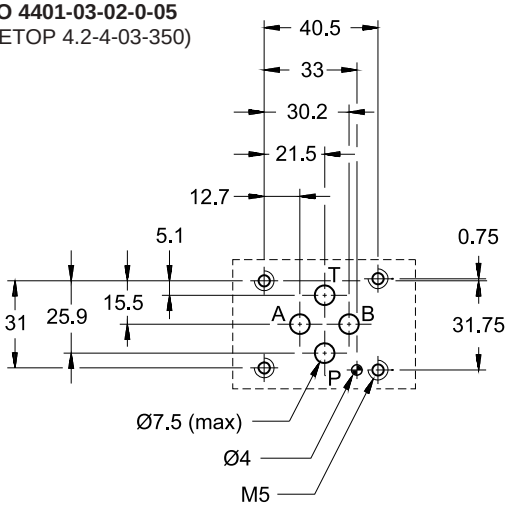


Side port type	A
S01, S04	242.5
S02, S03	242

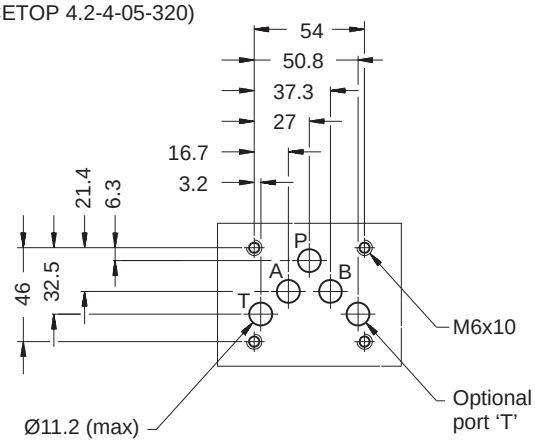
1	Side port
2	Cable gland. To be ordered separately, see p. 19

15 - MOUNTING SURFACES

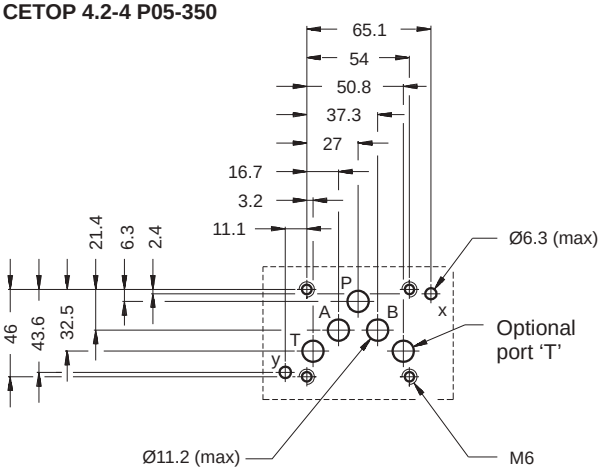
DS3K*
ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)



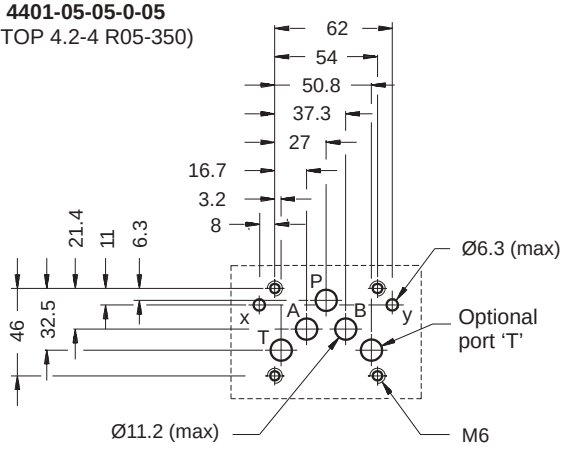
DL5BK*
ISO 4401-05-04-0-05
(CETOP 4.2-4-05-320)



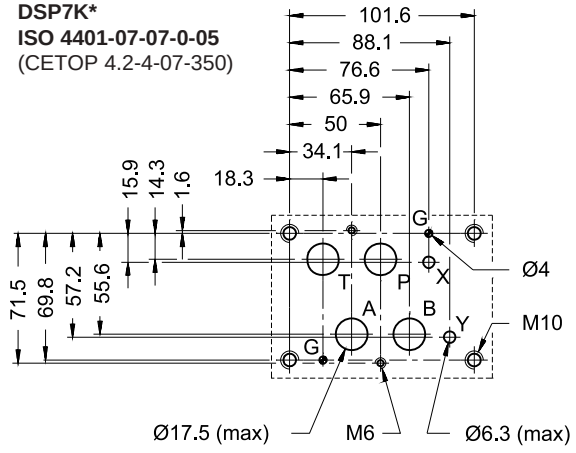
DSP5K*
CETOP 4.2-4 P05-350



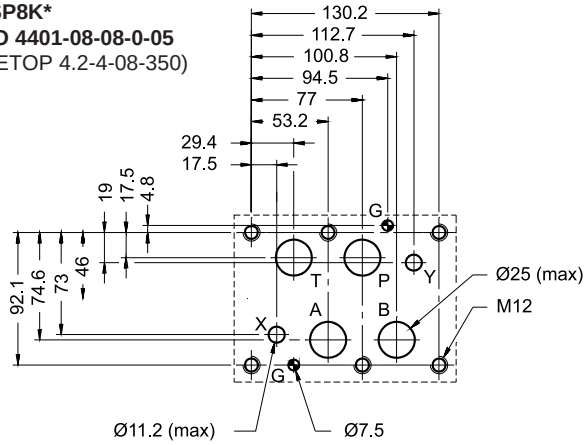
DSP5RK*
ISO 4401-05-05-0-05
(CETOP 4.2-4 R05-350)



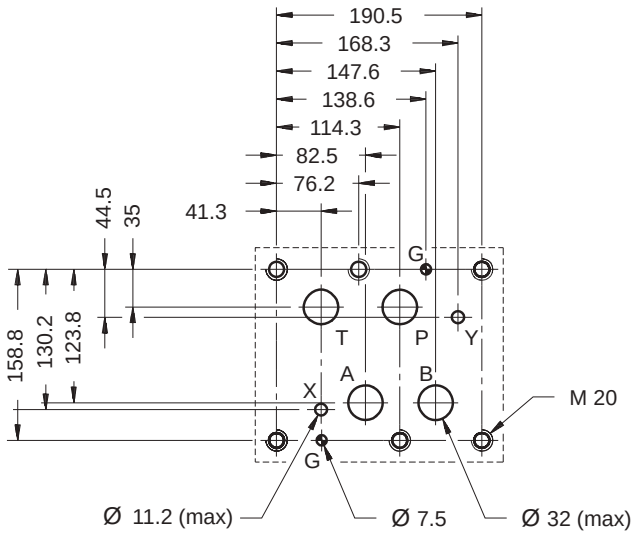
DSP7K*
ISO 4401-07-07-0-05
(CETOP 4.2-4-07-350)



DSP8K*
ISO 4401-08-08-0-05
(CETOP 4.2-4-08-350)



DSP10K*
ISO 4401-10-09-0-05
(CETOP 4.2-4-10-350)



16 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

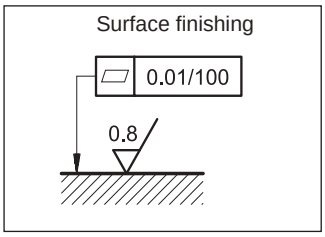
17 - INSTALLATION

Installation must adheres to instructions reported in the *Use and Maintenance manual*, always attached to the valve. Unauthorized interventions can be harmful to people and goods because of the explosion hazards present in potentially explosive atmospheres.

Configurations with centering and recall springs can be mounted in any position; The RK versions, without springs and with mechanical detent, must be mounted with the longitudinal axis horizontal.

Valve fastening takes place by means of screws or tie rods, laying the valve on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing.

If the minimum values of planarity or smoothness are not met, fluid leakages between valve and mounting surface can easily occur.



18 - MANUAL OVERRIDES

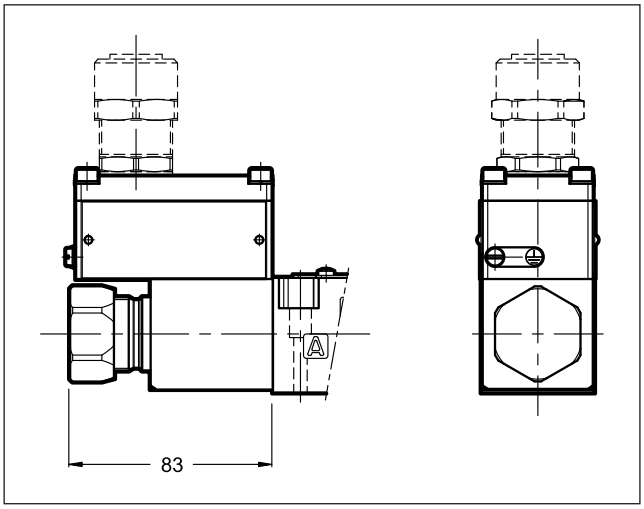
18.1 - CB - Blind ring nut

The metal ring nut protects the solenoid tube from atmospheric agents and isolates the manual override from accidental operations. The ring nut is tightened on a threaded fastener that keeps the coil in its position even without the ring nut.

To access the manual override loosen the ring nut and remove it; then reassemble hand tightening, until it stops.

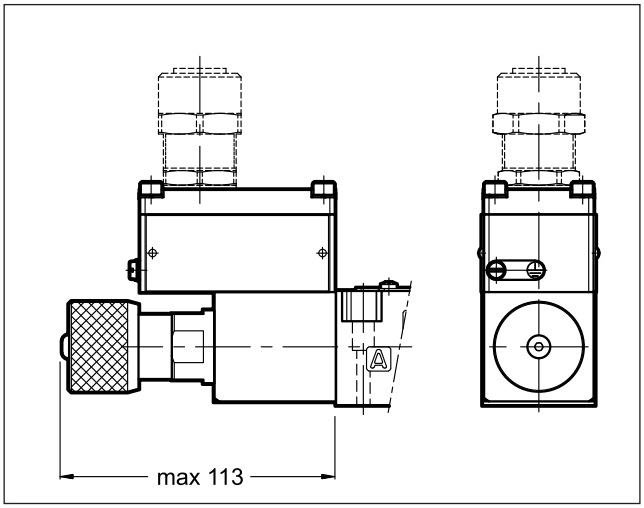
Activate the manual override always and only with non-sparking tools suitable for use in potentially explosive atmospheres.

More information on safe use of explosion-proof components are provided in the instruction manual, always supplied with the valve.



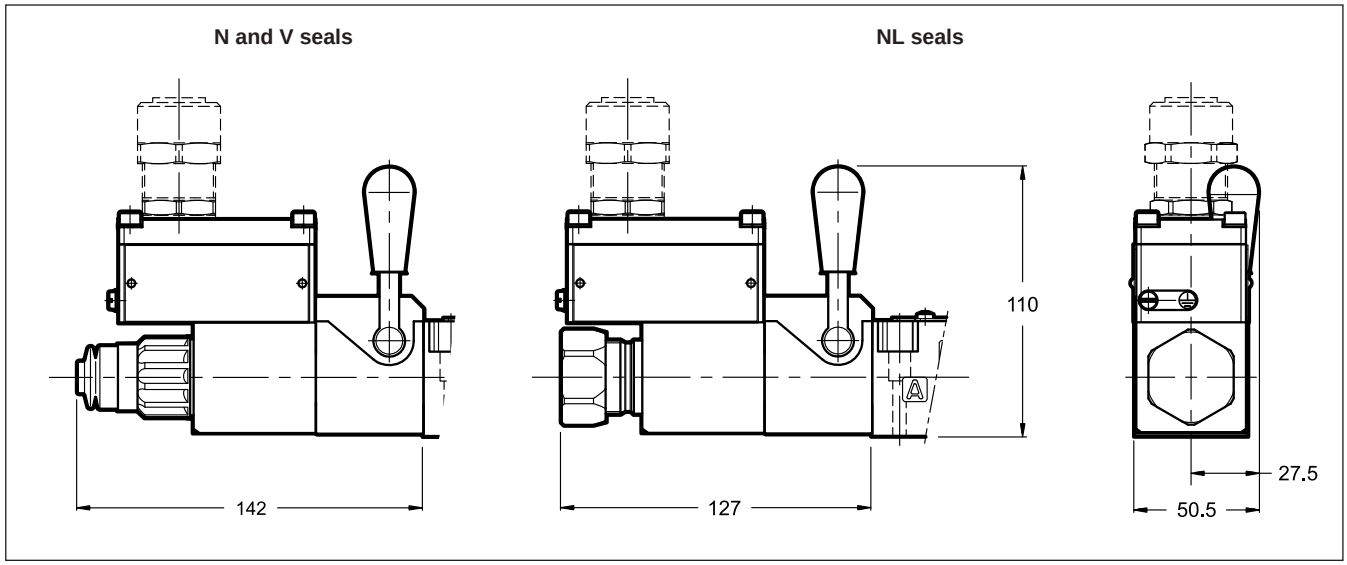
18.2 - CK1 - Knob manual override

This turning knob is available for DC valves only.



18.3 - CH - Lever manual override

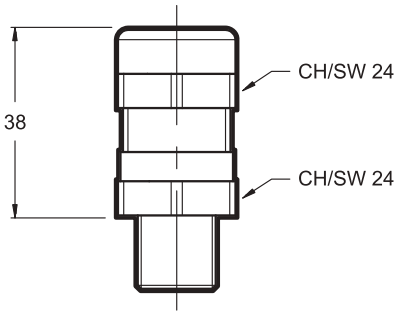
The lever manual override is available for DS3K only. The seals choice leads the type of the standard ring nut to be mounted. The boot isn't a redundant manual override, instead acts as protection for the tube. The lever device is always placed at side A, except for valves with TB spools.



19 - CABLE GLANDS

Cable glands must be ordered separately; Duplomatic offers some types of cable glands with the following features:

- version for non-armoured cable, external seal on the cable (suitable for Ø 8 ÷ 10 mm cables);
- ATEX II 2GD, I M2; IECEx Gb, Db, Mb certified
- cable gland material: nickel brass
- inner rubber tip material: silicone
- ambient temperature range: -65 ºC ÷ +220 ºC
- protection degree: IP66/IP68



To order the desired cable glands, specify description, code and quantity.

Description: CGK2/NB-01/10

Code: 3908108001

M20x1.5 - ISO 261 male thread, suitable for coils with T01 and S01 connections. It is supplied equipped with copper washer, that must be assembled between the cable gland and the coil, so as to ensure IP66/IP68 protection degree.

Tightening torque: 45 ÷ 50 Nm

Description: CGK2/NB-02/10

Code: 3908108002

Gk 1/2 - UNI EN 10226-2 male thread, suitable for coils with T02 and S02 connections. The customer must apply LOCTITE® 243™ threadlocker or similar between the cable gland connection thread and the coil in order to ensure IP66/IP68 protection degree.

Tightening torque: 20 ÷ 25 Nm

Description: CGK2/NB-03/10

Code: 3908108003

1/2” NPT - ANSI B1.20.1 (ex ANSI B2.1), suitable for coils with T03 and S03 connections. The customer must apply LOCTITE® 243™ threadlocker or similar between the cable gland connection thread and the coil in order to ensure IP66/IP68 protection degree.

Tightening torque: 20 ÷ 25 Nm

Description: CGK2/NB-04/10

Code: 3908108004

M16x1.5 - ISO 261 male thread, suitable for coils with S04 connection. It is supplied equipped with copper washer, that must be assembled between the cable gland and the coil, so as to ensure IP66/IP68 protection degree.

Tightening torque: 45 ÷ 50 Nm

20 - SUBPLATES

(see catalogue 51 000)

	DS3K*	DL5BK*		DSP5K*	DSP7K*	DSP8K*
Type with rear ports	PMMD-AI3G	PMD4-AI4G	-	PME4-AI5G	PME07-AI6G	-
Type with side ports	PMMD-AL3G	-	PMD4-AL4G	PME4-AL5G	PME07-AL6G	PME5-AL8G
P, T, A, B ports dimensions X, Y ports dimensions	3/8” BSP -	3/4” BSP -	1/2” BSP -	3/4” BSP 1/4” BSP	1” BSP 1/4” BSP	1 ½” BSP 1/4” BSP

NOTE: Subplates (to be ordered separately) contain neither aluminium nor magnesium at a rate higher than the value allowed by norms according to ATEX directive for category II 2GD and I M2.

The user will bear to do the complete assessment of the ignition risk that can occur from the relative use in potentially explosive environments.

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duplomaticmotionsolutions.com

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EXPLOSION-PROOF CLASSIFICATION for

SOLENOID AND PROPORTIONAL VALVES

ref. catalogues:

pressure control valves

RQM*K*-P	**21 515**
P*E*K*	**81 316**
ZDE3K*	**81 515**
DZCE*K*	**81 606**

flow control valves

QDE3K*	**82 225**

directional valves

D*K*	**41 515**
DT3K*	**42 215**
DS(P)E*K*	**83 510**

GENERAL INFO

This informative technical datasheet displays information about **classification and marking** of Duplomatic explosion-proof valves range.

Duplomatic MS offers valves with the following certifications:

ATEX	**II 2G**	**II 2D**	**I M2**
IECEx	**Gb**	**Db**	**Mb**
PESO	**Gb**		

Instructions for use and maintenance can be found in the related manuals, always supplied toghether with valves.

1 - ATEX CLASSIFICATION AND TEMPERATURES

Duplomatic valves are suitable for application and installation in potentially explosive atmospheres, according to ATEX directive; the supply always includes the declaration of conformity to the directive and the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environments.

Coils assembled on these valves have been separately certified according to ATEX directive and so they are suitable for use in potentially explosive atmospheres.

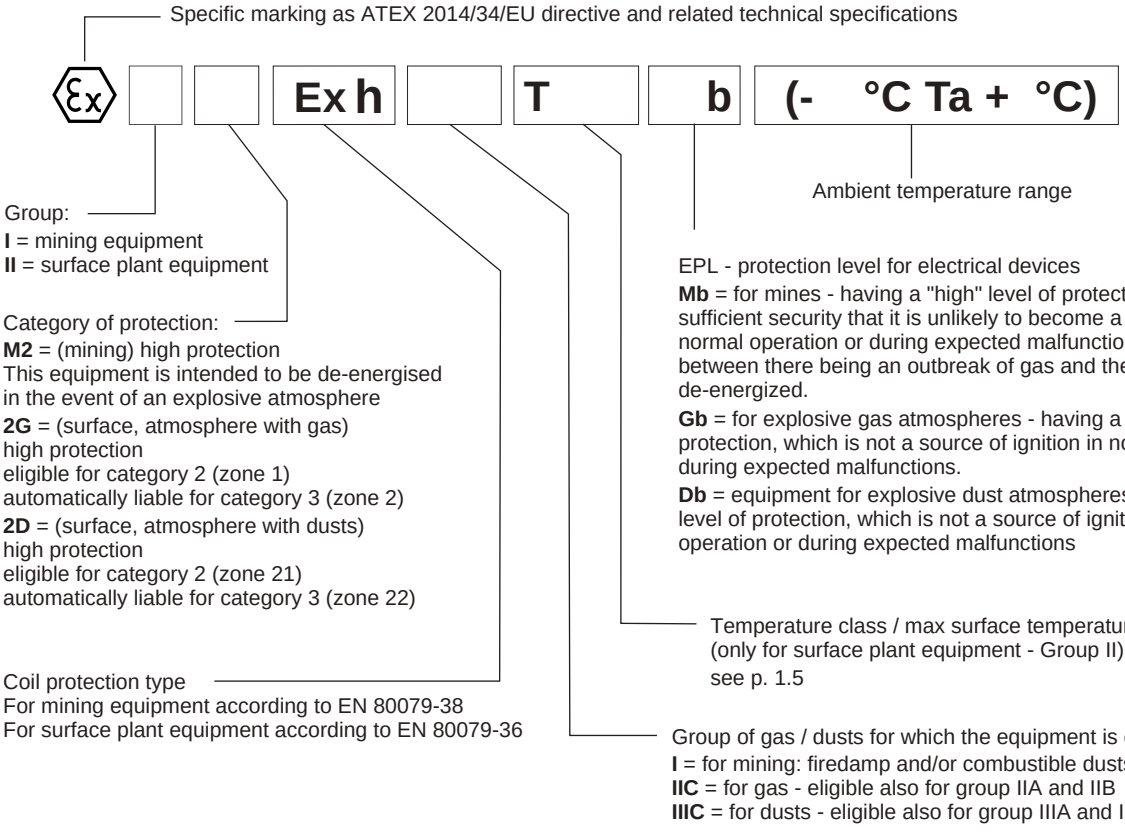
1.1 - ATEX classification for valves

The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

ATEX II 2G ATEX II 2D	***KD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur occasionally.The means of protection relating to equipment in this category ensure the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account.
ATEX I M2	***KDM2**	equipment intended for use in underground parts of mines as well as those parts of surface installations of such mines likely to be endangered by firedamp and/or combustible dust. This equipment is intended to be de-energised in the event of an explosive atmosphere.

1.2 - ATEX marking for valves

valve code		N and V seals	NL seals
***KD2**	for gas	Ex II 2G Ex h IIC T4 Gb (-20°C Ta +80°C)	Ex II 2G Ex h IIC T4 Gb (-40°C Ta +80°C)
	for dusts	Ex II 2D Ex h IIIC T135°C Db (-20°C Ta +80°C)	Ex II 2D Ex h IIIC T135°C Db (-40°C Ta +80°C)
***KD2 /T5**	for gas	Ex II 2G Ex h IIC T5 Gb (-20°C Ta +55°C)	Ex II 2G Ex h IIC T5 Gb (-40°C Ta +55°C)
	for dusts	Ex II 2D Ex h IIIC T100°C Db (-20°C Ta +55°C)	Ex II 2D Ex h IIIC T100°C Db (-40°C Ta +55°C)
***KDM2**	mining	Ex I M2 Ex h I Mb (-20°C Ta +80°C)	Ex I M2 Ex h I Mb (-40°C Ta +80°C)



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1.3 - ATEX classification of the coils

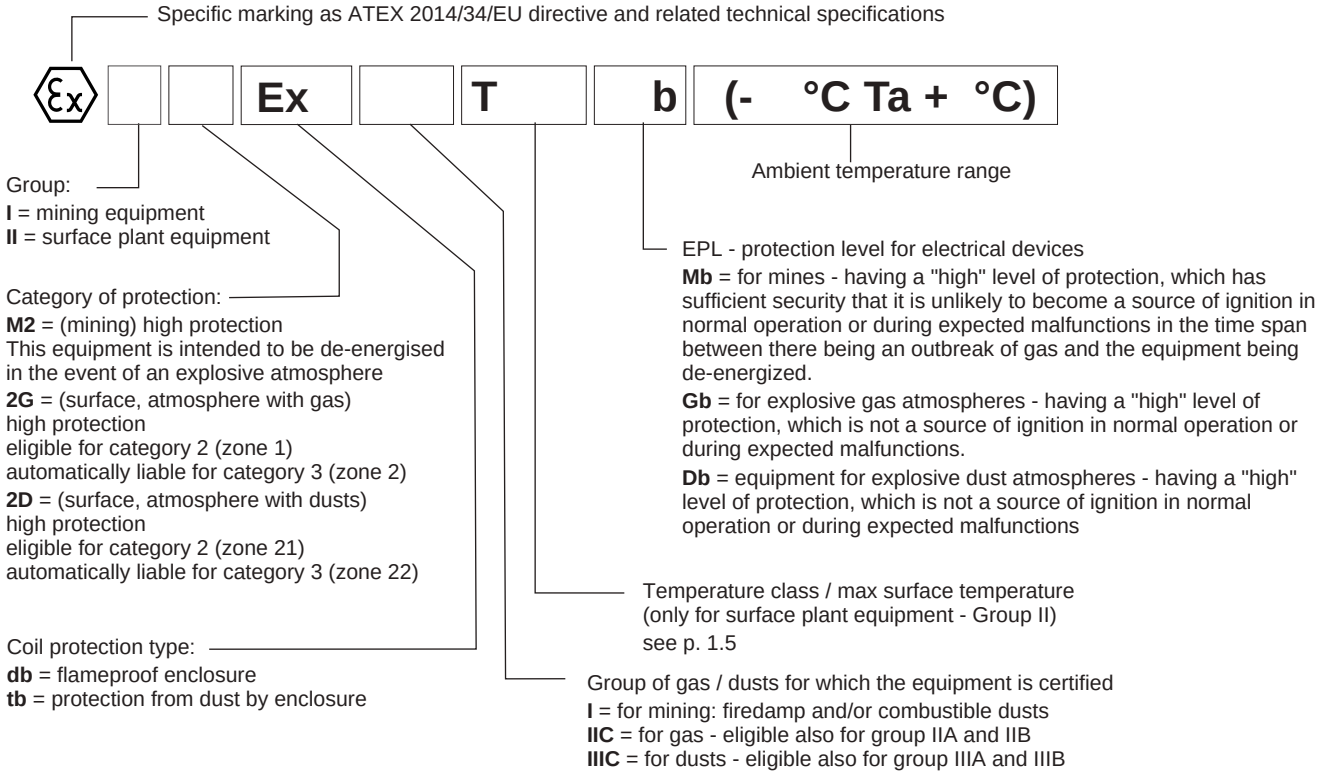
The coil of the explosion-proof valves is ATEX certified and, as such, is identified with its own tag, carries the relative ATEX marking. The mechanical construction of the coil housing is made in order to ensure its resistance to possible internal explosion and to avoid any explosion propagation to the outside environment, matching an “Ex db” type protection (explosion-proof coil).

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

1.4 - ATEX marking on coils

EU-type examination certificate: TÜV 25 ATEX 410149 X

for valve type ***KD2**	for gas	Ⓔx II 2G Ex db IIC T4 Gb (-40°C Ta +80°C)
	for dusts	Ⓔx II 2D Ex tb IIIC T135°C Db (-40°C Ta +80°C)
for valve type ***KD2 /T5**	for gas	Ⓔx II 2G Ex db IIC T5 Gb (-40°C Ta +55°C)
	for dusts	Ⓔx II 2D Ex tb IIIC T100°C Db (-40°C Ta +55°C)
for valve type ***KDM2**	mining	Ⓔx I M2 Ex db I Mb (-40°C Ta +80°C)



1.5 - Operating temperatures

These valves are classified according to their maximum surface temperature (EN 13463-1), which must be lower than the ignition temperature of the gases, vapors and dusts for which the area in which they will be used is classified.

The valves in group II can also be used for less limiting temperature classes (surface temperature allowed higher).

		temperature range	N and V seals	NL seals	Temperature class	eligible also for
ATEX II 2G ATEX II 2D	***KD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas) T135°C (dusts)	T3, T2, T1 T200°C and higher
		of fluid				
	***KD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas) T100°C (dusts)	T4, T3, T2, T1 T135°C and higher
		of fluid	-20 / +60 °C	-40 / +60 °C		
ATEX I M2	***KDM2**	of ambient	-20 / +80 °C	-40 / +80 °C	-	-
		of fluid				

1.6 - Protection degree from atmospheric agents (EN 60529)

Protection degree from atmospheric agents according to EN 60529 is IP66/IP68.

2 - IECEX CLASSIFICATION AND TEMPERATURES

The IECEx certification requires the classification of the electrical equipment only.

Duplomatic supplies valves with IECEx certified coils, suitable for application and installation in potentially explosive atmospheres. The mechanical construction of the coil housing is made in order to ensure its resistance to possible internal explosion and to avoid any explosion propagation to the outside environment, matching an “Ex db” type protection (explosion-proof coil).

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

The supply always includes the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environment.

2.1 - IECEx classification

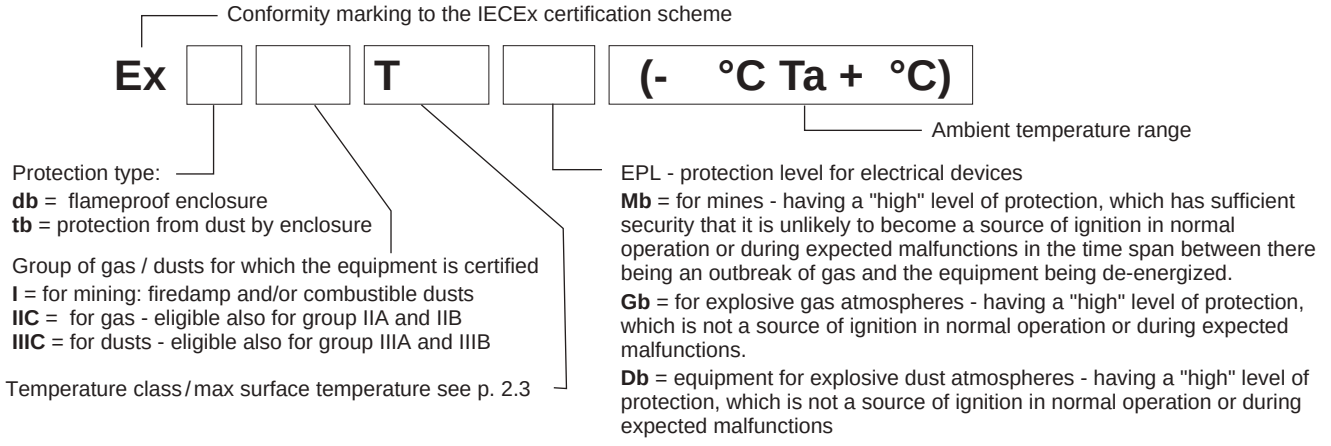
Certificate of conformity (CoC): IECEx TUN 15.0028X
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

IECEx Gb IECEx Db	***KXD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur occasionally.The means of protection relating to equipment in this category ensure the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account.
IECEx Mb	***KXDM2**	equipment intended for use in underground parts of mines as well as those parts of surface installations of such mines likely to be endangered by firedamp and/or combustible dust. This equipment is intended to be de-energised in the event of an explosive atmosphere.

2.2 - IECEx marking

There is a plate with the IECEx mark on each coil.

***KXD2** valves	for gas	Ex db IIC T4 Gb (-40°C Ta +80°C)
	for dusts	Ex tb IIIC T135°C Db (-40°C Ta +80°C)
***KXD2 /T5** valves	for gas	Ex db IIC T5 Gb (-40°C Ta +55°C)
	for dusts	Ex tb IIIC T100°C Db (-40°C Ta +55°C)
***KDM2** valves	mining	Ex db I Mb (-40°C Ta +80°C)



2.3 - Operating temperatures

These valves are classified according to their maximum surface temperature (EN 13463-1), which must be lower than the ignition temperature of the gases, vapors and dusts for which the area in which they will be used is classified.

Valves for surface plants can also be used for less limiting temperature classes (higher surface temperature allowed).

		temperature range	N and V seals	NL seals	Temperature class	eligible also for
IECEx Gb IECEx Db	***KXD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas) T135°C (dusts)	T3, T2, T1 T200°C and higher
		of fluid				
	***KXD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas) T100°C (dusts)	T4, T3, T2, T1 T135°C and higher
		of fluid	-20 / +60 °C	-40 / +60 °C		
IECEx Mb	***KXDM2**	of ambient	-20 / +80 °C	-40 / +80 °C	-	-
		of fluid				

2.4 - Protection degree from atmospheric agents (IEC EN 60529)

Protection degree from atmospheric agents according to IEC EN 60529 is IP66/IP68.

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3 - PESO CLASSIFICATION AND TEMPERATURES

The PESO certification requires the classification of the electrical equipment only.

Duplomatic supplies valves with PESO certified coils, suitable for application and installation in potentially explosive atmospheres. The mechanical construction of the coil housing is made in order to ensure its resistance to possible internal explosion and to avoid any explosion propagation to the outside environment, matching an “Ex db” type protection (explosion-proof coil).

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

The supply always includes the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environment.

3.1 - PESO classification

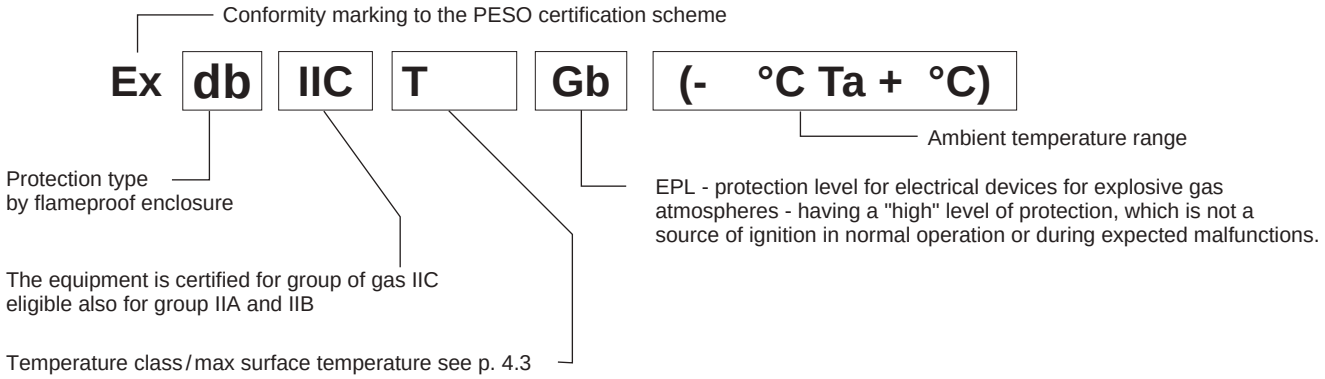
Certificate of conformity: P636522
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

PESO Gb	***KPD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists are likely to occur occasionally.The means of protection relating to equipment in this category ensure the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account.

3.2 - PESO marking

There is a plate with the PESO mark on each coil.

***KPD2** valves	for gas	Ex db IIC T4 Gb (-40°C Ta +80°C)
***KPD2 /T5** valves	for gas	Ex db IIC T5 Gb (-40°C Ta +55°C)



3.3 - Operating temperatures

These valves are classified according to their maximum surface temperature (EN 13463-1), which must be lower than the ignition temperature of the gases, vapors and dusts for which the area in which they will be used is classified.

Valves for surface plants can also be used for less limiting temperature classes (higher surface temperature allowed).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
PESO Gb	***KPD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas)	T3, T2, T1
		of fluid				
	***KPD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas)	T4, T3, T2, T1
		of fluid	-20 / +60 °C	-40 / +60 °C		

3.4 - Protection degree from atmospheric agents (IEC EN 60529)

Protection degree from atmospheric agents according to IEC EN 60529 is IP66/IP68.

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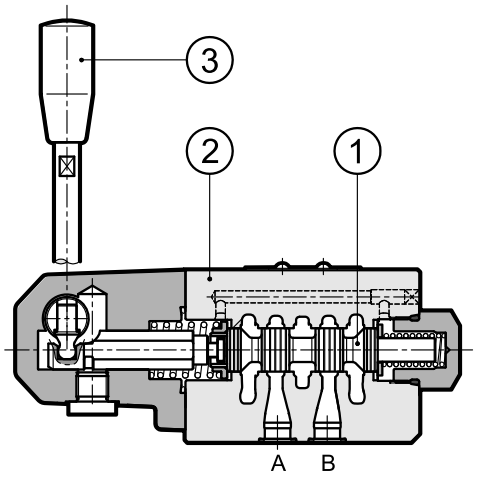


DSH*
LEVER OPERATED DIRECTIONAL CONTROL VALVE

MOUNTING SURFACES
DSH3 ISO 4401-03
DSH5 ISO 4401-05

p max (see performances table)
Q nom (see performances table)

OPERATING PRINCIPLE



— The DSH* are lever operated directional control valves, available with 3 or 4 ways and with several types of interchangeable spools (1).

— The valve body (2) is made with high strength iron castings provided with wide internal passages in order to minimize the flow pressure drop.

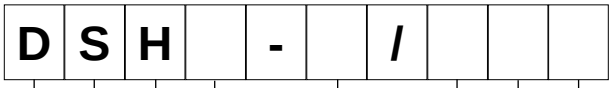
— They are available with 2 or 3 positions with return spring or mechanical retention.

— On DSH3 version is possible to rotate the lever (3) by 180° compared with the standard position, depending on installation requirements (par. 7).

PERFORMANCES (with mineral oil of viscosity of 36 cSt at 50°C)

		DSH3	DSH5
Maximum working pressure: - P - A - B ports - T port	bar	 350 210	 320 160
Nominal flow rate	l/min	75	150
Ambient temperature range	°C	-20 / +60	
Fluid temperature range	°C	-20 / +80	
Fluid viscosity range	cSt	10 ÷ 400	
Fluid contamination degree		according to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25	
Mass	kg	1.3	4.2

1 - IDENTIFICATION CODE



Directional control valve with spool

Lever operated (see **NOTE 1**)

Size:
3 = ISO 4401-03
5 = ISO 4401-05

Spool type (see par. 2)

Series No.:
11 for DSH3 (the overall and mounting dimensions remain unchanged from 10 to 19)
30 for DSH5 (the overall and mounting dimensions remain unchanged from 30 to 39)

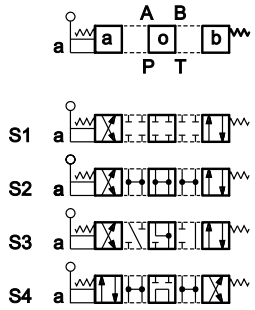
Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Option:
/ W7 = Zinc-nickel surface treatment (see **NOTE 2**). Omit if not required.

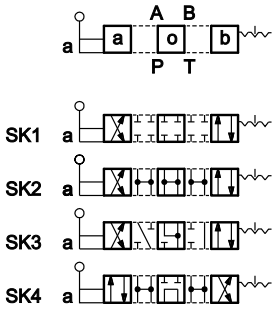
NOTE 1: On request it is possible to have the lever mounted in different positions from those in the catalogue. Please consult our Technical Department.
NOTE 2: Standard surface treatment: phosphating. The zinc-nickel finishing makes the valve suitable to ensure a salt spray resistance up to 600 hours.

2 - SPOOL TYPE

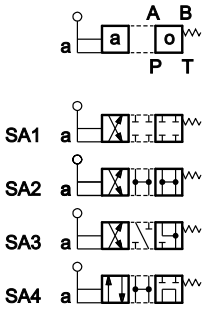
Type **S***:
3 positions
with spring centering



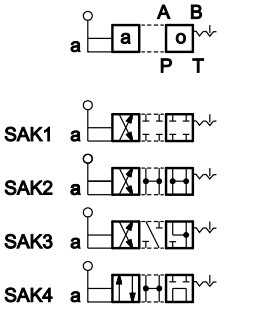
Type **SK***:
3 positions
with mechanical retention



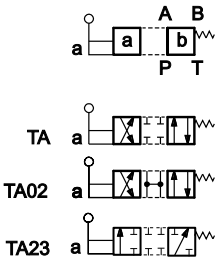
Type **SA***:
2 positions
(central + external)
with spring centering



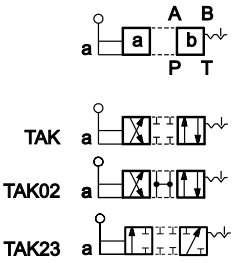
Type **SAK***:
2 positions
(central + external)
with mechanical retention



Type **TA**:
2 external positions
with return spring



Type **TAK**:
2 external positions
with mechanical retention



Besides the diagrams shown, which are the most frequently used, other special versions are available: consult our Technical Department for their identification and operating limits.

NOTE: TA02,TA23, TAK02 and TAK23 spools are available only for DSH3.

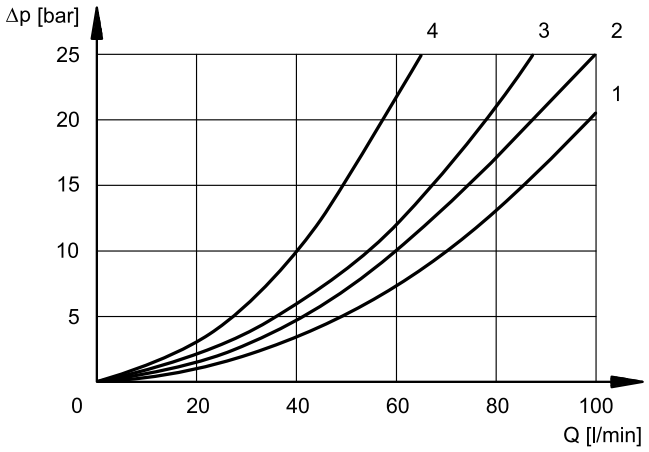
3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

4 - PRESSURE DROPS Δp-Q (values obtained with viscosity 36 cSt at 50 °C)

4.1 - DSH3



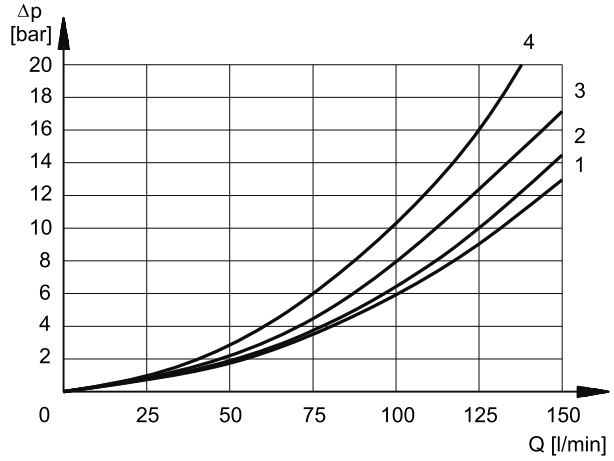
VALVE IN ACTUATED POSITION

SPOOL TYPE	FLOW DIRECTION			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPH			
S1, SA1, SAK1	2	2	3	3
S2, SA2, SAK2	1	1	3	3
S3, SA3, SAK3	3	3	1	1
S4, SA4, SAK4	4	4	4	4
TA, TAK	3	3	3	3
TA02, TAK02	2	2	2	2
TA23, TAK23	3	3		

VALVE IN NORMAL POSITION

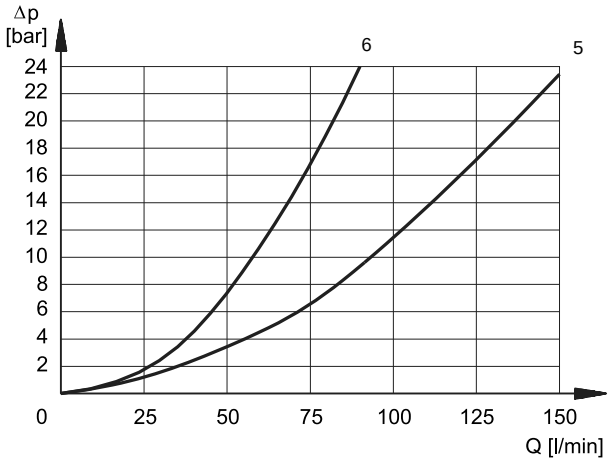
SPOOL TYPE	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S2, SA2, SAK2					2
S3, SA3, SAK3			3	3	
S4, SA4, SAK4					3

4.2 - DSH5



VALVE IN ACTUATED POSITION

SPOOL TYPE	FLOW DIRECTION			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPH			
S1, SK1	2	2	1	1
S2, SK2	3	3	1	1
S3, SK3	3	3	2	2
S4, SK4	1	1	2	2
TA, TAK	3	3	2	2



VALVE IN NORMAL POSITION

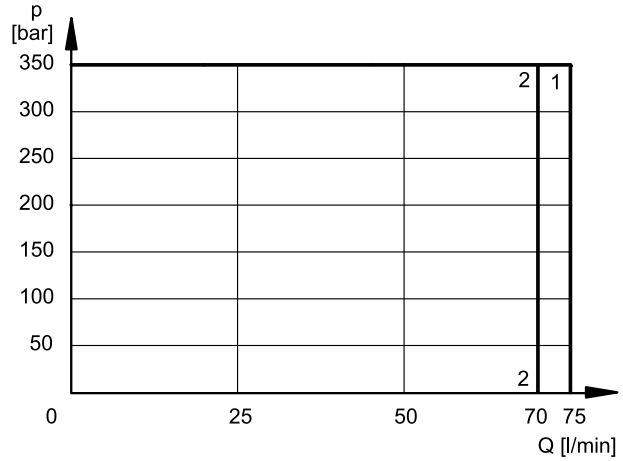
SPOOL TYPE	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S2, SK2					5
S3, SK3			6	6	
S4, SK4					5

5 - OPERATING LIMITS

The curves define the flow rate operating fields according to the valve pressure of the different versions.

The values have been obtained according to ISO 6403 norm, with mineral oil viscosity 36 cSt at 50 °C and filtration ISO 4406:1999 class 18/16/13.

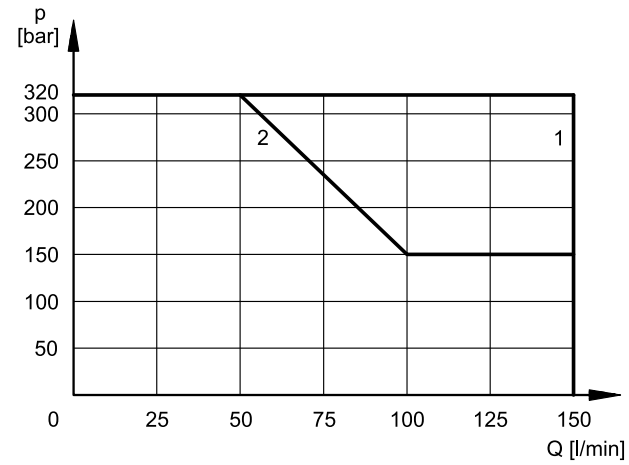
5.1 - DSH3



SPOOL TYPE	CURVE	
	P→A	P→B
S1, SK1, SA1, SAK1	1	1
S2, SK2, SA2, SAK2	1	1
S3, SK3, SA3, SAK3	1	1
S4, SK4, SA4, SAK4	2	2

SPOOL TYPE	CURVE	
	P→A	P→B
TA, TAK	1	1
TA02, TAK02	1	1
TA23, TAK23	1	1

5.2 - DSH5



SPOOL TYPE	CURVE	
	P→A	P→B
S1, SK1, SA1, SAK1	1	1
S2, SK2, SA2, SAK2	1	1
S3, SK3, SA3, SAK3	1	1
S4, SK4, SA4, SAK4	2	2

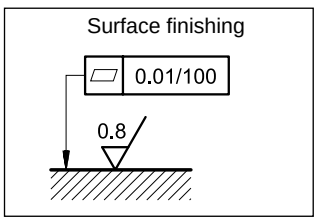
SPOOL TYPE	CURVE	
	P→A	P→B
TA, TAK	1	1

NOTE: Values in the graphs are relevant to the standard valve. The operating limits can be considerably reduced if a 4-way valve is used with port A or B plugged.

6 - INSTALLATION

Configurations with centering and return springs can be mounted in any position; valves with mechanical detent must be mounted with the longitudinal axis horizontal.

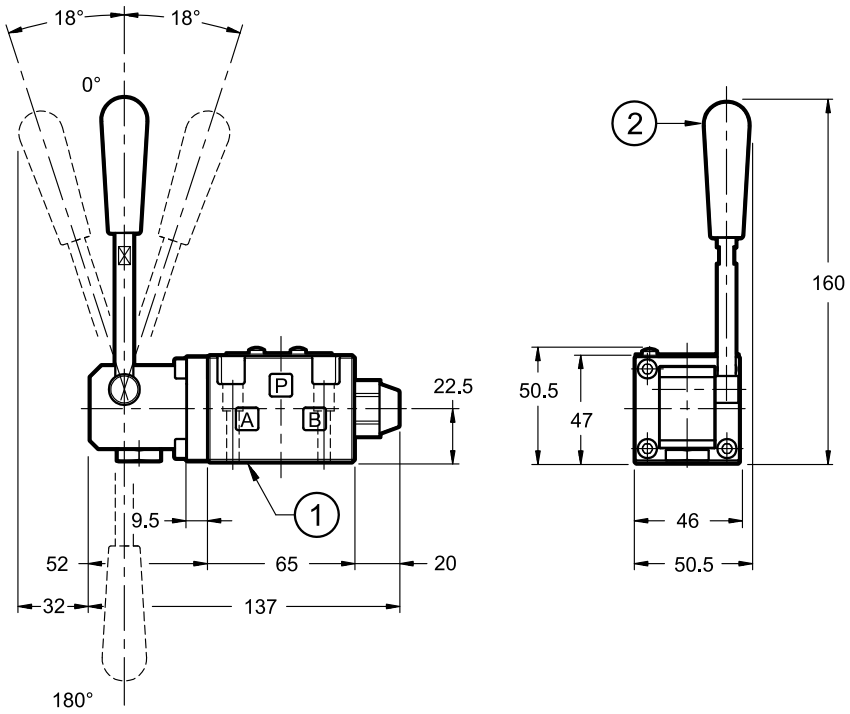
Valve fixing is by means of screws or tie rods, with the valve mounted on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing. If the minimum values of planarity and/or smoothness are not met, fluid leakage between valve and mounting surface can easily occur.

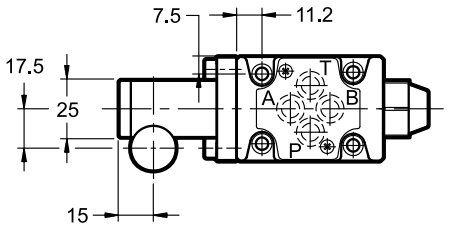


7 - OVERALL AND MOUNTING DIMENSIONS DSH3

dimensions in mm

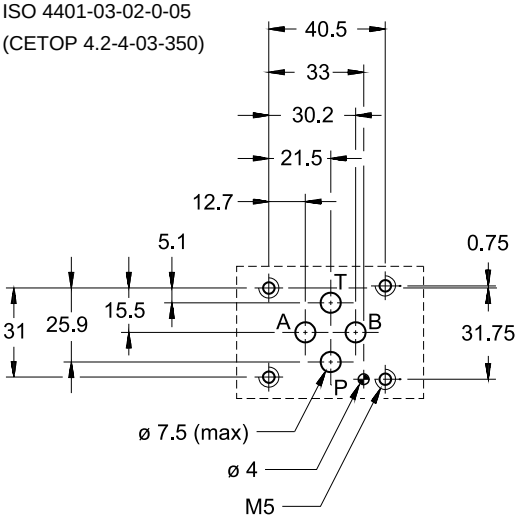
DSH3 - S*
DSH3 - SK*





DSH3 MOUNTING SURFACE

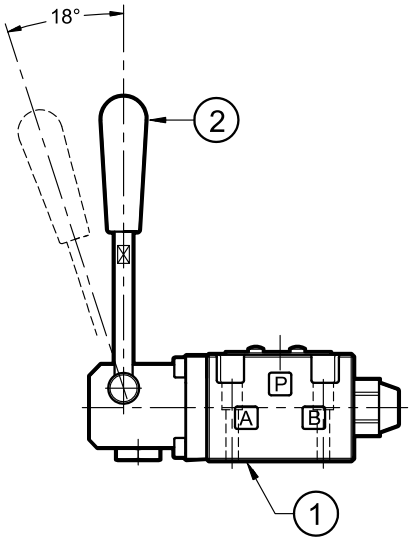
ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)



DSH3-TA
DSH3-TAK

DSH3-TA23
DSH3-TAK23

DSH3-SA*
DSH3-SAK*



1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) - 90 Shore
2	Hand lever (**NOTE**)

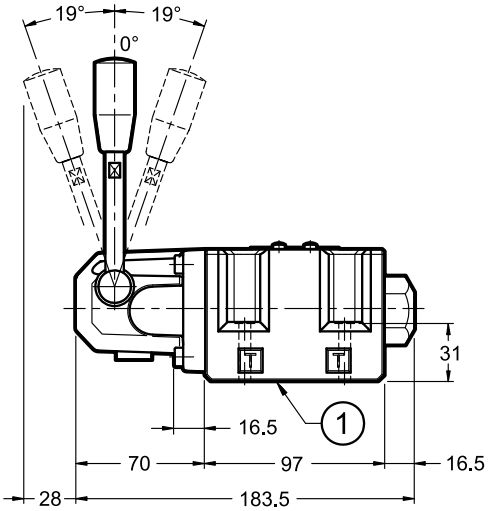
Valve fastening:	N. 4 SHC screws M5x30 ISO 4762
Tightening torque:	5 Nm (bolts A 8.8)
Threads of mounting holes:	M5x10

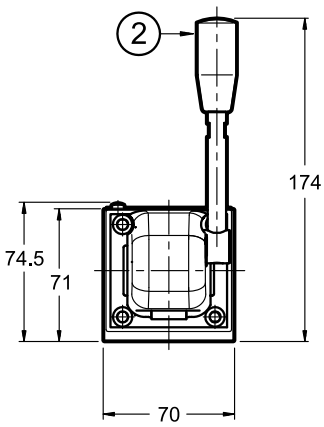
NOTE: The valve is supplied with the hand lever oriented in a perpendicular position with respect to the mounting surface (as indicated in the above drawing). For installation needs the hand lever can be oriented by the user directly at 180° to the standard position, simply by unscrewing the lever and re-screwing it in the desired position.

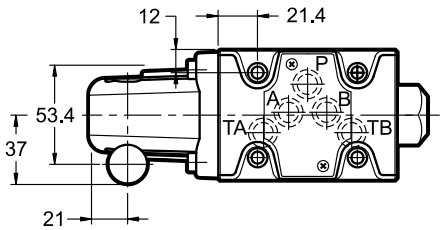
8 - OVERALL AND MOUNTING DIMENSIONS DSH5

dimensions in mm

DSH5-S*
DSH5-SK*

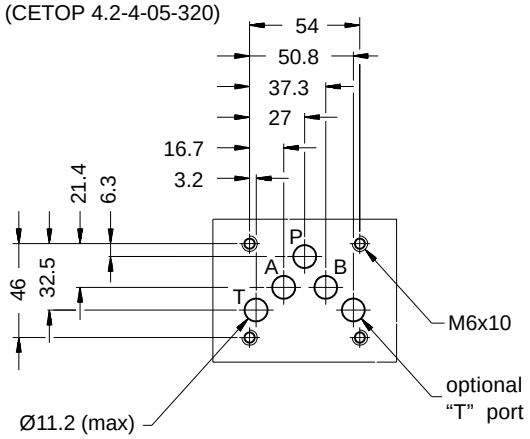






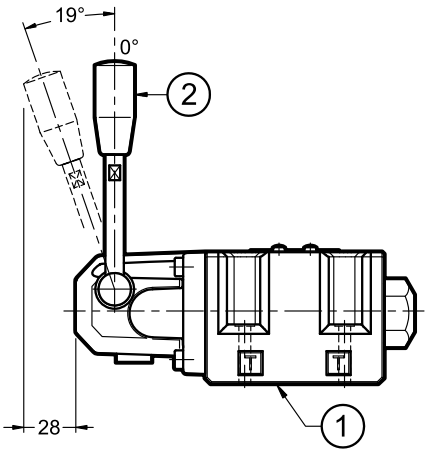
MOUNTING SURFACE DSH5

(CETOP 4.2-4-05-320)



DSH5-TA
DSH5-TAK

DSH5-SA*
DSH5-SAK*



1	Mounting surface with sealing rings: N. 5 OR type 2050 (12.42x1.78) - 90 Shore
2	Hand lever (**NOTE**)

Valve fastening:	N. 4 SHC screws ISO 4762 M6x40
Tightening torque:	8 Nm (A 8.8 screws)
Threads of mounting holes:	M6x10

NOTE: the valve can be supplied with hand lever oriented in different positions; ask our technical department for details.

9 - SUBPLATES (See catalogue 51 000)

	DSH3	DSH5
Type with rear ports	PMMD-AI3G	PMD4-AI4G - 3/4" BSP threaded
Type with side ports	PMMD-AL3G	PMD4-AL4G - 1/2" BSP threaded
P, T, A and B threads	3/8" BSP	

DUPLOMATIC MOTION SOLUTIONS
a member of DAIKIN group

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T +39 0331 895111 | E vendite.ita@duplomatic.com | sales.exp@duplomatic.com
duplomaticmotionsolutions.com

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DUPLOMATIC
MOTION SOLUTIONS

WWW.SUMY.IR

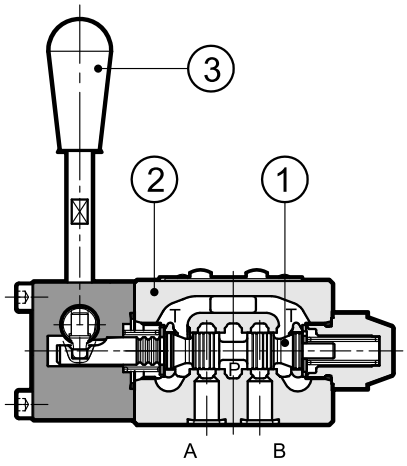


DSH3L
LEVER OPERATED DIRECTIONAL CONTROL VALVE
SERIES 10

MOUNTING SURFACE
ISO 4401-03

p max (see performances table)
Q nom **60** l/min

OPERATING PRINCIPLE



— DSH3L are lever (3) operated directional control valves, available with the more common types of spools (1).
— The valve body (2) is made with high strength iron castings provided with wide internal passages in order to minimize the flow pressure drop.
— They are available with 2 or 3 positions with return spring or mechanical retention.
— Upon request we can supply these valves with zinc-nickel surface treatment.

PERFORMANCES (with mineral oil of viscosity of 36 cSt at 50°C)

Maximum working pressure: - P - A - B ports - T port	bar	 350 210
Nominal flow rate	l/min	60
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree		according to ISO 4406:1999 class 20/18/15
Recommended viscosity	cSt	25
Mass	kg	1.4

1 - IDENTIFICATION CODE

D	S	H	3	L	-		/	10		

Directional control valve with spool

Lever operated

Size: ISO 4401-03

L = compact version

Spool type (see par. 2)

Series No.: the overall and mounting dimensions remain unchanged from 10 to 19

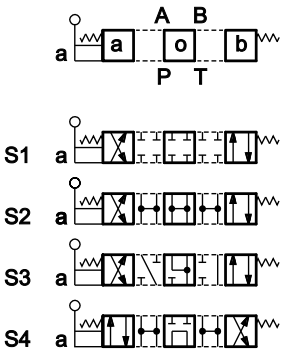
Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Option:
/ W7 = Zinc-nickel surface treatment (see **NOTE**). Omit if not required.

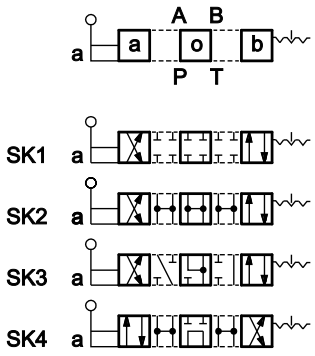
NOTE: Standard surface treatment: phosphating. The zinc-nickel finishing makes the valve suitable to ensure a salt spray resistance up to 600 hours.

2 - SPOOL TYPE

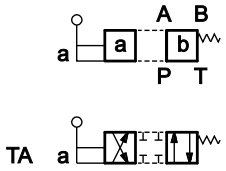
Type **S***:
3 positions
with spring centering



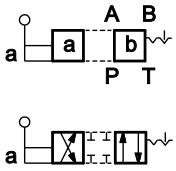
Type **SK***:
3 positions
with mechanical retention



Type **TA**:
2 external positions
with return spring



Type **TAK**:
2 external positions
with mechanical retention

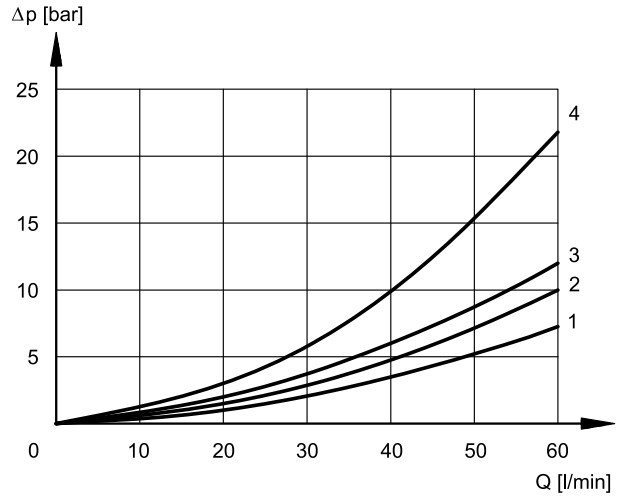


3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

4 - PRESSURE DROPS Δp-Q (values obtained with viscosity 36 cSt at 50 °C)



VALVE IN ACTUATED POSITION

SPOOL TYPE	FLOW DIRECTION			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPH			
S1, SK1	2	2	3	3
S2, SK2	1	1	3	3
S3, SK3	3	3	1	1
S4, SK4	4	4	4	4
TA, TAK	3	3	3	3

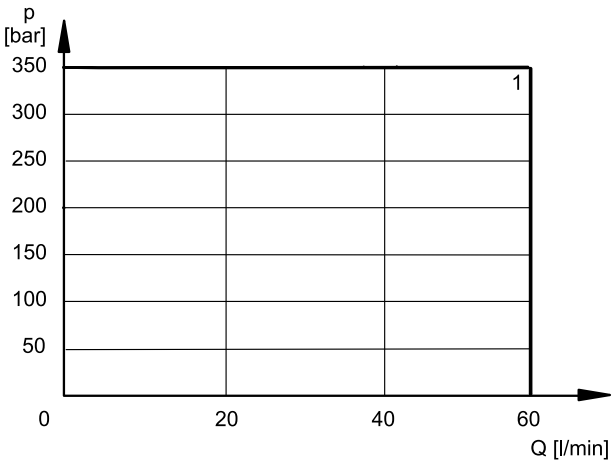
VALVE IN NORMAL POSITION

SPOOL TYPE	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S2, SK2					2
S3, SK3			3	3	
S4, SK4					3

5 - OPERATING LIMITS

The curves define the flow rate operating fields according to the valve pressure of the different versions.

The values have been obtained according to ISO 6403 norm, with mineral oil viscosity 36 cSt at 50 °C and filtration ISO 4406:1999 class 18/16/13.



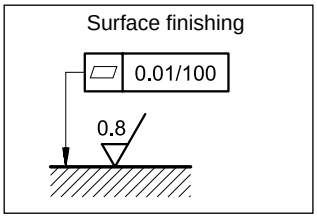
SPOOL TYPE	CURVE	
	P→A	P→B
S1, SK1	1	1
S2, SK2	1	1
S3, SK3	1	1
S4, SK4	1	1

SPOOL TYPE	CURVE	
	P→A	P→B
TA, TAK	1	1

6 - INSTALLATION

Configurations with centering and return springs can be mounted in any position; valves with mechanical detent must be mounted with the longitudinal axis horizontal.

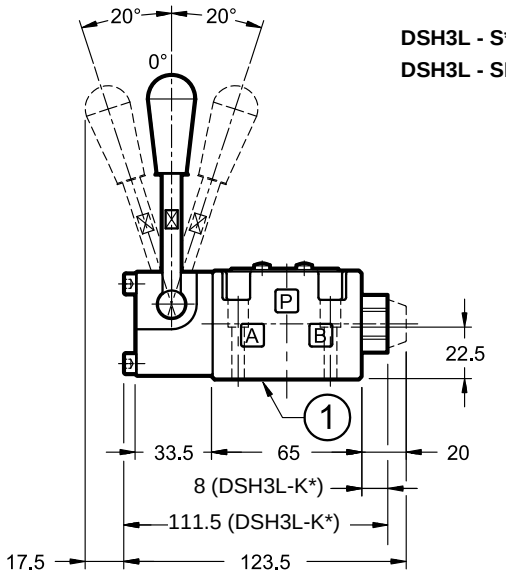
Valve fixing is by means of screws or tie rods, with the valve mounted on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing. If the minimum values of planarity and/or smoothness are not met, fluid leakage between valve and mounting surface can easily occur.

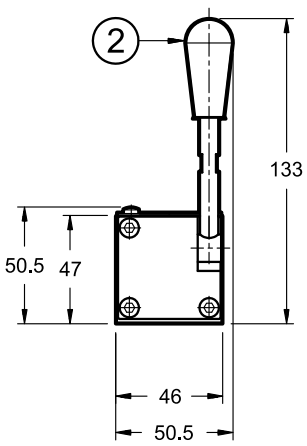


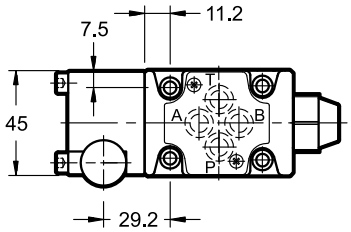
7 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

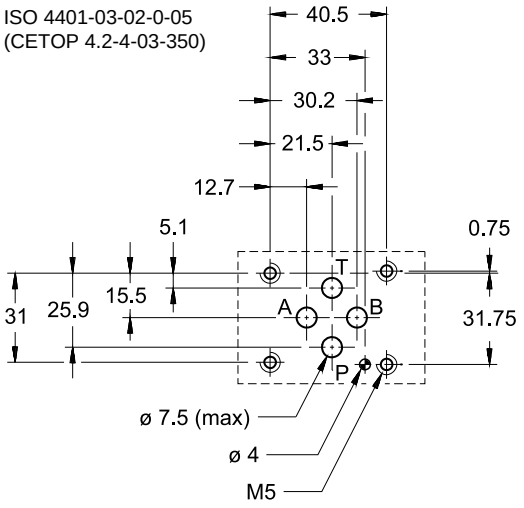
DSH3L - S*
DSH3L - SK*



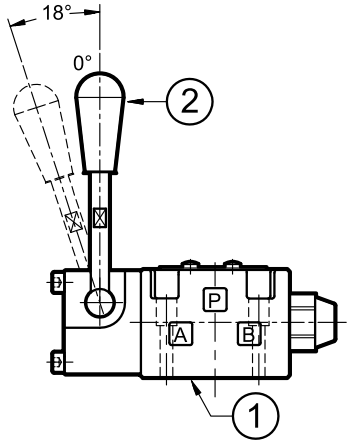




MOUNTING SURFACE
ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)



DSH3L-TA
DSH3L-TAK



1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) - 90 Shore
2	Hand lever

Valve fastening: N. 4 SHC screws M5x30 - ISO 4762
Tightening torque: 5 Nm (A 8.8 screws)
Threads of mounting holes: M5x10

8 - SUBPLATES (see catalogue 51 000)

Type with rear ports: PMMD-AI3G
Type with side ports: PMMD-AL3G
P, T, A and B threads: 3/8” BSP

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duplomaticmotionsolutions.com

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DSR3

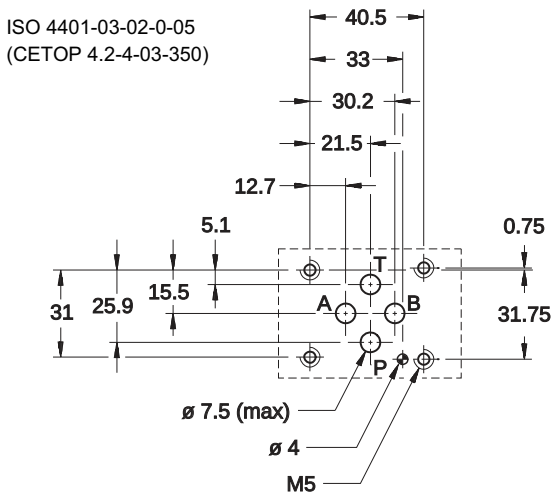
ROLLER CAM OPERATED DIRECTIONAL CONTROL VALVE

SERIES 11

SUBPLATE MOUNTING
ISO 4401-03 (CETOP 03)

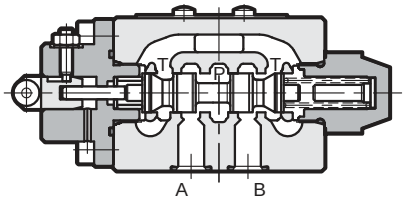
p max **350** bar
Q nom **75** l/min

MOUNTING INTERFACE

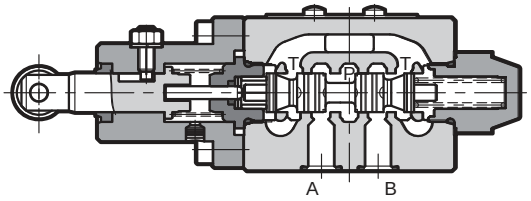


OPERATING PRINCIPLE

DSR3L



DSR3H



— The DSR3* are roller cam operated directional control valves, available with 4 ways, with mounting interface according to ISO 4401 (CETOP RP121H) standards.

— The valve body is made with high strength iron castings provided with wide internal passages in order to minimize the flow pressure drop.

— It is available in LIGHT (short) and HEAVY DUTY (long) versions, with 2 positions with return spring or with 2 positions with double mechanical command.

— The roller of the valve operating device can be positioned at 90° with respect to the valve mounting surface, in order to achieve flexible installation.

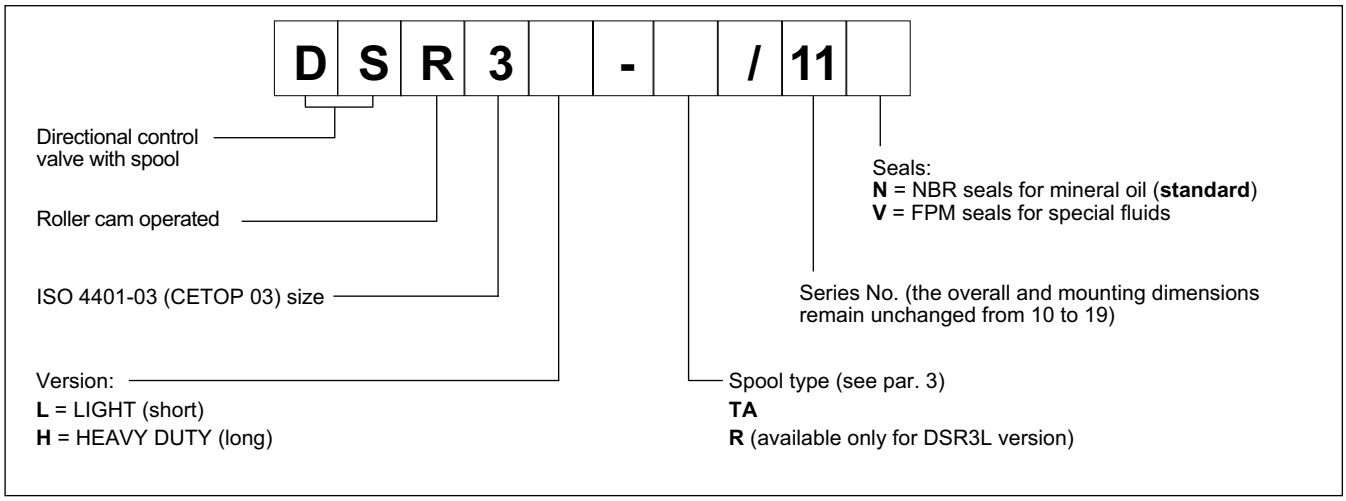
— This type of valve can be used as a hydraulic stroke end for cylinders, speed selectors (not compensated), hydraulic safety devices, directional control of hydraulic axes.

PERFORMANCE RATINGS

(obtained with mineral oil with viscosity of 36 cSt at 50°C)

Maximum operating pressure: - P A B ports - T ports	bar	 350 25
Nominal flow rate	l/min	75
Pressure drop Δp-Q	see par. 4	
Operating limits	see par. 5	
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	according to ISO 4406: 1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass: DSR3L-TA DSR3L-R DSR3H-TA	kg	1,1 1,2 1,2

1 - IDENTIFICATION CODE



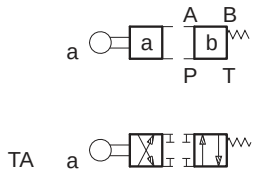
2 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

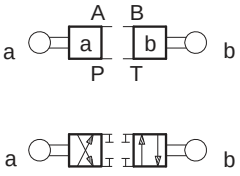
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

3 - SPOOL TYPE

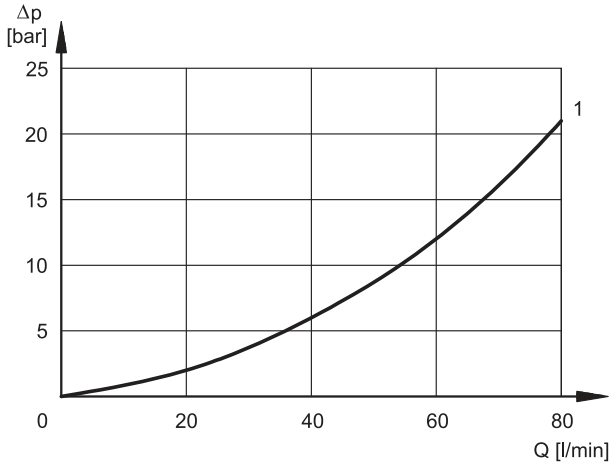
Type **TA**:
2 external positions
with return spring



Type **R**:
2 positions
with double mechanical command



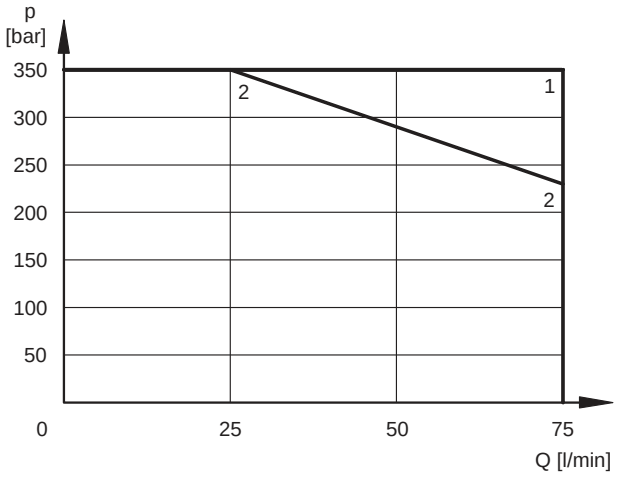
4 - PRESSURE DROPS Δp-Q (obtained with viscosity 36 cSt at 50 °C)



SPOOL TYPE	FLOW DIRECTION			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPH			
DSR3L-TA	1	1	1	1
DSR3L-R	1	1	1	1
DSR3H-TA	1	1	1	1

5 - OPERATING LIMITS

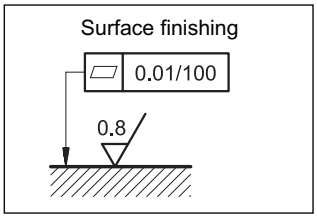
The curves define the flow rate operating fields according to the valve pressure of the different versions. The values have been obtained according to ISO 6403 norm, with mineral oil viscosity 36 cSt at 50 °C and filtration according to ISO 4406:1999 class 18/16/13.



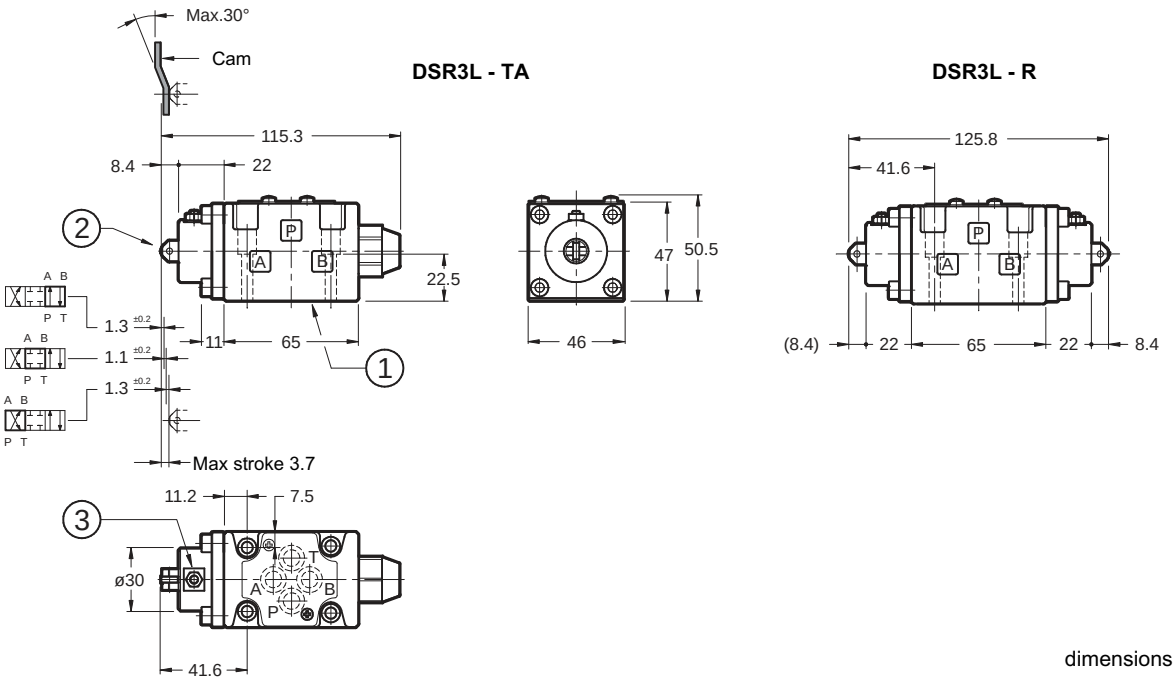
SPOOL TYPE	CURVE	
	P→A	P→B
DSR3L-TA	2	2
DSR3L-R	1	1
DSR3H-TA	1	1

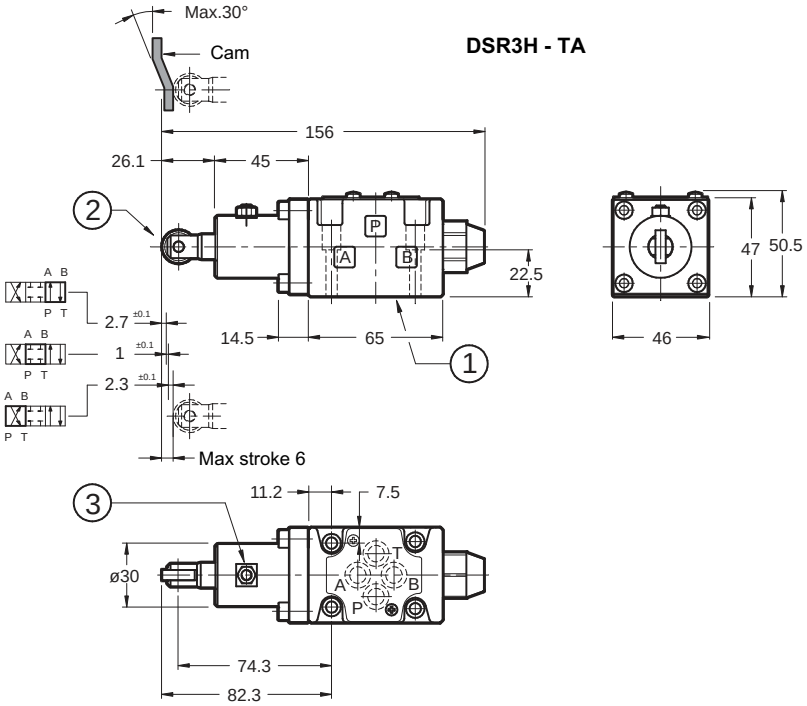
6 - INSTALLATION

Configurations with centering and return springs can be mounted in any position; type R valves - without springs - must be mounted with the longitudinal axis horizontal. Valve fixing is by means of screws or tie rods, with the valve mounted on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing. If the minimum values of planarity and/or smoothness are not met, fluid leakage between valve and mounting surface can easily occur.



7 - OVERALL AND MOUNTING DIMENSIONS





dimensions in mm

1	Mounting surface with sealing rings 4 OR type 2037 (9.25x1.78) - 90 Shore
2	Roller for valve operation (see **NOTE**)
3	Countersunk hexagonal screw for roller operation: **DSR3L** spanner 2 **DSR3H** spanner 2,5

NOTE: The valve is supplied as standard with the operating roller oriented in a perpendicular position with respect to the mounting surface. For installation needs the roller can be oriented by the user directly at 90° to the standard position:

- untight the locking nut and the countersunk hexagonal screw (ref. 3) until the spool and the relevant roller can be freely oriented.
- rotate through 90° the spool with the roller
- tighten the fixing screw (ref. 3) being careful that it goes inside the spool anti-rotation slot without preventing the spool movement.

8 - VALVE FASTENING BOLTS

N. 4 fastening bolts SHC ISO 4762 M5x30
Tightening torque 5 Nm (bolts A 8.8)

9 - SUBPLATES (see catalogue 51 000)

Type PMMD-AI3G with rear ports 3/8” BSP
Type PMMD-AL3G with side ports 3/8” BSP

DUPLOMATIC OLEODINAMICA

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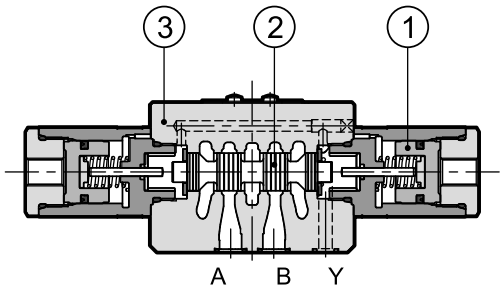


DSA*
DIRECTIONAL CONTROL VALVE, PNEUMATICALLY OPERATED

SUBPLATE MOUNTING
DSA3 ISO 4401-03
DSA5 ISO 4401-05

p max (see performances table)
Q nom (see performances table)

OPERATING PRINCIPLE



— The DSA* are pneumatically operated (1) directional control valves, available with 3 or 4 ways with several interchangeable spools (2) and with mounting interface according to ISO 4401 standards.

— The valve body (3) is made with high strength iron castings provided with wide internal passages in order to minimize the flow pressure drop.

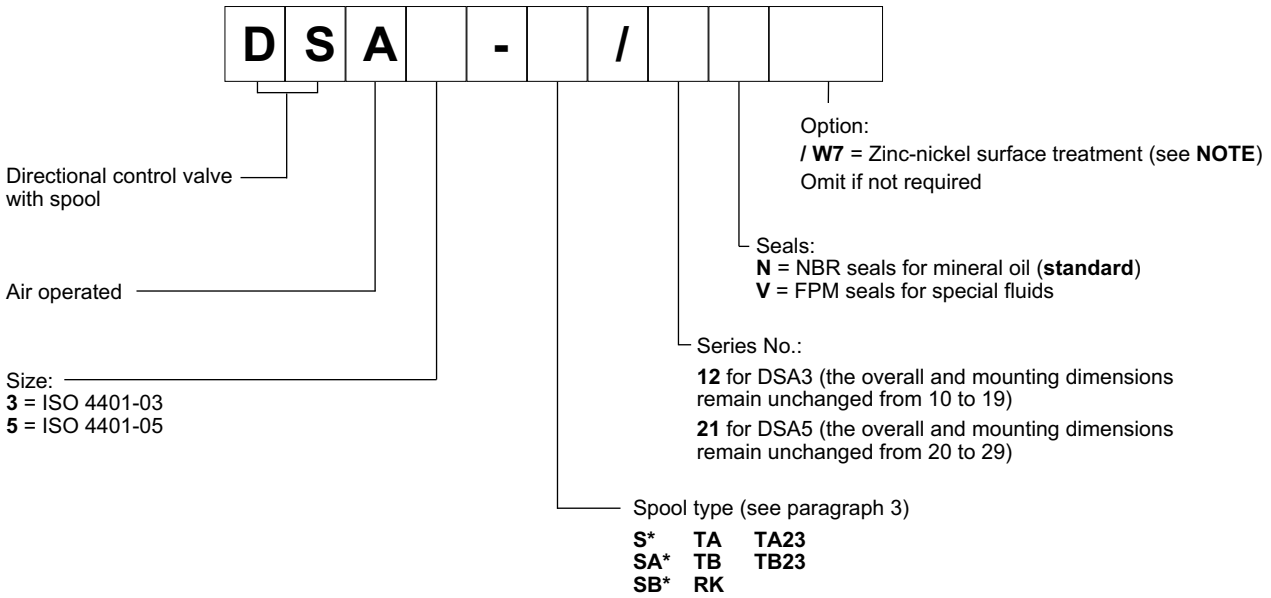
— IThey are available with 2 or 3 positions with return spring, or with 2 positions with mechanical retention.

— The DSA5 has an external drain port that must be connected when there is backpressure higher than 25 bar on the T port.

PERFORMANCES
(with mineral oil of viscosity 36 cSt at 50°C)

		DSA3	DSA5
Maximum working pressure: - P, A, B ports - T port without Y external drain - T port with Y external drain (available for DSA5 only)	bar	 350 25 -	 320 25 320
Piloting pressure: - min - max	bar	 4 12	 4,5 12
Nominal flow rate	l/min	75	120
Ambient temperature range	°C	-20 / +60	
Fluid temperature range	°C	-20 / +80	
Fluid viscosity range	cSt	10 ÷ 400	
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15		
Recommended viscosity	cSt	25	
Mass: single operator valve dual operator valve	kg	1,3 1,7	3,2 4,0

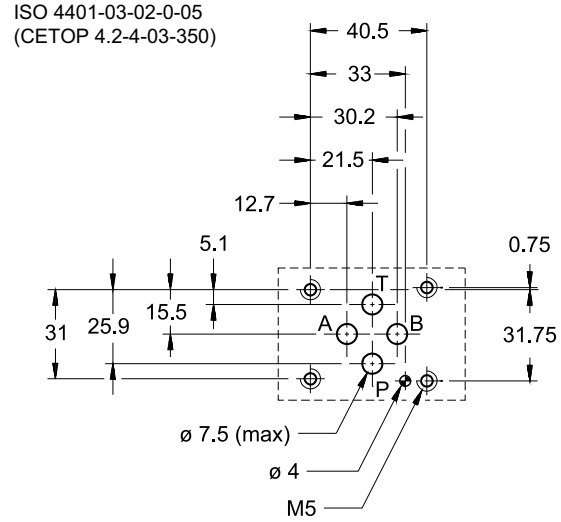
1 - IDENTIFICATION CODE



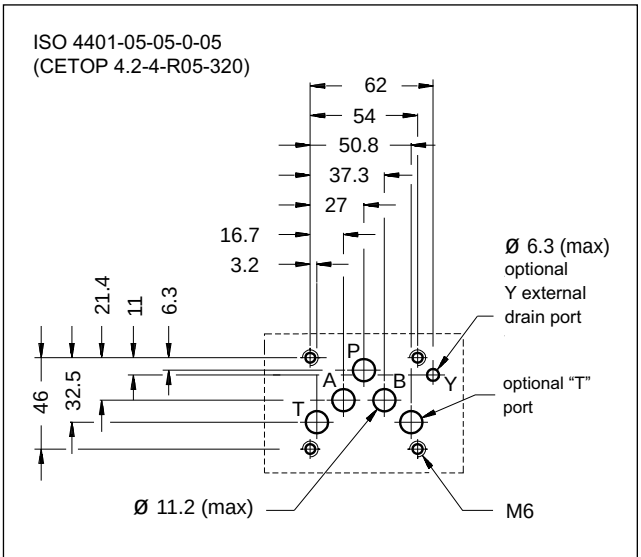
NOTE :The standard valve is supplied with surface treatment of phosphating black.
The zinc-nickel finishing on the valve body makes the valve suitable to ensure a salt spray resistance up to **600** hours.
(test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

2 - MOUNTING INTERFACES

DSA3



DSA5



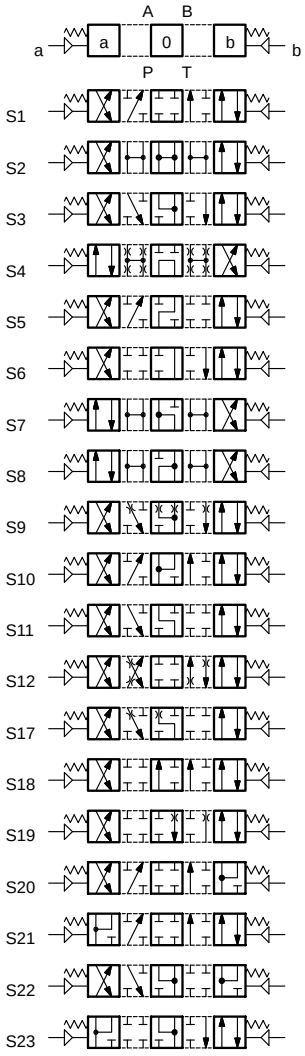
3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

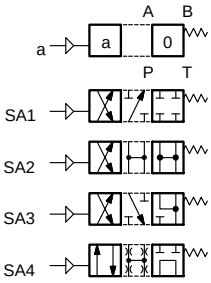
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

4 - SPOOLS TYPES

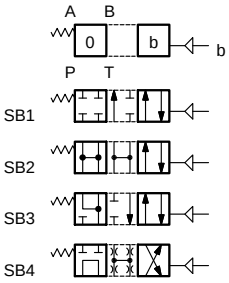
Type **S***:
2 operations - 3 positions
with spring centering



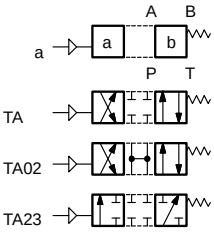
Type **SA***:
1 operation side A
2 positions (central + external)
with spring centering



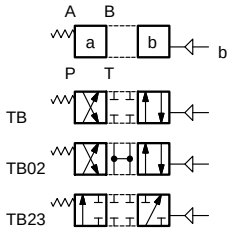
Type **SB***:
1 operation side B
2 positions (central + external)
with spring centering



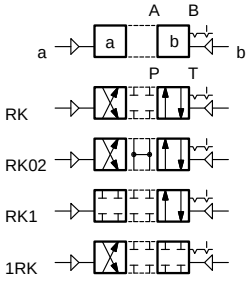
Type **TA**:
1 operation side A
2 external positions
with return spring



Type **TB**:
1 operation side B
2 external positions
with return spring



Type **RK**:
2 operations - 2 positions
with mechanical retention

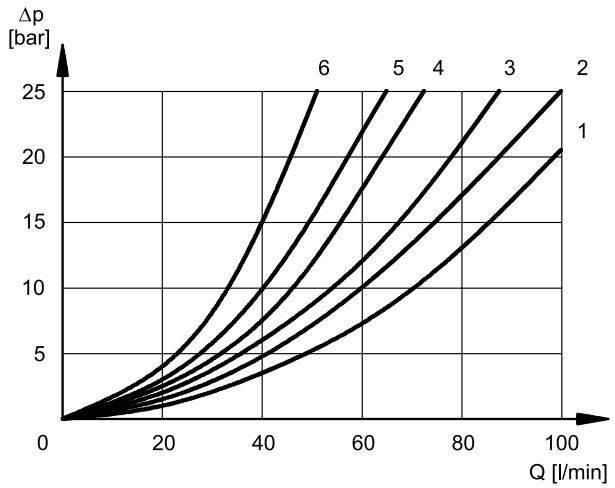


Besides the diagrams shown, which are the most frequently used, other special versions are available: consult our technical department for their identification and operating limits.

5 - PRESSURE DROPS Δp-Q

(values obtained with viscosity 36 cSt at 50 °C)

5.1 - DSA3



For pressure drops between A and B lines of spools S10, S20, S21, S22 and S23, which are used in the regenerative diagram, refer to curve 5.

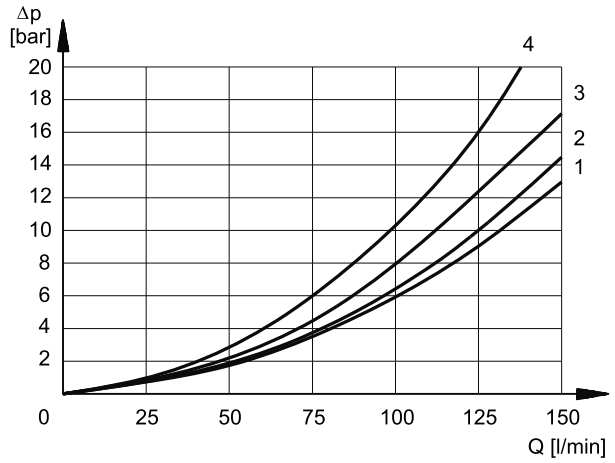
PRESSURE DROPS WITH VALVE IN ENERGIZED POSITION

SPOOL TYPE	FLOW DIRECTION			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPH			
S1, SA1, SB1	2	2	3	3
S2, SA2, SB2	1	1	3	3
S3, SA3, SB3	3	3	1	1
S4, SA4, SB4	5	5	5	5
S5	2	1	3	3
S6	2	2	3	1
S7, S8	4	5	5	5
S9	2	2	3	3
S10	1	3	1	3
S11	2	2	1	3
S12	2	2	3	3
S17	2	2	3	3
S18	1	2	3	3
S19	2	2	3	3
S20	1	5	2	
S21	5	1		2
S22	1	5	2	
S23	5	1		2
TA, TB	3	3	3	3
TA02, TB02	2	2	2	2
TA23, TB23	3	3		
RK	2	2	2	2
RK02	2	2	2	2
RK1, 1RK	2	2	2	2

PRESSURE DROPS WITH VALVE IN DE-ENERGIZED POSITION

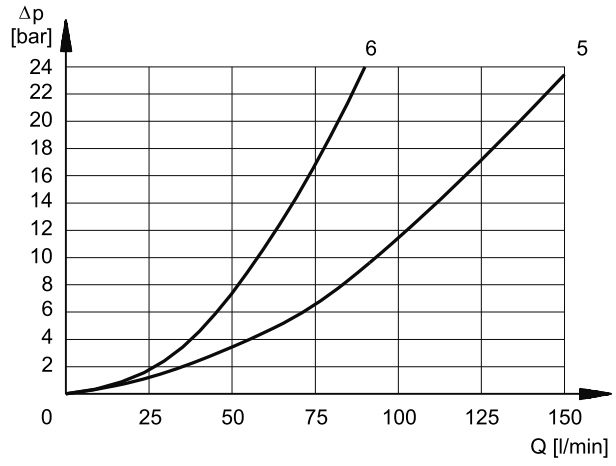
SPOOL TYPE	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S2, SA2, SB2					2
S3, SA3, SB3			3	3	
S4, SA4, SB4					5
S5		4			
S6				3	
S7, S8			6	6	5
S10	3	3			
S11			3		
S18	4				
S22			3	3	
S23			3	3	

5.2 - DSA5



PRESSURE DROPS WITH VALVE IN ENERGIZED POSITION

SPOOL TYPE	FLOW DIRECTION			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPH			
S1, SA1, SB1	2	2	1	1
S2, SA2, SB2	3	3	1	1
S3, SA3, SB3	3	3	2	2
S4, SA4, SB4	1	1	2	2
S5	2	1	1	1
S6, S11	3	3	2	2
S7, S8	1	1	2	2
S9	3	3	2	2
S10	1	1	1	1
S12	2	2	1	1
S17, S19	2	2	1	1
S18	1	2	1	1
S20, S21				
S22, S23				
TA, TB	3	3	2	2
TA02, TB02	3	3	2	2
TA23, TB23	4	4		
RK	3	3	2	2
RK02	3	3	2	2
RK1, 1RK	3	3	2	2



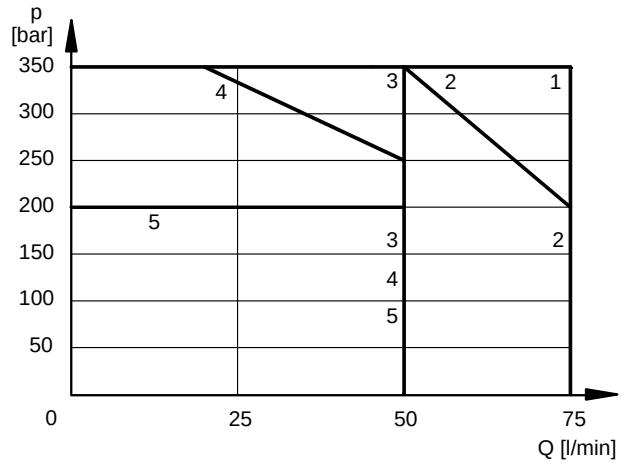
PRESSURE DROPS WITH VALVE IN DE-ENERGIZED POSITION

SPOOL TYPE	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S2, SA2, SB2					5
S3, SA3, SB3			6	6	
S4, SA4, SB4					5
S5		3			
S6				6	
S7					5
S10	3	3			
S11			6		
S18	3				
S22					
S23					

6 - OPERATING LIMITS

The curves define the flow rate operating fields according to the valve pressure of the different versions. The values have been obtained according to ISO 6403 norm, with mineral oil viscosity 36 cSt at 50 °C and filtration according to ISO 4406:1999 class 18/16/13.

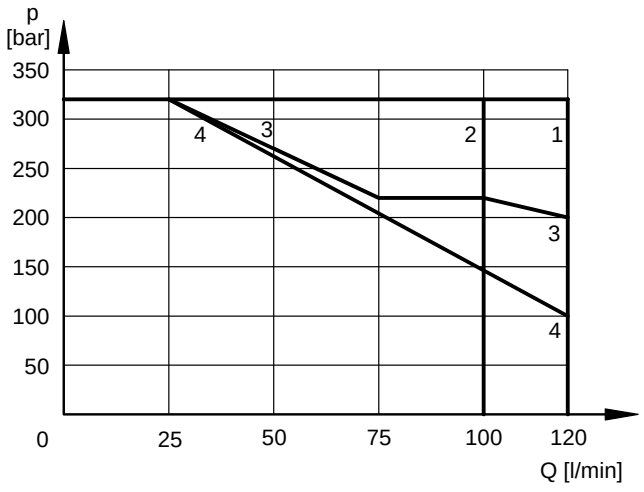
6.1 - DSA3



SPOOL TYPE	CURVE	
	P→A	P→B
S1,SA1,SB1	1	1
S2, SA2, SB2	1	1
S3, SA3, SB3	2	2
S4, SA4, SB4	3	3
S5	1	1
S6	3	2
S7	3	3
S8	3	3
S9	1	1
S10	1	1
S11	2	3
S12	1	1

SPOOL TYPE	CURVE	
	P→A	P→B
S17	1	1
S18	1	1
S19	1	1
S20	4	4
S21	4	4
S22	5	4
S23	4	5
TA, TB	1	1
TA02, TB02	1	1
TA23, TB23	1	1
RK	1	1
RK02	1	1
RK1, 1RK	1	1

6.2 - DSA5



SPOOL TYPE	CURVE	
	P→A	P→B
S1,SA1,SB1	1	1
S2, SA2, SB2	1	1
S3, SA3, SB3	3 *	3 *
S4, SA4, SB4	4	4
S5		
S6		
S7		
S8		
S9		
S10		
S11		
S12		

SPOOL TYPE	CURVE	
	P→A	P→B
S17		
S18		
S19		
S20		
S21		
S22		
S23		
TA, TB	2 *	2 *
TA02, TB02		
TA23, TB23		
RK		
RK02		
RK1, 1RK		

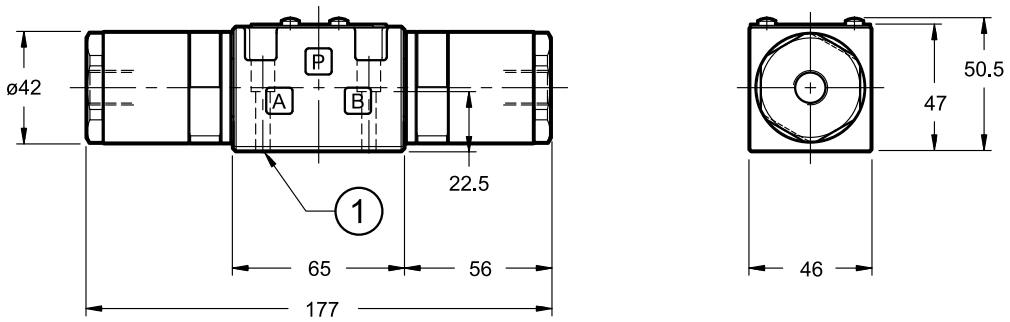
*** NOTE:** for spools S3 and TA, the curve has been obtained with a min. piloting pressure of 4,5 bar. If the minimum piloting pressure used is 5,5 bar, refer to the curve n° 1 (320 bar - 120 l/min).

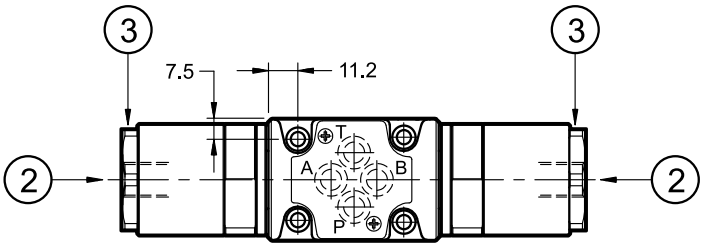
NOTE: The values indicated in the graphs are relevant to the standard valve. The operating limits can be considerably reduced if a 4-way valve is used with port A or B plugged or without flow.

7 - DSA3 OVERALL AND MOUNTING DIMENSIONS

DSA3 - S*
DSA3 - RK

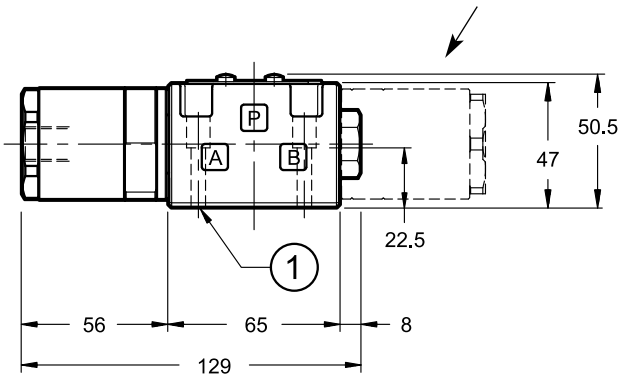
dimensions in mm





DSA3 - TA
DSA3 - SA*
DSA3 - TA23

operator position for configuration SB*, TB and TB23



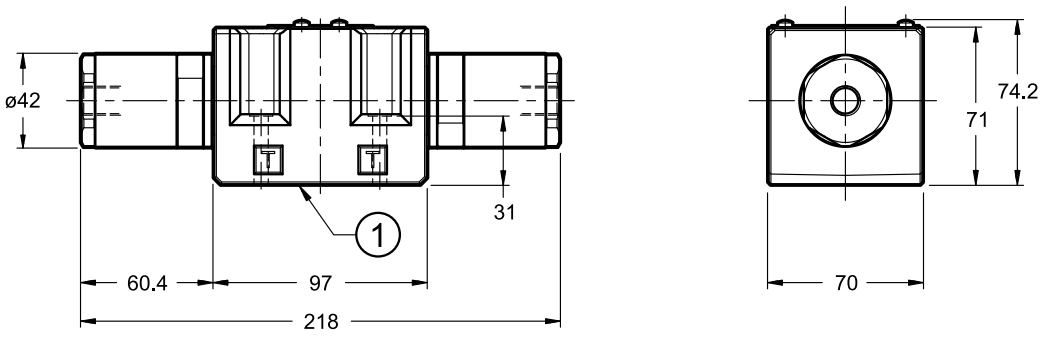
Valve fastening:	N. 4 SHC screws ISO 4762 - M5x30
Tightening torque:	5 Nm (bolts A 8.8)
Threads of mounting holes:	M5x10

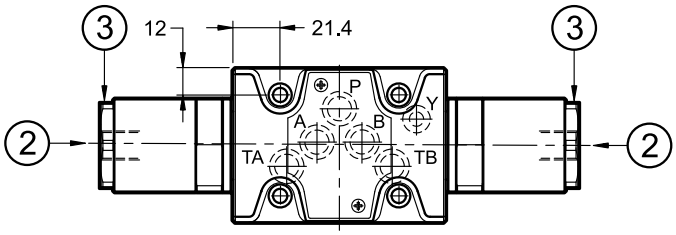
1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	1/4" BSP connection for pneumatic actuation
3	Hexagon: spanner 38 Tightening torque 35 ÷ 40 Nm

8 - DSA5 OVERALL AND MOUNTING DIMENSIONS

DSA5 - S*
DSA5 - RK

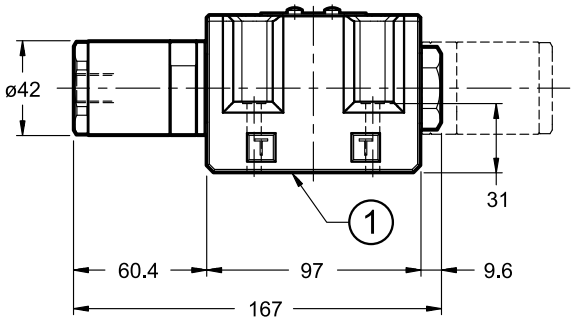
dimensions in mm





DSA5 - TA
DSA5 - SA*
DSA5 - TA23

operation position configuration SB*, TB and TB23



Valve fastening:	N. 4 SHC screws ISO 4762 - M6x40
Tightening torque:	8 Nm (bolts A 8.8)
Threads of mounting holes:	M6x10

1	Mounting surface with sealing rings: N. 5 OR type 2050 (12.42x1.78) 90 Shore N. 1 OR type 2037 (9.25x1.78) 90 Shore
2	1/4" BSP connection for pneumatic operator
3	Hexagon: spanner 38 Tightening torque 35 ÷ 40 Nm

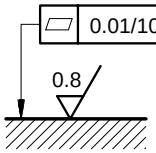
9 - INSTALLATION

Configurations with centering and return springs can be mounted in any position; type RK valves - without springs and with mechanical detent - must be mounted with the longitudinal axis horizontal.

Valve fixing is by means of screws or tie rods, with the valve mounted on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing.

If the minimum values of planarity and/or smoothness are not met, fluid leakage between valve and mounting surface can easily occur.

Surface finishing



10 - SUBPLATES

(see catalogue 51 000)

	DSA3	DSA5
Type with rear ports	PMMD-AI3G	PMD4-AI4G - 3/4” BSP threaded
Type with side ports	PMMD-AL3G	PMD4-AL4G - 1/2” BSP threaded
Threading of ports P, T, A and B	3/8” BSP	

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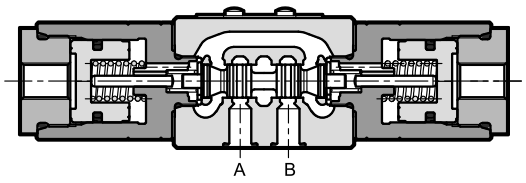


DSC*
HYDRAULIC OPERATED DIRECTIONAL CONTROL VALVE

SUBPLATE MOUNTING
DSC3 ISO 4401-03
DSC5 ISO 4401-05

p max (see performances table)
Q nom (see performances table)

OPERATING PRINCIPLE



— DSC3 and DSC5 are directional control valves, hydraulic operated, available in versions with 3 or 4 ports, with several spools and with mounting interface according to ISO 4401-03 and ISO 4401-05.

— It is available with 2 or 3 positions with return spring, or with two positions with mechanical detent.

— The valve body is made with high strength iron castings provided with wide internal passages in order to minimize the flow pressure drop.

PERFORMANCES

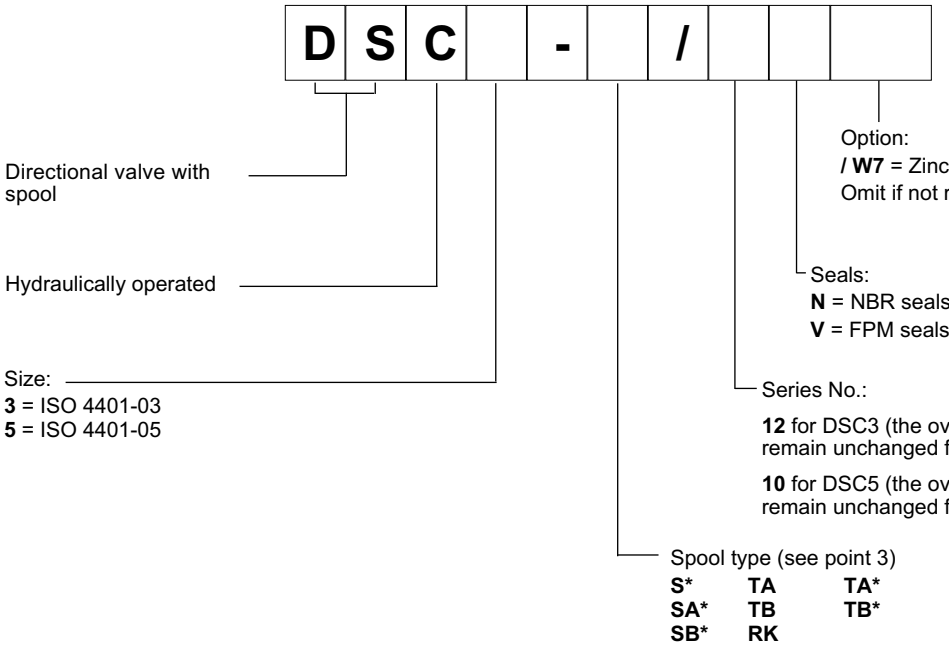
(measured with mineral oil of viscosity 36cSt at 50°C)

		DSC3	DSC5
Maximum working pressure: - P- A - B ports - T port	bar	350 25	320 25
Piloting pressure - min - max	bar	15 (**NOTE**) 210	
Nominal flow rate	l/min	75	150
Ambient temperature range	°C	-20 / +60	
Fluid temperature range	°C	-20 / +80	
Fluid viscosity range	cSt	10 ÷ 400	
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15		
Recommended viscosity	cSt	25	
Mass: single operation valve double operation valve	kg	1.3 1.7	3.6 4.2

NOTE: The pilot pressure must be at least 15 bar higher than the back pressure on the T line: to allow the spool to quickly return to the central position, the pilot pressure must drop rapidly to 0 bar.

The return spring of the plunger generates a minimum backpressure of 0.5 bar on the pilot line.

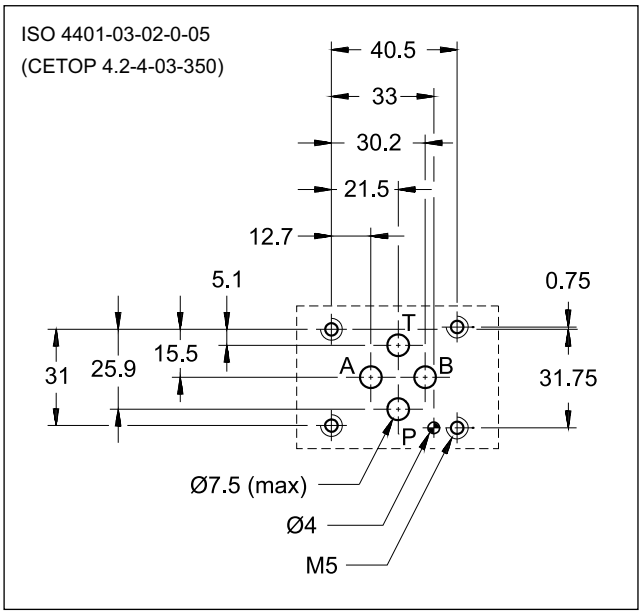
1 - IDENTIFICATION CODE



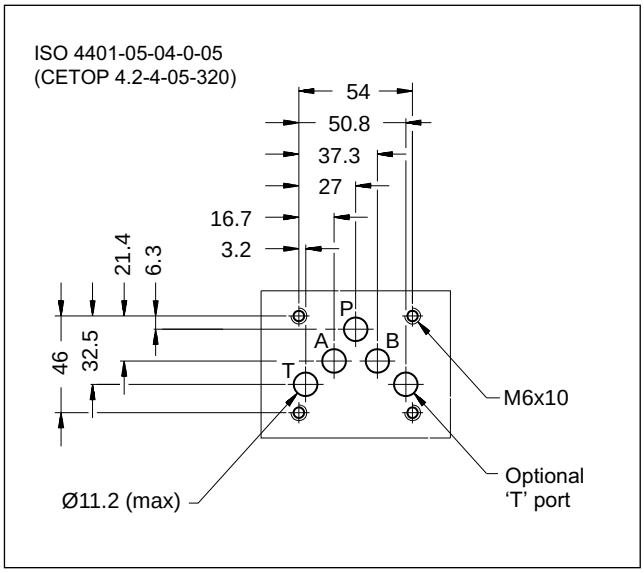
NOTE :The standard valve is supplied with surface treatment of phosphating black.
The zinc-nickel finishing on the valve body makes the valve suitable to ensure a salt spray resistance up to **600** hours.
(test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

2 - MOUNTING SURFACES

DSC3



DSC5



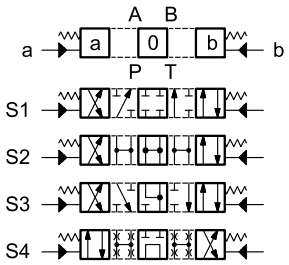
3 -HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V).

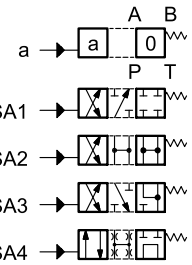
For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

4 - SPOOL TYPE

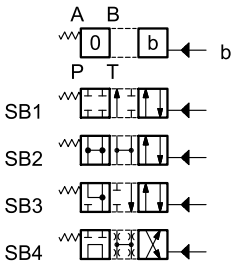
Type **S***:
2 operations - 3 positions
with spring centering



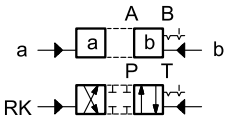
Type **SA***:
1 operation side A
2 positions (central + external)
with spring centering



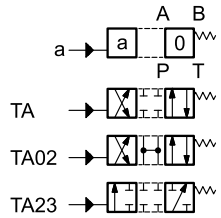
Type **SB***:
1 operation side B
2 positions (central + external)
with spring centering



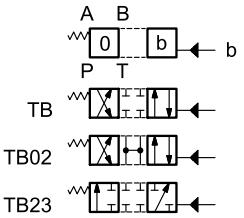
Type **RK**:
2 operations - 2 positions
with mechanical retention



Type **TA**:
1 operation side A
2 external positions
with return spring



Type **TB**:
1 operation side B
2 external positions
with return spring



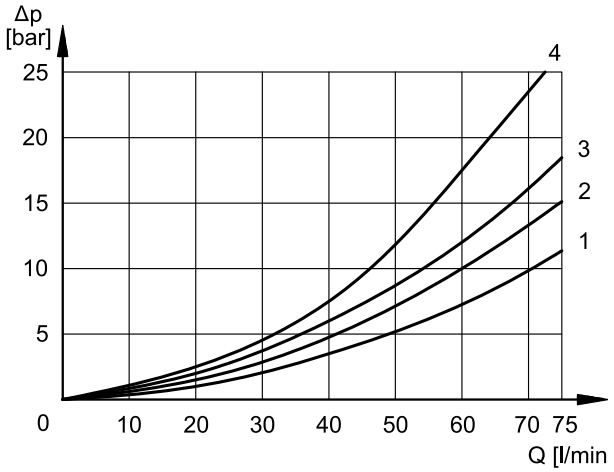
NOTE: TA02 and TB02 spools are available for DSC3 valve only.

Besides the diagrams shown, which are the most frequently used, other special versions are available: consult our technical department for their identification and operating limits.

5 - PRESSURE DROPS ΔP-Q

(values obtained with viscosity 36 cSt at 50 °C)

5.1 - DSC3



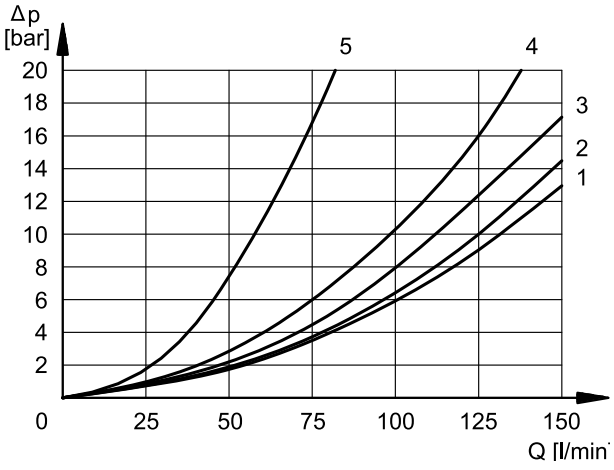
PRESSURE DROPS WITH VALVE IN ENERGIZED POSITION

SPOOL TYPE	FLOW DIRECTION			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPH			
S1, SA1, SB1	2	2	3	3
S2, SA2, SB2	1	1	3	3
S3, SA3, SB3	3	3	1	1
S4, SA4, SB4	4	4	4	4
TA, TB	3	3	3	3
TA02, TB02	2	2	2	2
TA23, TB23	3	3		
RK	2	2	2	2

PRESSURE DROPS WITH VALVE IN DE-ENERGIZED POSITION

SPOOL TYPE	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S2, SA2, SB2					2
S3, SA3, SB3			3	3	
S4, SA4, SB4					3

5.2 - DSC5



PRESSURE DROPS WITH VALVE IN ENERGIZED POSITION

SPOOL TYPE	FLOW DIRECTION			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPH			
S1, SA1, SB1	2	2	1	1
S2, SA2, SB2	3	3	1	1
S3, SA3, SB3	3	3	2	2
S4, SA4, SB4	1	1	2	2
TA, TB	3	3	2	2
TA23, TB23	4	4		
RK	3	3	2	2

PRESSURE DROPS WITH VALVE IN DE-ENERGIZED POSITION

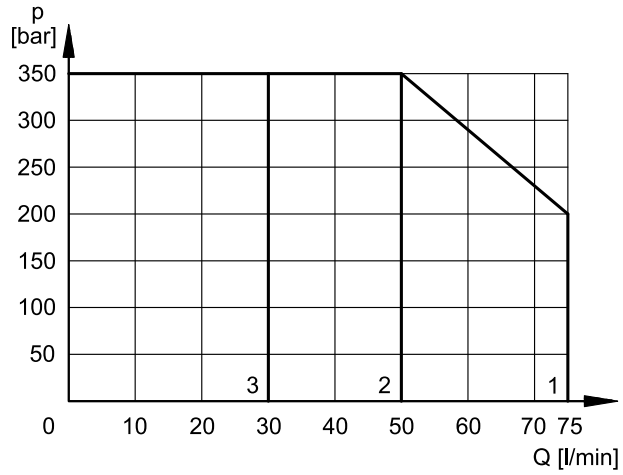
SPOOL TYPE	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S2, SA2, SB2					4
S3, SA3, SB3			5	5	
S4, SA4, SB4					4

6 - OPERATING LIMITS

The curves define the flow rate operating fields according to the valve pressure of the different versions.

The values have been obtained according to ISO 6403 norm, with mineral oil viscosity 36 cSt at 50 °C and filtration according to ISO 4406:1999 class 18/16/13.

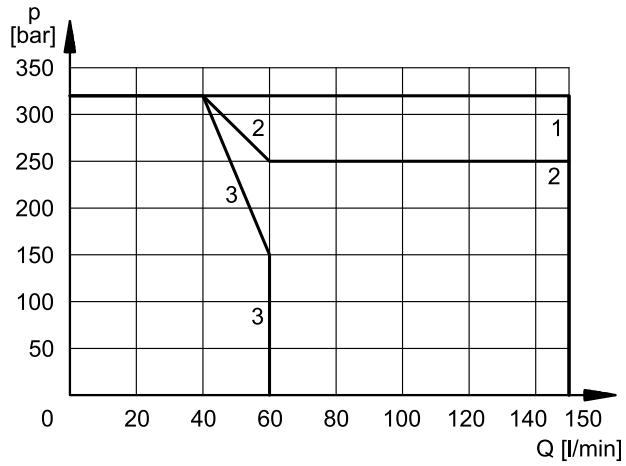
6.1 - DSC3



SPOOL TYPE	CURVE	
	P→A	P→B
S1, SA1, SB1	1	1
S2, SA2, SB2	2	2
S3, SA3, SB3	1	1
S4, SA4, SB4	2	2

SPOOL TYPE	CURVE	
	P→A	P→B
TA, TB	1	1
TA02, TB02	2	2
TA23, TB23	1	1
RK	3	3

6.2 - DSC5



SPOOL TYPE	CURVE	
	P→A	P→B
S1, SA1, SB1	1	1
S2, SA2, SB2	1	1
S3, SA3, SB3	2	2
S4, SA4, SB4	3	3

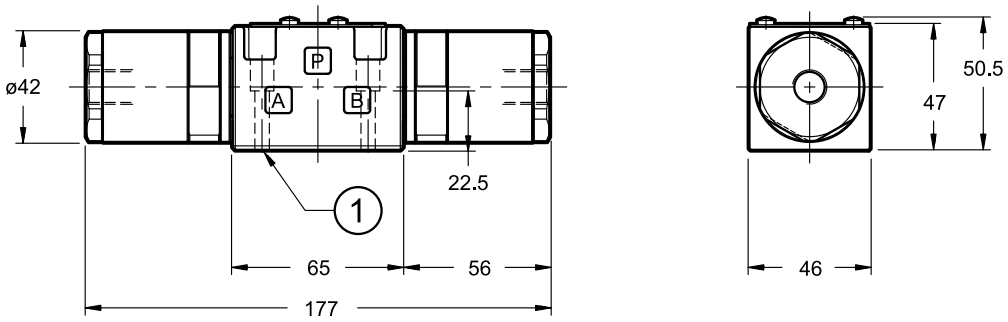
SPOOL TYPE	CURVE	
	P→A	P→B
TA, TB	1	1
TA23, TB23	2	2
RK	1	1

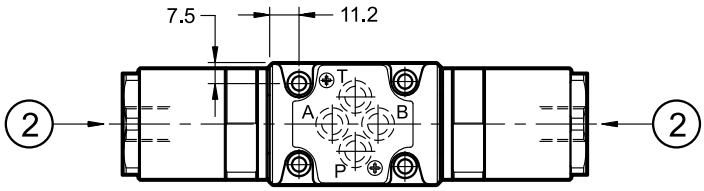
NOTE: The values indicated in the graphs are relevant to the standard valve. The operating limits can be considerably reduced if a 4-way valve is used with port A or B plugged or without flow.

7 - DSC3 - OVERALL AND MOUNTING DIMENSIONS

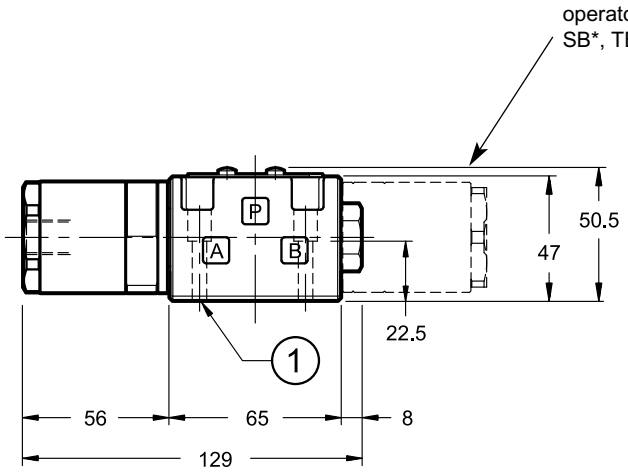
DSC3-S*
DSC3-RK

dimensions in mm





DSC3-SA*
DSC3-TA
DSC3-TA*



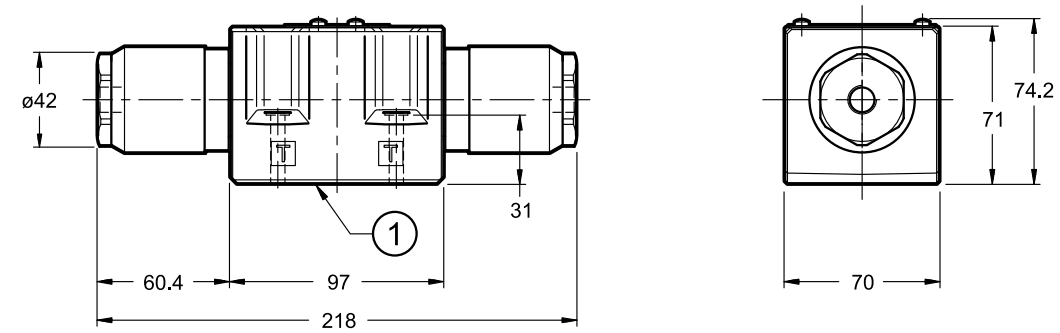
Valve fastening: 4 SHC screws ISO 4762 M5x30
Tightening torque: 5 Nm (screws A8.8)
Threads of mounting holes: M5x10

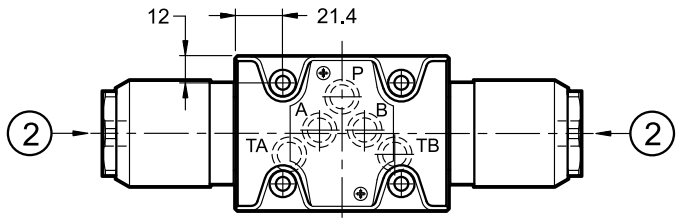
1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) - 90 Shore
2	1/4” BSP connection for hydraulic operation

8 - DSC5 - OVERALL AND MOUNTING DIMENSIONS

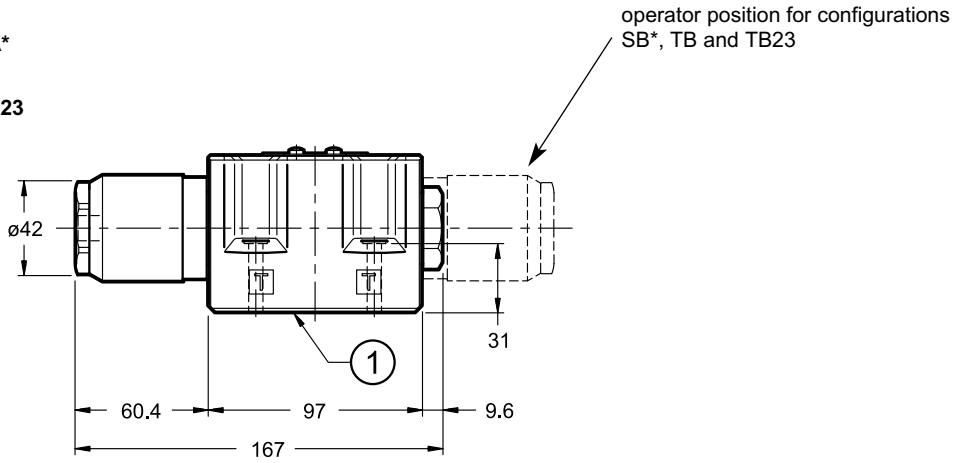
DSC5-S*
DSC5-RK

dimensions in mm





DSC5-SA*
DSC5-TA
DSC5-TA23



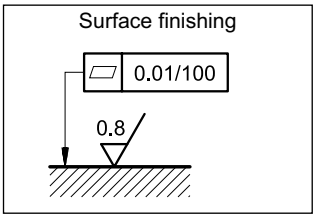
Valve fastening: 4 SHC screws ISO 4762 M6x40
Tightening torque: 8 Nm (screws A8.8)
Threads of mounting holes: M6x10

1	Mounting surface with sealing rings: 5 OR type 2050 (12.42x1.78) - 90 Shore
2	1/4" BSP connection for hydraulic operation

9 - INSTALLATION

Configurations with centering and return springs can be mounted in any position; type RK valves - without springs and with mechanical detent - must be mounted with the longitudinal axis horizontal.

Valve fixing is by means of screws or tie rods, with the valve mounted on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing. If the minimum values of planarity and/or smoothness are not met, fluid leakage between valve and mounting surface can easily occur.



10 - SUBPLATES

(see cat. 51 000)

	DSC3	DSC5
With rear ports	PMMD-AI3G	PMD4-AI4G - thread 3/4” BSP
Type with side ports	PMMD-AL3G	PMD4-AL4G - thread 1/2” BSP
Thread of ports P, T, A, B	3/8” BSP	

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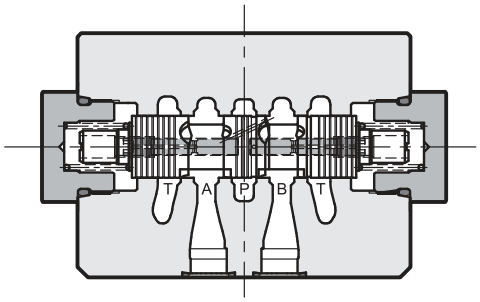


DSB*
SELF-REVERSING VALVE
SERIES 10

MOUNTING SURFACES
DSB3 **ISO 4401-03** (CETOP 03)
DSB5 **ISO 4401-05** (CETOP 05)

p max (see performances table)
Q nom (see performances table)

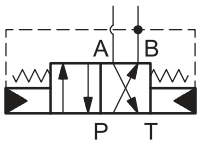
OPERATING PRINCIPLE



— The DSB* are directional control valves with self-reversing spool and mounting interface according to ISO 4401-03 and 4401-05 (CETOP RP121H) standards.

— The valves realize the reciprocation of the flow direction when the flowrate stops in A or B line (f.e., when a cylinder reaches the end stroke). The reversing process is independent of the line pressure.

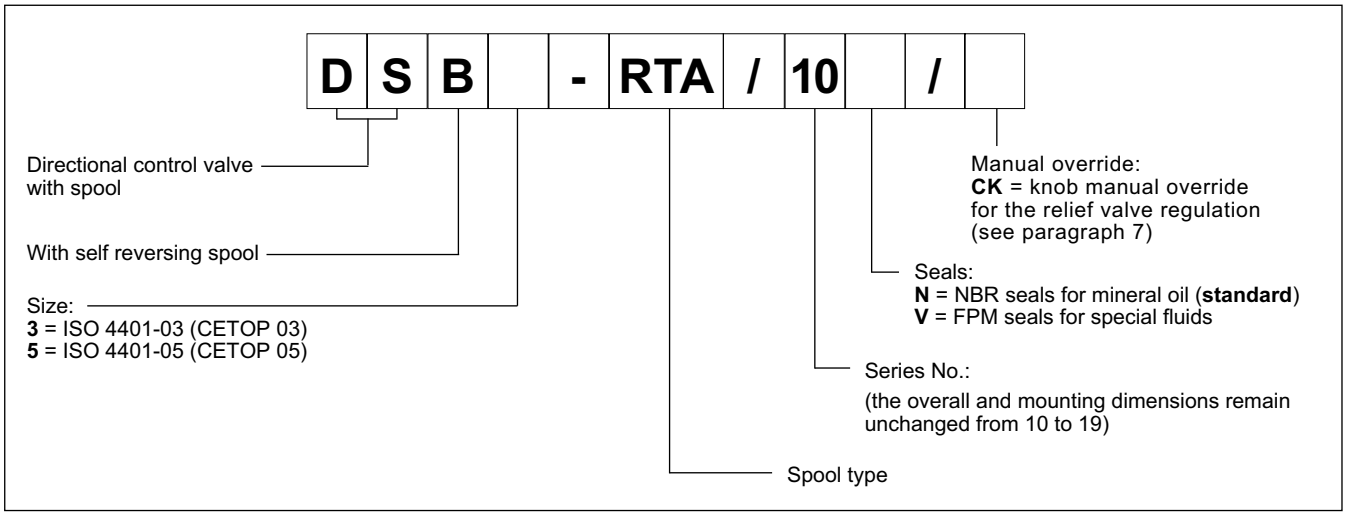
HYDRAULIC SYMBOL



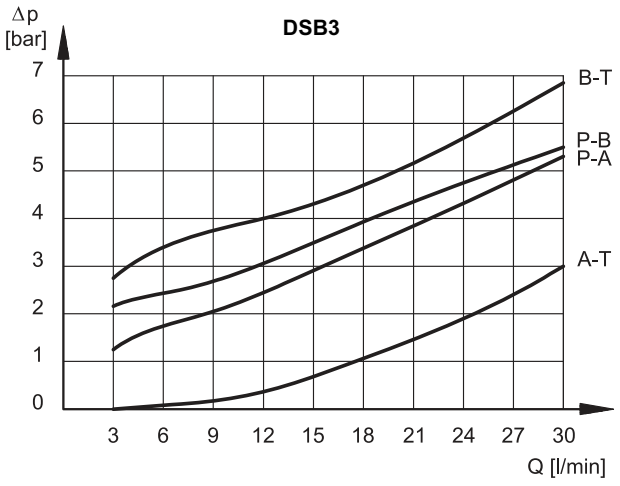
PERFORMANCES (measured with mineral oil of viscosity 36 cSt at 50°C)

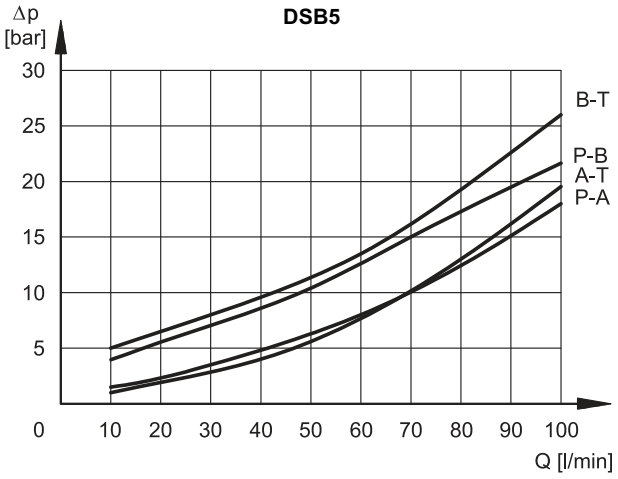
		DSB3	DSB5
Maximum operating pressure on port P	bar	350	320
Minimum allowed pressure	bar	50	60
Maximum flow rate	l/min	30	100
Minimum allowed flow rate	l/min	3	10
Ambient temperature range	°C	-20 / +50	
Fluid temperature range	°C	-20 / +80	
Fluid viscosity range	cSt	10 ÷ 400	
Recommended viscosity	cSt	25	
Fluid contamination degree		according to ISO 4406:1999 class 20/18/15	
Mass	kg	0,9	2,8

1 - IDENTIFICATION CODE



2 - PRESSURE DROPS Δp-Q (values obtained with viscosity 36 cSt at 50 °C)





3 - HYDRAULIC FLUIDS

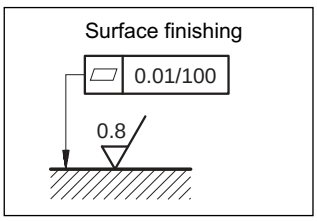
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

4 - INSTALLATION

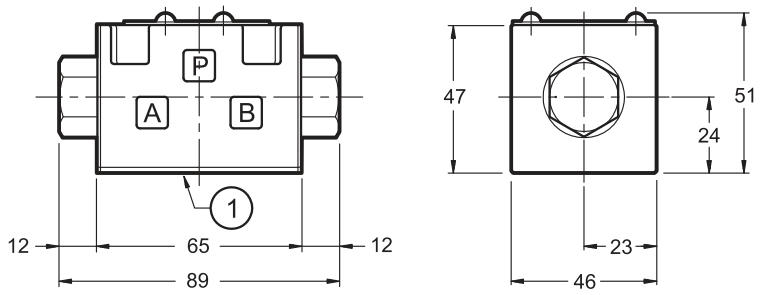
The valves can be mounted in any position. Valve fixing is by means of screws or tie rods, with the valve mounted on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing.

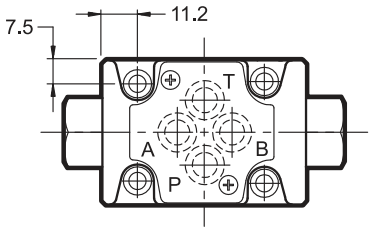
If the minimum values of planarity and/or smoothness are not met, fluid leakage between valve and mounting surface can easily occur.



5 - OVERALL AND MOUNTING DIMENSIONS DSB3

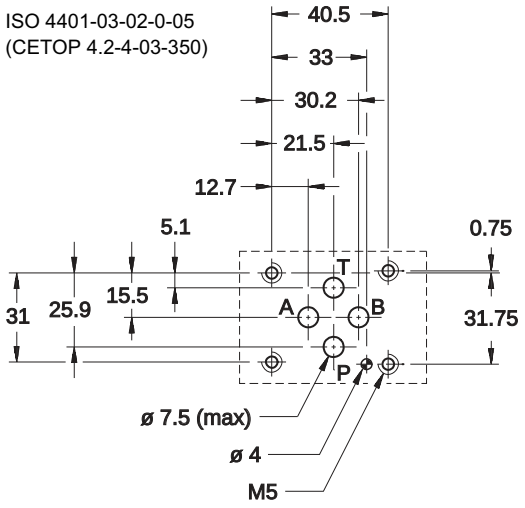
dimensions in mm





MOUNTING SURFACE

ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)

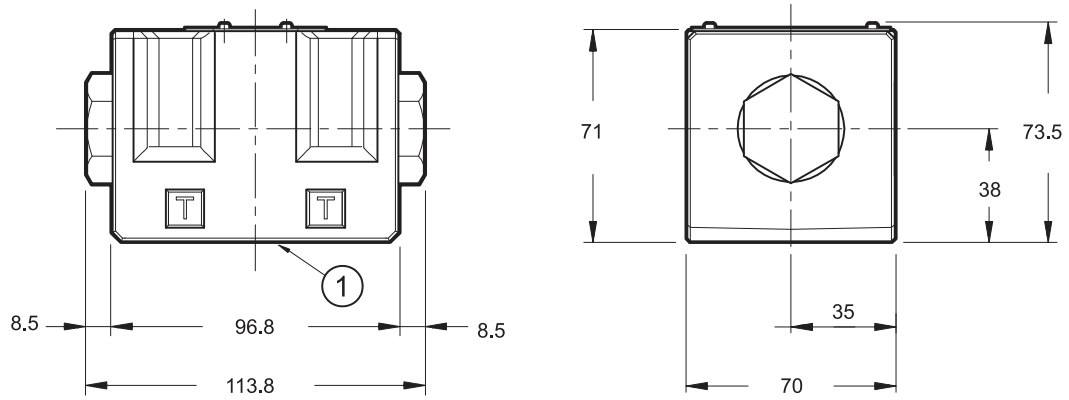


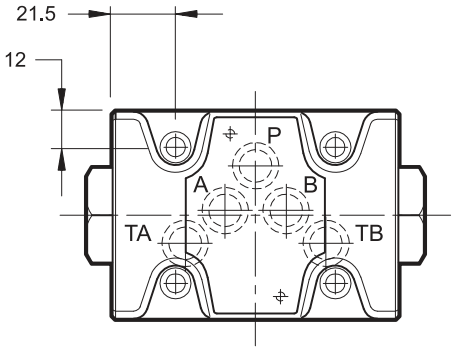
1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 shore

Valve fastening:	N. 4 bolts SHC M5x30 - ISO 4762
Tightening torque:	5 Nm (bolts A 8.8)

6 - OVERALL AND MOUNTING DIMENSIONS DSB5

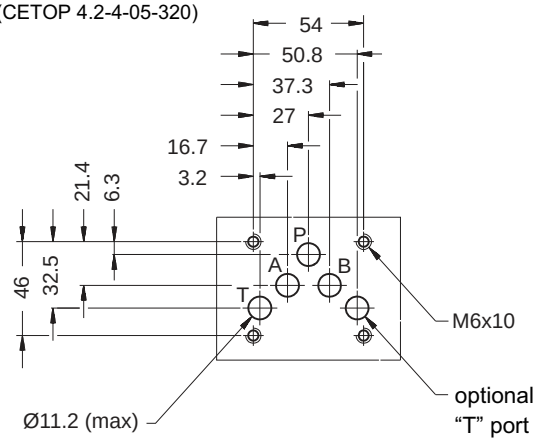
dimensions in mm





MOUNTING SURFACE

ISO 4401-05-04-0-05
(CETOP 4.2-4-05-320)

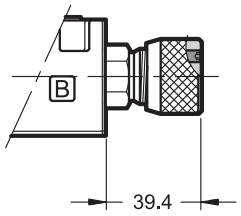
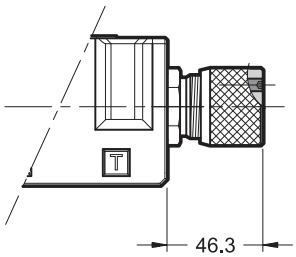


1	Mounting surface with sealing rings: N. 5 OR type 2050 (12.42x1.78) 90 shore

Valve fastening:	N. 4 bolts SHC M6x40 - ISO 4762
Tightening torque:	8 Nm (bolts A 8.8)

7 - KNOB MANUAL OVERRIDE

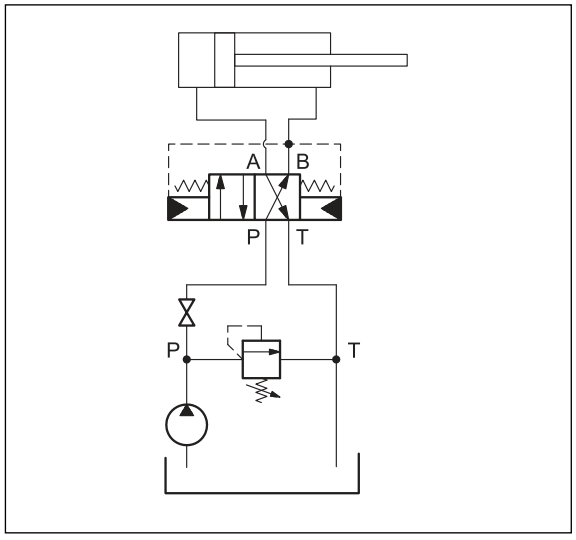
The knob manual override **CK** allows to set the pressure of the relief valve without using shut-off valves.

Manual override CK for **DSB3**	Manual override CK for **DSB5**
	
Spanner for set screw: 2,5 mm	Spanner for set screw: 3 mm

8 - APPLICATION EXAMPLES

We suggest to use the circuits shown, connecting the A port with the rear chamber of the cylinder. In this way, with the start of the pump, the valve places itself, so as to retract the rod. To work properly the valve needs an area ratio of the cylinder chambers included between 1:1,25 and 1:2.

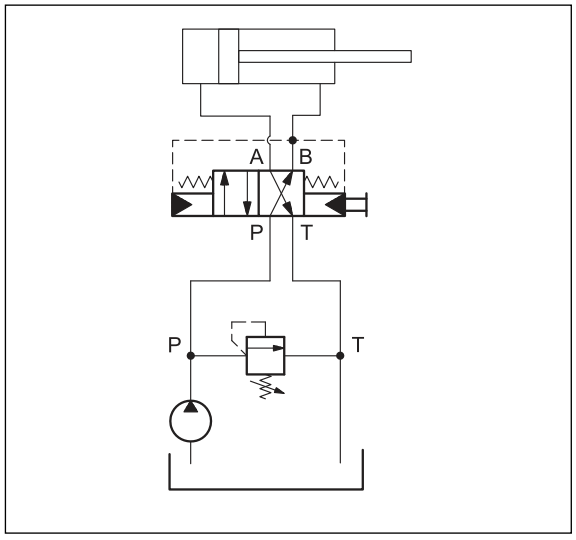
8.1 - Standard valve



To set the system relief valve correctly, the self-reversing function must be inactive.

To do so, close the shut-off valve, start the pump, set the pressure relief valve and stop the pump. Then, open the shut-off valve and restart the pump.

8.2 - Valve with knob manual override



To set the system relief valve correctly, the self-reversing function must be inactive.

To do so, completely unscrew the set screw then tighten the knob until it is at machanical stop. The spool is now clamped in position P → B and A → T. Start the pump, set the pressure of the relief valve and then stop the pump. Re-establish the working conditions of the valve, unscrewing almost completely the knob and screwing the set screw, until its point is aligned with the edge of the knob.

The valve is in normal working conditions when the knob is tightened and the point of the set screw is aligned with the edge of the knob.

⚠ Do not use the manual override when the valve is on, if it is necessary stop the pump.

8 - SUBPLATES (see catalogue 51 000)

	DSB3	DSB5
Type with rear ports	PMMD-AI3G	PMD4-AI4G - 3/4” BSP threaded
Type with side ports	PMMD-AL3G	PMD4-AL4G - 1/2” BSP threaded
Threading of ports P, T, A, B	3/8” BSP	-

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DT03

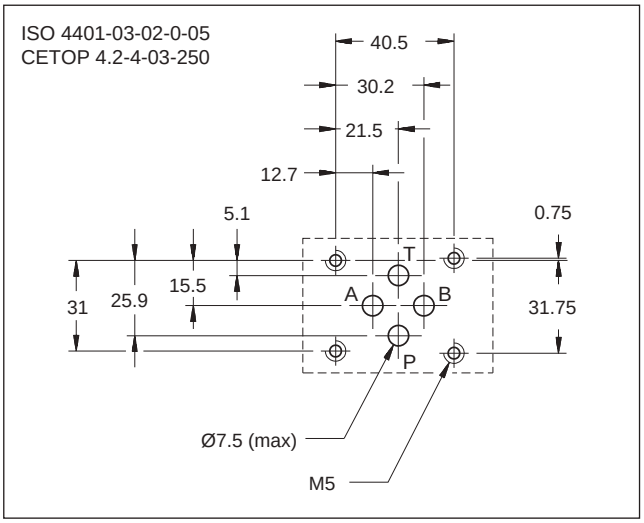
SOLENOID OPERATED DIRECTIONAL CONTROL VALVE, POPPET TYPE

SERIES 11

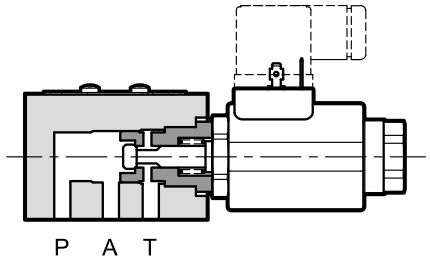
SUBPLATE MOUNTING ISO 4401-03

p max **250** bar
Q max **25** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



— The DT03 is a direct-operated directional poppet valve, solenoid actuated, with conical seat seal.

— It is available in 2/2 or 3/2 designation. Two-way models provide bidirectional sealing.

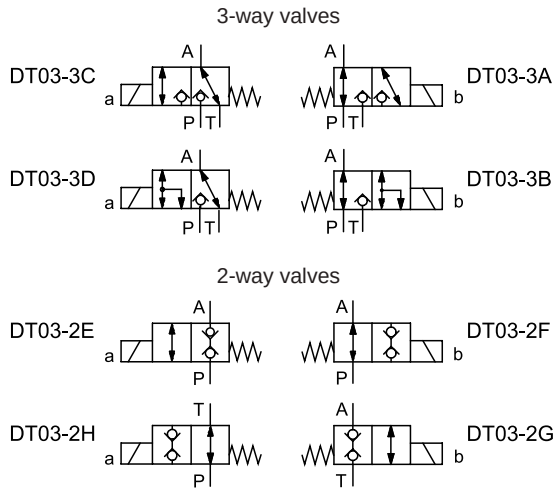
— Solenoids are oil-bath, leakproof. The valve is available for DC or AC power supply.

PERFORMANCES

(measured with mineral oil of viscosity 36 cSt at 50 °C)

Maximum operating pressure	bar	250
Maximum flow rate	l/min	25
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	according to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass	kg	1,3

HYDRAULIC SYMBOLS



1 - IDENTIFICATION CODE

D	T	03	-			/		/	11		-		K1

Solenoid actuated directional control valve, poppet type

Size: ISO 4401-03

Number of ways:
2 = two-way configuration
3 = three-way configuration

Valve port / position designation:
A - B - C - D: 3-way, 2-position
E - F - G - H: 2-way, 2-position

Variant in port P (omit if not required):
D08 = orifice Ø0.8
D10 = orifice Ø1.0

Coil electrical connection:
plug for connector type
EN 175301-803 (ex DIN 43650)

DC power supply:
D24 = 24 V
AC power supply to be rectified
R110 = 110 V
R220 = 220 V

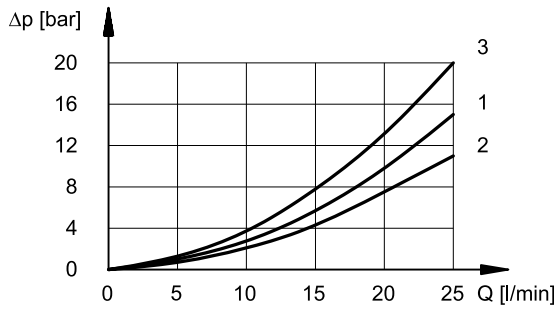
Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Series No.
(The overall and mounting dimensions remain unchanged from 10 to 19)

2 - CHARACTERISTIC CURVES

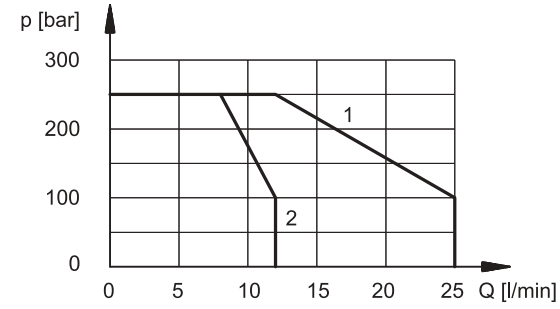
(values obtained with viscosity 36 cSt at 50 °C)

2.1 - Pressure drops Δp-Q



VALVE TYPE	CURVES	
	NORMAL POSITION	ACTUATED POSITION
DT03-3A	1	3
DT03-3B	2	3
DT03-3C	1	3
DT03-3D	2	3
DT03-2E	-	3
DT03-2F	1	-
DT03-2G	-	3
DT03-2H	1	-

2.2 - Operating limits



VALVE TYPE	CURVE
DT03-3A	2
DT03-3B	1
DT03-3C	1
DT03-3D	1
DT03-2E	1
DT03-2F	2
DT03-2G	1
DT03-2H	1

3 - FLOW LIMITATION

When the solenoid valve is supplied by an accumulator or by high delivery pumps it is necessary to limit the flow to the working limits by means of orifices. The orifice must always be located on the accumulator side.

WARNING! During the transition from one end-position to the other, all the valve flow paths are interconnected. This means that during switching, the oil will flow from the accumulator to the tank through the valve, until the swithing process is completed.

For this reason, the flow rate shall be limited to 12 l/min by means of appropriate orifices.

4 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluids such as HFA, HFB or HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes faster degradation of the fluid and of the seals' characteristics.

The fluid must be preserved in its physical and chemical properties.

5 - ELECTRICAL FEATURES

5.1 - Solenoids

These are essentially made up of two parts: the tube and the coil.

The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation.

The coil is fastened to the tube by a threaded ring, and can be rotated 360°, to suit the available space.

The interchangeability of coils of different voltages is permitted within the same type of supply current (DC / AC)

NOTE: The protection degree is guaranteed only with the connector correctly mated and installed.

VOLTAGE SUPPLY FLUCTUATION	± 10% Vnom
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	In compliance with 2014/30/EU
LOW VOLTAGE	In compliance with 2014/35/EU
CLASS OF PROTECTION Atmospheric agents (EN 60529) Coil insulation (VDE 0580) Impregnation	 IP65 (**NOTE**) class H class F

5.2 - Current and power consumption

The table shows the power consumption values for the different coil types.

It is essential to use D-type connectors (with an integrated rectifier - see catalogue 49 000) together with R* coils when operating from an alternating-current supply.

Rectification is performed by a bridge rectifier, either integrated in the D-type connector or provided externally, between the AC power source (110 V or 220 V, 50/60 Hz) and the coil.

	Nominal voltage [V]	Resistance at 20°C [Ohm]	Current consumpt. [A]	Power consumpt. [W]	Coil code
D24	24	21,8	1,10	26,4	1904211
R110	110	420	0,23	22	1904213
R220	220	1750	0,11	22	1904214

6 - SWITCHING TIMES

The values indicated refer to a flow rate of 10 l/min at 210 bar, using mineral oil at a temperature of 50 °C, with a viscosity of 36 cSt and a supply voltage equal to 90% of the nominal value.

TIMES [ms]	
ENERGIZING	DE-ENERGIZING
30	50

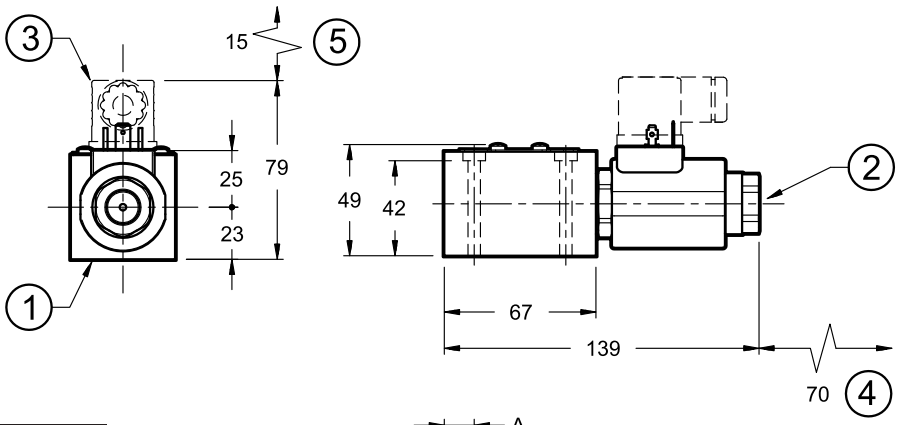
7 - ELECTRIC CONNECTORS

Solenoid operated valves are delivered without connectors. Connectors type EN 175301-803 (ex DIN 43650) for K1 connections can be ordered separately. See catalogue 49 000.

8 - OVERALL AND MOUNTING DIMENSIONS

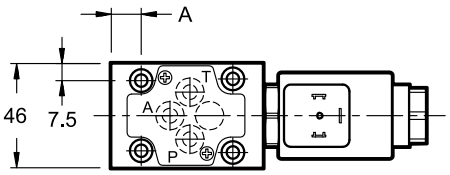
NOTE: The solenoid position shown applies to the A-B-F-G versions. Other versions have the solenoid on the opposite side.

dimensions in mm



Fastening bolts:
4 bolts M5x50 - torque: 5 Nm

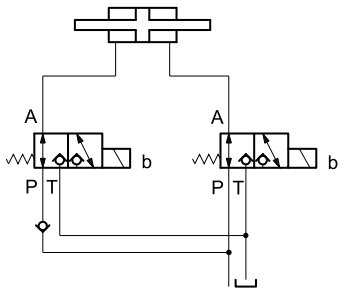
1	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) - 90 Shore
2	Manual override
3	Electric connector to be ordered separately (see cat. 49 000)
4	Coil removal space
5	Connector removal space



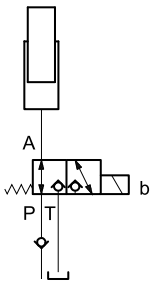
versions	C-D-E-H	A-B-F-G
A [mm]	19.2	13.2

9 - APPLICATION EXAMPLES

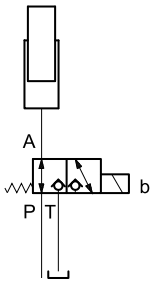
DT03-3A



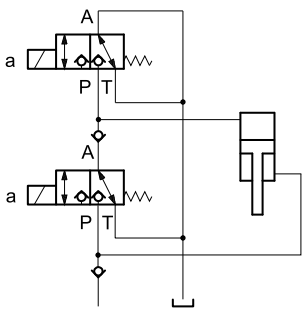
DT03-3A



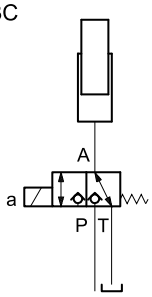
DT03-3A



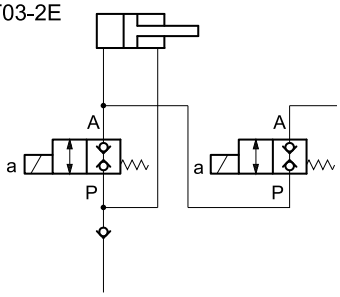
DT03-3C



DT03-3C



DT03-2E



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DT3K*

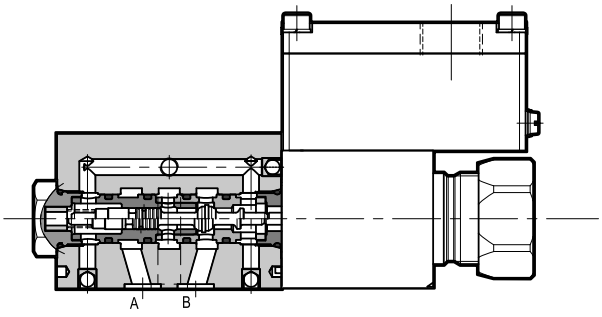
EXPLOSION-PROOF SOLENOID ACTUATED POPPET VALVE ATEX, IECEx, PESO

SERIES 10

SUBPLATE MOUNTING ISO 4401-03

p max **350** bar
Q max **25** l/min

OPERATING PRINCIPLE



— Directional solenoid actuated poppet valve, direct operated, with ISO 4401-03 mounting surface.

— Three-port version, normally open or normally closed. These valves apply in hydraulic circuits applications where leakage free is strictly required.

— They are compliant with ATEX, IECEx or PESO requirements and are suitable for use in potentially explosive atmospheres, for surface plants or mines.

— The DT3K* valves are supplied with a zinc-nickel finishing surface treatment that ensures a salt spray resistance up to 600 h.

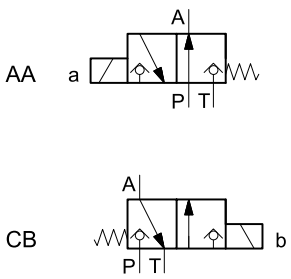
— **Details for classification, operating temperatures and electrical characteristics are in the technical data sheet 02 500 'Explosion proof classification'.**

PERFORMANCES

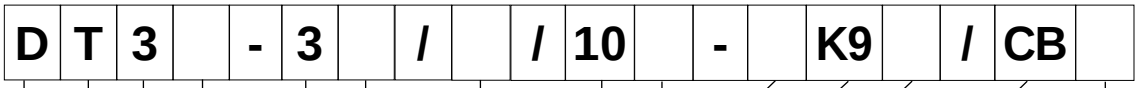
(obtained with mineral oil with viscosity of 36 cSt at 50°C)

Maximum operating pressure: P - A - B ports T port	bar	 350 210
Maximum flow	l/min	25
Operating temperatures (ambient and fluid)	°C	see data sheet 02 500
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree		according to ISO 4406:1999 class 20/18/15
Recommended viscosity	cSt	25
Mass	kg	2.3

HYDRAULIC SYMBOLS



1 - IDENTIFICATION CODE



Solenoid actuated poppet valve

Size: ISO 4401-03

Explosion-proof certification:
See table 1.1

3-ports version

Types of configuration:
AA = P→A in the rest position, solenoid on side A
CB = A→T in the rest position, solenoid on side B

Variant on line P (omit if not required):
D15 = orifice Ø1.5

Series No.
(The overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
For temperature range -20 / +80 °C
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Power supply
Direct current (DC)
D12 = 12 V
D24 = 24 V
D48 = 48 V
D110 = 110 V
Alternate current with built-in rectifier bridge (RAC)
R120 = 120 V
R240 = 240 V

Coil electrical connection: junction box

Connection type for cable gland
upper connection:
T01 = M20x1.5 - ISO 261
T02 = Gk 1/2 - UNI EN 10226-2
T03 = 1/2" NPT - ANSI B1.20.1 (ex ANSI B2.1)
side connection:
S01 = M20x1.5 - ISO 261
S02 = Gk 1/2 - UNI EN 10226-2
S03 = 1/2" NPT - ANSI B1.20.1 (ex ANSI B2.1)
S04 = M16x1.5 - ISO 261

Blind ring nut
(see p. 6)

Option: **/T5** version in T5 temperature class.
Omit if not required.

NOTE: Valves are supplied with zinc-nickel surface treatment, that is suitable to ensure a salt spray resistance up to 600 h (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

Version with monobloc steel coil

Standard coils are made of zinc-nickel steel, with anodized aluminium junction box on it.

Monobloc coils **MD24K9S01** completely made of steel are available upon request. They have zinc-nickel treatment, power supply voltage D24 and cable gland connection type S01. Other variants for voltage and cable gland connection are available, always on request.

1.1 - Names of valves per certification

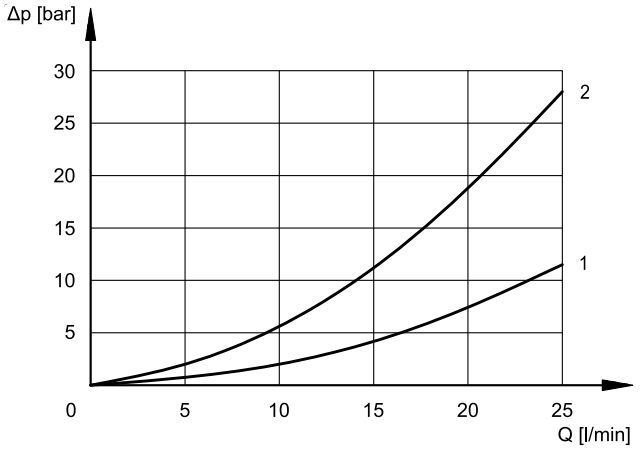
	ATEX		IECEx		PESO	
for gases for dusts	**KD2**	II 2GD	**KXD2**	IECEx Gb IECEx Db	**KPD2**	PESO Gb not applicable for dust
for mines	**KDM2**	I M2	**KXDM2**	IECEx Mb	not applicable for mines	

NOTE: Refer to the technical data sheet 02 500 for marking, operating temperatures and available versions.

2 - CHARACTERISTIC CURVES

(values obtained with viscosity 36 cSt at 50 °C, with DC solenoid valves)

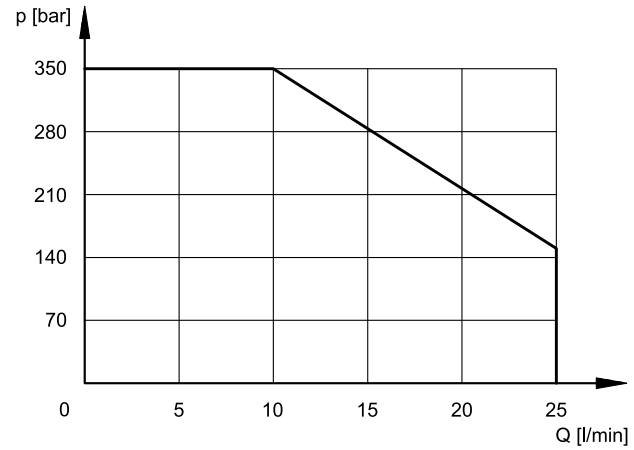
2.1 - Pressure drops



CURVE	
P→A	A→T
1	2

2.2 - Performance limits

The curves define the flow rate operating fields according to the valve pressure of the different versions. The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage, with mineral oil with viscosity 36 cSt, temperature 50 °C and filtration according to ISO 4406:1999 class 18/16/13.



2.3 - Switching times

The indicated values are obtained according to ISO 6403 standard, with mineral oil viscosity 36 cSt at 50°C.

TIMES (± 10%) [ms]	ENERGIZING	DE-ENERGIZING
DC	250	130

3 - FLOW LIMITATION

In applications where the poppet valve is fed by an accumulator or by high delivery pumps it is necessary to limit the flowrate within the valve working limits by means of orifices. The orifice must be located on accumulator side always.

WARNING! During transition from initial position to end position all the valve ports are connected. This means that as long as the switching is not completed, the oil will flow from the P and A lines to the tank.

4 - ELECTRICAL CHARACTERISTICS

(values ± 5%)

Coil type	Nominal voltage [V]	Resistance at 20°C [Ω]	Current consumpt. [A]	Power consumpt. [W]
D12	12	7.2	1.7	20
D24	24	28.7	0.83	20
D48	48	115	0.42	20
D110	110	549	0.2	22

VOLTAGE SUPPLY FLUCTUATION (ripple included)	± 10% Vnom
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2014/30/EU
CLASS OF PROTECTION Atmospheric agents Coil insulation (VDE 0580)	 IP66/IP68 class H

Coil type (**NOTE**)	Nominal voltage [V]	Freq. [Hz]	Resistance at 20°C [Ω]	Current consumpt. [A]	Power consumpt. [VA]
R120	110V-50Hz 120V-60Hz	50/60	489.6	0.19	21
				0.21	25
R240	230V-50Hz 240V-60Hz		2067.7	0.098	22,5
				0.1	24

NOTE: type R* coils are for alternating current supply for both 50 or 60 Hz. For R* coils the resistance can not be measured in the usual way because of the presence of diodes bridge inside the coil.

4.1 - Wiring

In order to realise the electrical connection of the coil, it is necessary to access the terminal block (1) unscrewing the 4 screws (2) that fasten the cover (3) with the box (4) that contains the terminal block.

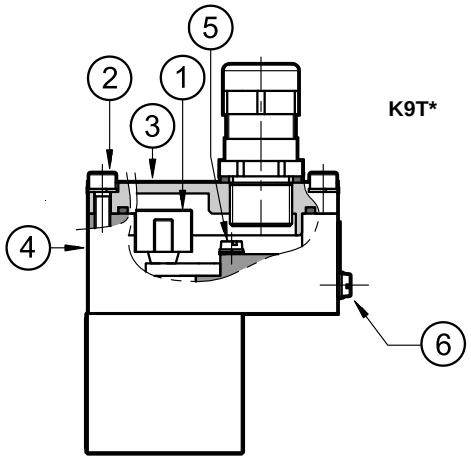
The electrical connection is polarity-independent.

By doing electrical connection it is important to connect also the grounding point (5) in the terminal block box (M4 screws), through suitable conductors with the general grounding line of the system.

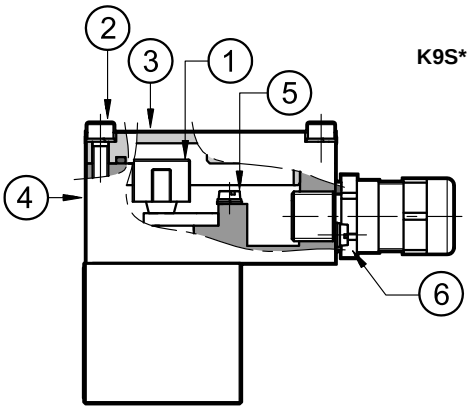
On the external body of the coil there is a grounding point (6) (M4 screw) that allow to ensure equipotentiality between the valve and the general grounding line of the system; connecting this point the regulation of the EN 13463-1 standard, that impose to verify the equipotentiality of the elements included in a potentially explosive environment (the maximum resistance between the elements must be 100 Ω), is guaranteed.

At the end of the electrical wiring, it is necessary to reassemble the cover (3) on the box (4), checking the correct positioning of the seal located in the cover seat and fastening the 4 M5 screws with a torque of 4.9÷6 Nm.

Electrical wiring must be done following in compliance with standards about protection against explosion hazards.



K9T*



K9S*

Characteristics of the cables connectable for wiring are indicated in the table below:

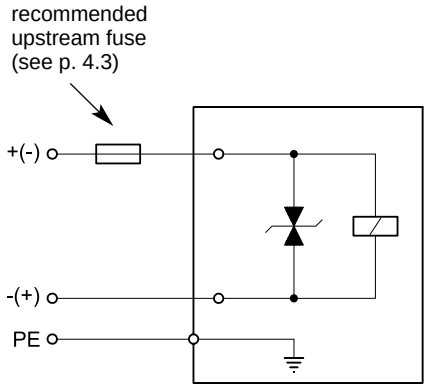
Function	Cable section
Operating voltage cables connection	max 2.5 mm²
Connection for internal grounding point	max 2.5 mm²
Connection for external equipotential grounding point	max 6 mm²

Cables for wiring must be non-armoured cables, with external covering sheath and must be suitable for use in environments with temperatures from - 20 °C to +110 °C (for valves either with N or V seals).

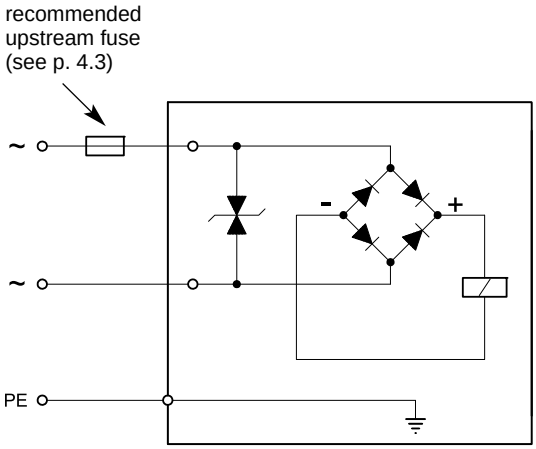
Cable glands (which must be ordered separately, see point 8) allow to use cables with external diameter between 8 and 10 mm.

4.2 - Electrical diagrams

DC coil



RAC coil



4.3 - Overcurrent fuse and switch-off voltage peak

Upstream of each valve, an appropriate fuse (max 3 x In according to IEC 60127) or a protective motor switch with short-circuit and thermal instantaneous tripping, as short-circuit protection, must be connected. The cut-off power of the fuse must correspond or exceed the short circuit current of the supply source. The breaking capacity of the fuse link shall be the same as or higher than the maximum short-circuit current expected to occur at the place of installation (normally 1500 A).

The fuse or the protective motor must be placed outside the dangerous area or they must be protected with an explosion-proof covering.

In order to safeguard the electronic device to which the valve is connected, there is a protection circuit in the coil, that reduces voltage peaks, which can occur when inductances are switched off.

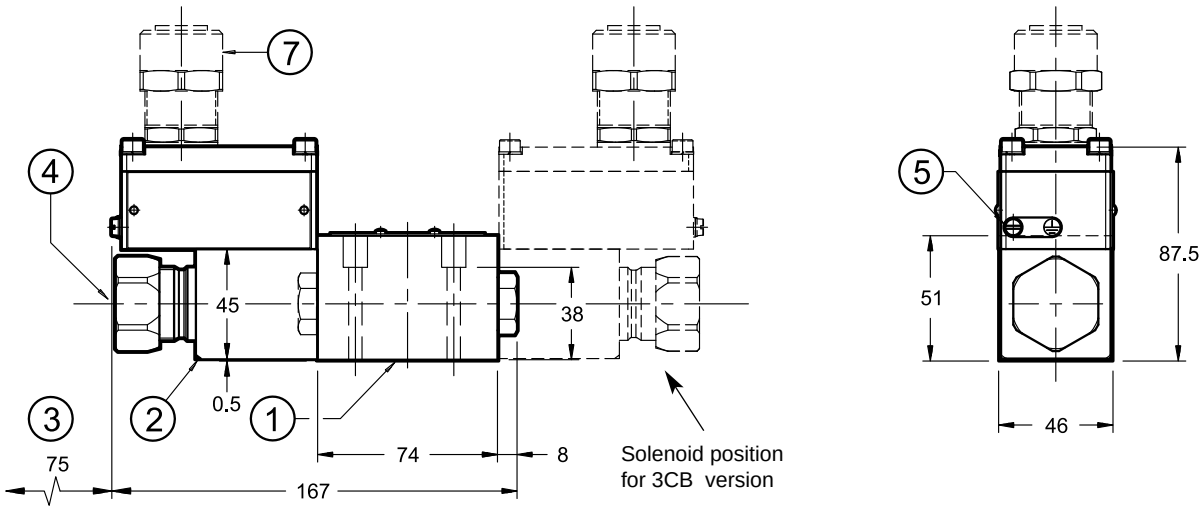
The table shows the type of fuse recommended according to the nominal voltage of the valve and to the value of the voltage peaks reduction.

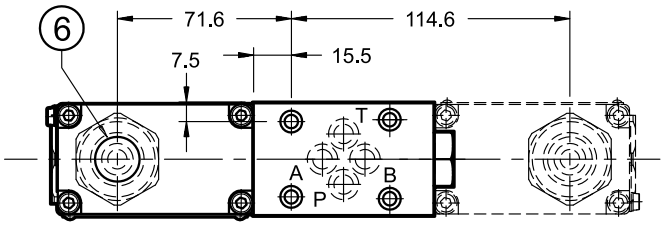
Coil type	Nominal voltage [V]	Rated current [A]	**Recommended pre-fuse characteristics medium time-lag according to DIN 41571 [A]**	Maximum voltage value upon switch off [V]	Suppressor circuit
D12	12	1.7	2.5	- 49	Transient voltage suppressor bidirectional
D24	24	0.83	1.25	- 49	
D48	48	0.42	0.6	- 81	
D110	110	0.2	0.3	- 309	
R120	120	0.21	0.3	- 3	
R240	240	0.1	0.15	- 3	

5 - OVERALL AND MOUNTING DIMENSIONS

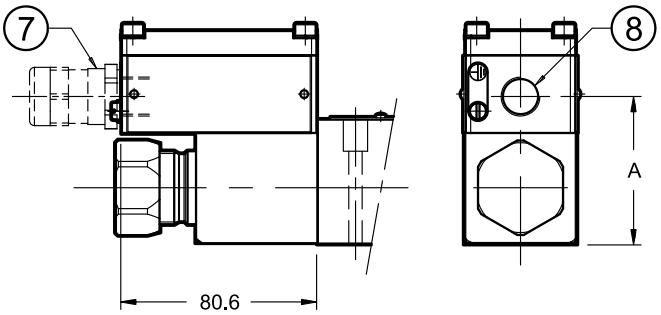
DT3K*- 3AA/10*-*K9T*/CB

dimensions in mm

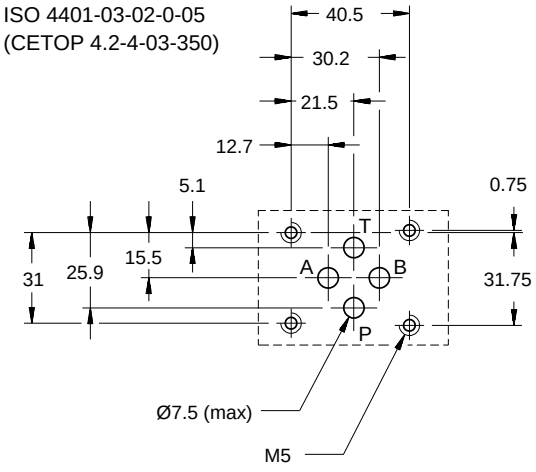




DT3K*- 3*/10*-*K9S*/CB



MOUNTING SURFACE
ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)



Side port type	A
S01, S04	59.5
S02, S03	59

Valve fastening: 4 SHC screws ISO 4762 M5x45	
Tightening torque: 5 Nm (A8.8 screws)	
Threads of mounting holes: M5x10	

1	Mounting surface with sealing rings: 4 OR type 108 (8.73x1.78) - 90 Shore
2	Explosion-proof coil
3	Minimum clear space required
4	Blind ring nut, metal
5	Terminal for supplementary GND connection
6	Upper port for cable gland
7	Cable gland. To be ordered separately, see point 9
8	Side port for cable gland

6 - CB - BLIND RING NUT

The metal ring nut protects the solenoid tube from atmospheric agents and isolates the manual override from accidental operations. The ring nut is tightened on a threaded fastener that keeps the coil in its position even without the ring nut.

To access the manual override, loosen the ring nut and remove it; then reassemble hand tightening, until the ring stops.

Activate the manual override always and only with non-sparking tools suitable for use in potentially explosive atmospheres.

More information on safe use of explosion-proof components are provided in the instruction manual, always supplied with the valve.

7 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

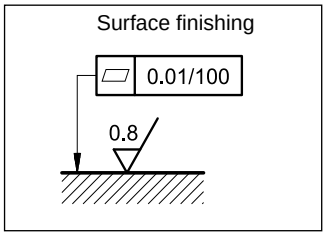
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

8 - INSTALLATION

Installation must adheres to instructions reported in the *Use and Maintenance manual*, always attached to the valve. Unauthorized interventions can be harmful to people and goods because of the explosion hazards present in potentially explosive atmospheres.

Valves can be mounted in any position. Valve fastening takes place by means of screws or tie rods, laying the valve on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing.

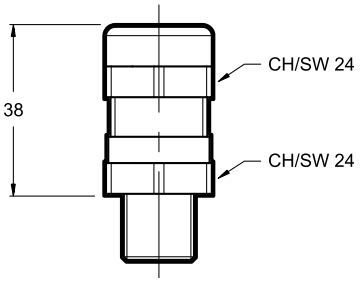
If the minimum values of planarity or smoothness are not met, fluid leakages between valve and mounting surface can easily occur.



9 - CABLE GLANDS

Cable glands must be ordered separately; Duplomatic offers some types of cable glands with the following features:

- version for non-armoured cable, external seal on the cable (suitable for Ø8÷10 mm cables);
- ATEX II 2GD, I M2; IECEx Gb, Db, Mb;
- cable gland material: nickel brass
- internal rubber tip material: silicone
- ambient temperature range: -65 ºC ÷ +220 ºC
- protection degree: IP66/IP68



To order the desired cable glands, specify description, code and quantity.

Description: CGK2/NB-01/10

Code: 3908108001

M20x1.5 - ISO 261 male thread, suitable for coils with T01 and S01 connections. It is supplied equipped with copper washer, that must be assembled between the cable gland and the coil, so as to ensure IP66/IP68 protection degree.

Tightening torque: 45 ÷ 50 Nm

Description: CGK2/NB-02/10

Code: 3908108002

Gk 1/2 - UNI EN 10226-2 male thread, suitable for coils with T02 and S02 connections. The customer must apply LOCTITE® 243™ threadlocker or similar between the cable gland connection thread and the coil in order to ensure IP66/IP68 protection degree.

Tightening torque: 20 ÷ 25 Nm

Description: CGK2/NB-03/10

Code: 3908108003

1/2” NPT - ANSI B1.20.1 (ex ANSI B2.1), suitable for coils with T03 and S03 connections. The customer must apply LOCTITE® 243™ threadlocker or similar between the cable gland connection thread and the coil in order to ensure IP66/IP68 protection degree.

Tightening torque: 20 ÷ 25 Nm

Description: CGK2/NB-04/10

Code: 3908108004

M16x1.5 - ISO 261 male thread, suitable for coils with S04 connection. It is supplied equipped with copper washer, that must be assembled between the cable gland and the coil, so as to ensure IP66/IP68 protection degree.

Tightening torque: 45 ÷ 50 Nm

10 - SUBPLATES

(see catalogue 51 000)

Type with rear ports	PMMD-AI3G
Type with side ports	PMMD-AL3G
P, T, A, B ports dimensions X, Y ports dimensions	3/8” BSP -

NOTE: Subplates (to be ordered separately) contain neither aluminium nor magnesium at a rate higher than the value allowed by norms according to ATEX directive for category II 2GD and I M2.

The user will bear to do the complete assessment of the ignition risk that can occur from the relative use in potentially explosive environments.

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duplomaticmotionsolutions.com

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EXPLOSION-PROOF CLASSIFICATION for

SOLENOID AND PROPORTIONAL VALVES

ref. catalogues:

pressure control valves

RQM*K*-P	**21 515**
P*E*K*	**81 316**
ZDE3K*	**81 515**
DZCE*K*	**81 606**

flow control valves

QDE3K*	**82 225**

directional valves

D*K*	**41 515**
DT3K*	**42 215**
DS(P)E*K*	**83 510**

GENERAL INFO

This informative technical datasheet displays information about **classification and marking** of Duplomatic explosion-proof valves range.

Duplomatic MS offers valves with the following certifications:

ATEX	**II 2G**	**II 2D**	**I M2**
IECEx	**Gb**	**Db**	**Mb**
PESO	**Gb**		

Instructions for use and maintenance can be found in the related manuals, always supplied toghether with valves.

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1 - ATEX CLASSIFICATION AND TEMPERATURES

Duplomatic certificates the combination valve-coil for the valves suitable for application and installation in potentially explosive atmospheres, according to ATEX directive; the supply always includes the declaration of conformity to the directive and the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environments.

Coils assembled on these valves have been separately certified according to ATEX directive and so they are suitable for use in potentially explosive atmospheres.

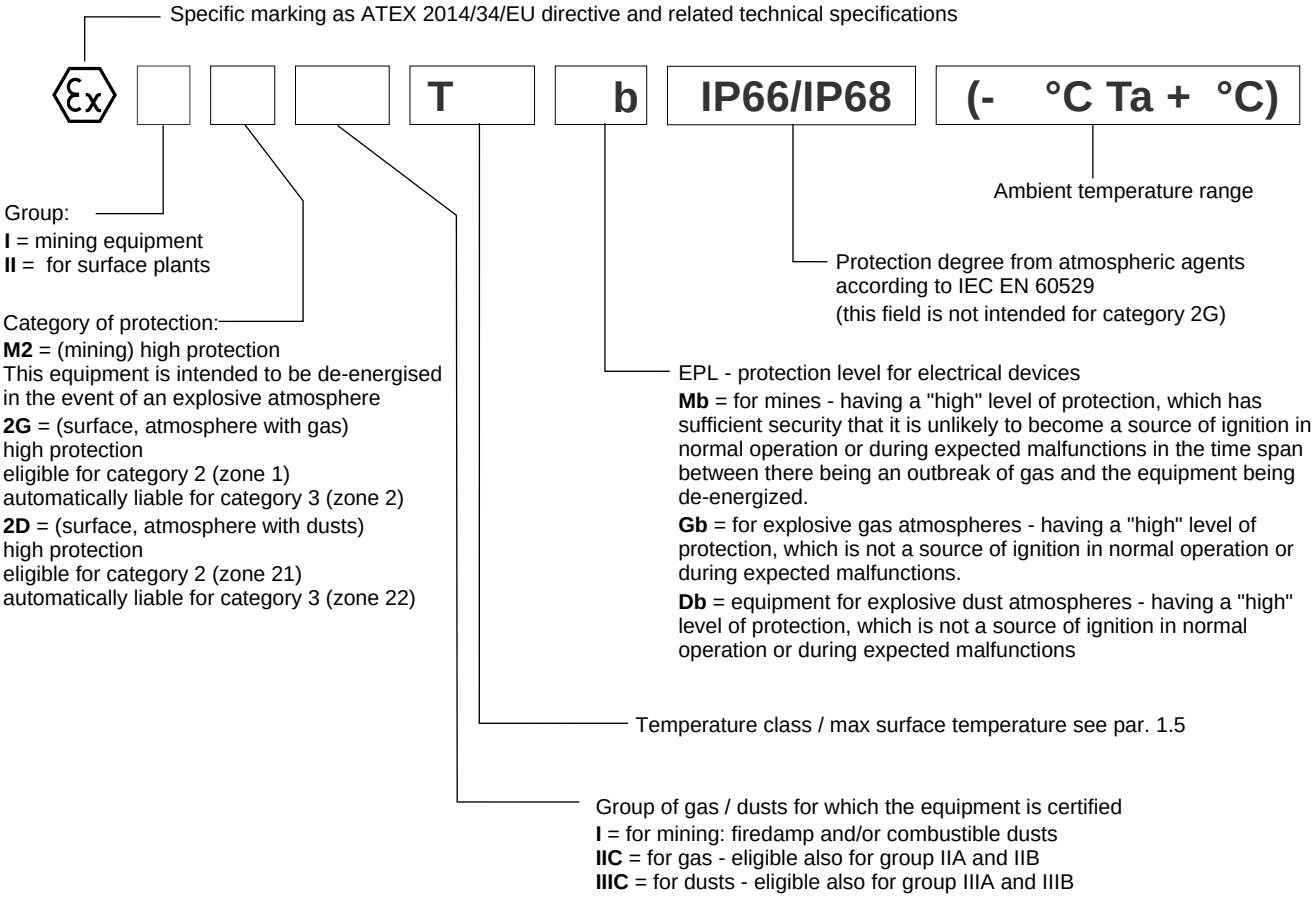
1.1 - ATEX classification for valves

Type examination certificate: AR18ATEX055
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

ATEX II 2G ATEX II 2D	***KD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur occasionally.The means of protection relating to equipment in this category ensure the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account.
ATEX I M2	***KDM2**	equipment intended for use in underground parts of mines as well as those parts of surface installations of such mines likely to be endangered by firedamp and/or combustible dust. This equipment is intended to be de-energised in the event of an explosive atmosphere.

1.2 - ATEX marking for valves

valve code		N and V seals	NL seals
***KD2**	for gas	Ex II 2G IIC T4 Gb (-20°C Ta +80°C)	Ex II 2G IIC T4 Gb (-40°C Ta +80°C)
	for dusts	Ex II 2D IIIC T154°C Db IP66/IP68 (-20°C Ta +80°C)	Ex II 2D IIIC T154°C Db IP66/IP68 (-40°C Ta +80°C)
***KD2 /T5**	for gas	Ex II 2G IIC T5 Gb (-20°C Ta +55°C)	Ex II 2G IIC T5 Gb (-40°C Ta +55°C)
	for dusts	Ex II 2D IIIC T129°C Db IP66/IP68 (-20°C Ta +55°C)	Ex II 2D IIIC T129°C Db IP66/IP68 (-40°C Ta +55°C)
***KDM2**	mining	Ex I M2 I T150°C Mb IP66/68 (-20°C Ta +75°C)	Ex I M2 I T150°C Mb IP66/68 (-40°C Ta +75°C)



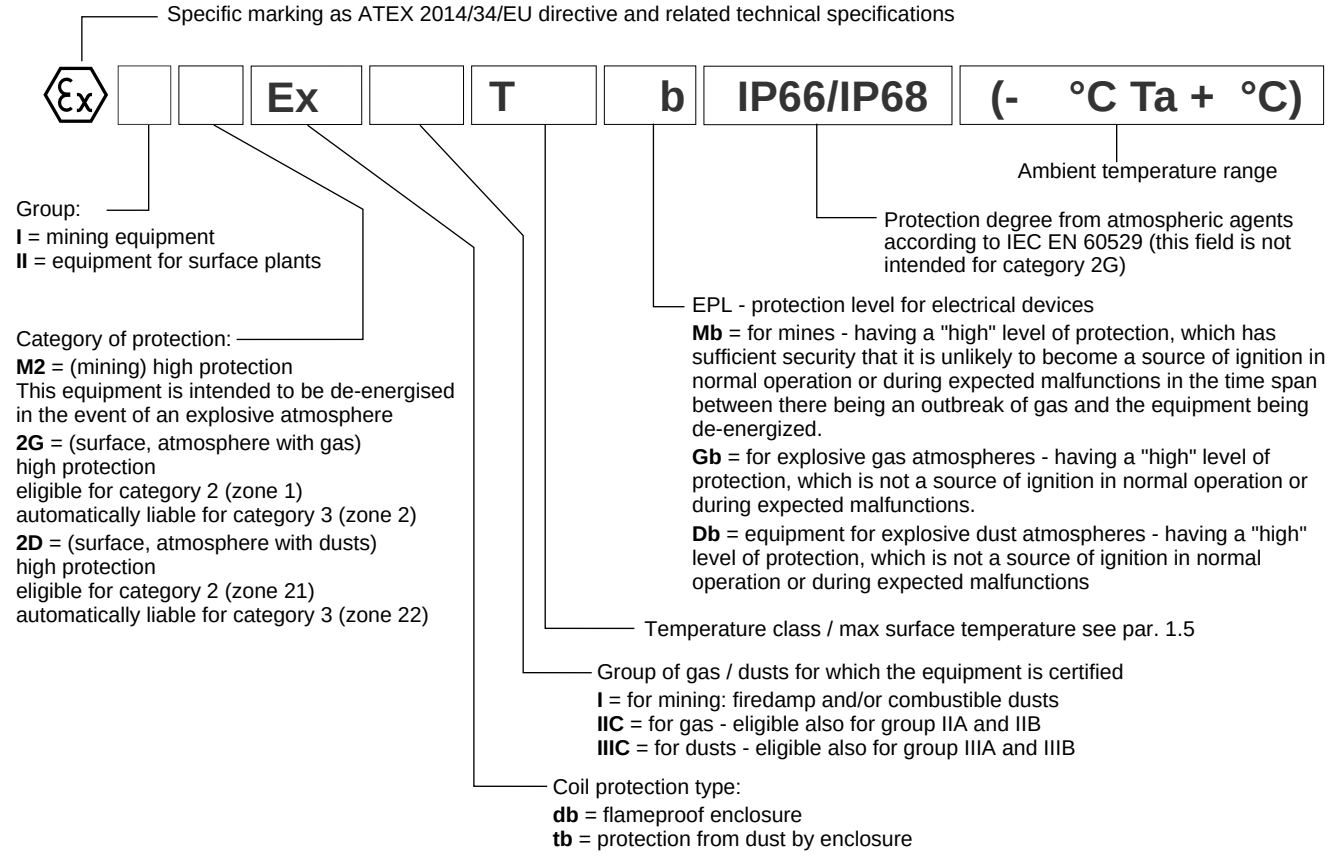
1.3 - ATEX classification of the coils

The coil of the explosion-proof valves is ATEX certified itself and, as such, is identified with its own tag, carries the relative ATEX marking. The mechanical construction of the coil housing is made in order to ensure its resistance to possible internal explosion and to avoid any explosion propagation to the outside environment, matching an “Ex db” type protection (explosion-proof coil).

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

1.4 - ATEX marking on coils

for valve type ***KD2**	for gas	Ex II 2G Ex db IIC T4 Gb (-40°C Ta +80°C)
	for dusts	Ex II 2D Ex tb IIIC T154°C Db IP66/IP68 (-40°C Ta +80°C)
for valve type ***KD2 /T5**	for gas	Ex II 2G Ex db IIC T5 Gb (-40°C Ta +55°C)
	for dusts	Ex II 2D Ex tb IIIC T129°C Db IP66/IP68 (-40°C Ta +55°C)
for valve type ***KDM2**	mining	Ex I M2 Ex db I T150°C Mb IP66/IP68 (-40°C Ta +75°C)



1.5 - Operating temperatures

These valves are classified according to their maximum surface temperature (EN 13463-1), which must be lower than the ignition temperature of the gases, vapors and dusts for which the area in which they will be used is classified.

The valves in group II can also be used for less limiting temperature classes (surface temperature allowed higher).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
ATEX II 2G ATEX II 2D	***KD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas) T154°C (dusts)	T3, T2, T1 T200°C and higher
		of fluid				
	***KD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas) T129°C (dusts)	T4, T3, T2, T1 T135°C and higher
		of fluid	-20 / +60 °C	-40 / +60 °C		
ATEX I M2	***KDM2**	of ambient	-20 / +75 °C	-40 / +75 °C	T150°C	-
		of fluid				

2 - IECEX CLASSIFICATION AND TEMPERATURES

The IECEx certification requires the classification of the electrical equipment only.

Duplomatic supplies valves with IECEx certified coils, suitable for application and installation in potentially explosive atmospheres. The mechanical construction of the coil housing is made in order to ensure its resistance to possible internal explosion and to avoid any explosion propagation to the outside environment, matching an “Ex db” type protection (explosion-proof coil).

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

The supply always includes the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environment.

2.1 - IECEx classification

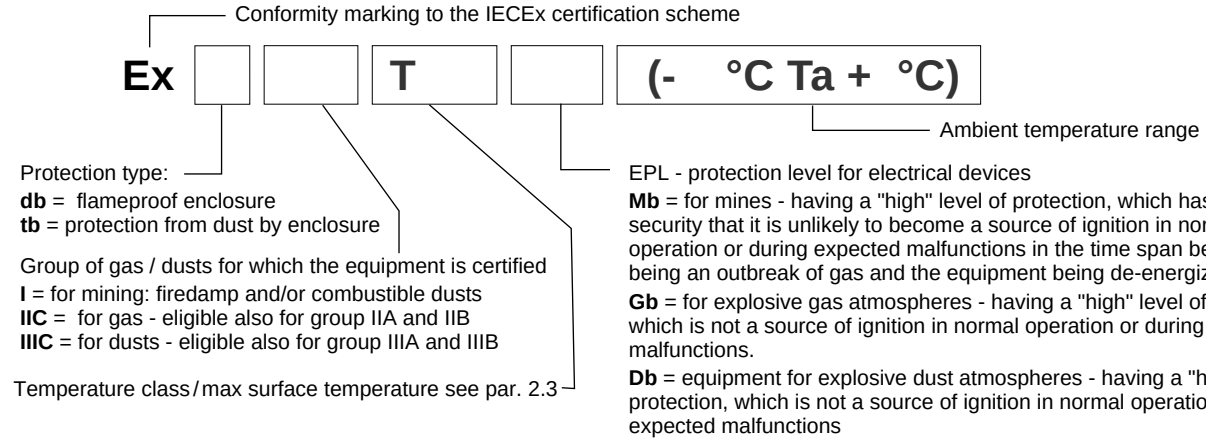
Certificate of conformity (CoC): IECEx TUN 15.0028X
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

IECEx Gb IECEx Db	***KXD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur occasionally.The means of protection relating to equipment in this category ensure the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account.
IECEx Mb	***KXDM2**	equipment intended for use in underground parts of mines as well as those parts of surface installations of such mines likely to be endangered by firedamp and/or combustible dust. This equipment is intended to be de-energised in the event of an explosive atmosphere.

2.2 - IECEx marking

There is a plate with the IECEx mark on each coil.

***KXD2** valves	for gas for dusts	Ex db IIC T4 Gb (-40°C Ta +80°C) Ex tb IIIC T135°C Db (-40°C Ta +80°C)
***KXD2 /T5** valves	for gas for dusts	Ex db IIC T5 Gb (-40°C Ta +55°C) Ex tb IIIC T100°C Db (-40°C Ta +55°C)
***KDM2** valves	mining	Ex db I Mb (-40°C Ta +80°C)



2.3 - Operating temperatures

These valves are classified according to their maximum surface temperature (EN 13463-1), which must be lower than the ignition temperature of the gases, vapors and dusts for which the area in which they will be used is classified.

Valves for surface plants can also be used for less limiting temperature classes (higher surface temperature allowed).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
IECEx Gb IECEx Db	***KXD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas) T135°C (dusts)	T3, T2, T1 T200°C and higher
		of fluid				
	***KXD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas) T100°C (dusts)	T4, T3, T2, T1 T135°C and higher
		of fluid	-20 / +60 °C	-40 / +60 °C		
IECEx Mb	***KXDM2**	of ambient	-20 / +80 °C	-40 / +80 °C	-	-
		of fluid				

2.4 - Protection degree from atmospheric agents (IEC EN 60529)

Protection degree from atmospheric agents according to IEC EN 60529 is IP66/IP68.

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3 - PESO CLASSIFICATION AND TEMPERATURES

The PESO certification requires the classification of the electrical equipment only.

Duplomatic supplies valves with PESO certified coils, suitable for application and installation in potentially explosive atmospheres. The mechanical construction of the coil housing is made in order to ensure its resistance to possible internal explosion and to avoid any explosion propagation to the outside environment, matching an “Ex db” type protection (explosion-proof coil).

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

The supply always includes the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environment.

3.1 - PESO classification

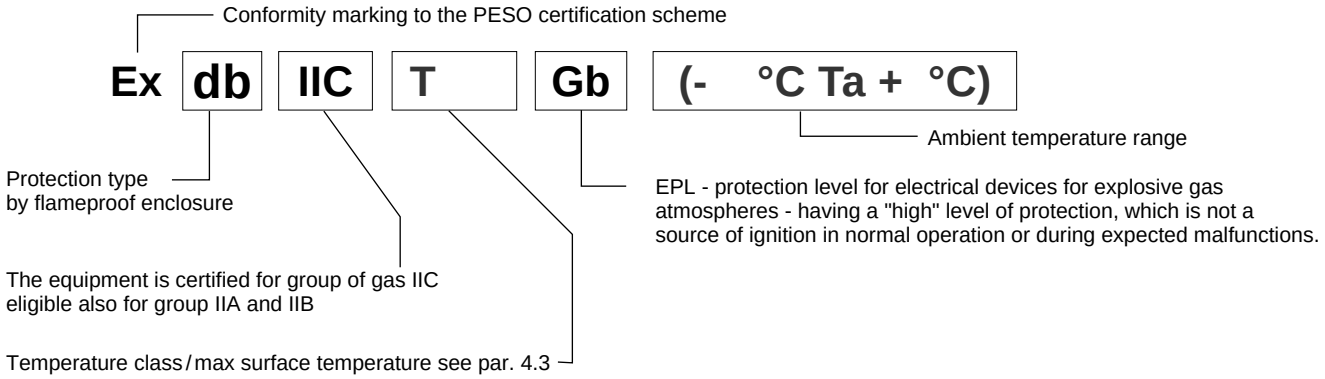
Certificate of conformity: P480801
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

PESO Gb	***KPD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists are likely to occur occasionally.The means of protection relating to equipment in this category ensure the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account.

3.2 - PESO marking

There is a plate with the PESO mark on each coil.

***KPD2** valves	for gas	Ex db IIC T4 Gb (-40°C Ta +80°C)
***KPD2 /T5** valves	for gas	Ex db IIC T5 Gb (-40°C Ta +55°C)



3.3 - Operating temperatures

These valves are classified according to their maximum surface temperature (EN 13463-1), which must be lower than the ignition temperature of the gases, vapors and dusts for which the area in which they will be used is classified.

Valves for surface plants can also be used for less limiting temperature classes (higher surface temperature allowed).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
PESO Gb	***KPD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas)	T3, T2, T1
		of fluid				
	***KPD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas)	T4, T3, T2, T1
		of fluid	-20 / +60 °C	-40 / +60 °C		

3.4 - Protection degree from atmospheric agents (IEC EN 60529)

Protection degree from atmospheric agents according to IEC EN 60529 is IP66/IP68.

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duplomaticmotionsolutions.com

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MDT

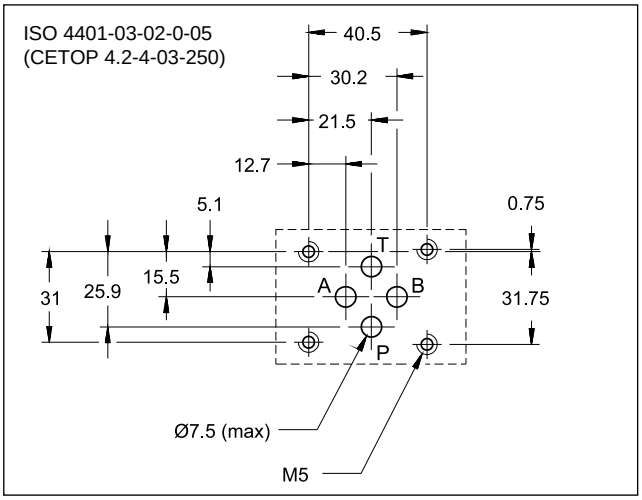
POPPET TYPE SOLENOID OPERATED DIRECTIONAL CONTROL VALVE

SERIES 11

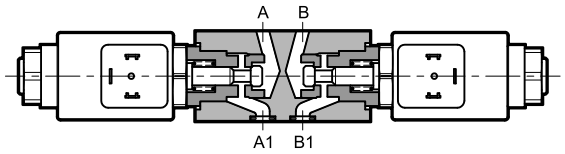
MODULAR VERSION ISO 4401-03

p max **250** bar
Q max **25** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



— MDT is a direct-acting control valve with conical seat seal, in modular version, designed to keep hydraulic actuators in position.

— Two-way, normally closed, it provides bidirectional sealing when the solenoid is de-energized.

— Solenoids are oil-bath, leakproof. The valve is available for DC or AC power supply.

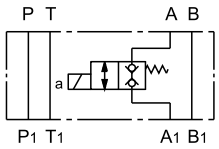
VALVE CONFIGURATIONS

(see hydraulic symbols table)

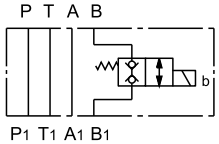
Configuration “SA”: used to control flow in line A.
Configuration “SB”: used to control flow in line B.
Configuration “D”: used to control flow in lines A and B

HYDRAULIC SYMBOLS

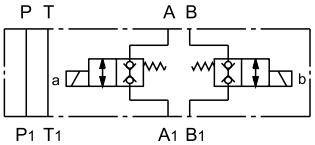
MDT-SA1



MDT-SB1



MDT-D1



PERFORMANCES

(measured with mineral oil of viscosity 36 cSt at 50 °C)

Maximum operating pressure	bar	250
Maximum flow rate in controlled lines Maximum flow rate in free lines	l/min	25 65
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	according to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass MDT-D1 MDT-SA1/SB1	kg	1,7 1,2

1 - IDENTIFICATION CODE

M	D	T	-		1	/	11		-		K1

Modular valve ISO 4401-03

Poppet type solenoid operated directional control valve

Configurations: **SA** = control on line A
SB = control on line B
D = control on lines A and B

Double seal - normally closed

Series No.: (the overall and mounting dimensions remain unchanged from 10 to 19)

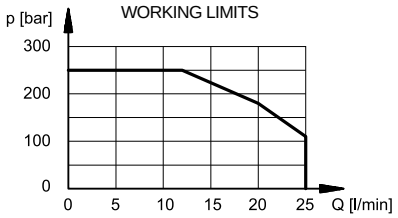
Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

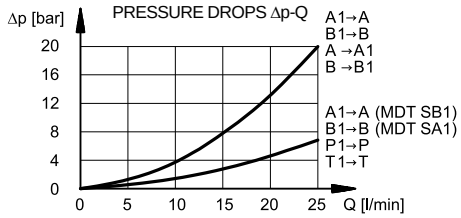
DC power supply:
D24 = 24 V
AC power supply to be rectified
R110 = 110 V
R220 = 220 V

Coil electrical connection for EN 175301-803 connector

NOTE: Solenoid valves are delivered without connectors. Connectors type EN 175301-803 (ex DIN 43650) can be ordered separately. See catalogue 49 000.

2 - CHARACTERISTIC CURVES (values obtained with viscosity 36 cSt at 50 °C)





3 - ELECTRICAL FEATURES AND SWITCHING TIMES

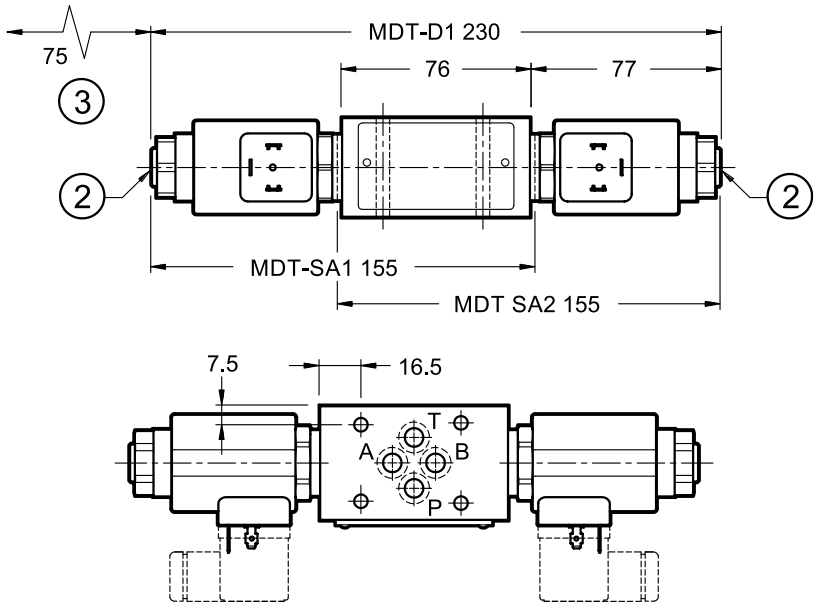
Please refer to catalogue 42 200 - DT03.

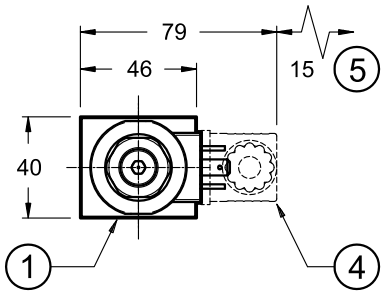
4 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

5 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm





1	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) - 90 Shore
2	Manual override
3	Coil removal space
4	EN 175301-803 (ex DIN 43650) electrical connector, to be ordered separately (see cat. 49 000)
5	Connector removal space

DUPLOMATIC
MOTION SOLUTIONS
a member of DAIKIN group

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duplomaticmotionsolutions.com

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KT*

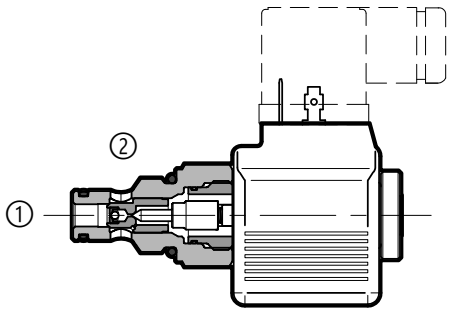
SOLENOID OPERATED CARTRIDGE, POPPET TYPE

SERIES 1

CARTRIDGE TYPE
seat SAE 08, SAE 10 and SAE 12

p max **350** bar
Q max **150** l/min

OPERATING PRINCIPLE



— The KT* are 2-port pilot operated poppet valves, actuated by solenoid. They are available in three nominal sizes, in normally closed versions (NC) and in normally open versions (NO).

— Single flow, reverse flow and double seal designs are available, with maximum flow rate up to 150 l/min.

— KT* valves ensure a low internal leakage, which decreases while the pressure increases.

— Coils for DC power supply with standard connection type EN 175301-803 (ex DIN 43650), AMP Junior or DEUTSCH are available.

— The manual override is available as option (see point 19).

PERFORMANCES

(working with mineral oil of viscosity of 36 cSt at 50°C)

		KT08	KT10	KT12
Maximum operating pressure	bar	350		
Nominal flow rate	l/min	40	80	150
Maximum internal leakage at 350 bar	cm^3/min	0.25		
Pressure drops Δp - Q	view points 7, 9, 11, 13, 15			
Electrical characteristics	view point 16			
Electrical connections	EN 175301-803 (ex DIN 43650) / AMP Junior / DEUTSCH			
Ambient temperature range	°C	-20 / +50		
Fluid temperature range	°C	-20 / +80		
Fluid viscosity range	cSt	10 ÷ 400		
Fluid contamination degree	according to ISO 4406:1999 class 20/18/15			
Recommended viscosity	cSt	25		
Mass	kg	0.1 ÷ 0.5	0.2 ÷ 0.6	0.25
Surface treatment of the cartridge	zinc coating (salt spray resistance: 96 h)			

1 - IDENTIFICATION CODE

K	T		-	2			-			-	N		-	1

Cartridge solenoid valve

Poppet type valve

Nominal body dimension:
08 = 3/4-16 UNF-2A
10 = 7/8-14 UNF-2A
12 = 1 1/16-12 UN-2A

2-port

Seals (see hydraulic symbols and table for availability):
S = standard seal (from 2 to 1)
R = reverse seal (from 1 to 2)
D = double seal

Initial position:
NC = normally closed
NO = normally open

Availability

	nominal dimension		
	08	**10**	**12**
2SNC	■	■	■
2RNC	■	■	-
2DNC	■	-	-
2SNO	■	■	-
2DNO	■	-	-

DC power supply :
D00 = valve without coil (the coil locking ring and the related OR are supplied)
D12 = 12 V
D24 = 24 V
D110 = 110 V
D220 = 220 V

Coil electrical connection (see point 17):
K1 = plug for connector type EN 175301-803 (ex DIN 43650) (**standard**)

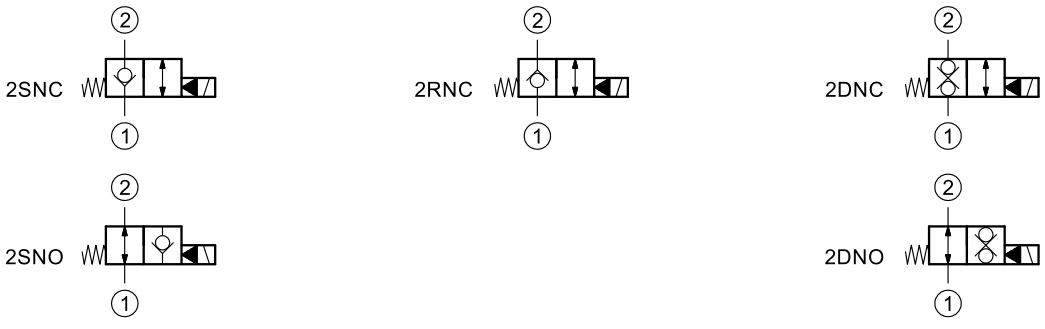
For **D12** and **D24** coils only:
K2 = plug for connector type AMP JUNIOR
K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S

NBR seal for mineral oil

Manual override (see point 19):
N = no override, blind
K2 = push and twist

Series Number

2 - HYDRAULIC SYMBOLS



3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

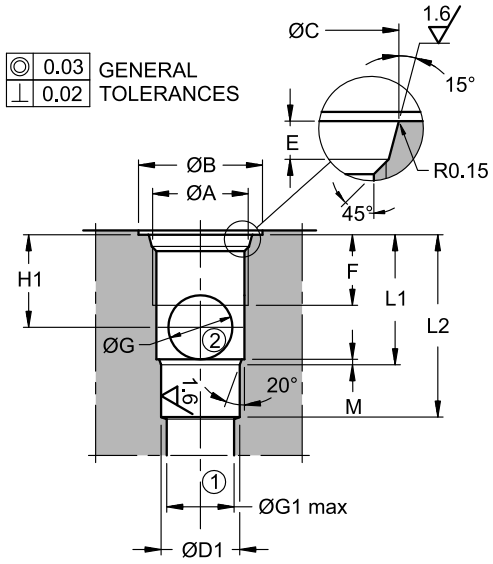
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

4 - SWITCHING TIMES

The values indicated refer to a valve tested with Q = 25 l/min, p = 350 bar, with mineral oil at a temperature of 50°C and a viscosity of 36 cSt.

TIMES [ms]		
	ENERGIZING	DE-ENERGIZING
KT08-2SNC, KT08-2SNO, KT08-2RNC, KT10-2SNC	30	60
KT08-2DNC	30 ÷ 40	60 ÷ 80
KT10-2RNC	50	70
KT08-2DNO, KT10-2SNO	100	50
KT12-2SNC	40	90

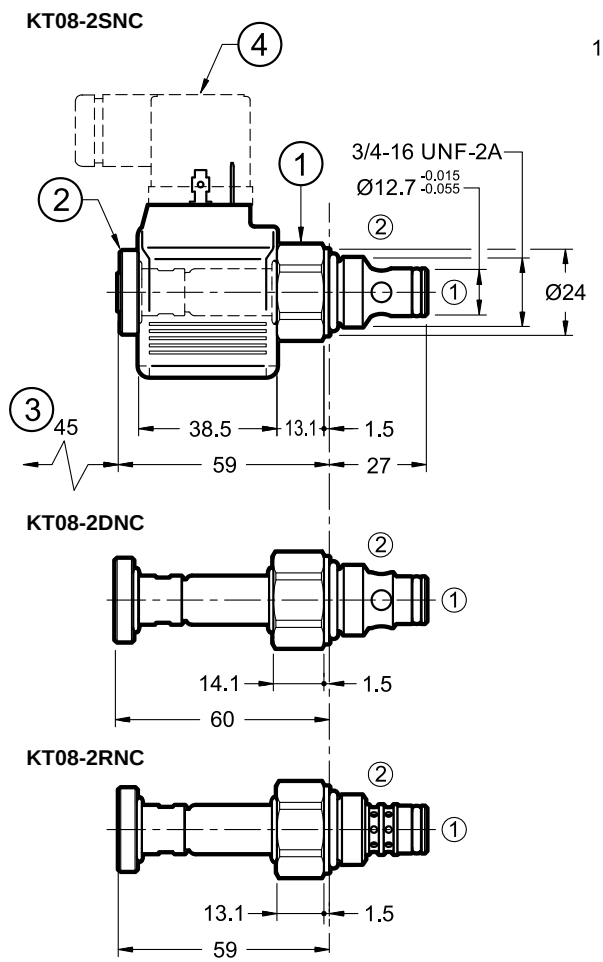
5 - SEAT DIMENSIONS FOR SAE CARTRIDGE VALVES



	KT08	KT10	KT12
cavity	SAE 08-2N	SAE 10-2N	SAE 12-2N
øA	3/4-16 UNF-2B	7/8-14 UNF-2B	1-1/16 12 UN-2B
øB	26	30	35
øC	$20.6^{+0.1}_{0}$	$23.9^{+0.1}_{0}$	$29.2^{+0.1}_{0}$
øD1	$12.7^{+0.05}_{0}$	$15.87^{+0.05}_{0}$	$22.22^{+0.05}_{0}$
E	$2.6^{+0.3}_{0}$	$2.6^{+0.3}_{0}$	$3.3^{+0.3}_{0}$
F	13	15	20
øG	9	11.75	18
øG1 max	12	15	19
H1	14	17.5	25.3
L1	$20.5^{\pm0.3}$	$25.5^{\pm0.3}$	$36.5^{\pm0.3}$
L2	$29^{\pm0.3}$	$34.5^{\pm0.3}$	$48^{\pm0.3}$
M	1.5	1.5	1.6

6 - KT08-2*NC - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

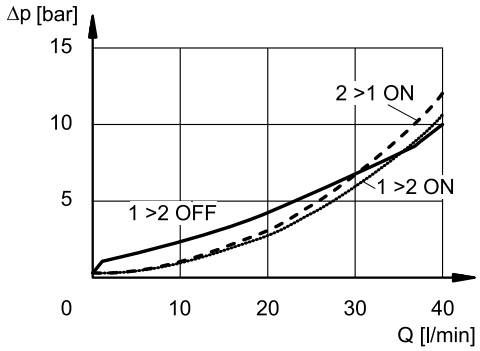


1	Hexagonal: spanner 24 tightening torque 40 ÷ 45 Nm
2	Coil locking ring: 9 ±1 Nm
3	Coil removal space
4	Electrical connector type EN 175301-803 (ex DIN 43650) To be ordered separately - see p. 18
5	Connector removal space

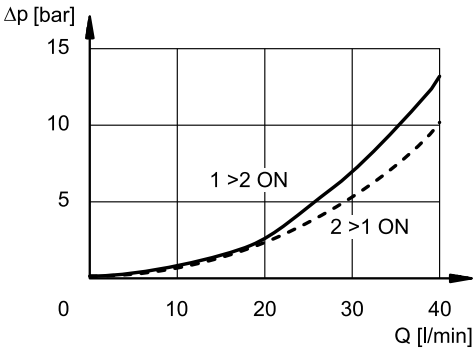
7 - KT08-2*NC - PRESSURE DROPS

(Obtained with viscosity 46 cSt at 40 °C, minimum voltage 90% nom.)

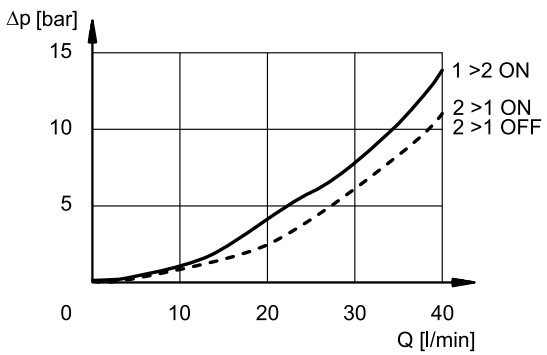
7.1 - KT08-2SNC



7.2 - KT08-2DNC

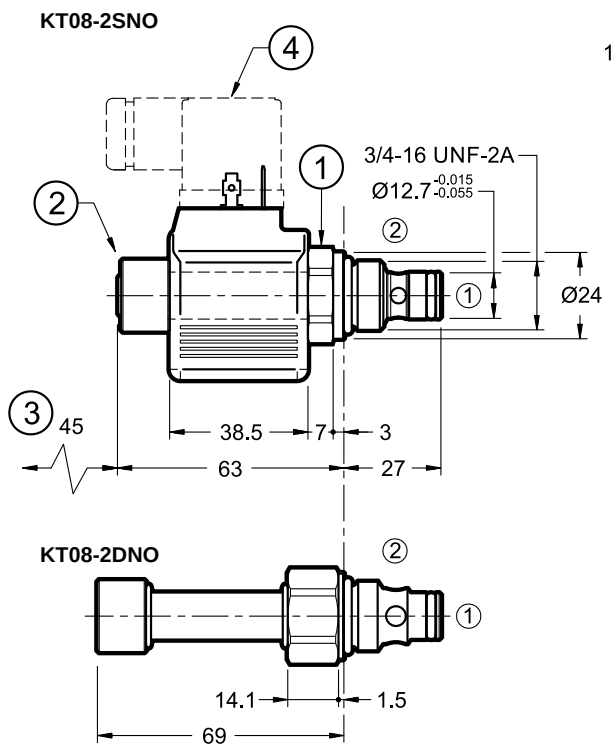


7.3 - KT08-2RNC



8 - KT08-2*NO - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

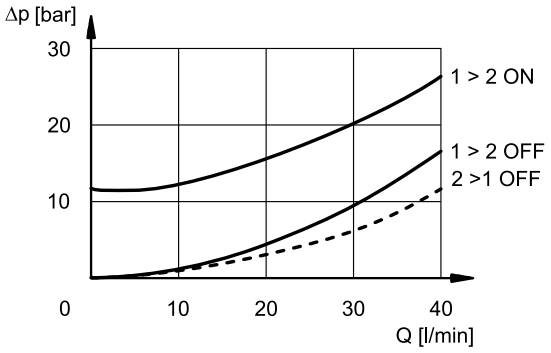


1	Hexagonal: spanner 24 tightening torque 40 ÷ 45 Nm
2	Coil locking ring: 9 ±1 Nm
3	Coil removal space
4	Electrical connector type EN 175301-803 (ex DIN 43650) To be ordered separately - see p. 18
5	Connector removal space

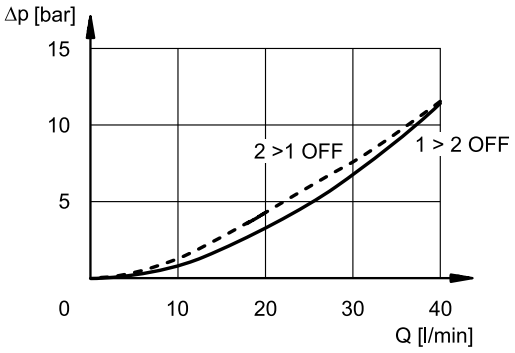
9 - KT08-2*NO - PRESSURE DROPS

(Obtained with viscosity 46 cSt at 40 °C, minimum voltage 90% nom.)

9.1 - KT08-2SNO



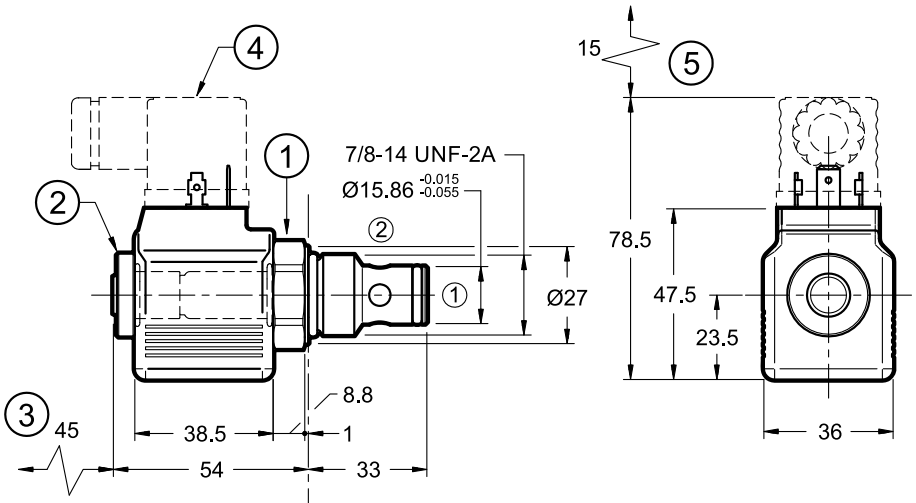
9.2 - KT08-2DNO



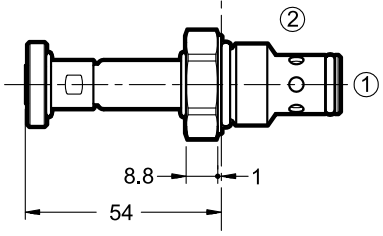
10 - KT10-2*NC - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

KT10-2SNC



KT10-2RNC

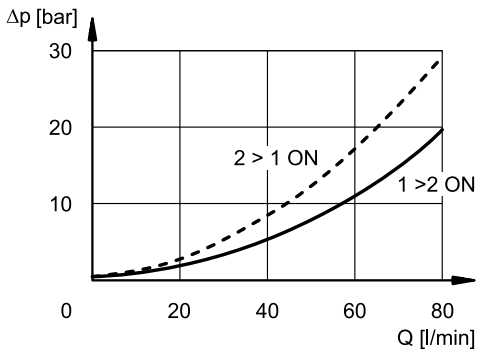


1	Hexagonal: spanner 27 tightening torque 65 ÷ 75 Nm
2	Coil locking ring: 9 ±1 Nm
3	Coil removal space
4	Electrical connector type EN 175301-803 (ex DIN 43650) To be ordered separately - see p. 18
5	Connector removal space

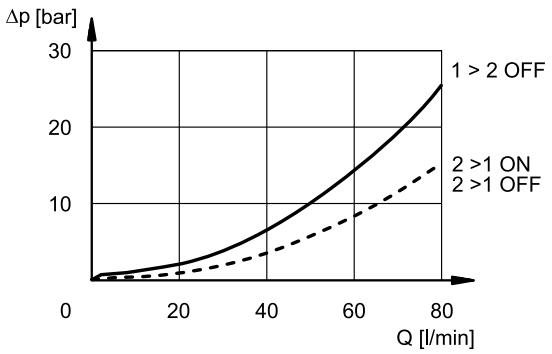
11 - KT10-2*NC - PRESSURE DROPS

(Obtained with viscosity 46 cSt at 40 °C, minimum voltage 90% nom.)

11.1 - KT10-2SNC

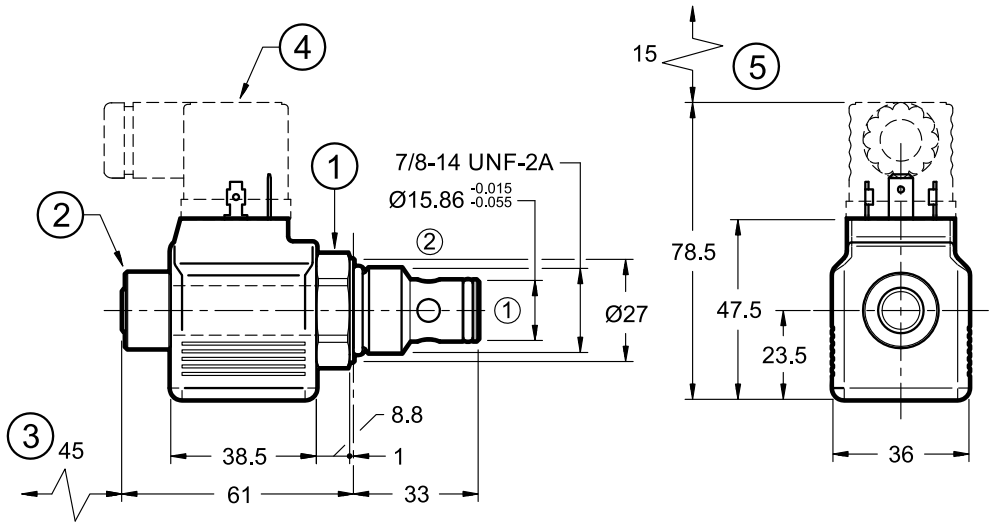


11.2 - KT10-2RNC



12 - KT10-2SNO - OVERALL AND MOUNTING DIMENSIONS

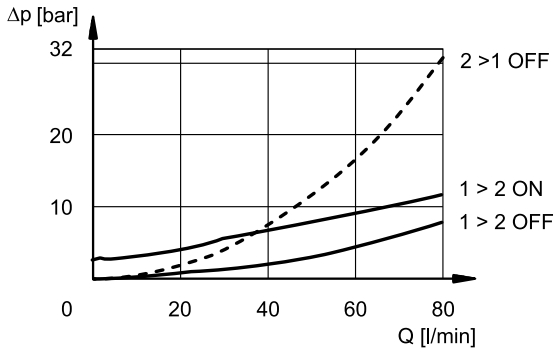
dimensions in mm



1	Hexagonal: spanner 27 tightening torque 65 ÷ 75 Nm
2	Coil locking ring: 9 ±1 Nm
3	Coil removal space
4	Electrical connector type EN 175301-803 (ex DIN 43650) To be ordered separately - see p. 18
5	Connector removal space

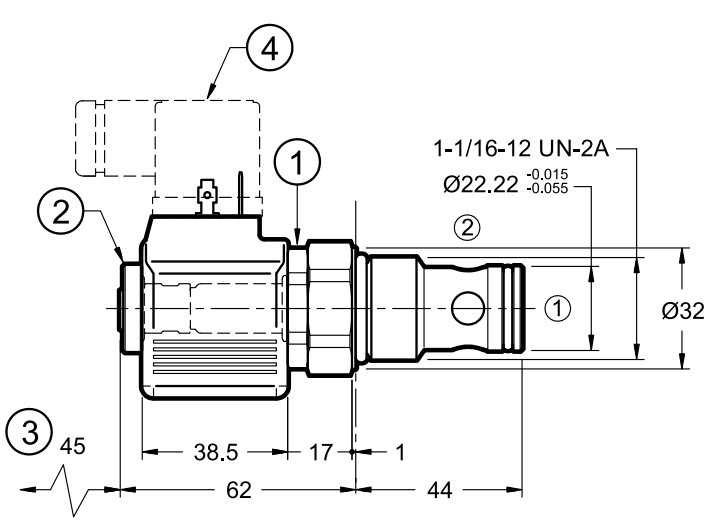
13 - KT10-2SNO - PRESSURE DROPS

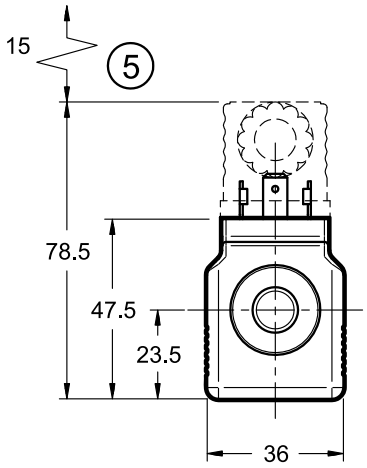
(Obtained with viscosity 46 cSt at 40 °C, minimum voltage 90% nom.)



14 - KT12-2SNC - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

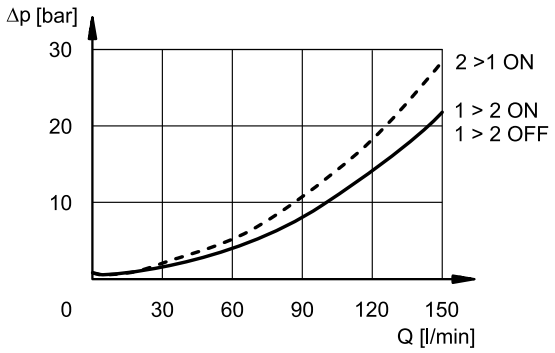




1	Hexagonal: spanner 32 tightening torque 85 ÷ 95 Nm
2	Coil locking ring: 9 ±1 Nm
3	Coil removal space
4	Electrical connector type EN 175301-803 (ex DIN 43650) To be ordered separately - see p. 18
5	Connector removal space

15 - KT12-2SNC - PRESSURE DROPS

(Obtained with viscosity 46 cSt at 40 °C, minimum voltage 90% nom.)



16 - ELECTRICAL FEATURES

16.1 - Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation.

The coil is fastened to the tube by a threaded ring, and can be easily replaced. To replace the coil even with different voltage it is possible without replacing the tube.

Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree, correctly connected and installed.

electric connection	electric connection protection	whole valve protection
K1	IP65	IP65
K2	IP65/67	
K7	IP65/67	

SUPPLY VOLTAGE FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY	10.000 ins/hour
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	In compliance with 2014/30/UE
LOW VOLTAGE	In compliance with 2014/35/UE
CLASS OF PROTECTION Coil insulation (VDE 0580) Impregnation	 class H class F

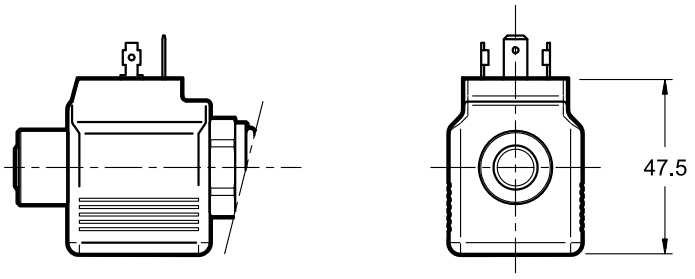
16.2 - Current and absorbed power

The table shows the absorption values relating to the various types of coil for direct current power supply.

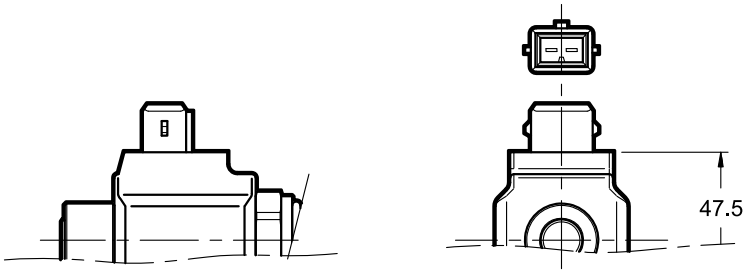
	Nominal voltage [V] (±10%)	Resistance at 20°C [Ω] (±7%)	Absorbed current [A]	Absorbed power [W]	Coil code K1	Coil code K2	Coil code K7
D12	12	6.5	1.84	22	1904140	1904180	1904150
D24	24	26.2	0.92	22	1904141	1904181	1904151
D110	110	550	0.2	22	1904142	-	-
D220	220	2200	0.1	22	1904143	-	-

17 - ELECTRIC CONNECTIONS

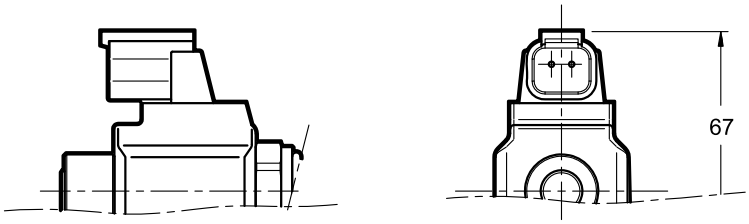
connection for EN 175301-803
(ex DIN 43650) connector
code **K1** (**standard**)



connection for AMP JUNIOR
connector type
code **K2**



connection for
DEUTSCH DT06-2S male
connector type
code **K7**



18 - ELECTRIC CONNECTORS

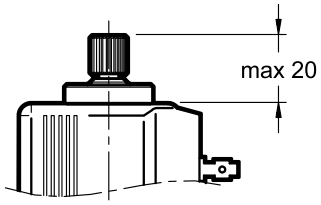
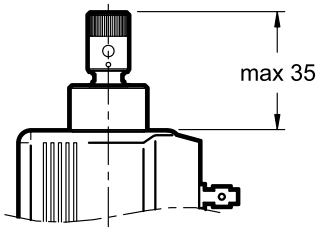
Solenoid valves are delivered without connectors. Connectors type EN 175301-803 (ex DIN 43650) for K1 connection can be ordered separately. See catalogue 49 000.

19 - MANUAL OVERRIDE

Valves can be delivered with push and twist manual override (K2 code) or without any override (N code).

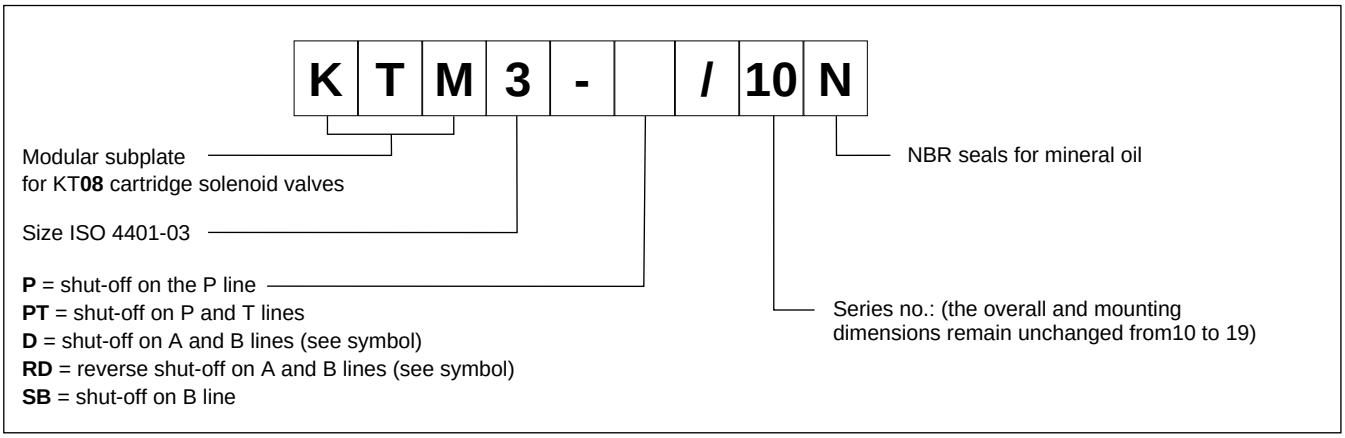
The override is activated by pressing and turning the knob (clockwise for NO versions, anticlockwise for NC versions); it is deactivated by pressing and turning the knob again in the opposite direction. A small spring allows the knob to return to its initial position.

The shape is different depending on NC or NO version.

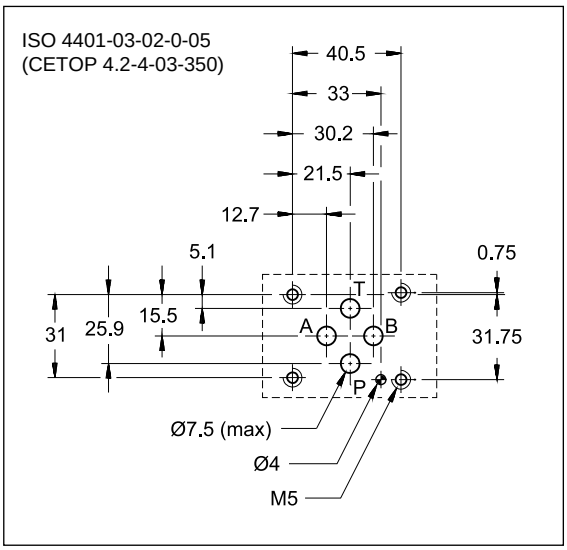
K2 for NC version	K2 for NO version
	

20 - KT08 SUBPLATES FOR MODULAR MOUNTING

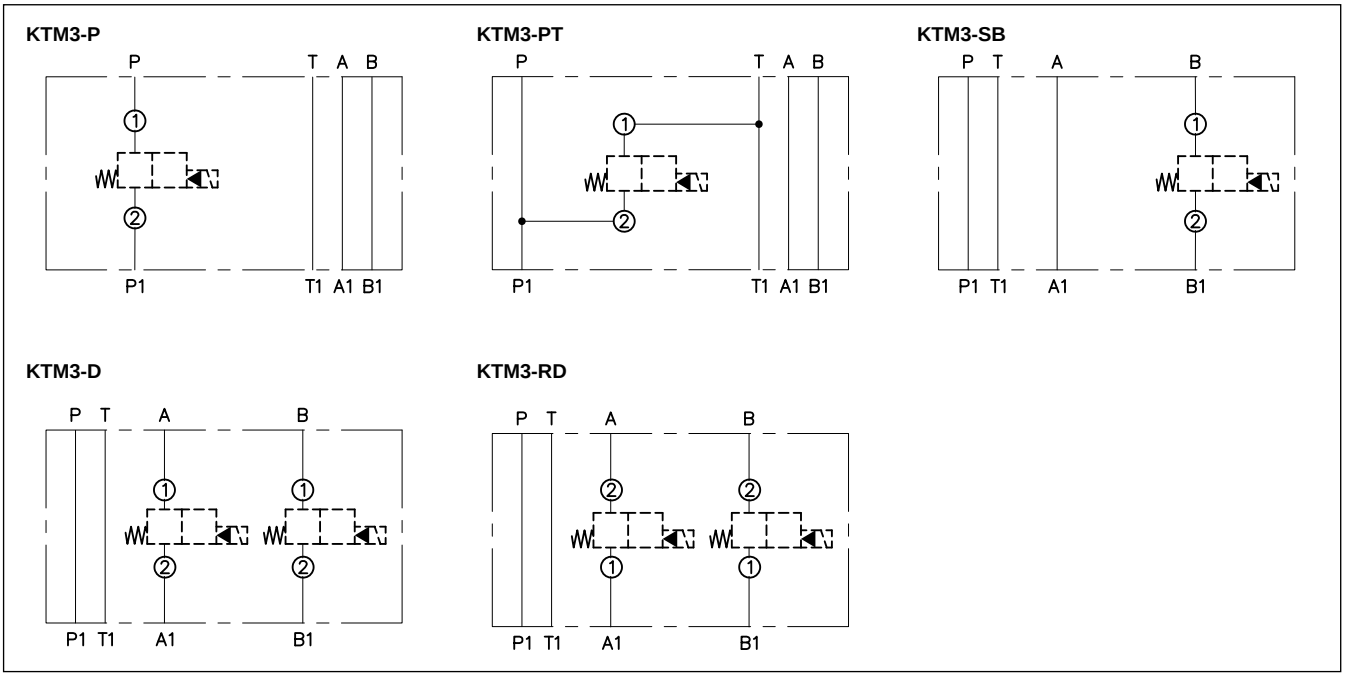
20.1 - Identification code



MOUNTING INTERFACE

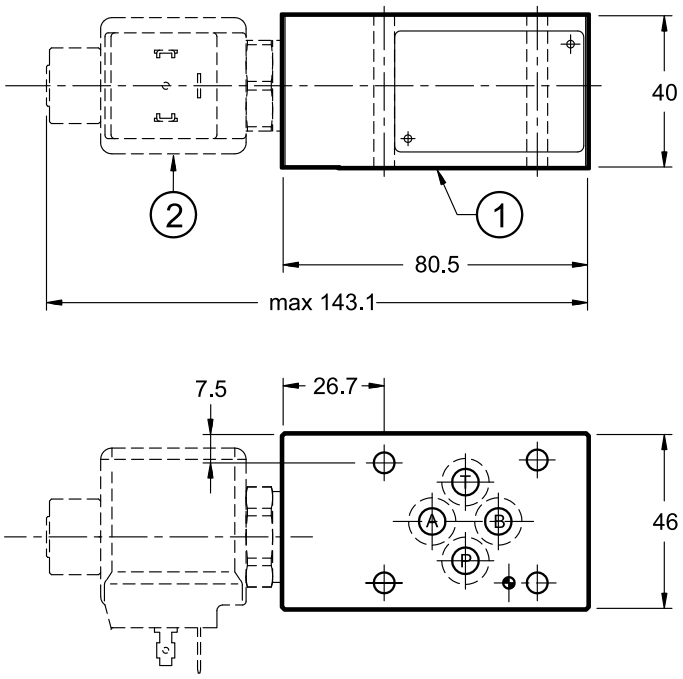


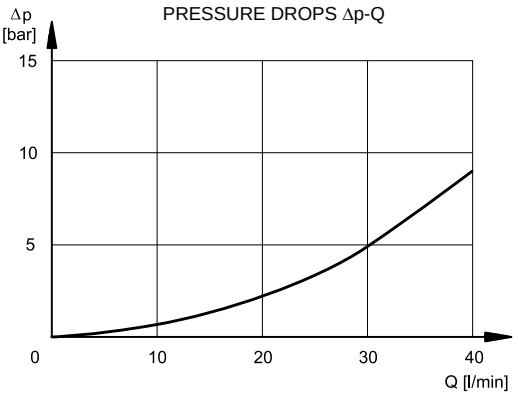
HYDRAULIC SYMBOLS



20.2 - Overall and mounting dimensions KTM3-P

dimensions in mm

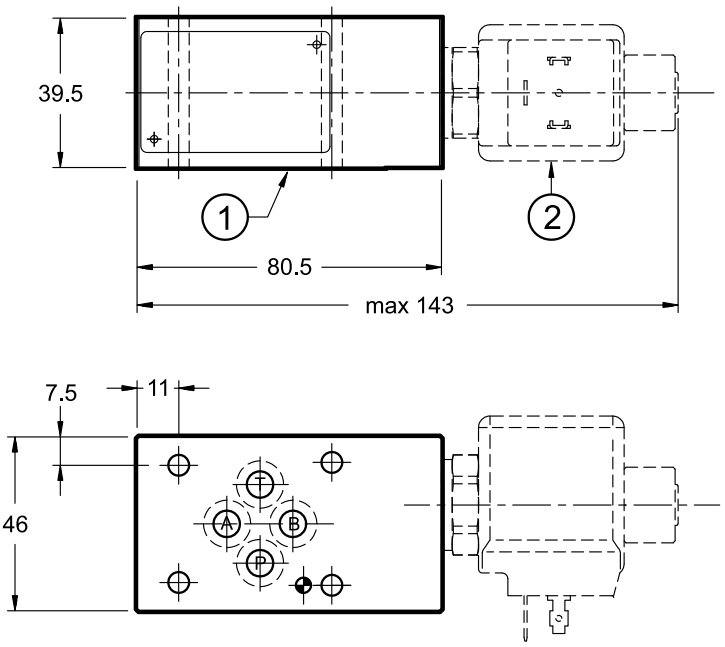


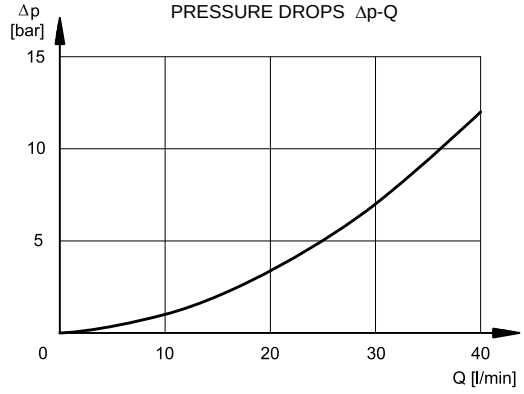


1	Mounting surface with sealing rings: n. 4 OR type 2037 (9.25x1.78) - 90 Shore
2	Cartridge solenoid valve type KT08 (to be ordered separately)

20.3 - Overall and mounting dimensions KTM3-PT

dimensions in mm





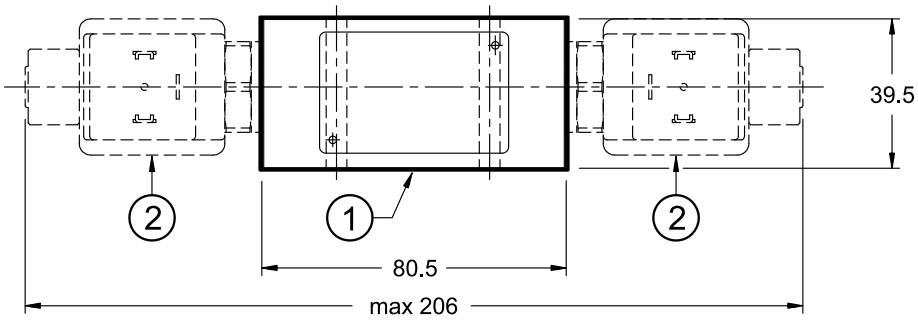
1	Mounting surface with sealing rings: n. 4 OR type 2037 (9.25x1.78) - 90 Shore
2	Cartridge solenoid valve type KT08 (to be ordered separately)

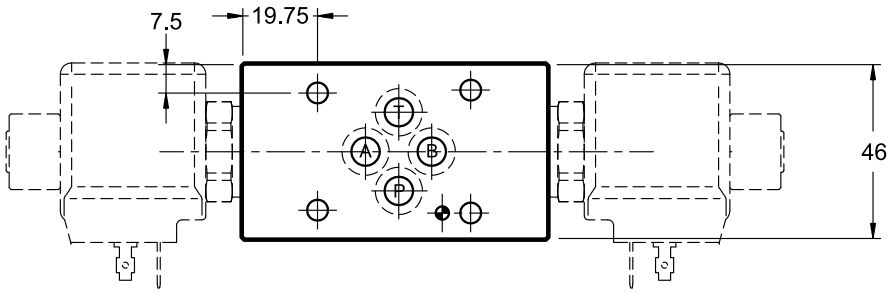
20.4 - Overall and mounting dimensions KTM3-D, KTM3-RD and KTM3-SB

dimensions in mm

KTM3-D

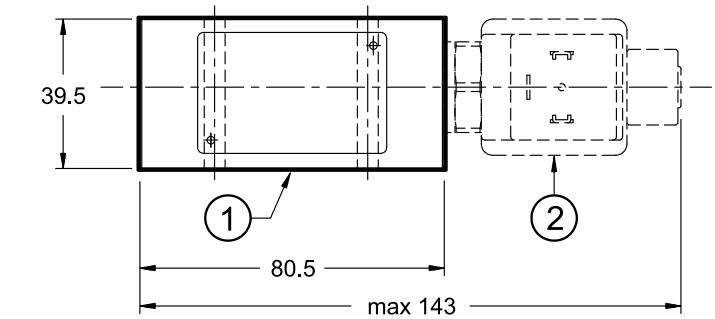
KTM3-RD

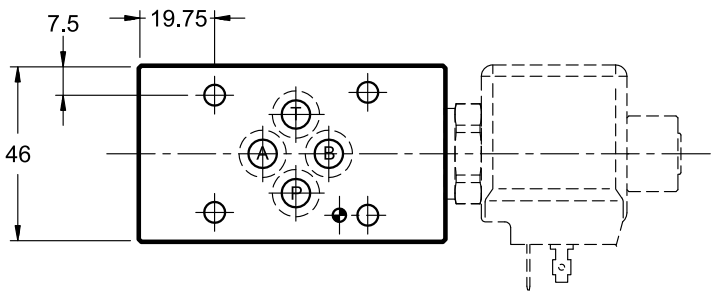




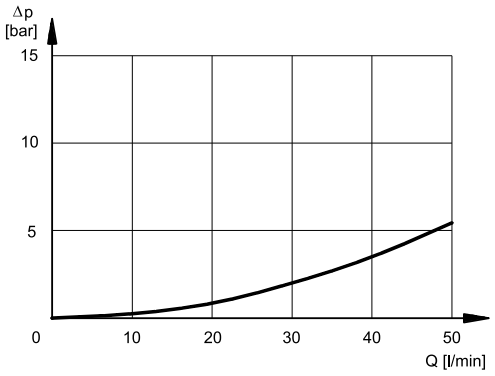
NOTE: In order to use just one of the working port (shut-off on path A), the plug must be ordered separately.
Code **0266683**.

KTM3-SB





PRESSURE DROPS Δp-Q



1	Mounting surface with sealing rings: n. 4 OR type 2037 (9.25x1.78) - 90 Shore
2	Cartridge solenoid valve type KT08 (to be ordered separately)

DUPLOMATIC
MOTION SOLUTIONS
a member of DAIKIN group

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duplomaticmotionsolutions.com

REPRODUCTION IS FORBIDDEN. THE COMPANY RESERVES THE RIGHT TO APPLY ANY MODIFICATIONS



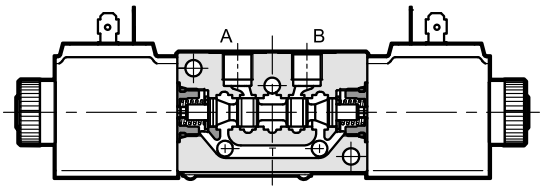
BDL1

STACKABLE DIRECTIONAL CONTROL VALVES

SERIES 10

p max **350** bar
Q max **15** l/min

OPERATING PRINCIPLE



— BDL1 is an assemblage of stackable valves, very versatile thanks to its modular design.

— Stackable elements have been designed to be assembled in parallel connection, mounting up to 8 stackable directional valves.

— BD* assemblies are suitable for compact applications, mainly in mobile industries and in mini-power packs.

— The directional valves have a thickness of 28 mm and 1/8" BSP connections on working ports.

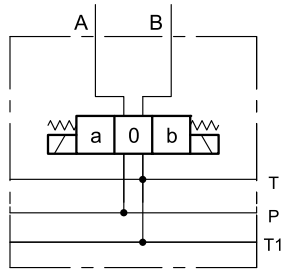
— Inlet elements have P and T ports 1/4" BSP.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C)

Maximum operating pressure: - P-A-B ports - T / T1 ports	bar	 350 280
Maximum flowrate	l/min	15
Pressure drops Δp - Q	see paragraph 3	
Electrical characteristics	see paragraph 6	
Operating limits	see paragraph 4	
Electrical connections	see paragraph 7	
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass (directional valve)	kg	0.8
Surface treatment of inlet and outlet elements and of valve body	zinc-nickel	

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODES OF SEPARATE ELEMENTS

Here below are shown the identification codes for the separate elements of the stackable valve.

1.1 - Directional valve element

BD	L	1	-	B18	-		/	10		-			/	

Stack directional valve element, on-off

13 mm solenoid tube

Size : thickness 28 mm

Ports 1/8” BSP

Spool type
(see point 1.2)

Series no.
(the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Coil type:
DC coils
D12 = 12 V
D24 = 24 V
D00 = valve without coil supplied with locking ring

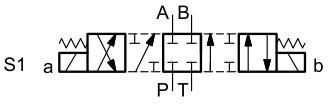
Coil electrical connection:
K1 = plug for connector type EN 175301-803 (ex DIN 43650) (**standard**)
K2 = plug for connector type AMP JUNIOR
K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S

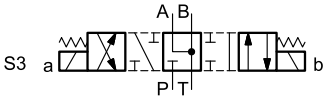
Manual override:
Omit for pin manual override integrated in the tube (**standard**).
CM = manual override boot protected

NOTE: A galvanic surface treatment zinc-nickel is applied to body elements and plates, making the assembly suitable to withstand a salt spray exposure time of **600** hours (test carried out according to the UNI EN ISO 9227 and assessment test carried out according to UNI EN ISO 10289).

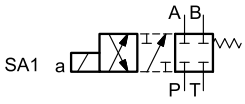
1.2 - Available spools

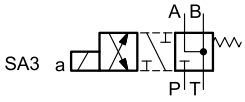
Type **S**:
2 solenoids - 3 positions
spring centreing



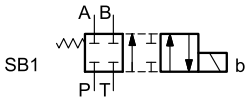


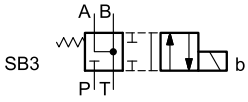
Type **SA***: 1 solenoid side A
2 positions (central + external)
spring centreing



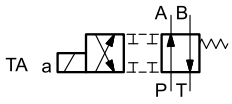


Type **SB***: 1 solenoid side B
2 positions (central + external)
spring centreing

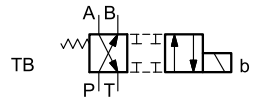




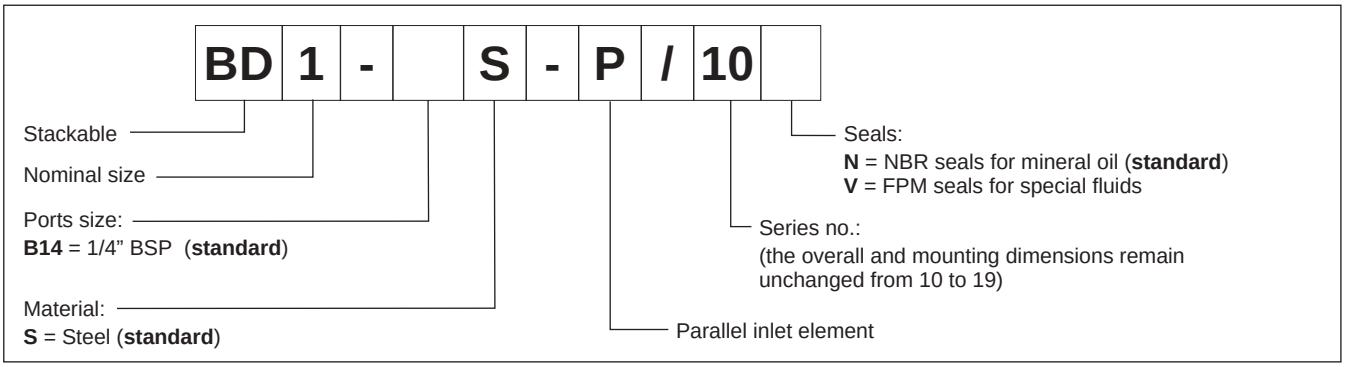
Type **TA***:
1 solenoid side A
2 external positions
with return spring



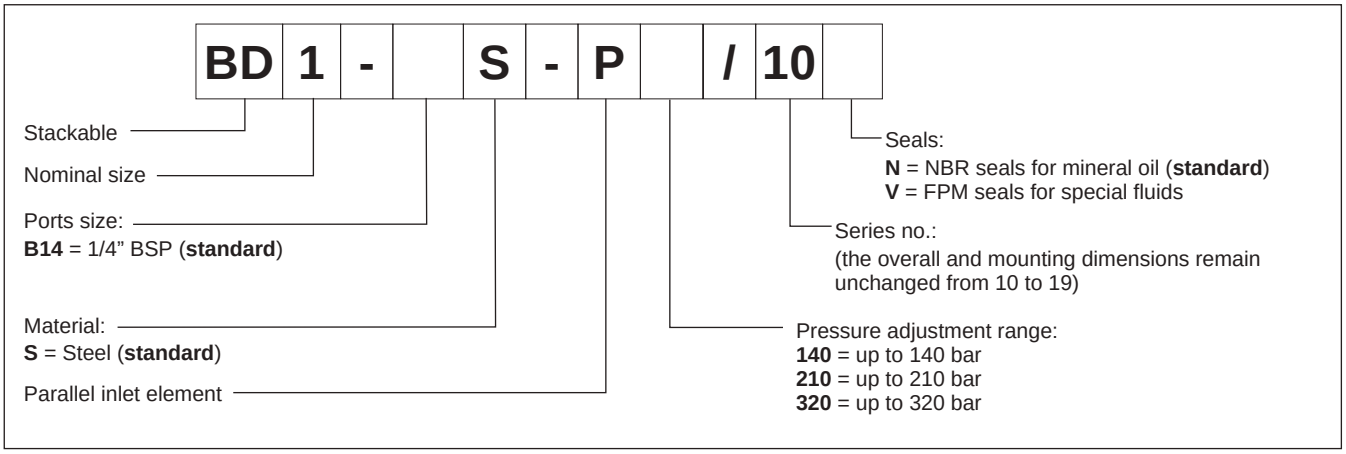
Type **TB***:
1 solenoid side B
2 external positions
with return spring



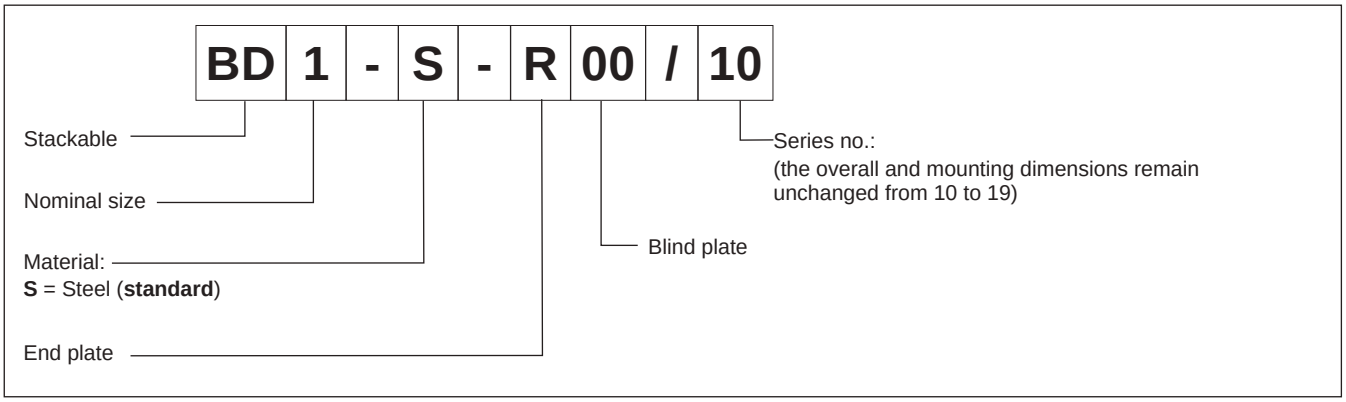
1.3 - Inlet element without pressure control valve



1.4 - Inlet element with pressure control valve



1.5 - End plate



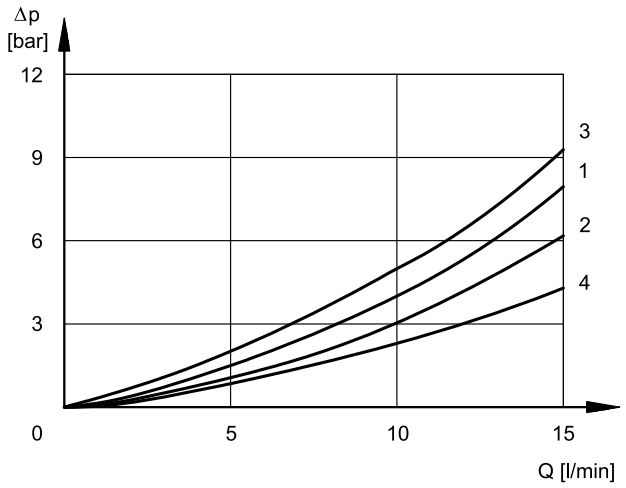
2 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.The fluid must be preserved in its physical and chemical characteristics.

3 - CHARACTERISTIC CURVES

(values obtained with viscosity 36 cSt at 50 °C)



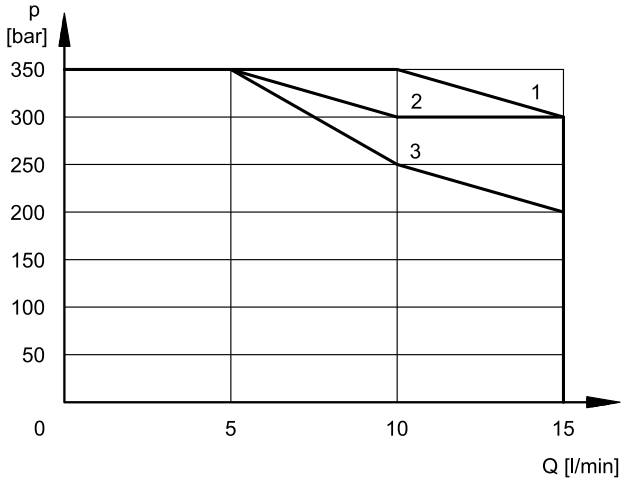
SPOOL TYPE	FLOW DIRECTION			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPHS			
S1, SA1, SB1	1	1	2	2
S3, SA3, SB3	3	3	4	4
TA, TB	1	1	2	2

Please refer to the curve 2 for pressure drops of S3 spool in central position.

4 - OPERATING LIMITS

The curves define the flow rate operating fields according to the valve pressure of the different versions. The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage.

Values obtained with mineral oil, viscosity 36 cSt, temperature 50 °C and filtration according to ISO 4406:1999 class 18/16/13.



SPOOL TYPE	
S1	1
S3	3
TA, TB	2

5 - SWITCHING TIMES

Values obtained according to ISO 6403, with mineral oil with viscosity 36 cSt at 50°C.

TIMES [ms] (±10%)	ENERGIZING	DE-ENERGIZING
BDL1	25 ÷ 75	15 ÷ 25

6 - ELECTRICAL FEATURES

6.1 - Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation. The coil is fastened to the tube by a threaded ring, and can be rotated to suit the available space.

SUPPLY VOLTAGE FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY	10.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	In compliance with 2014/30/EU
LOW VOLTAGE	In compliance with 2014/35/EU
CLASS OF PROTECTION Coil insulation (VDE 0580) Impregnation	 class H class H

6.2 - Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree, correctly connected and installed.

The protection degree IP69K is not taken into account in IEC 60529 but it is included in ISO 20653.

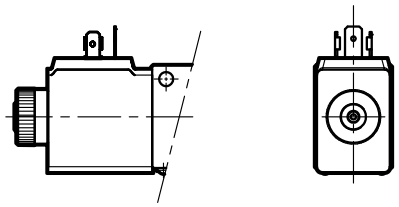
protection referred to	electrical connection		whole valve
	IP65	IP69 IP69K	IP65
K1 EN 175301-803	x		x
K2 AMP JUNIOR	x		x
K7 DEUTSCH DT04 male	x	x	x

Current and absorbed power
(values ±5 %)

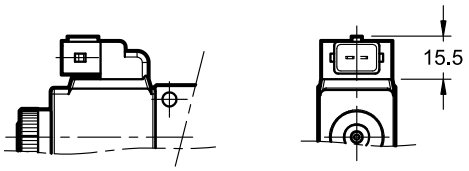
	Resistance 20°C [Ω]	Absorbed current [A]	Absorbed power [W]	Coil code K1	K2	K7
D12	6.6	1.8	21.8	1903710	1903720	1903730
D24	27	0.9	21.6	1903711	1903721	1903731

7 - ELECTRICAL CONNECTIONS

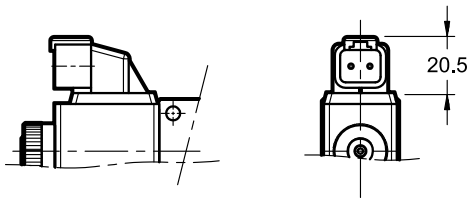
connection for EN 175301-803
(ex DIN 43650) connector
code **K1 (standard)**



connection for AMP JUNIOR connector
code **K2**



DEUTSCH DT04-2P connection for DEUTSCH
DT06-2S male connector
code **WK7**



8 - ELECTRICAL CONNECTORS

The solenoid valves are supplied without connectors. Connectors for electrical connections K1 (EN 175301-803, ex DIN 43650) can be ordered separately with code 0672129.

9 - INSTALLATION

The stack valve assembly can be installed in any position without impair the proper operation.

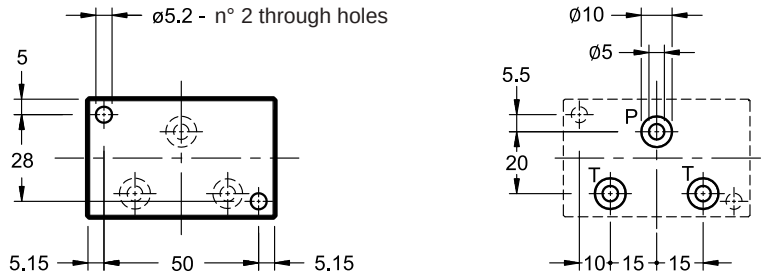
9.1 - Fixing and tie-rods

Fixing kit are available. Please contact the technical dept. for dimensional check and ordering codes.

10 - OVERALL AND MOUNTING DIMENSIONS OF DIRECTIONAL VALVES

10.1 - Mounting surface

dimensions in mm

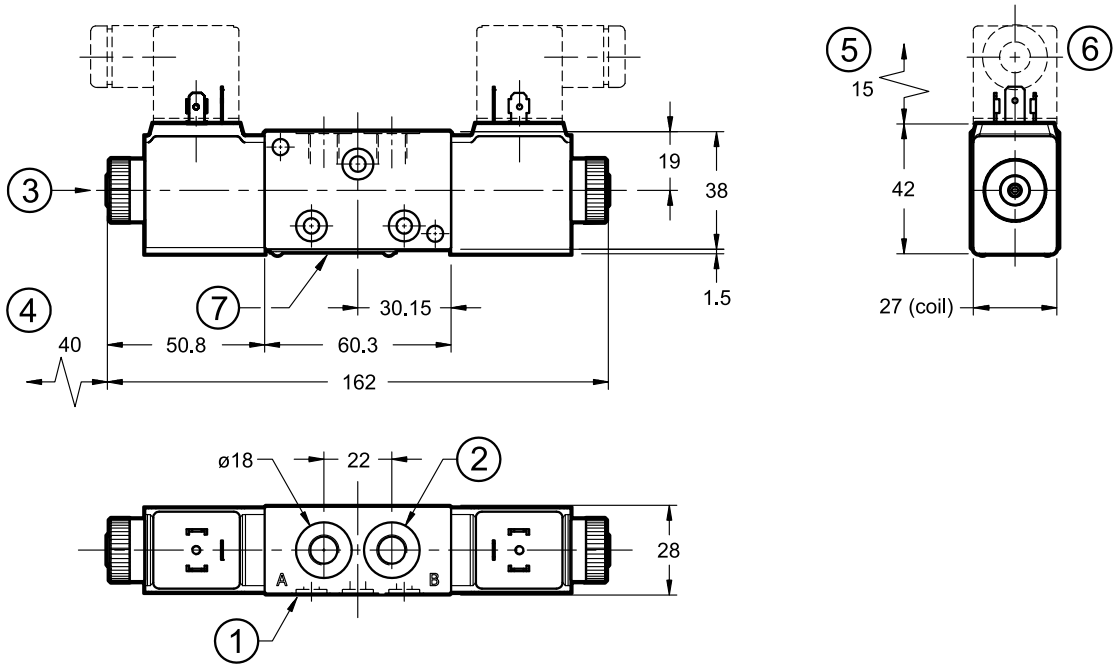


Seals: 3 OR type 106 (7.66x1.78)

10.2 - Directional valve element - solenoid tube ø13

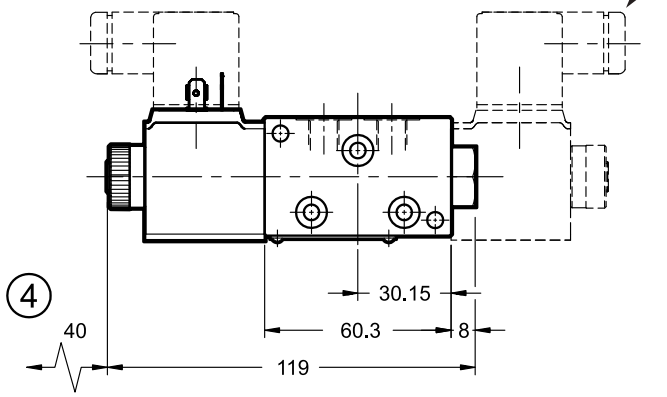
dimensions in mm

BDL1 - B18-S*



solenoid position for SB* and TB configurations

BDL1 - B18-SA
BDL1 - B18-TA

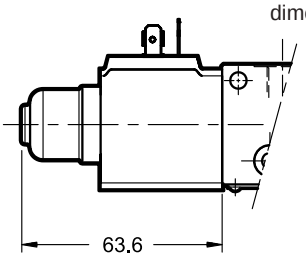


1	Mounting surface with sealing rings
2	A and B ports: 1/8” BSP
3	Locking ring with embedded manual override. Ring tightening torque: 3 Nm
4	Coil removal space
5	EN 175301-803 (ex DIN 43650) connector removal space
6	EN 175301-803 (ex DIN 43650) connector for K1 coil connection To be ordered separately.
7	Element label

10.3 - CM - Boot protected manual override

The version with boot protected manual override is available.
To order it, add **/CM** at the end of the identification code

dimensions in mm

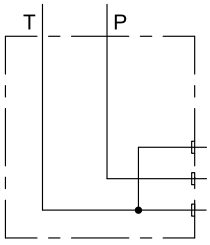


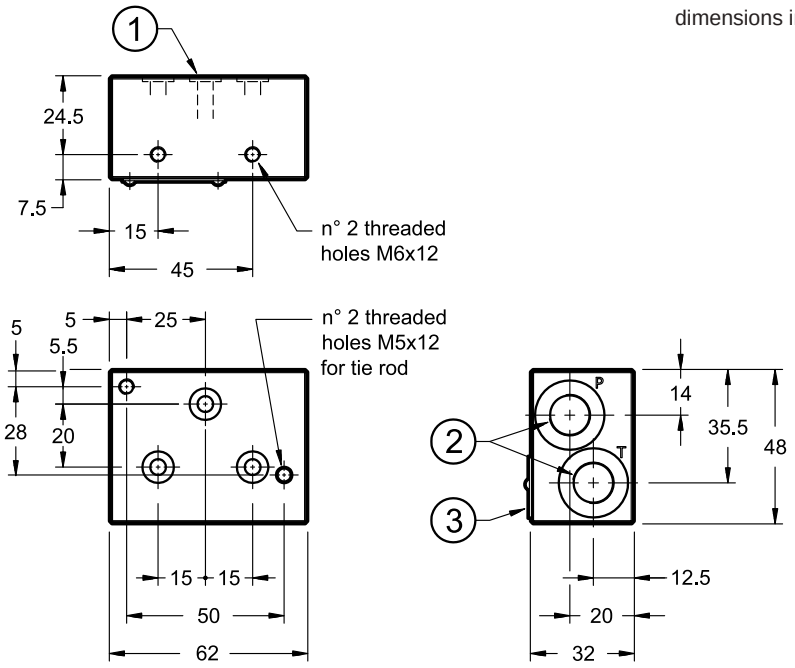
11 - DIMENSIONS OF INLET AND OUTLET ELEMENTS

11.1 - Inlet elements

dimensions in mm

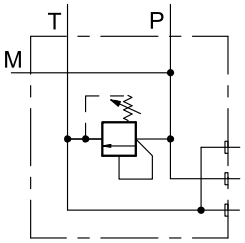
BD1-B14S-P
without pressure control valve

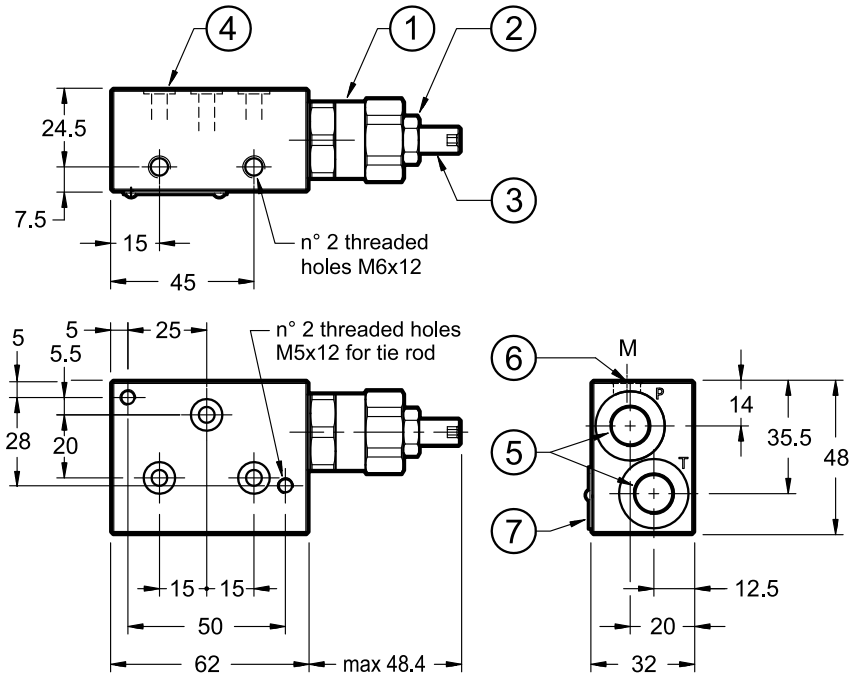




1	Mounting surface with sealing rings: 3 OR type 106 (6.75x1.78)
2	P and T ports: 1/4” BSP
3	Element label

BD1-B14S-P*
with pressure control valve





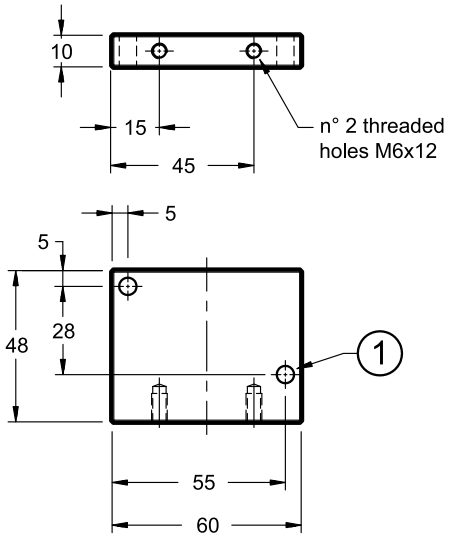
1	Pressure control valve
2	Locking nut: spanner 13
3	Socket hex adjustment screw: Allen key 4 Clockwise rotation to increase pressure
4	Mounting surface with sealing rings: 3 OR type 106 (6.75x1.78)
5	P and T ports: 1/4” BSP
6	Pressure gauge port: 1/8” BSP
7	Element label

11.3 - End plate

BD1-S-R00
blind plate

dimensions in mm





1	n° 2 through holes ø5.5 for stack assembly tie rods

12 - IDENTIFICATION CODE FOR STACK VALVE ASSEMBLY

BD	L	1	-	P		/	10		-			/	XXXXX

Solenoid stack valve assembly

13 mm solenoid tube

Size: thickness 28 mm

Parallel circuit

Qty. of directional valves

Configuration code (5 digits), assigned by Duplomatic

Coil electrical connection:

K1 = plug for connector type EN 175301-803 (ex DIN 43650) (**standard**)

K2 = plug for connector type AMP JUNIOR

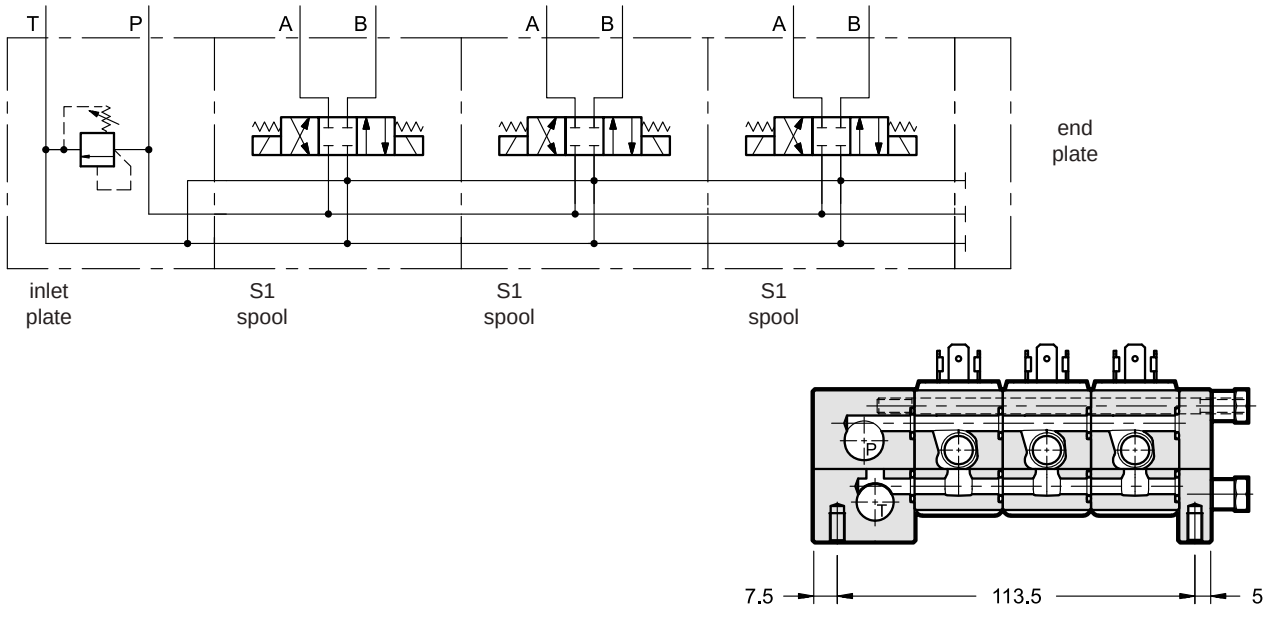
K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S

Coil type:
DC coils
D12 = 12 V
D24 = 24 V
D00 = valve without coil supplied with locking ring

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Series no.:
(the overall and mounting dimensions remain unchanged from 10 to 19)

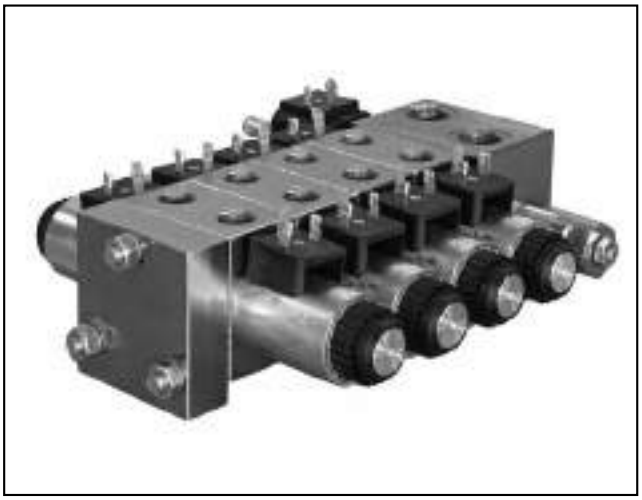
13 - ASSEMBLY EXAMPLE AND HYDRAULIC DIAGRAM



DUPLOMATIC
MOTION SOLUTIONS
a member of DAIKIN group

DUPLOMATIC MS Spa
via Mario Re Depaolini, 24 | 20015 Parabiago (MI) | Italy
T +39 0331 895111 | E vendite.ita@duplomatic.com | sales.exp@duplomatic.com
duplomaticmotionsolutions.com

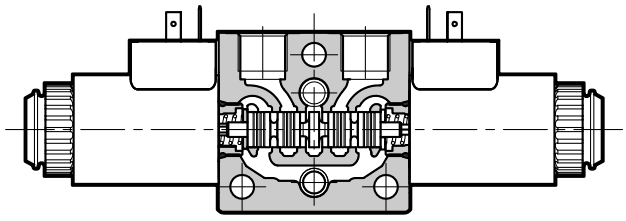
REPRODUCTION IS FORBIDDEN. THE COMPANY RESERVES THE RIGHT TO APPLY ANY MODIFICATIONS.



BD*
STACKABLE DIRECTIONAL CONTROL VALVE
SERIES 10

p max (see table of performances)
Q max (see table of performances)

OPERATING PRINCIPLE



— BDL, BDM and BDS are stacked valve assemblies, very well-rounded thanks to their modular design.

— Elements have been designed to be assembled in parallel connection, mounting up to 10 stackable valves. The same elements allow to create series circuits by inserting plugs in order to divert the oil path.

— Elements specifically designed for BD*2 series circuits complete the BD* range.

— BD* assemblies are suitable for compact applications in the mobile and in mini-power pack industries.

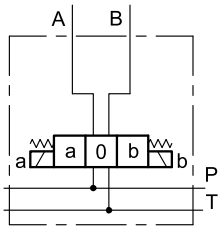
— Directional valve elements are available in two thicknesses, with working ports 3/8" BSP, 1/2" BSP, SAE–06 and SAE–08 threaded.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C)

		BDL	BDM	BDS
Maximum operating pressure: - P-A-B ports - T / T1 ports	bar	 280 280	 320 250	 320 250
Maximum flowrate: - parallel - series	l/min	 40 40	 50 40	 60 50
Pressure drops Δp - Q	see point 3			
Electrical characteristics	see point 6			
Operating limits	see point 4			
Electrical connections	see point 7			
Ambient temperature range	°C	-20 / +50		
Fluid temperature range	°C	-20 / +80		
Fluid viscosity range	cSt	10 ÷ 400		
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15			
Recommended viscosity	cSt	25		
Mass (BDS3-B38-S)	kg	1,57	1,73	2,1
Surface treatment of inlet and outlet elements and valves bodies	zinc-nickel			

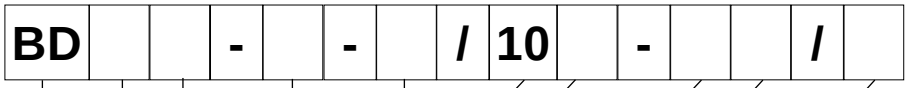
HYDRAULIC SYMBOL



1 - IDENTIFICATION CODES OF SEPARATE ELEMENTS

Here below are shown the identification codes for the separate elements of the stackable valve. Parallel circuits can be assembled with these elements. The same elements allow to create series circuits by inserting plugs in order to divert the oil path.

1.1 - Directional valve element



Stack directional valve element, on-off

Solenoid tube (mm):
L = 14
M = 19
S = 22 (only size 3)

Size :
2 = thickness 38 mm
3 = thickness 46 mm

Ports:
B38 = 3/8" BSP
B12 = 1/2" BSP (only for size 3)
S06 = 9/16" 18 UNF (SAE 06)
S08 = 3/4" 16 UNF (SAE 08) (only for size 3)

Spool type
(see point 1.2)

Series no.
(the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Coil type:
DC coils
D12 = 12 V
D24 = 24 V
D28 = 28 V
D48 = 48 V
D00 = valve without coil supplied with locking ring

Coil electrical connection:
See below for availability, see points 6 and 7 for details
K1 = plug for connector type EN 175301-803 (ex DIN 43650) (**standard**)
K7, WK7, WK7D = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S

The electrical connection K2 (AMP JUNIOR type) is available upon request

Manual override (see point 10.6 - 10.8):
for **BDL**:
omit for manual override boot protected integrated in the coil locking ring (**standard**)
for **BDM** and **BDS:**
omit for pin manual override integrated in the tube (**standard**).
CM = manual override boot protected
for **BDL**, **BDM** and **BDS**
CK1 = turning knob override
CHL = light duty hand lever. p max 50 bar in T line (not available for series circuits)

NOTE: Variants are available. See point 10.1

Available coils

	BDL			BDM			BDS					
	K1	K2	K7	K1	K2	K7	K1	K2	K7	WK1	WK7	WK7D
D12	■	■	■	■	■	■	■	□	■	■	■	■
D24	■	■	■	■	■	■	■	□	■	■	■	■
D28	■	-	-	-	-	-	■	-	-	-	-	-
D48	■	-	-	-	-	-	■	-	-	-	-	-

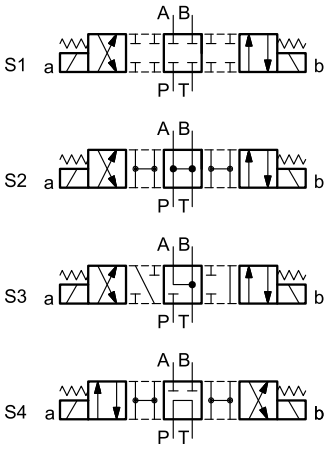
■ available
□ upon request

The letter 'W' identifies coils with an high IP degree. This IP degree is reached by specific surface treatments and / or design adaptations, such as the boot protected manual override or other manual overrides to protect the solenoid tube.

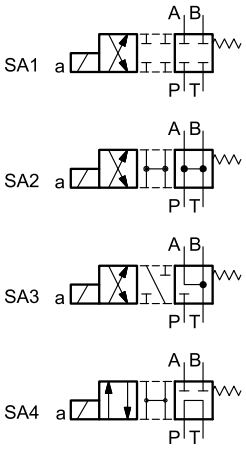
NOTE: A galvanic surface treatment zinc-nickel is applied to body elements and plates, so BDS valves with WK* type coils and the BDL type valves suitable to withstand a salt spray exposure time of **600** hours. BDS valves with K* type coils and BDM valves are suitable to withstand a salt spray exposure time of **240** hours (test carried out according to the UNI EN ISO 9227 and assessment test carried out according to UNI EN ISO 10289).

1.2 - Available spools

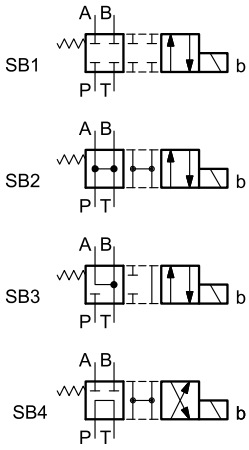
Type **S**:
2 solenoids - 3 positions
spring centreing



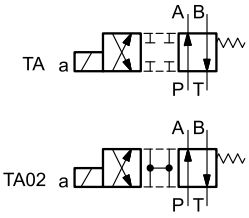
Type **SA***: 1 solenoid side A
2 positions (central + external)
spring centreing



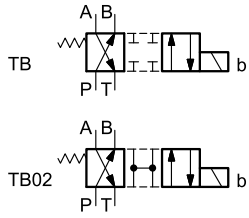
Type **SB***: 1 solenoid side B
2 positions (central + external)
spring centreing



Type **TA***:
1 solenoid side A
2 external positions
with return spring



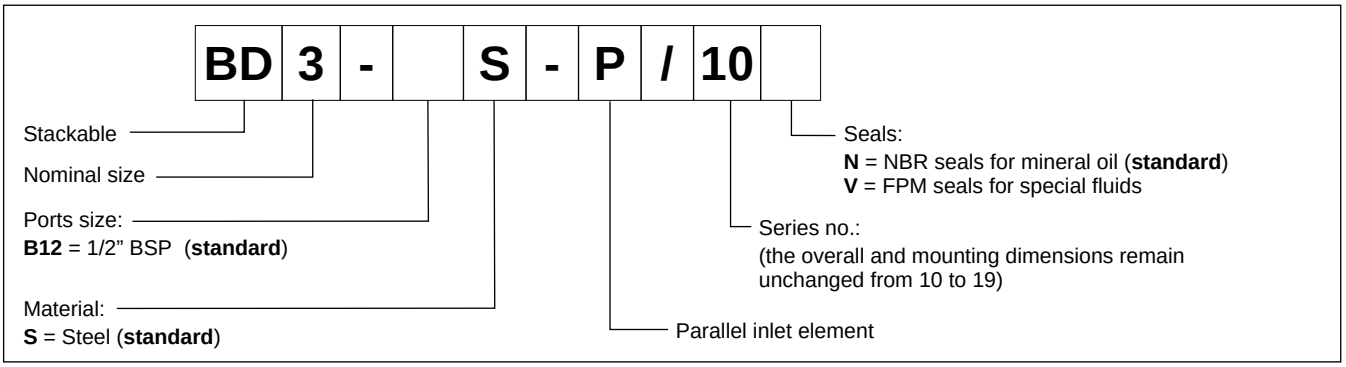
Type **TB***:
1 solenoid side B
2 external positions
with return spring



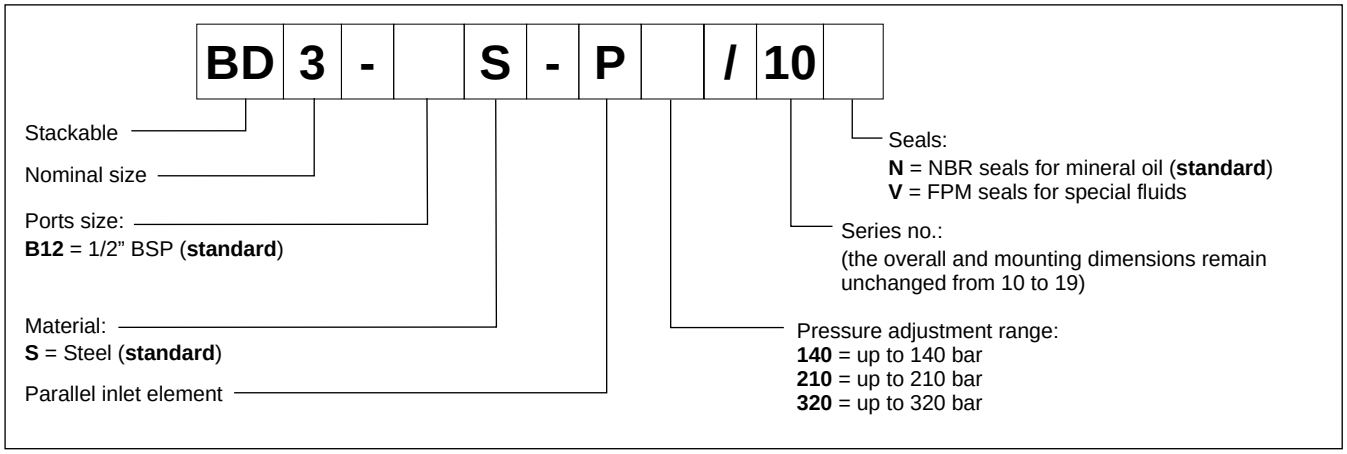
NOTE 1: BDS valves use spools of DS3 solenoid valve. Please refer to catalogue 41 150 for additional spools.

NOTE 2: Further spools for BDL and BDM are available upon request. Please contact our technical department.

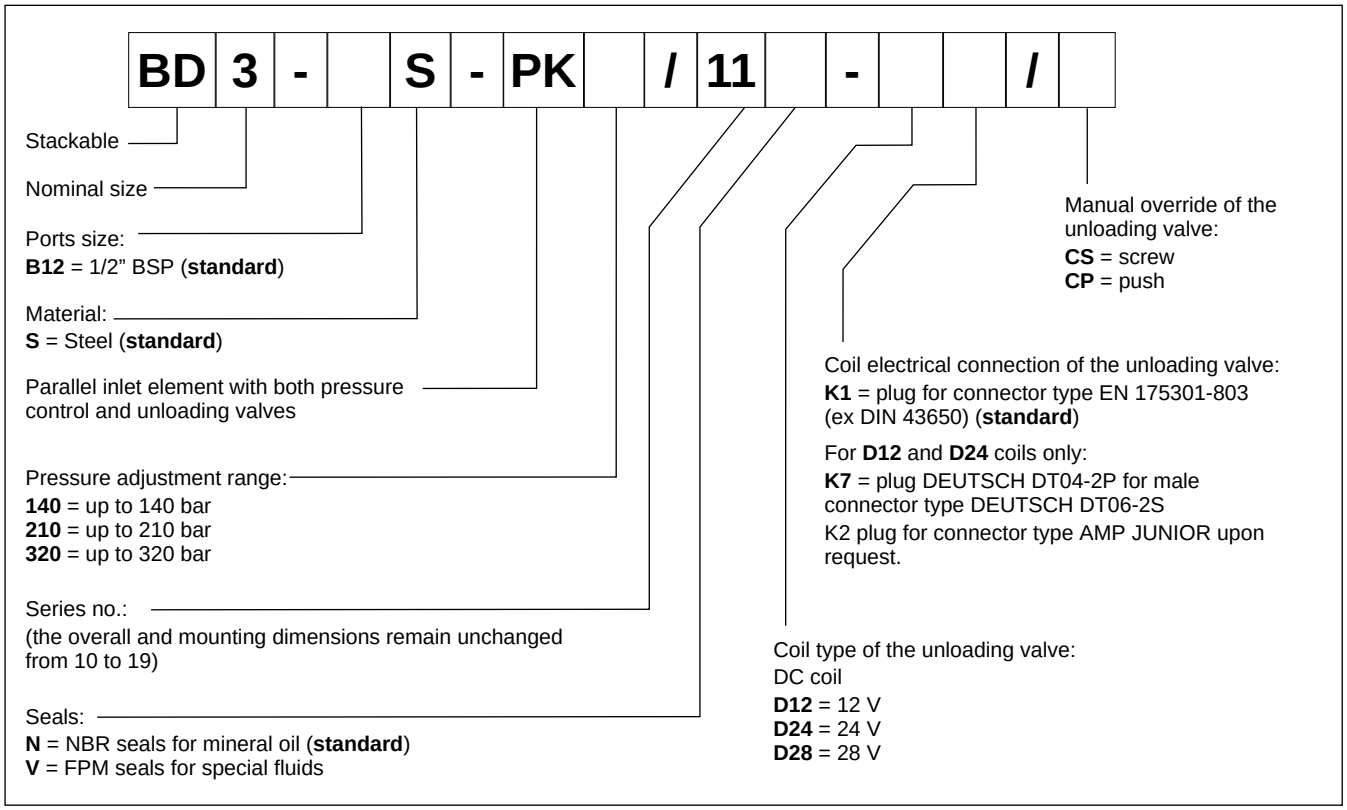
1.3 - Inlet element without pressure relief valve



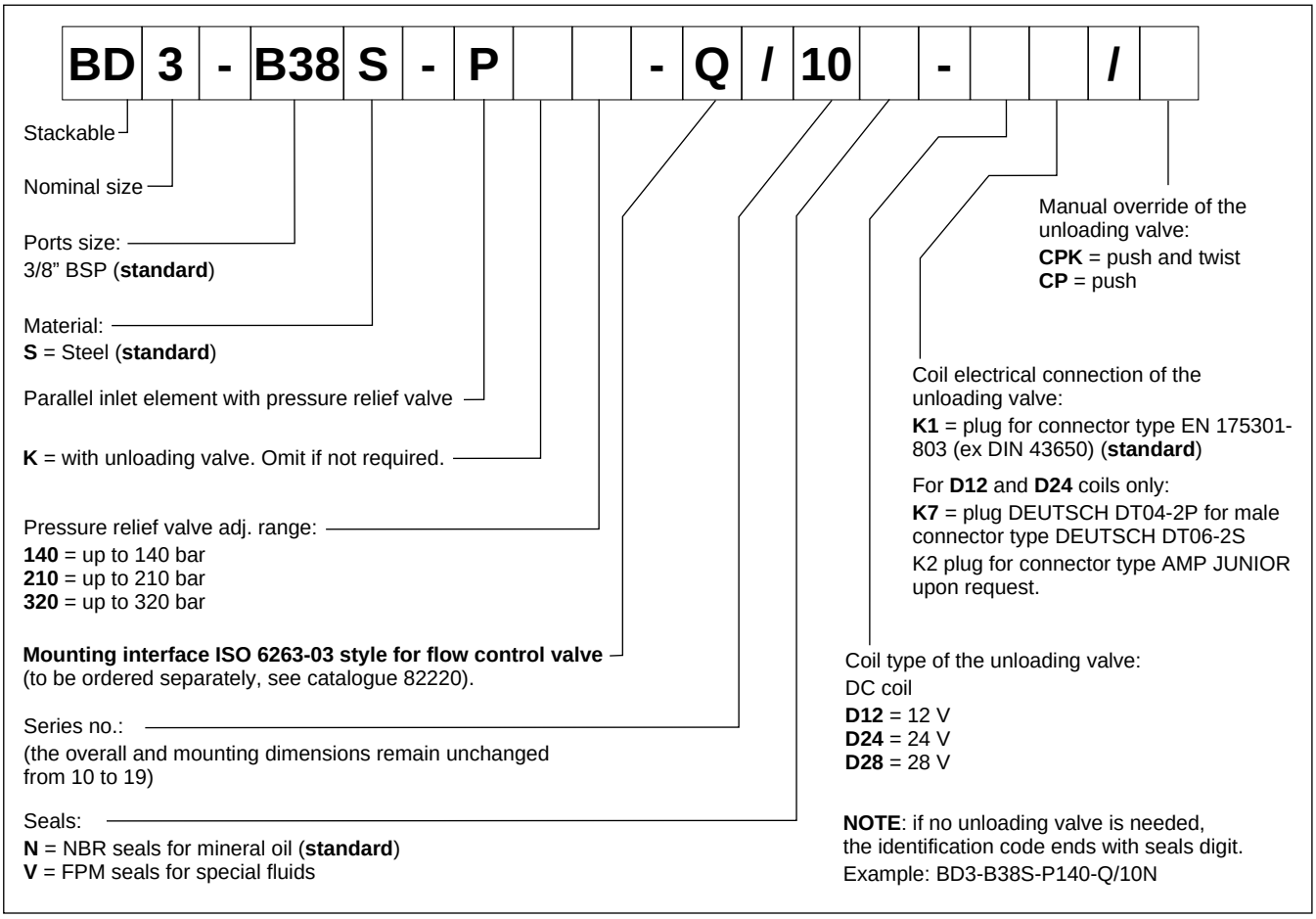
1.4 - Inlet element with pressure relief valve



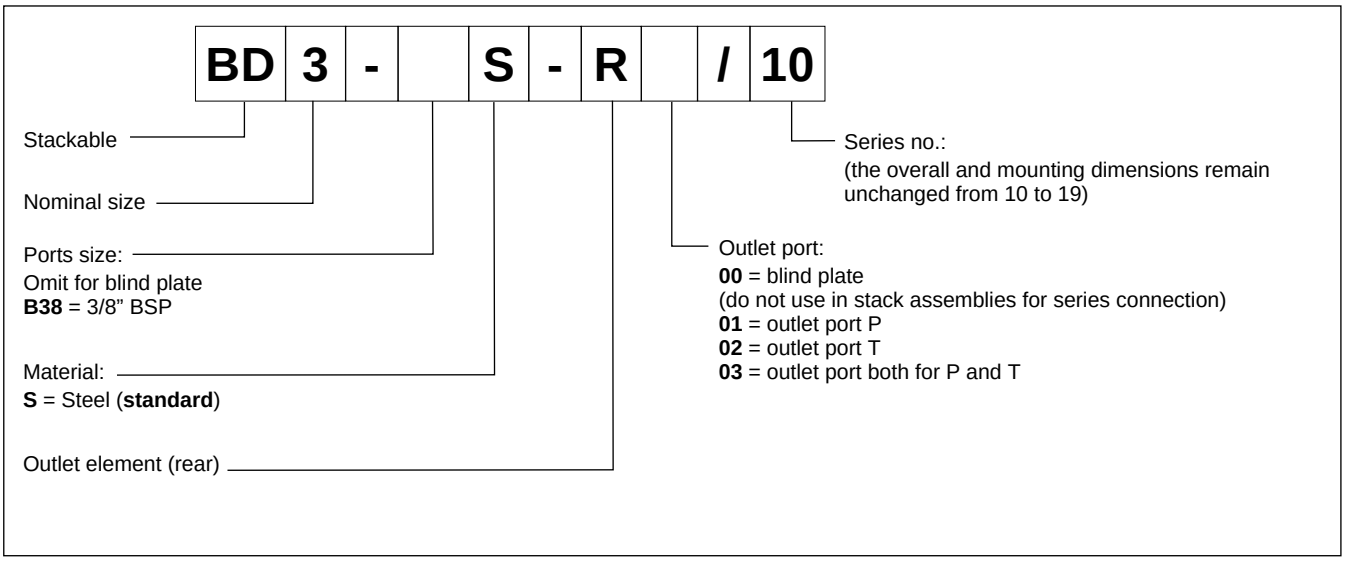
1.5 - Inlet element with both pressure control and unloading valves



1.6 - Inlet element for flow control valve



1.7 - Outlet elements



2 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

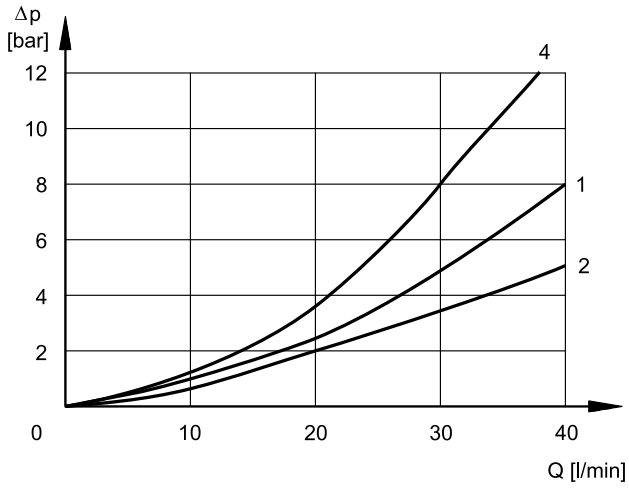
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.The fluid must be preserved in its physical and chemical characteristics.

3 - CHARACTERISTIC CURVES

(values obtained with viscosity 36 cSt at 50 °C)

3.1 - BDL

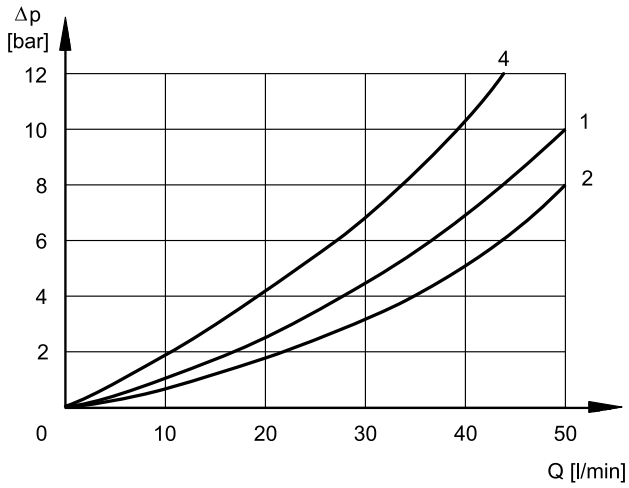
Values obtained with one element BDL2-B38A (thickness 38, ports 3/8" BSP)



SPOOL TYPE	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPHS				
S1, SA1, SB1	1	1	1	1	-
S2, SA2, SB2	2	2	2	2	2
S3, SA3, SB3	1	1	2	2	-
S4, SA4, SB4	4	4	4	4	1
TA, TB	1	1	1	1	-
TA02, TB02	1	1	1	1	-

3.2 - BDM

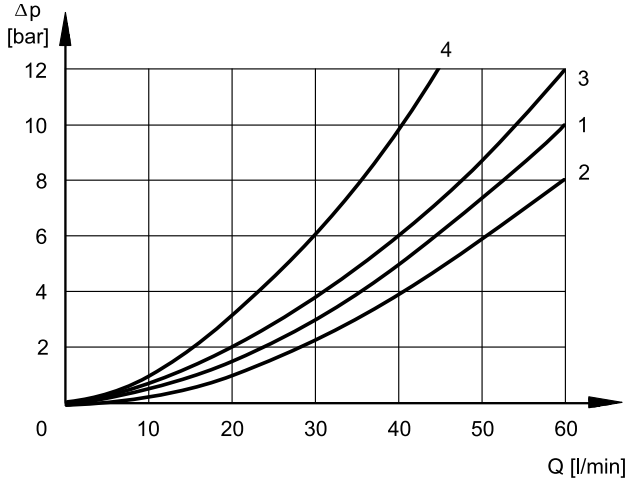
Values obtained with one element BDM3-B38 (thickness 46, ports 3/8" BSP)



SPOOL TYPE	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPHS				
S1, SA1, SB1	1	1	1	1	-
S2, SA2, SB2	2	2	2	2	2
S3, SA3, SB3	1	1	2	2	-
S4, SA4, SB4	4	4	4	4	1
TA, TB	2	2	2	2	-
TA02, TB02	1	1	1	1	-

3.3 - BDS

Values obtained with one element BDS3-B12 (thickness 46, ports 1/2" BSP)



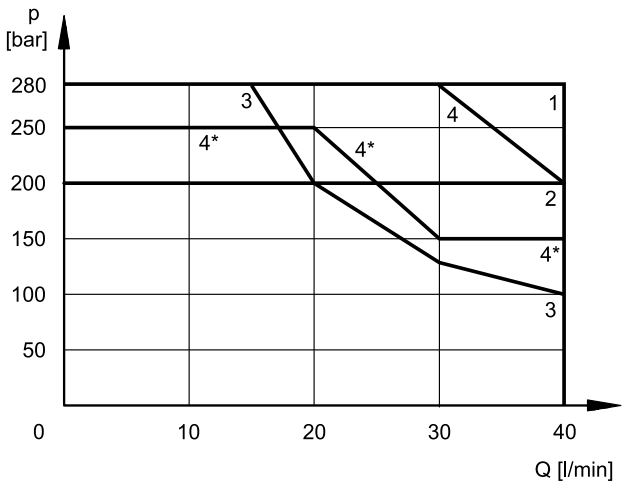
SPOOL TYPE	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPHS				
S1, SA1, SB1	1	1	3	3	-
S2, SA2, SB2	2	2	1	1	2
S3, SA3, SB3	3	3	2	2	-
S4, SA4, SB4	4	4	4	4	1
TA, TB	3	3	3	3	-
TA02, TB02					

4 - OPERATING LIMITS

The curves define the flow rate operating fields according to the valve pressure of the different versions. The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage.

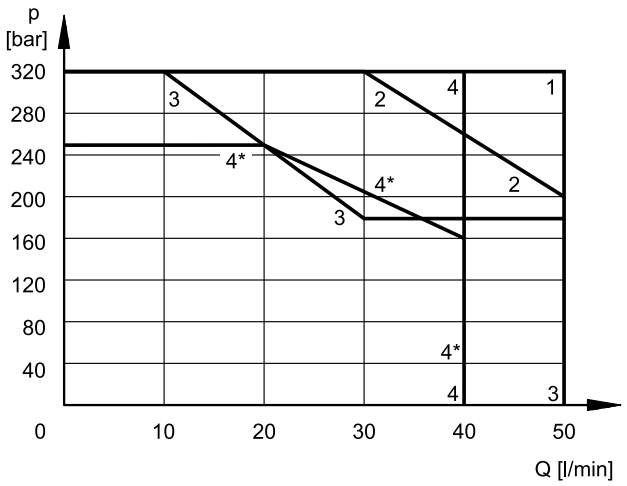
Values obtained with mineral oil, viscosity 36 cSt, temperature 50 °C and filtration according to ISO 4406:1999 class 18/16/13.

4.1 - BDL



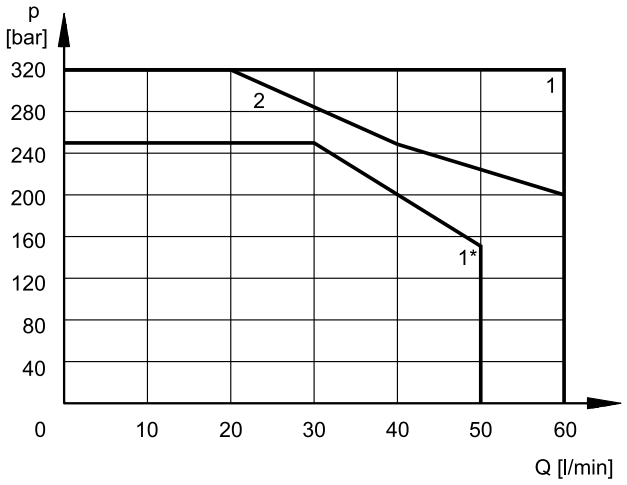
SPOOL TYPE	
S1, SA1, SB1	1
S2, SA2, SB2	2
S3, SA3, SB3	3
S4, SA4, SB4	4
S4, SA4, SB4 reverse flow	4*
TA, TB	4
TA02, TB02	1

4.2 - BDM



SPOOL TYPE	
S1, SA1, SB1	1
S2, SA2, SB2	2
S3, SA3, SB3	3
S4, SA4, SB4	4
S4, SA4, SB4 reverse flow	4*
TA, TB	2
TA02, TB02	1

4.3 - BDS



SPOOL TYPE	
S1, SA1, SB1	1
S2, SA2, SB2	1
S3, SA3, SB3	2
S4, SA4, SB4	1
S4, SA4, SB4 reverse flow	1*
TA, TB	1
TA02, TB02	1

NOTE: The reverse flow condition occurs in series circuits made with elements for parallel connection, in even-position elements only.

See scheme at point 13.2

5 - SWITCHING TIMES

Values obtained according to ISO 6403, with mineral oil with viscosity 36 cSt at 50°C.

TIMES [ms] (±10%)	ENERGIZING	DE-ENERGIZING
BDL	25 ÷ 75	15 ÷ 25
BDM	25 ÷ 75	15 ÷ 25
BDS	25 ÷ 75	15 ÷ 25

6 - ELECTRICAL FEATURES

6.1 - Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation. The coil is fastened to the tube by a threaded ring, and can be rotated to suit the available space.

6.2 - Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree, correctly connected and installed.

The protection degree IP69K is not taken into account in IEC 60529 but it is included in ISO 20653.

SUPPLY VOLTAGE FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY	10.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	In compliance with 2014/30/EU
LOW VOLTAGE	In compliance with 2014/35/EU
CLASS OF PROTECTION coil insulation (VDE 0580) impregnation	 class H class F

6.3 - BDL (solenoid tube Ø14)

IP degrees

protection referred to	electrical connection / whole valve				
	IP65	IP66	IP67	IP68	IP69 IP69K
K1 EN 175301-803	x	x			
K7 DEUTSCH DT04 male	x		x	x	x

Current and absorbed power
(values ±5 %)

	Resistance 20°C [Ω]	Absorbed current [A]	Absorbed power [W]
D12	5,4	2,2	26,5
D24	20,7	1,16	27,8
D28	27,5	1,02	28,5
D48	82	0,58	28

NOTE: It is possible to order the coils spare.
See catalogue 41 211 at point 14 - “Identification code for DC coils”.

6.4 - BDM (solenoid tube Ø19)

IP degrees

protection referred to	electrical connection whole valve
	IP65
K1 EN 175301-803	x
K7 DEUTSCH DT04 male	x

Current and absorbed power
(values ±10 %)

	Resistance 20°C [Ω]	Absorbed current [A]	Absorbed power [W]
D12	4.98	2.41	28.9
D24	21	1.15	28

NOTE: It is possible to order the coils spare.
See catalogue 41 110 at point 7.2.

6.5 - BDS (solenoid tube Ø22)

Coils with letter 'W' feature a zinc-nickel surface treatment, that makes them resistant to exposure to the salt spray for 600 hours (test performed according to UNI EN ISO 9227 and assessment test performed according to UNI EN ISO 10289).

The WK7D coils include a suppressor diode of pulses for protection from voltage peaks during switching. During the switching the diode significantly reduces the energy released by the winding, by limiting the voltage to 31.4V in the D12 coils and to 58.9 V in the D24 coils.

IP degrees

protection referred to	electrical connection					whole valve				
	IP65	IP66	IP67	IP68	IP69 IP69K	IP65	IP66	IP67	IP68	IP69 IP69K
K1 EN 175301-803 (ex DIN 43650)	x					x				
WK1 EN 175301-803 (ex DIN 43650)	x	x				x	x			
K7 DEUTSCH DT04 male	x		x			x				
WK7 / **WK7D** DEUTSCH DT04 male	x	x	x	x	x	x	x	x	x	x

Current and absorbed power
(values ±10 %)

	Resistance at 20°C [Ω]	Absorbed current [A]	Absorbed power [W]
D12	4.4	2.72	32.7
D24	18.6	1.29	31
D28	26	1.11	31
D48	78.6	0.61	29.5

NOTE: It is possible to order the coils spare.
See catalogue 41 150 at point 19 - "Identification code for DC coils".

6.6 - Unloading valve, solenoid operated (inlet plates)

Current and absorbed power
(values ±10 %)

BD3-B38S-**- Q/10**

	Resistance 20°C [Ω]	Absorbed current [A]	Absorbed power [W]
D12	7	1.2	20.5
D24	28	0.6	20.5

BD3-B12S-PK*/11*

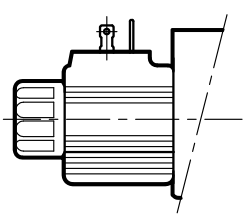
	Resistance 20°C [Ω]	Absorbed current [A]	Absorbed power [W]]
D12	7.2	1.67	20
D24	28.8	0.83	20

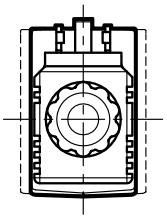
ELECTROMAGNETIC COMPATIBILITY (EMC)	In compliance with 2014/30/EU
LOW VOLTAGE	In compliance with 2014/35/EU
CLASS OF PROTECTION atmospheric agents (EN 60529) coil insulation (VDE 0580) impregnation	 IP65 class H class H

7 - ELECTRICAL CONNECTIONS

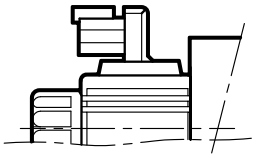
7.1 - BDL

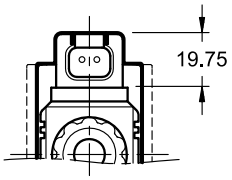
connection for EN 175301-803
(ex DIN 43650) connector
code **K1 (standard)**





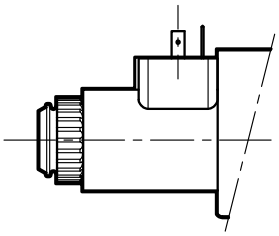
DEUTSCH DT04-2P connection for DEUTSCH
DT06-2S male connector
code **K7**

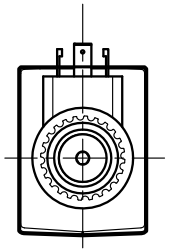




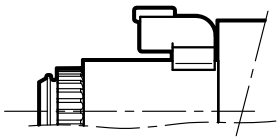
7.2 - BDM

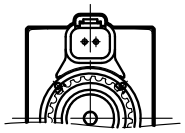
connection for EN 175301-803
(ex DIN 43650) connector
code **K1 (standard)**





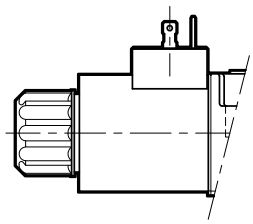
DEUTSCH DT04-2P connection for DEUTSCH
DT06-2S male connector
code **K7**

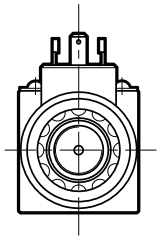




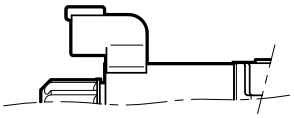
7.3 - BDS

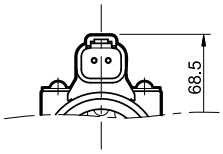
connection for EN 175301-803 (ex DIN 43650) connector
code **K1** (**standard**)
code **WK1** (W7 version only)



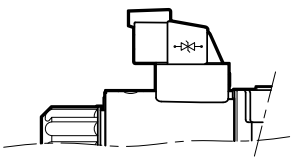


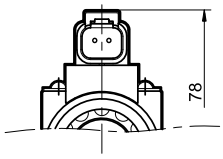
connection for DEUTSCH DT06-2S male connector
code **K7**





connection for DEUTSCH DT06-2S male connector
code **WK7** (W7 version only)
code **WK7D** (W7 version only - coil with diode)





8 - ELECTRICAL CONNECTORS

The solenoid valves are supplied without connectors. Connectors for electrical connections K1 and WK1 (EN 175301-803, ex DIN 43650) can be ordered separately. See catalogue 49 000.

9 - INSTALLATION

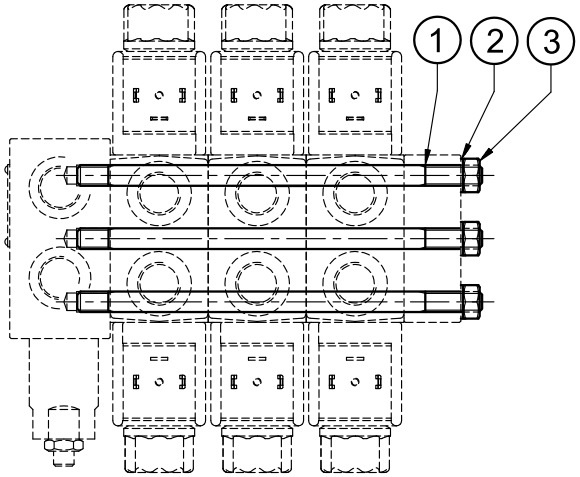
The stacked valve assembly can be installed in any position without impair the proper functioning.

9.1 - Fixing and tie-rods

Please contact the technical dept. for dimensional check of special assemblies before order.

Tightening torque: 20 (0/+3) Nm

Valve type	Valve qty.	KIT code
BDL2 BDM2	3	3404100100
	4	3404100101
	5	3404100102
	6	3404100103
	7	3404100104
	8	3404100105
	9	3404100106
BDL3 BDM3 BDS3	3	3404100108
	4	3404100109
	5	3404100110
	6	3404100111

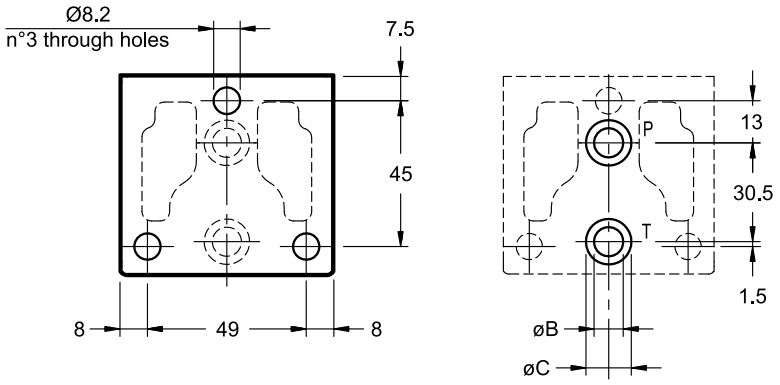


1	galvanized trapped screw
2	galvanized nut
3	galvanized safety washer

10 - OVERALL AND MOUNTING DIMENSIONS OF DIRECTIONAL VALVES

10.1 - BD* - mounting surfaces

dimensions in mm



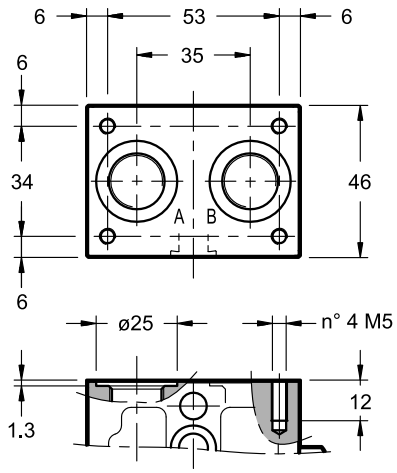
NOTE: the variant is available adding **A** after ports size in the identification code.
Example: BDL3-B38**A**-S1/10

	ØB	ØC	Seals
standard	9	14	2 OR type 2043 (10.82x1.78)
A variant	7.5	12	2 OR type 2037 (9.25x1.78)

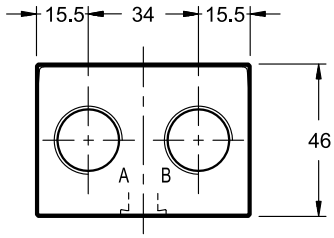
10.2 - BD* directional valve element - bodies

dimensions in mm

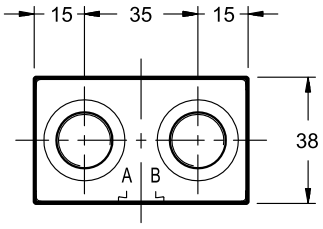
picture A - BD*3
with mounting surface
for flangeable element
available ports:
B38 or **S06**



picture B - BD*3
available ports:
B12 or **S08**



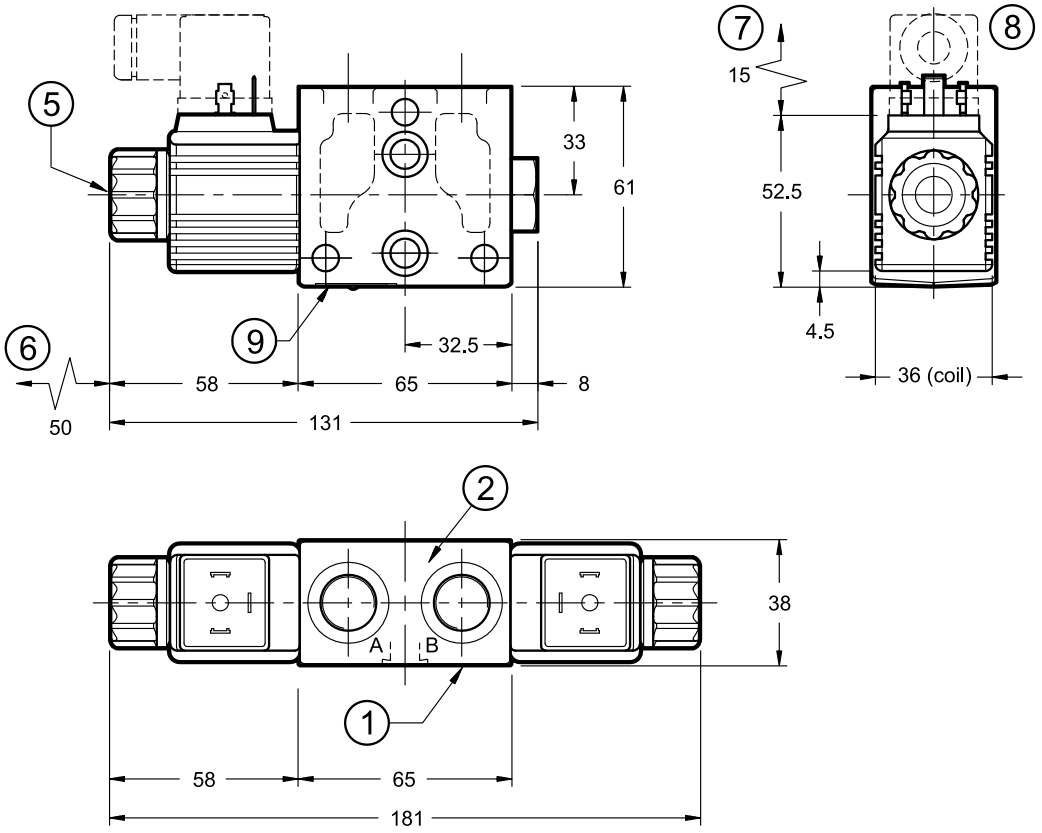
picture C - BD*2
available ports:
B38 or **S06**



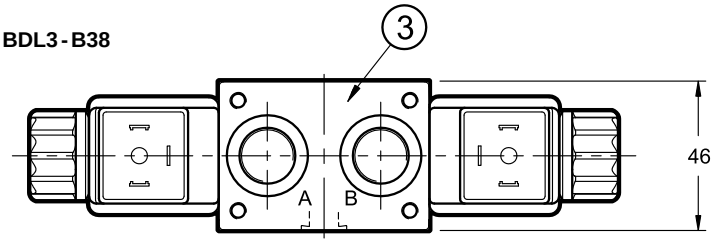
10.3 - BDL - Directional valve element - solenoid tube ø14

dimensions in mm

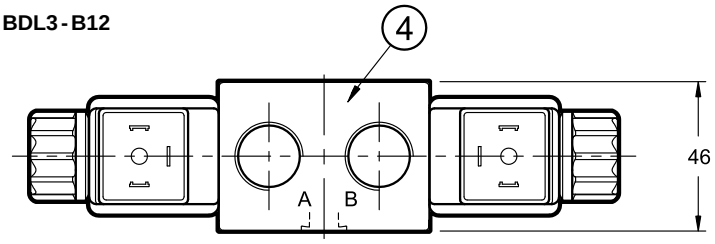
BDL2 - B38



BDL3 - B38



BDL3 - B12

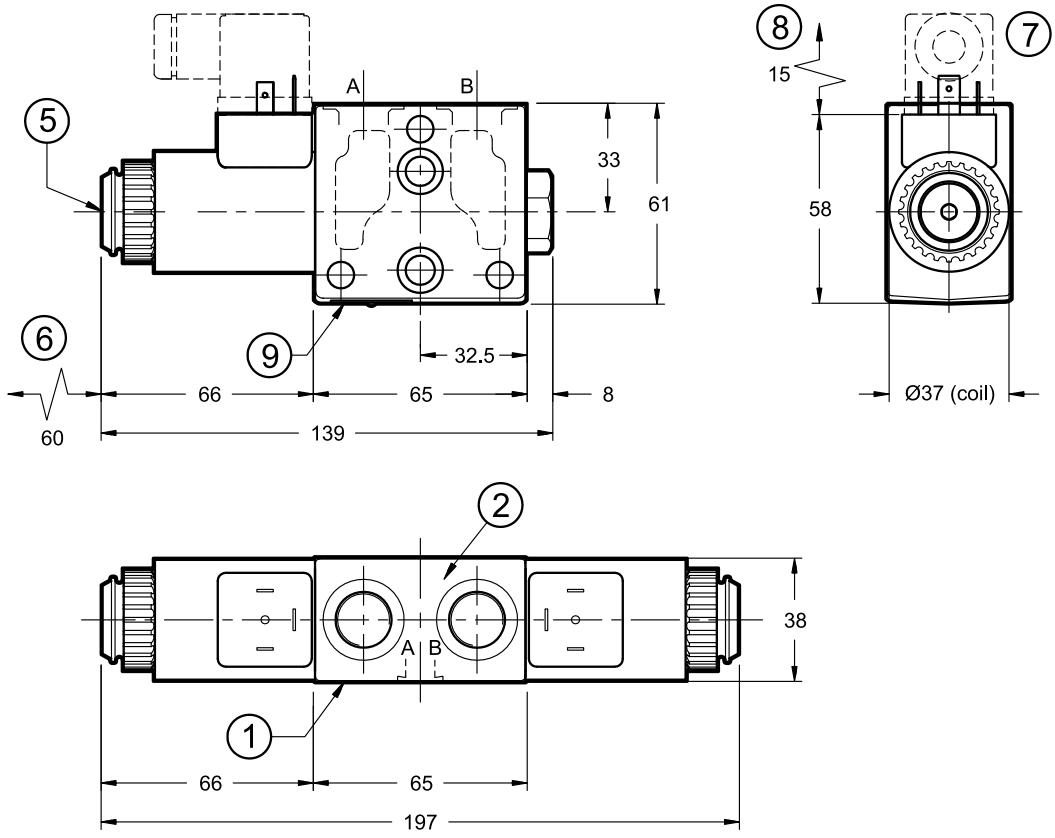


1	Mounting surface with sealing rings
2	A and B ports: 3/8” BSP
3	A and B ports: 3/8” BSP with mounting interface for flangeable elements
4	A and B ports: 1/2” BSP
5	Locking ring with embedded boot manual override. ring tightening torque: 3 Nm
6	Coil removal space
7	EN 175301-803 (ex DIN 43650) connector removal space
8	EN 175301-803 (ex DIN 43650) connector for K1 coil connection To be ordered separately.
9	Element label

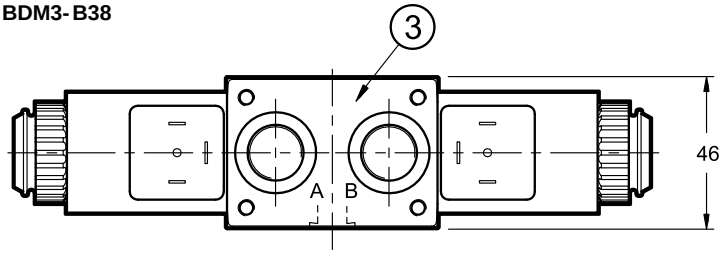
10.4 - BDM - Directional valve element - solenoid tube ø19

dimensions in mm

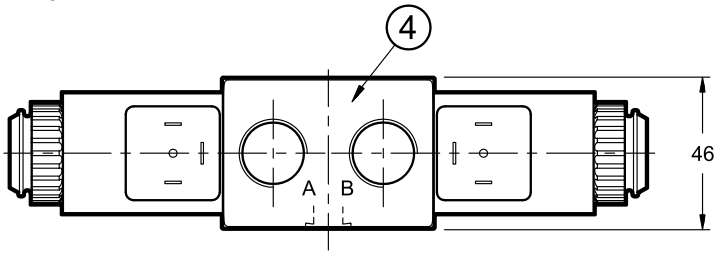
BDM2-B38



BDM3-B38



BDM3-B12

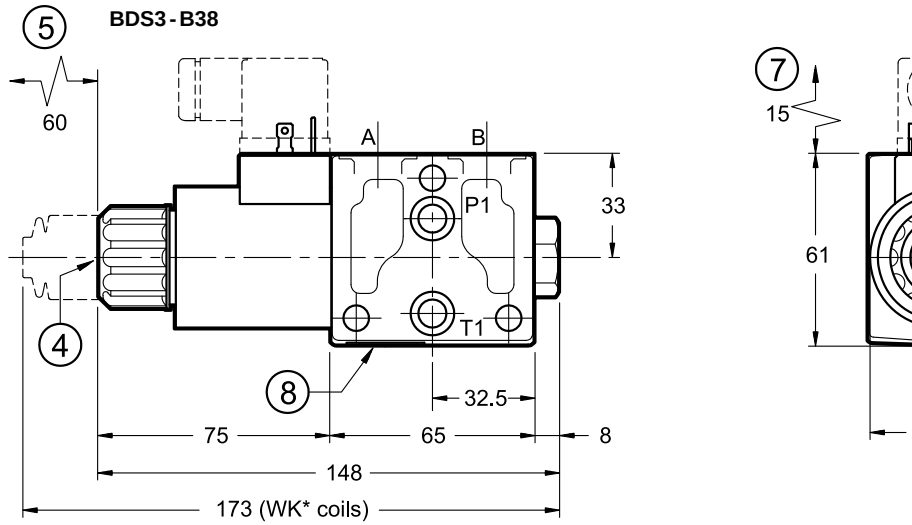


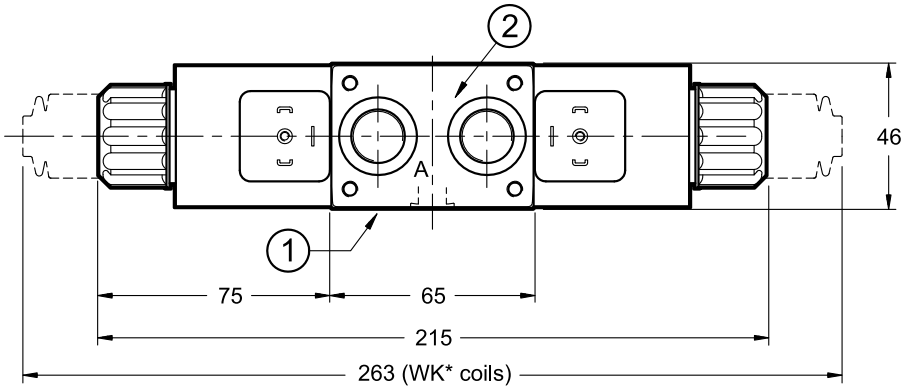
1	Mounting surface with sealing rings
2	A and B ports: 3/8” BSP
3	A and B ports: 3/8” BSP with mounting interface for flangeable elements
4	A and B ports: 1/2” BSP
5	Locking ring with manual override (pin) embedded in the tube. Ring tightening torque: 5 Nm
6	Coil removal space
7	EN 175301-803 (ex DIN 43650) connector removal space
8	EN 175301-803 (ex DIN 43650) connector for K1 coil connection To be ordered separately.
9	Element label

10.5 - BDS - Directional valve element - solenoid tube ø22

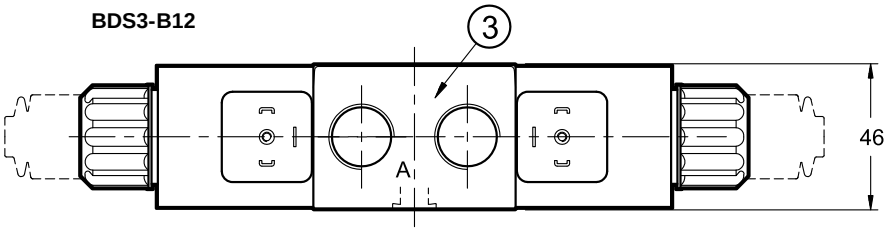
dimensions in mm

BDS3 - B38





BDS3-B12



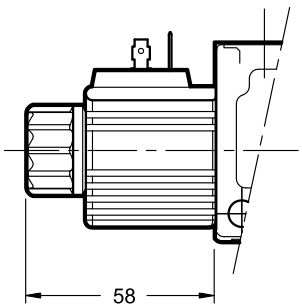
1	Mounting surface with sealing rings
2	A and B ports: 3/8” BSP with mounting interface for flangeable elements
3	A and B ports: 1/2” BSP
4	Locking ring with manual override (pin) embedded in the tube. Ring tightening torque: 5 Nm
5	Coil removal space
6	EN 175301-803 (ex DIN 43650) connector removal space
7	EN 175301-803 (ex DIN 43650) connector for K1 coil connection To be ordered separately.
8	Element label

10.6 - CM - boot protected

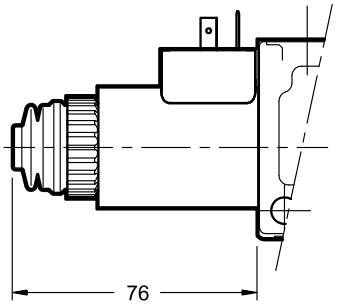
The BDL standard element is already equipped with boot protection of the solenoid tube. For both BDM and BDL elements add **/CM** at the end of the code.

dimensions in mm

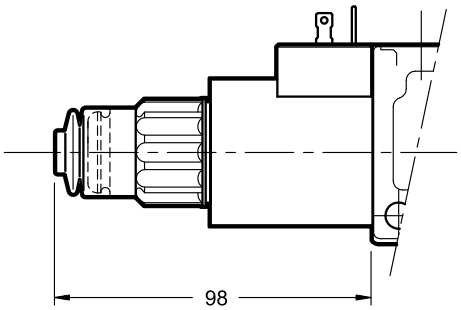
BDL



BDM* /CM



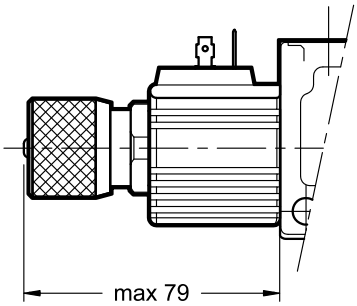
BDS* /CM



10.7 - CK1 - knob manual override, turning

dimensions in mm

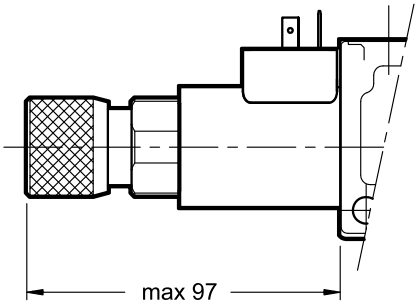
BDL* /CK1



Max stroke: 4.5 mm

mm per turn: 1

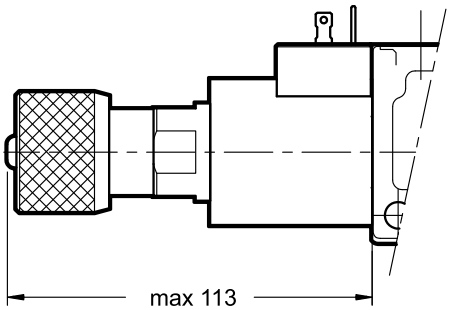
BDM* /CK1



Max stroke: 5.5 mm

mm per turn: 1

BDS* /CK1



Max stroke: 6.5 mm

mm per turn: 1.25

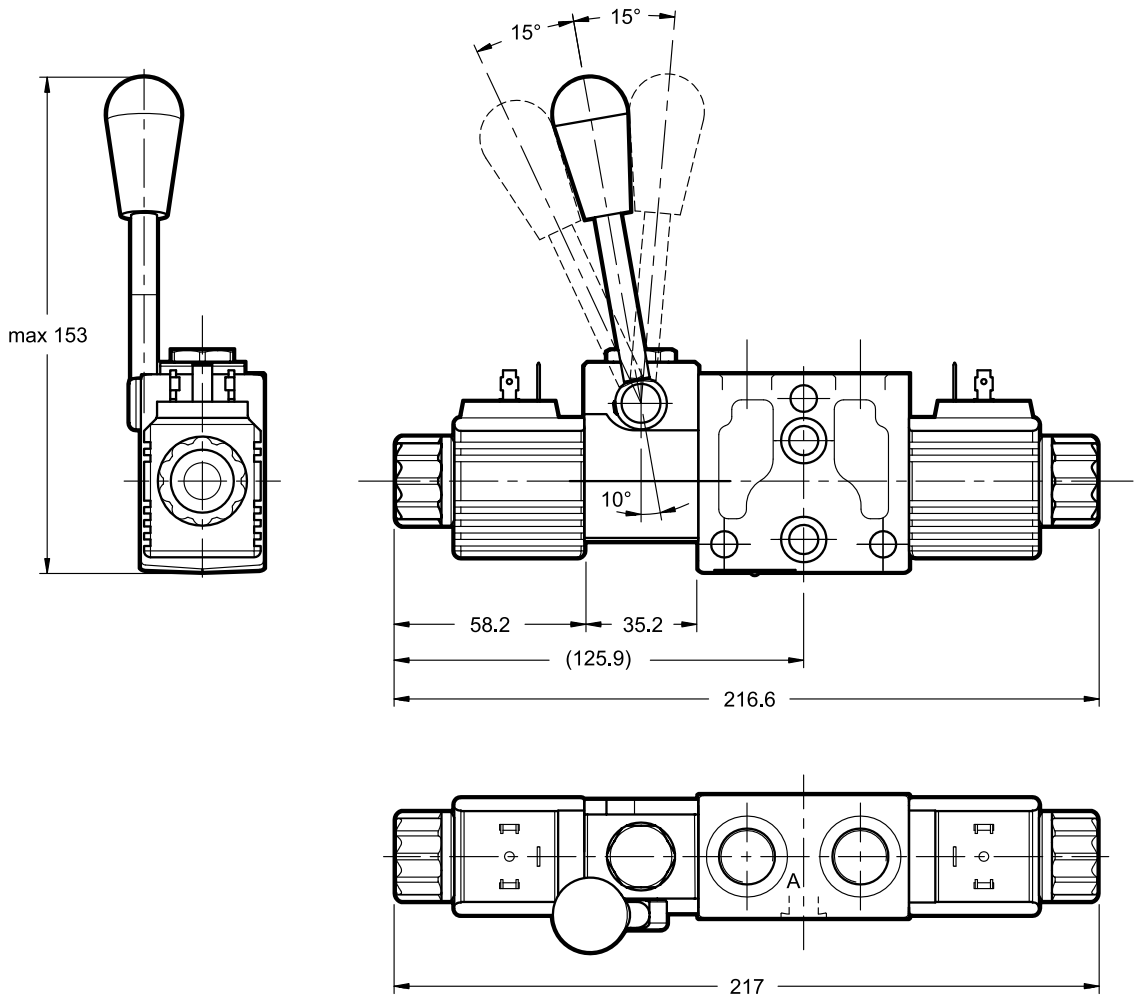
10.8 - CHL light duty lever manual override

Devices are placed on side A. Please contact our technical depth for other positions. For non-quoted dimensions, please refer to the overall tables in previous pages.

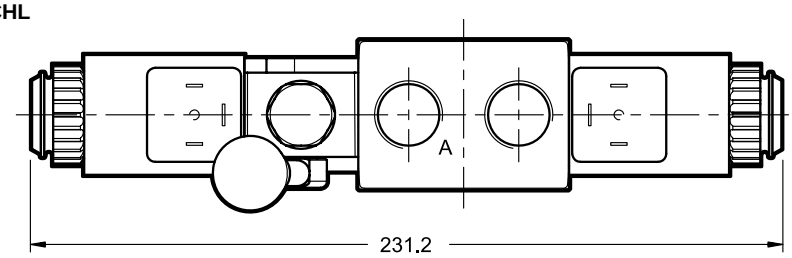
The CHL lever device can work with a maximum pressure in line T up to 50 bar, therefore it is not suitable for series circuits.

dimensions in mm

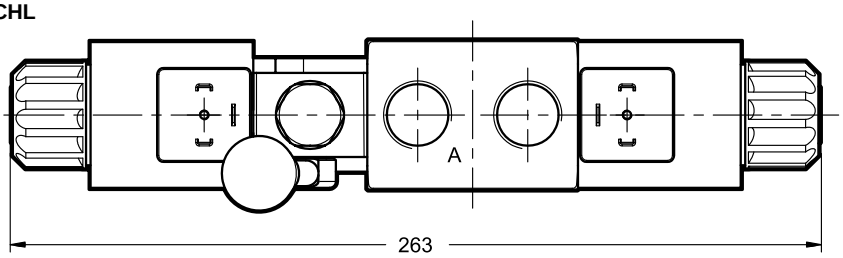
BDL2-* /CHL



BDM3-* /CHL



BDS3-* /CHL

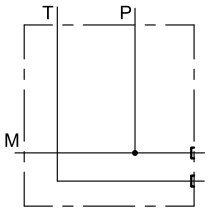


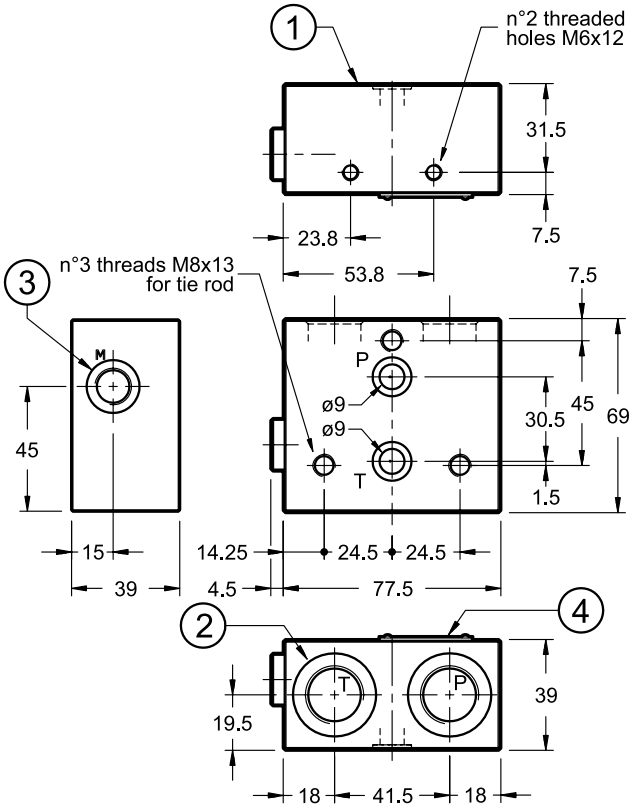
11 - DIMENSIONS OF INLET AND OUTLET ELEMENTS FOR PARALLEL CIRCUITS

11.1 - Inlet elements

BD3-B12S-P
without pressure relief valve

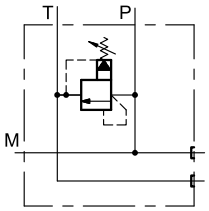
dimensions in mm

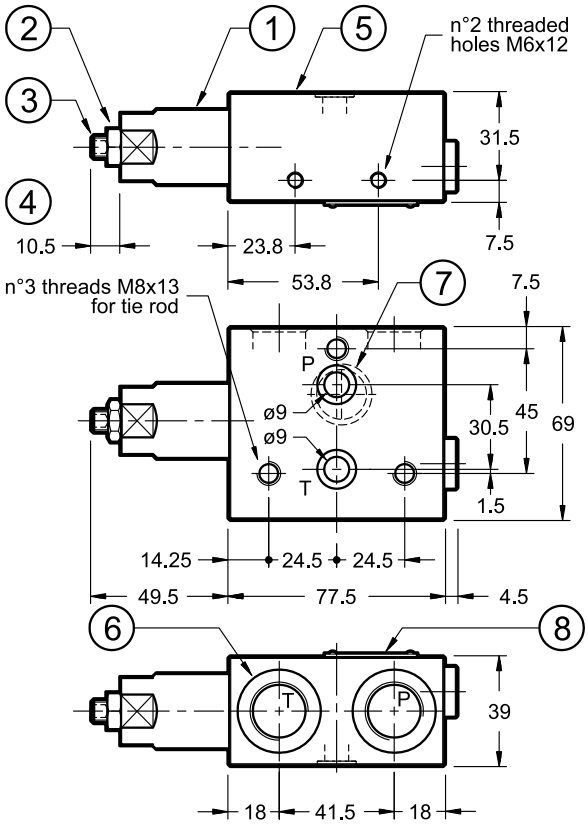




1	Mounting surface with sealing rings: 2 OR type 2043 (10.82x1.78)
2	P and T ports: 1/2” BSP
3	Pressure gauge port: 1/4” BSP
4	Element label

BD3-B12S-P*
with pressure relief valve

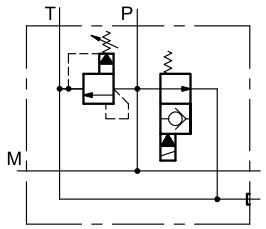


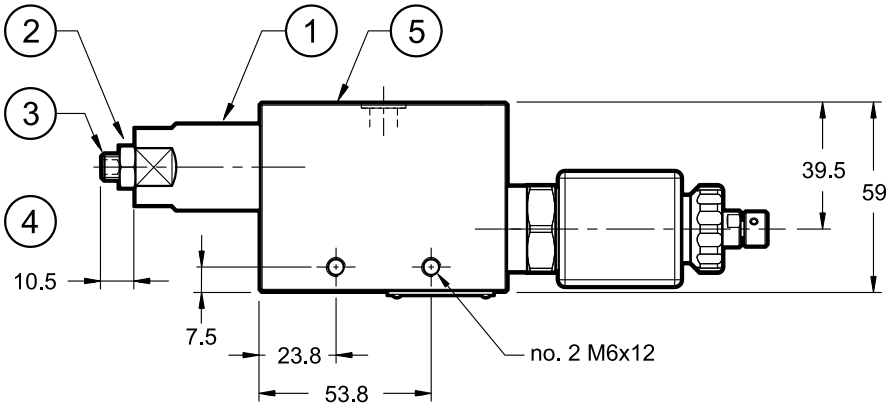


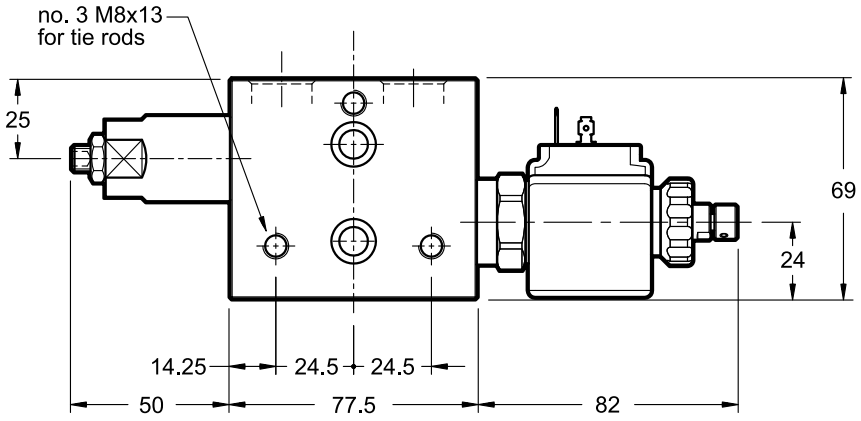
1	Pressure relief valve
2	Locking nut: spanner 13
3	Socket hex adjustment screw: Allen key 4 Clockwise rotation to increase pressure
4	Maximum screw stroke
5	Mounting surface with sealing rings: 2 OR type 2043 (10.82x1.78)
6	P and T ports: 1/2” BSP
7	Pressure gauge port:1/4” BSP
8	Element label

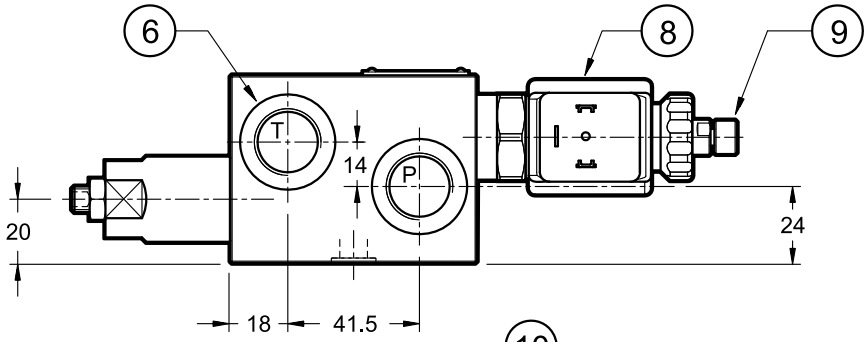
BD3-B12S-PK*
with pressure relief valve and unloading valve

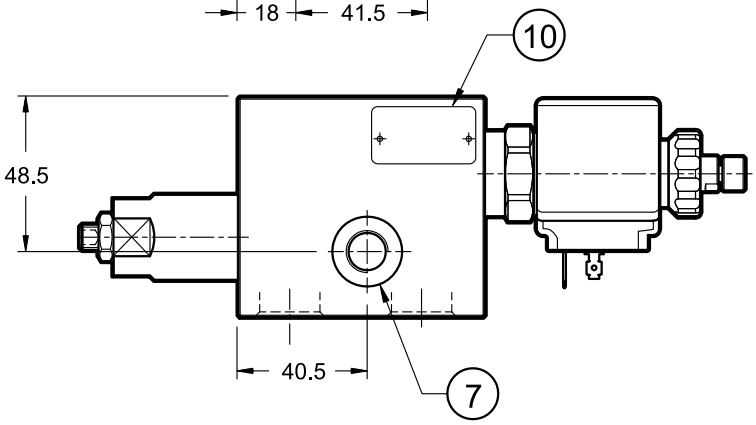
dimensions in mm











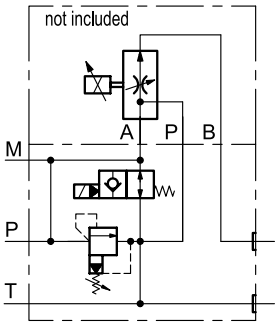
1	Pressure relief valve
2	Locking nut: spanner 13
3	Socket hex adjustment screw: Allen key 4 Clockwise rotation to increase pressure
4	Maximum stroke
5	Mounting surface with sealing rings: 2 OR type 2043 (10.82x1.78)
6	P and T ports: 1/2” BSP
7	Pressure gauge port:1/4” BSP
8	Unloading valve Here shown with K1 connection
9	CP type manual override. See identification codes for further choices.
10	Element label

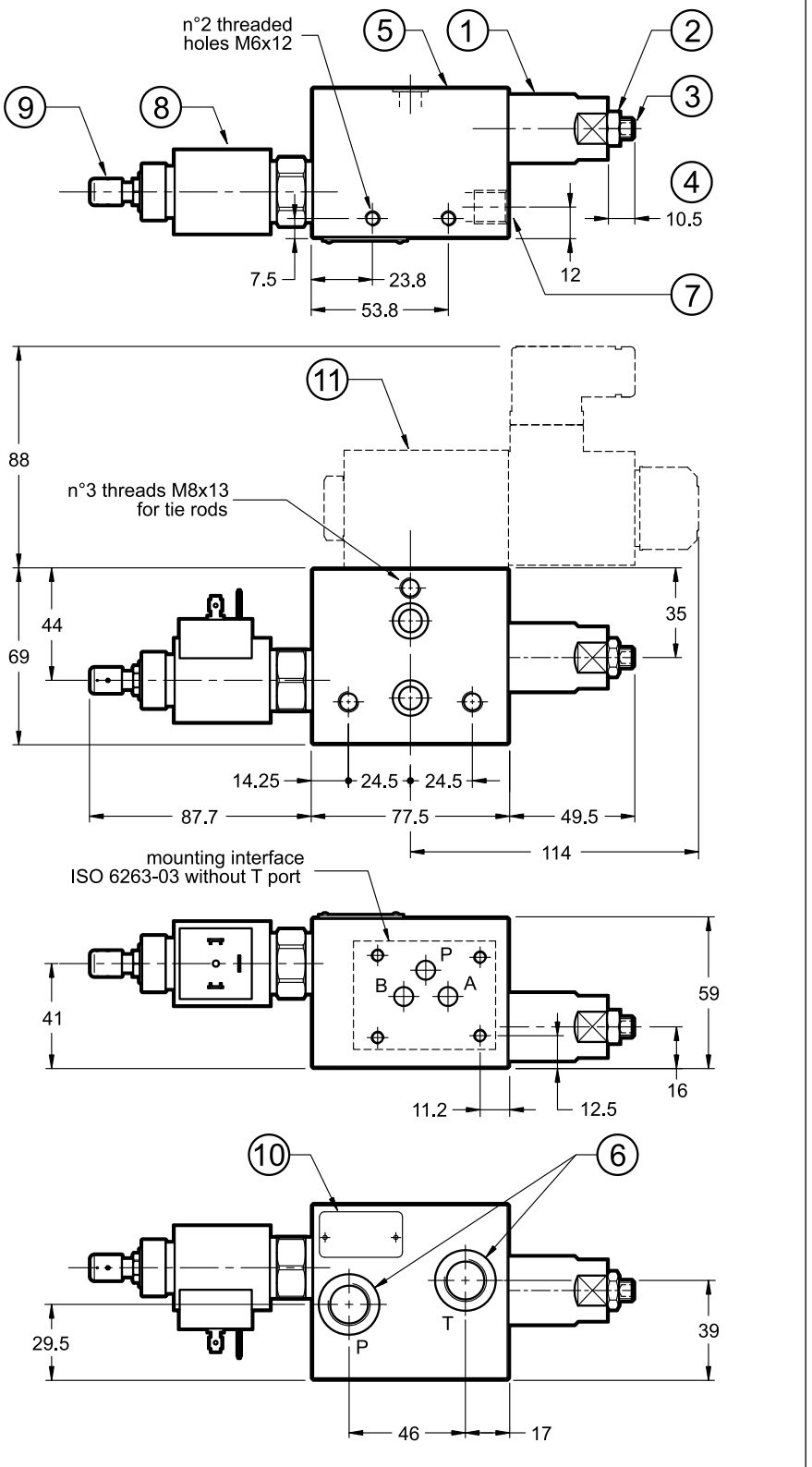
NOTE: for missing dimensions of mounting interface please refer to par. 10.1 ’mounting surfaces’.

11.2 - Inlet elements for flow control valve

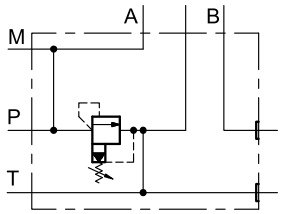
BD3-B38S-PK*-Q**
with pressure relief valve and unloading valve

dimensions in mm





NOTE :The same component without part no. 8 is:
BD3-B38S-P*-Q**
with pressure relief valve
without unloading valve



1	Pressure relief valve
2	Locking nut: spanner 13
3	Socket hex adjustment screw: Allen key 4 Clockwise rotation to increase pressure
4	Maximum stroke
5	Mounting surface with sealing rings: 2 OR type 2043 (10.82x1.78)
6	P and T ports: 3/8” BSP
7	Pressure gauge port: 1/4” BSP
8	Unloading valve Here shown with K1 connection
9	Push and twist manual override: see identification codes for further choices.
10	Element label
11	Encumbrance of flow control valve. To be ordered separately. See catalogue 82 220

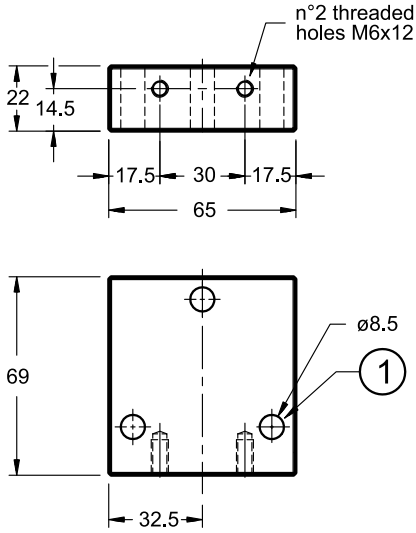
NOTE: for missing dimensions of mounting interface please refer to par. 10.1 ’mounting surfaces’.

11.3 - Outlet elements

dimensions in mm

BD3-S-R00
blind plate
Code **0194019**

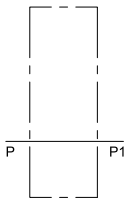


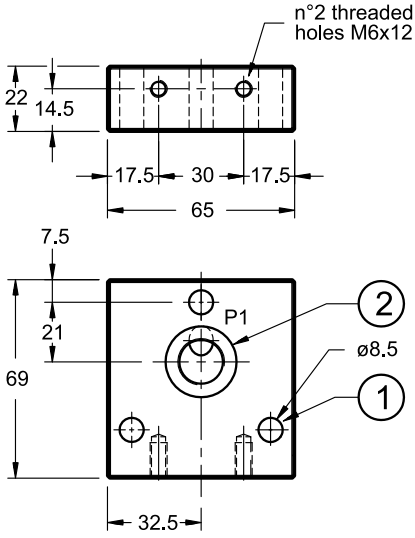


1	n° 3 through holes for stack assembly tie-rods

NOTE: for missing dimensions of mounting interface please refer to par. 10.1 'mounting surfaces'.

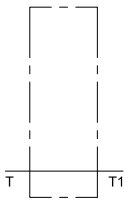
BD3-B38S-R01
plate with P1 outlet
Code **0194062**

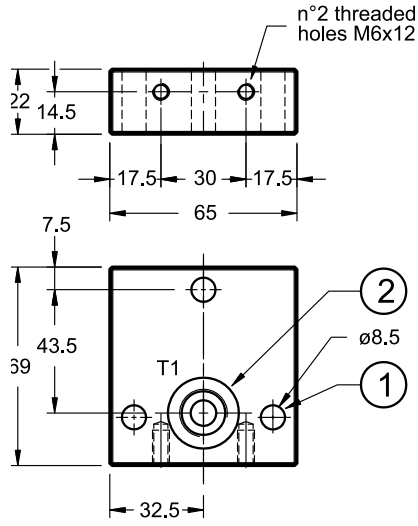




1	n° 3 through holes for stack assembly tie-rods
2	P1 port: 3/8 BSP

BD3-B38S-R02
plate with T1 outlet
Code **0194055**

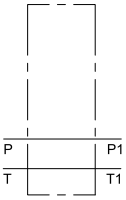


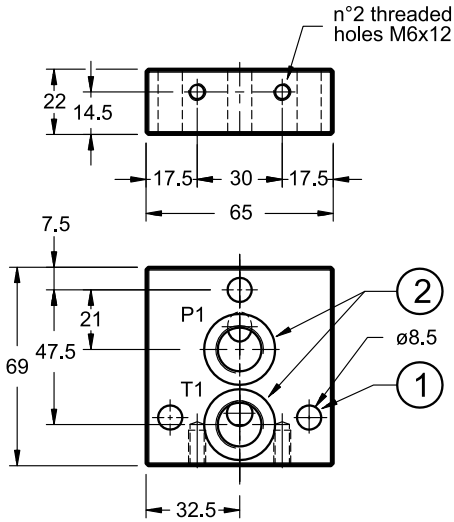


1	n° 3 through holes for stack assembly tie-rods
2	T1 port: 3/8 BSP

BD3-B38S-R03
plate with P1 and T1 outlet
Code **0194063**

dimensions in mm





1	n° 3 through holes for stack assembly tie-rods
2	P1 and T1 ports: 3/8" BSP

NOTE: for missing dimensions of mounting interface please refer to par. 10.1 'mounting surfaces'.

12 - IDENTIFICATION CODE FOR STACKED VALVE ASSEMBLY

BD			-			/	10		-			/	XXXXX

Stacked valve assembly

Solenoid tube (mm):
L = 14
M = 19
S = 22 (only size 3)

Size:
2 = thickness 38 mm
3 = thickness 46 mm

Circuit type:
P = parallel
S = series (parallel elements with plugs)
C = series (series elements)
Available for size 2 only

No. of directional valves

Series no.:
(the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Coil type:
DC coils
D12 = 12 V
D24 = 24 V
D28 = 28 V
D00 = valve without coil supplied with locking ring

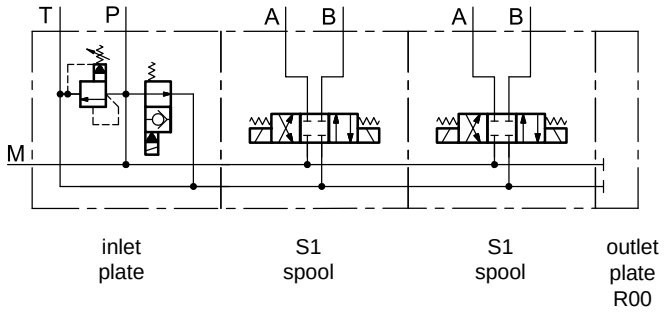
Coil electrical connection:
K1 = plug for connector type EN 175301-803 (ex DIN 43650) (**standard**)
K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S

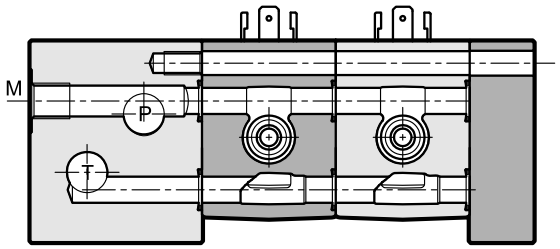
Configuration code (5 digits), assigned by Duplomatic

13 - CONNECTION SCHEMES EXAMPLES

13.1 - BD**-P parallel connection

Parallel circuit is obtained with elements for parallel connection (see point 1).

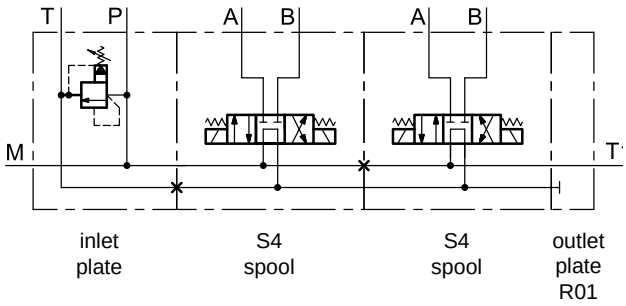


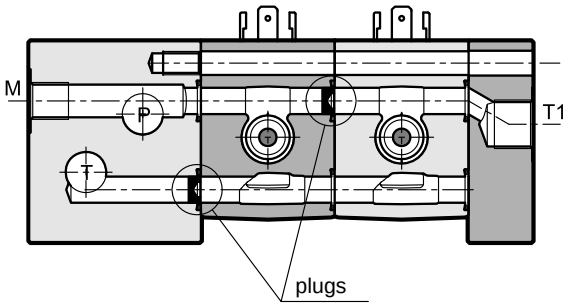


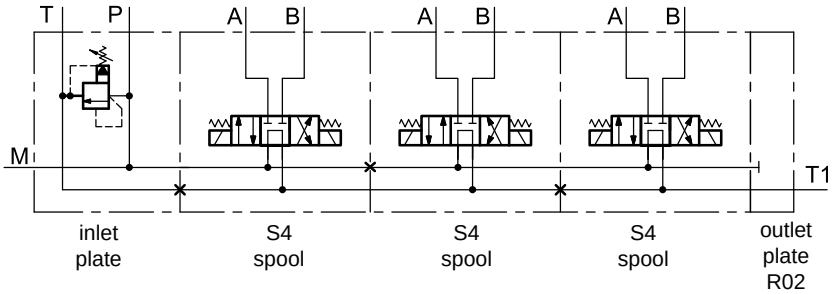
13.2 - BD-S series connection**

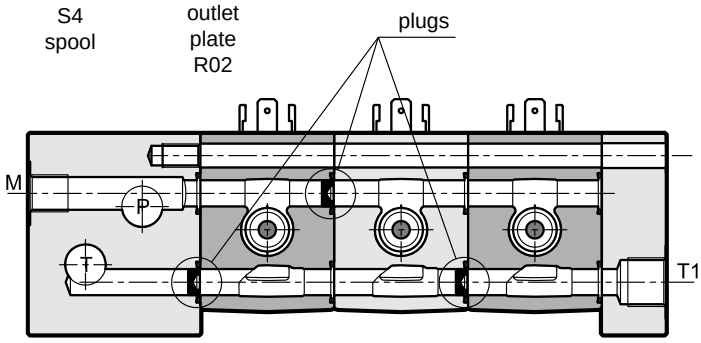
Series circuit is obtained by inserting plugs in elements for parallel connection (see point 1).

Please note that this kind of configuration requires a different outlet plate, depending on the number (even or odd) of directional valves in the assembly.





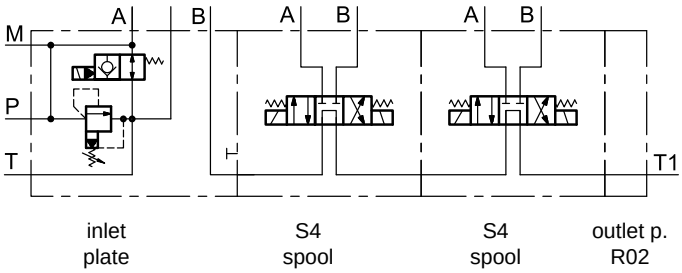


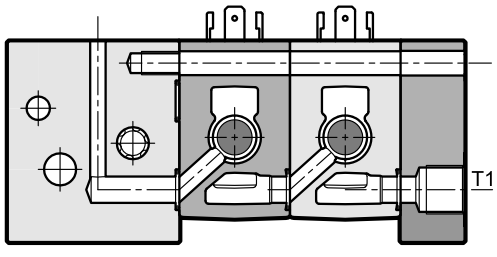


plug Ø9 - ordering code: **0612253**

13.3 - BDL2-C and BDM2-C series connection

BD*2-C series connection is obtained with elements designed for series (see point 14). The series elements are available in size 2 only.

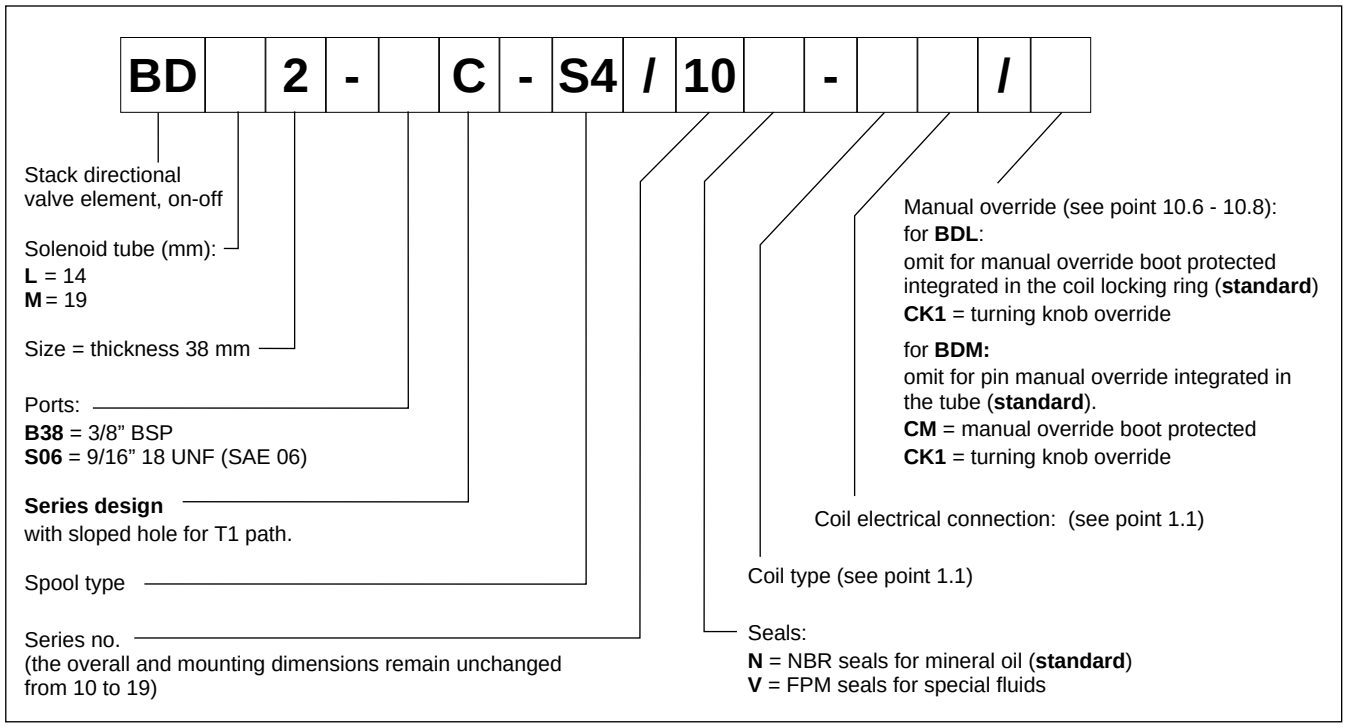




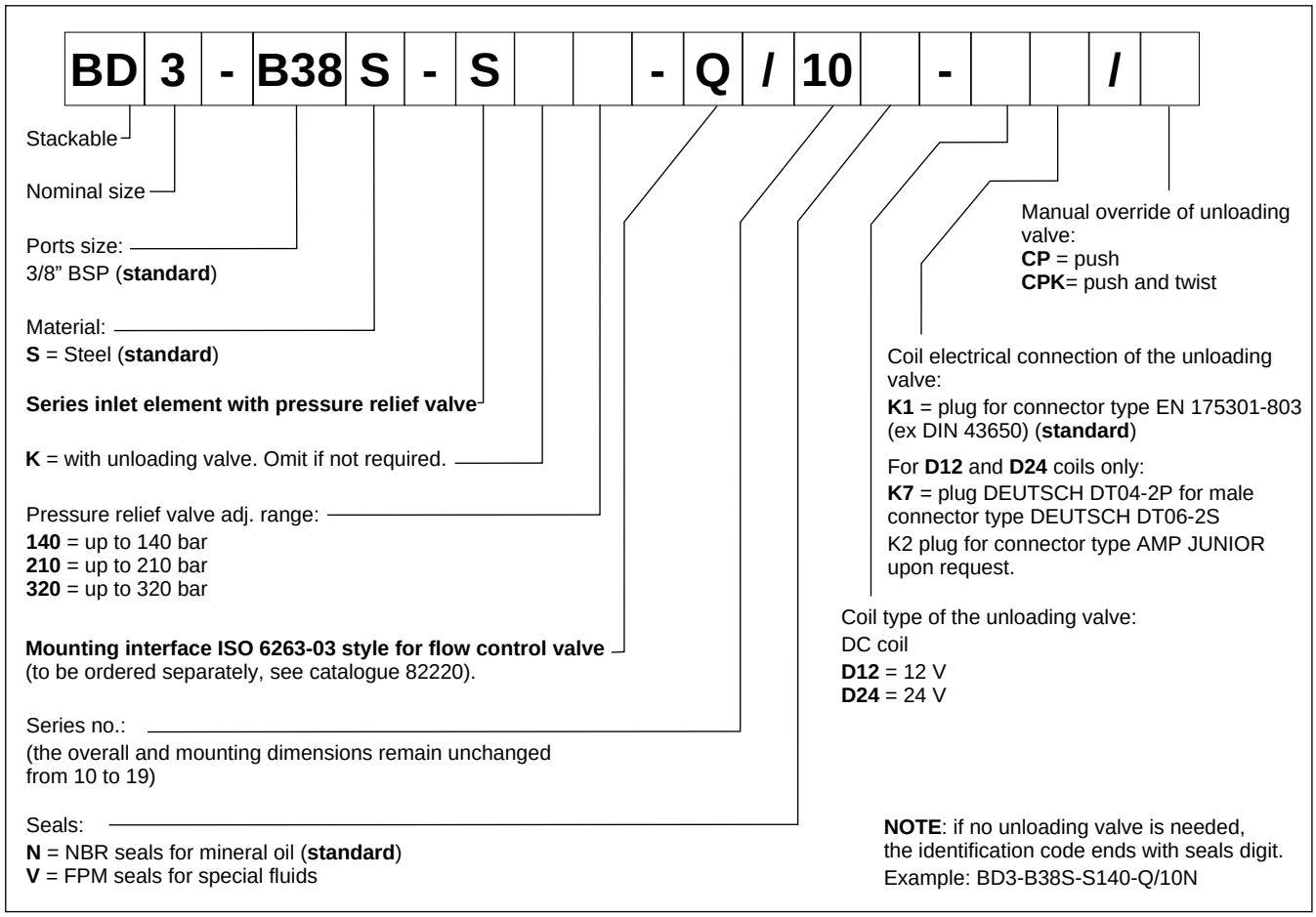
14 - IDENTIFICATION CODES OF SEPARATE ELEMENTS FOR BDL2 AND BDM2 SERIES CIRCUITS

14.1 - Directional valve element

This code identifies BD*2 elements, designed for series connection. Series circuits with BD*3 modules are feasible by inserting plugs to divert the oil path (see point 13.2).



14.2 - Inlet elements for flow control valve



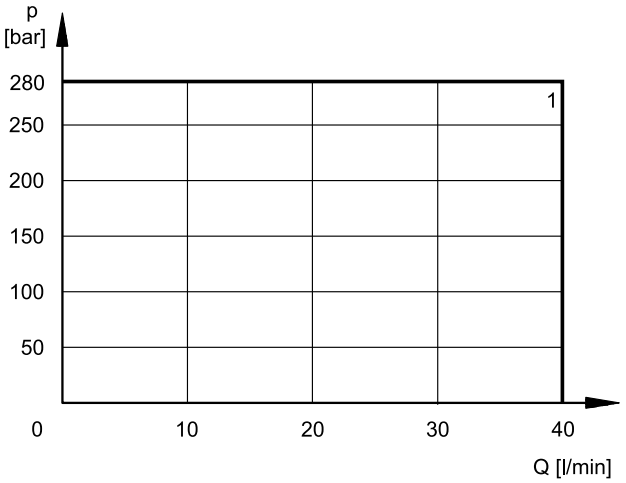
14.3 - Outlet elements

Please choose the proper outlet element amongst those in point 1.7. Overall dimensions are at point 11.3.

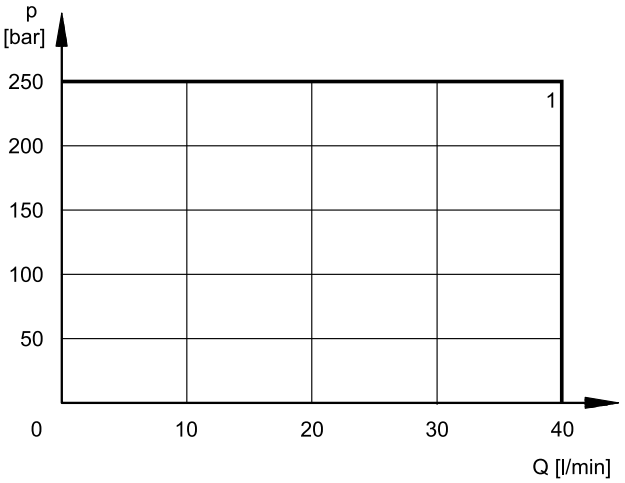
15 - CHARACTERISTIC CURVES AND OPERATING LIMITS FOR SERIES

Please refer to diagrams at point 3 for pressure drops, whereas operating limits are here below.

15.1 - BDL2-B38C-S4



15.2 - BDM2-B38C-S4

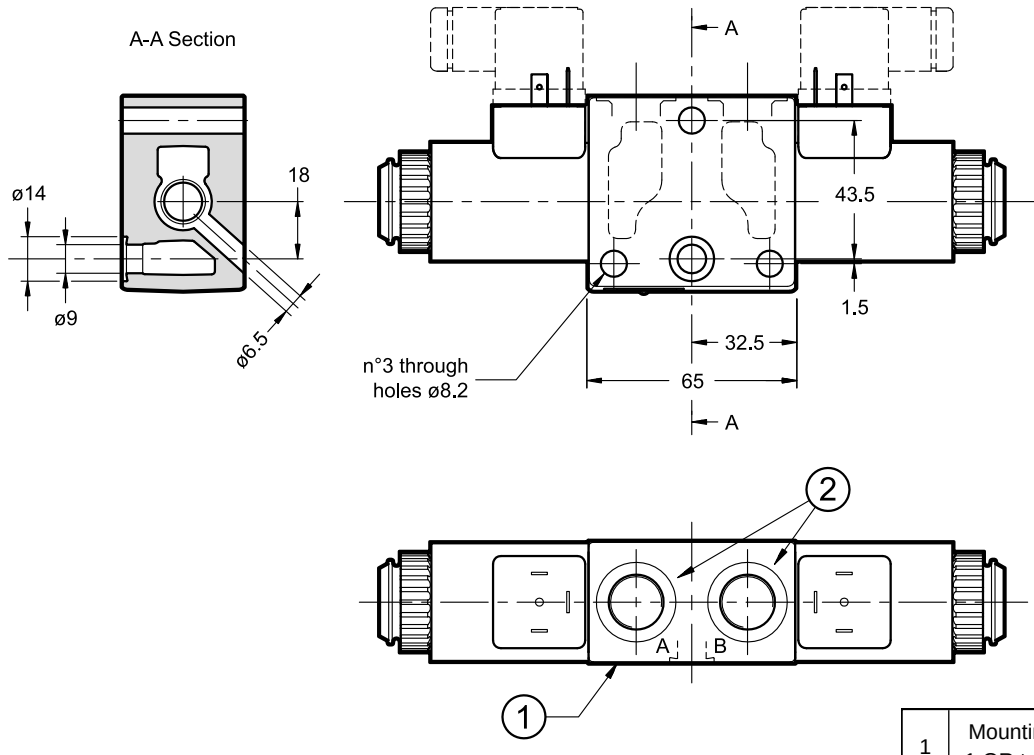


16 - DIMENSIONS OF ELEMENTS FOR SERIES CONNECTION

16.1 - BD*2-B38C-S4/10* - directional valve element

The BDM2 configuration is showed here. The same directional valve is available as BDL2. For non-quoted dimensions, please refer to the drawings for parallel circuits. Overall dimensions are the same.

dimensions in mm

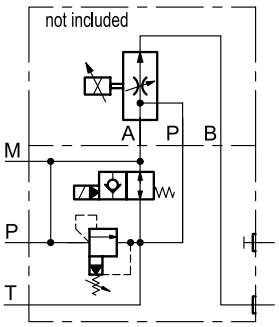


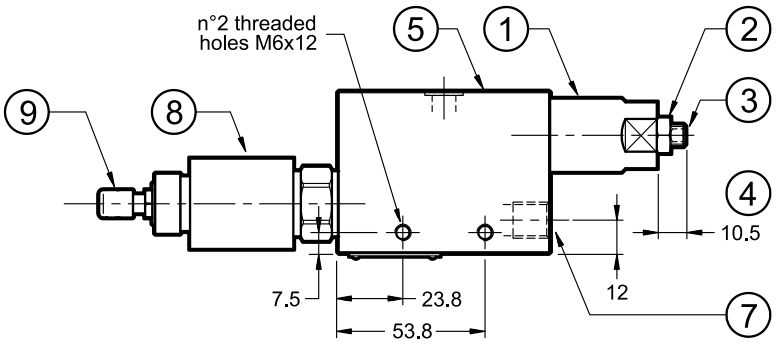
1	Mounting surface with sealing ring: 1 OR type 2043 (10.82x1.78)
2	A and B ports: 3/8" BSP

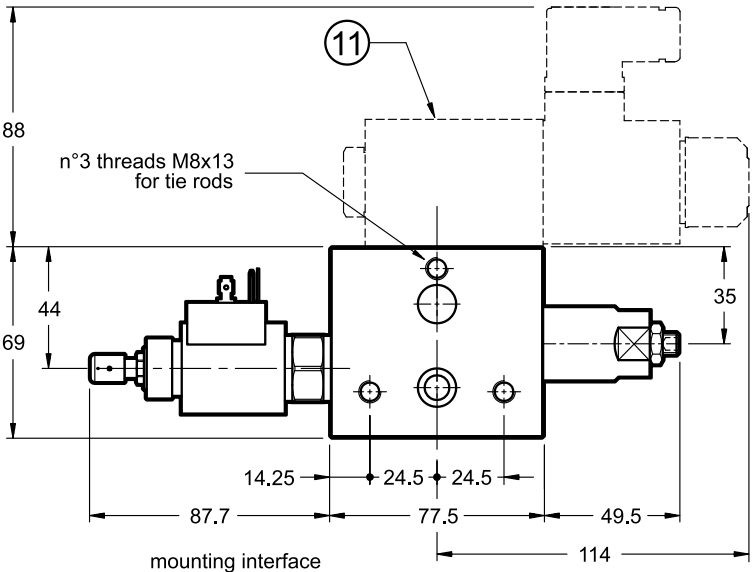
16.2 - Inlet elements for flow control valve

BD3-B38S-SK*-Q**
with pressure relief valve and unloading valves

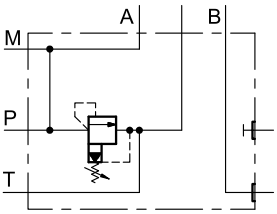
dimensions in mm

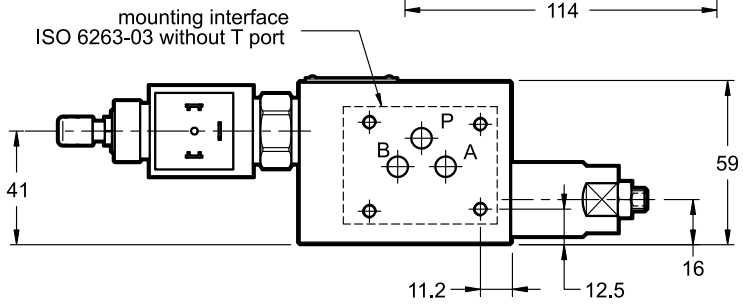


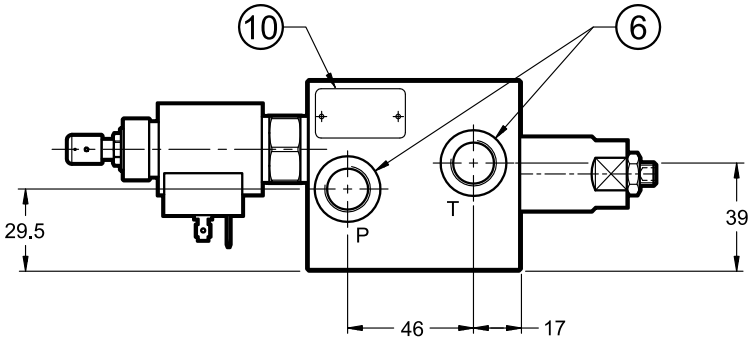




NOTE :The same component without part no. 8 is:
BD3-B38S-S*-Q**
with pressure relief valve
without unloading valve







1	Pressure relief valve
2	Locking nut: spanner 13
3	Socket hex adjustment screw: Allen key 4 Clockwise rotation to increase pressure
4	Maximum screw stroke
5	Mounting surface with sealing rings: 2 OR type 2043 (10.82x1.78)
6	P and T ports: 3/8” BSP
7	Pressure gauge port:1/4” BSP
8	Unloading valve Here shown with K1 connection
9	CPK manual override: see identification codes for further choices.
10	Element label
11	Overall dimensions of the flow control valve. To be ordered separately. See catalogue 82 220

NOTE: for missing dimensions of mounting interface please refer to the point 10.1 ‘mounting surfaces’.

DUPLOMATIC
MOTION SOLUTIONS
a member of DAIKIN group

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T +39 0331 895111 | E vendite.ita@duplomatic.com | sales.exp@duplomatic.com
duplomaticmotionsolutions.com

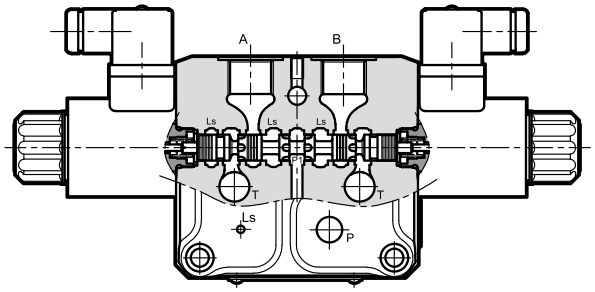
REPRODUCTION IS FORBIDDEN. THE COMPANY RESERVES THE RIGHT TO APPLY ANY MODIFICATIONS.



BLS6
PROPORTIONAL STACKABLE VALVE ASSEMBLY WITH LOAD SENSING
SERIES 21

p max **315** bar
Q max **120** l/min

OPERATING PRINCIPLE



— The BLS6 is a stackable valve assembly. It can be assembled with up to 8 working sections (proportional and solenoid directional valves together).

— Each working section is equipped with a meter-in compensator that keeps the flow costant, regardless from load variations.

— Sections with pressure compensator are not influenced in any way by other operated functions, provided that sufficient pump capacity is available. In order to work correctly, the sum of the flows required at the same time must not overcome the 90% of the inlet flow.

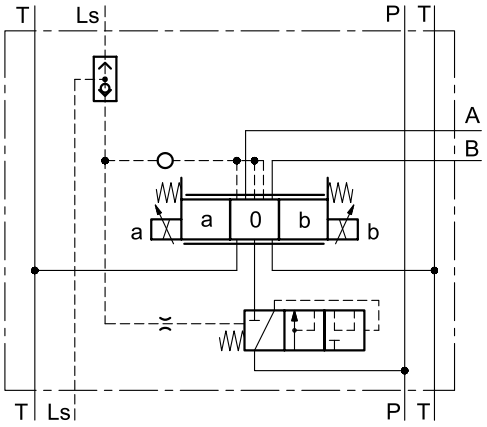
— A and B working ports are threaded 1/2" BSPP. P and T ports of the inlet plate are 3/4" BSPP threaded.

— The lever override is available as option.

PERFORMANCES
(obtained with mineral oil with viscosity of 36 cSt at 50 °C)

Maximum operating pressure: - A, B and P ports - T ports	bar	 315 20
Maximum flowrate: - A and B ports - P ports - T ports	l/min	 45 100 120
Electrical characteristics	see point 4	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Single body mass	kg	4,5
Surface treatment of body and plates	galvanic, zinc-nickel	

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODES FOR SPARE MODULES

Here below are shown the identification codes of all the loose components of the valve assembly. To order the assembled valve, please refer to the codes at points 9 and 10.

Different versions of inlet section are available, for fixed pumps and for systems with Load Sensing pump.

1.1 - Proportional working sections

BLS	6	-				/	21	V	-			/	

Compensated proportional directional valve, direct operated

Size

Spool type:
PC = proportional valve, closed center
PA = proportional valve, open center

Solenoid position:
(omit for configuration with two solenoids)
A = 1 solenoid on side A
B = 1 solenoid on side B

Spool nominal flow (see below)

Series no. (the overall and mounting dimensions remain unchanged from 20 to 29)

Seals: FPM seals

Coil type:
D12 = Nominal solenoid voltage 12V DC
D24 = Nominal solenoid voltage 24V DC

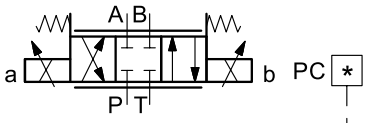
Coil electrical connection:
(see point 6)
K1 = plug for connector type EN 175301-803 (ex DIN 43650) (**standard**)
K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S

Manual override
(see point 11)

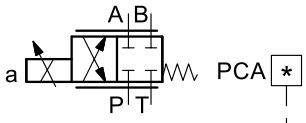
SPOOLS

Valve configuration depends on the combination of the following elements: solenoid quantity, spool type, nominal flow rate.

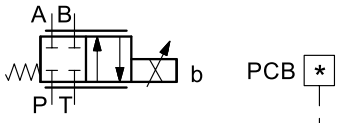
2 solenoids:
3 positions with spring centering



1 solenoid on side A:
2 positions (central + external)
with spring return

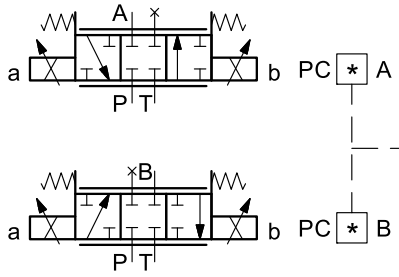


1 solenoid on side B:
2 positions (central + external)
with spring return



SYMMETRICAL	
Q max	Δp
05/05	4
09/09	8
15/15	4
25/25	8
30/30	4
45/45	8

ASYMMETRICAL	
Q max	Δp
15/10	4
25/15	8
30/20	4
45/30	8



SINGLE FLOW	
Q max	Δp
30	4
45	8

1.2 - Solenoid working sections

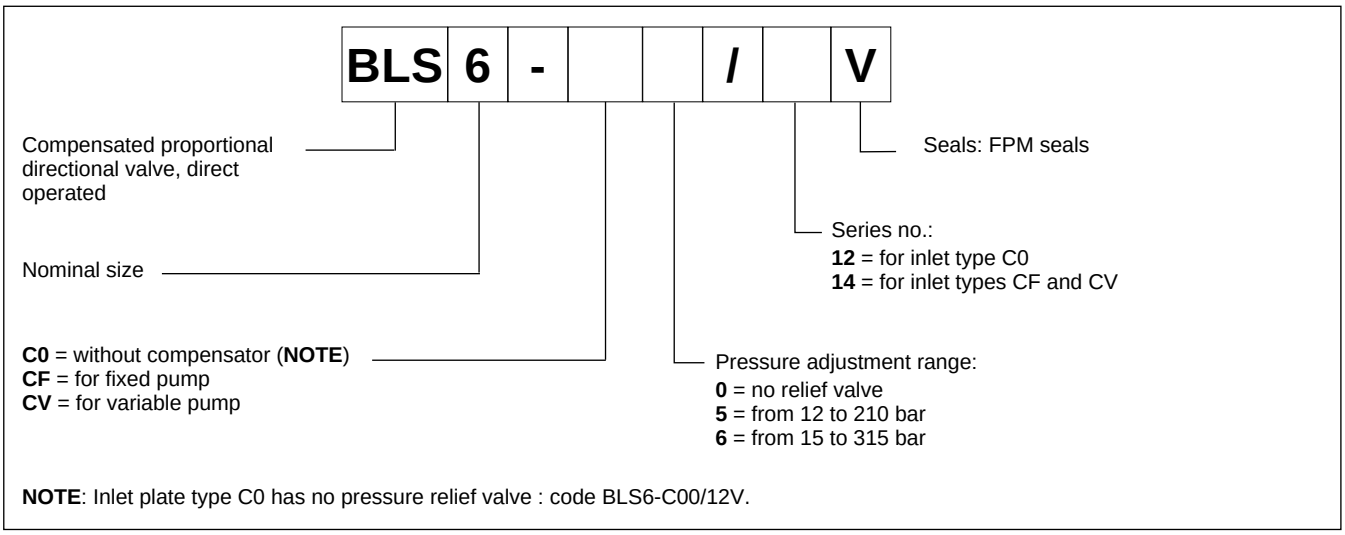
Proportional directional valves can be used together with directional solenoid valves in the same assembly. To order on-off modules, enter the following codes in the identification code, under 'spool type':

SC = solenoid valve, closed centre
SA = solenoid valve, open centre

In addition to the flow rates already indicated, two spools for high flow rates are also available: SC60/60 and SA60/60.

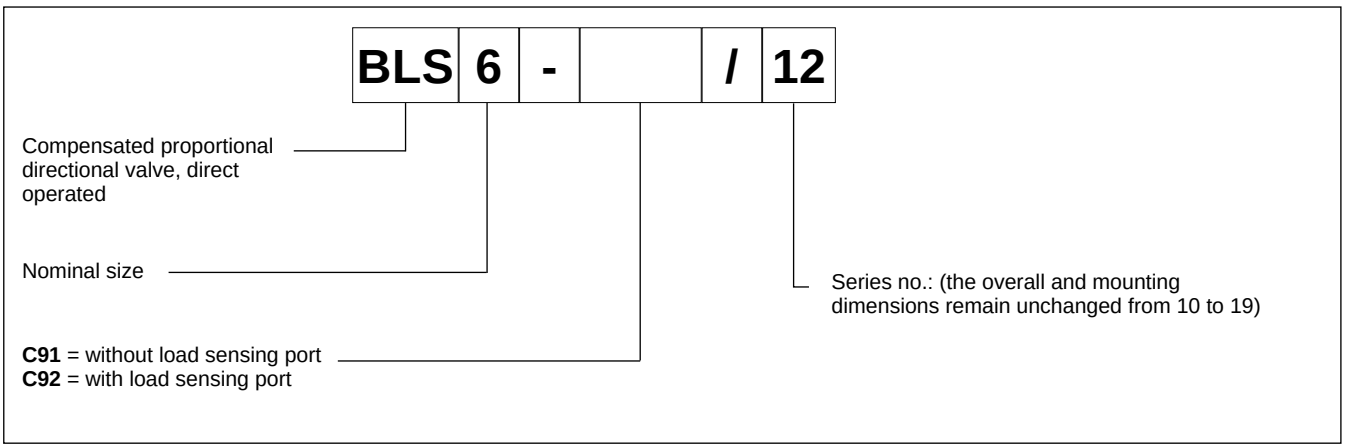
1.3 - Inlet plates

Inlet plates for fixed pumps and for variable pumps with load sensing are available.



NOTE: Inlet plate type C0 has no pressure relief valve : code BLS6-C00/12V.

1.4 - End plates



2 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4 or fluids HFDR type. For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

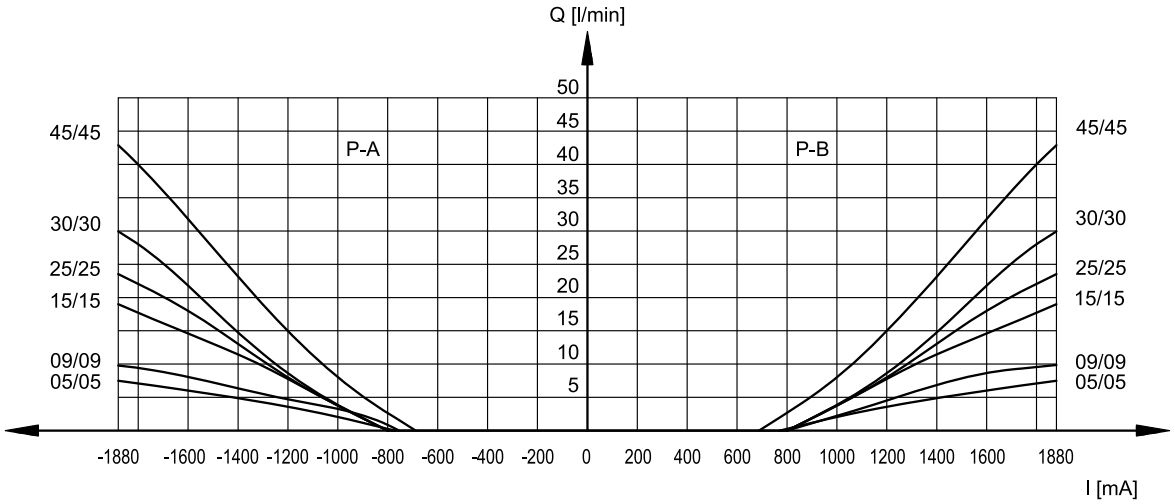
The fluid must be preserved in its physical and chemical characteristics.

3 - CHARACTERISTIC CURVES

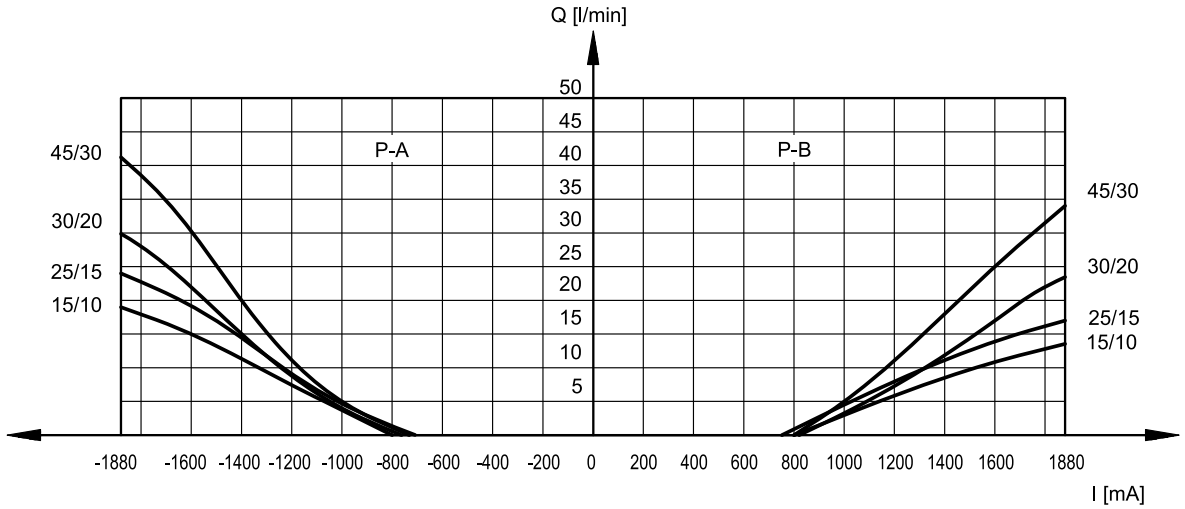
(values obtained with viscosity 36 cSt at 50 °C)

Typical constant flow rate obtained through the embedded compensator, with 12 V supply voltage (for D24 version the maximum current is 860 mA), measured for the various spool types available.

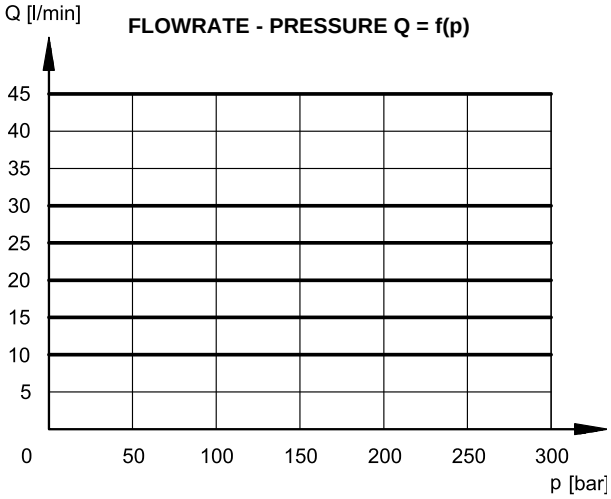
PRESSURE DROPS Δp-Q OF PROPORTIONAL WORKING SECTIONS
SYMMETRICAL FLOWS - PC AND PA SPOOLS



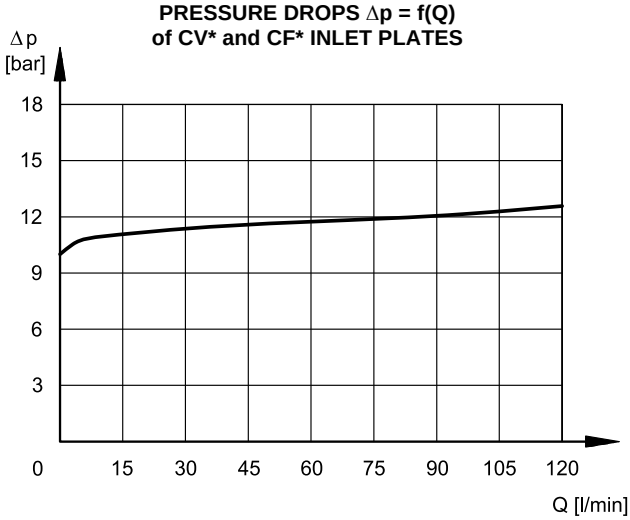
ASYMMETRICAL FLOWS - PC and PA SPOOLS



FLOWRATE - PRESSURE Q = f(p)



PRESSURE DROPS Δp = f(Q)
of CV* and CF* INLET PLATES



4 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid is made of two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut.

It can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20 °C)	ohm	4.4	18.6
NOMINAL CURRENT	A	1.88	0.86
DUTY CYCLE		100%	
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2014/30/EU		
CLASS OF PROTECTION Coil insulation (VDE 0580) Impregnation	class H class F		

Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree correctly connected and installed.

electric connection	electric connection protection	whole valve protection
K1 EN 175301-803 (ex DIN 43650)	IP65	IP65
K7 DEUTSCH DT04 male	IP65/67	

5 - STEP RESPONSE

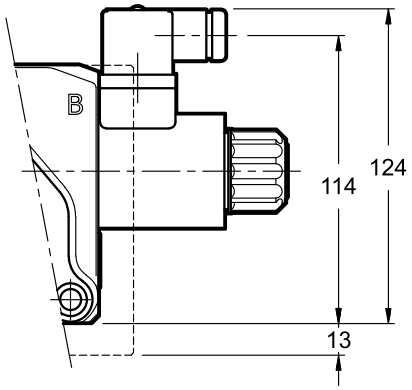
(Obtained with mineral oil with viscosity of 36 cSt at 50°C with electronic control card)

Step response is the time (delay) taken for the valve to reach 90% of the set position value following a step change of the reference signal.

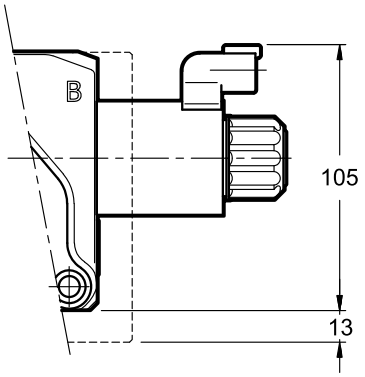
Reference signal step	0 →100%	100 →0%
STEP RESPONSE [ms]		
BLS6	50	40

6 - ELECTRICAL CONNECTIONS

connection for EN 175301-803 (ex DIN 43650) connector code **K1** (**standard**)



connection for DEUTSCH DT04-2P connector type code **K7**



7 - ELECTRICAL CONNECTORS

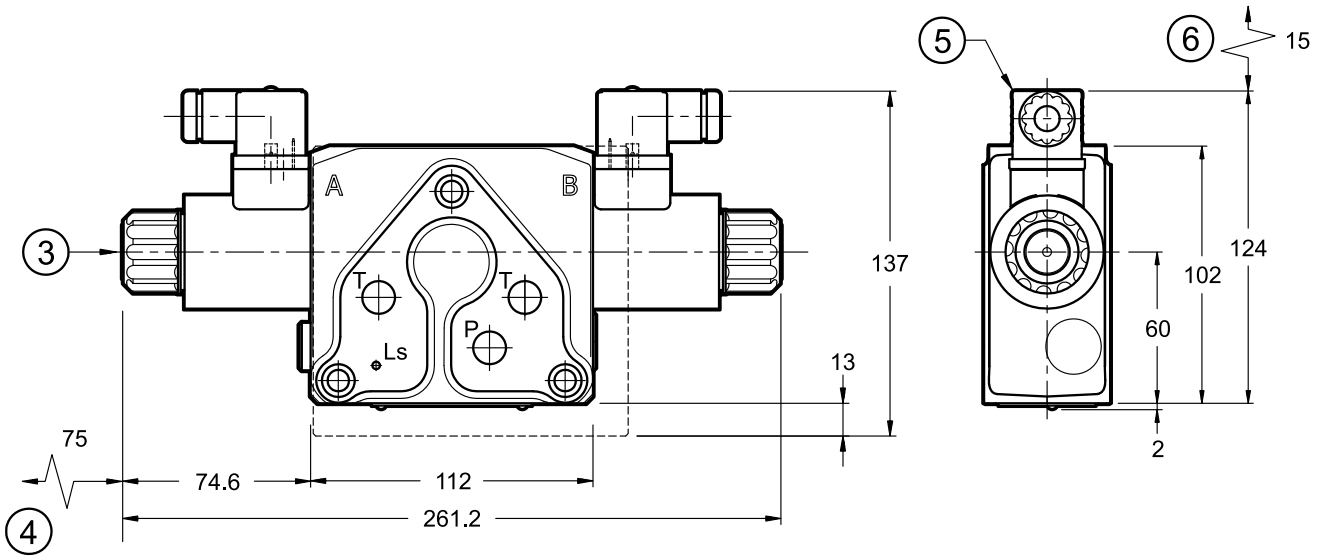
Solenoid working sections are supplied without connectors. Connectors for solenoid valves with K1 electrical connection EN 175301-803 (ex DIN 43650) can be ordered separately: see catalogue 49 000.

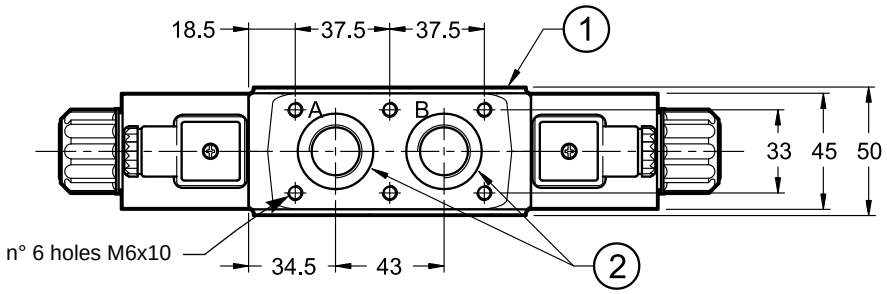
8 - OVERALL AND MOUNTING DIMENSIONS

8.1 - Working sections

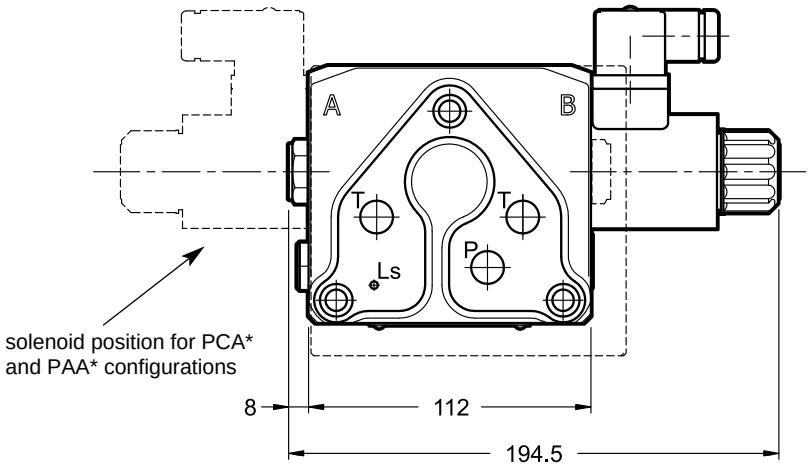
dimensions in mm

2 SOLENOIDS **BLS6-PC*, BLS6-SC***
BLS6-PA*, BLS6-SA*





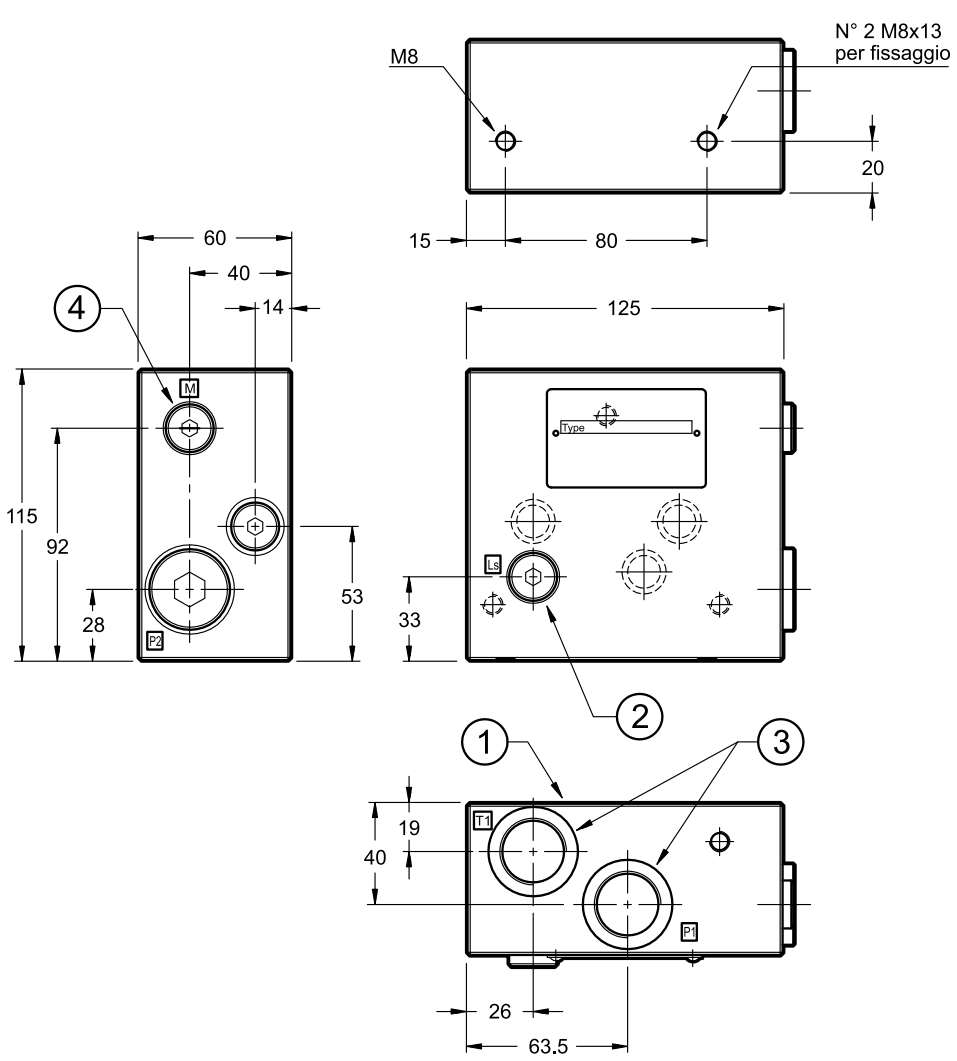
1 SOLENOID **BLS6-PCB***
BLS6-PAB*



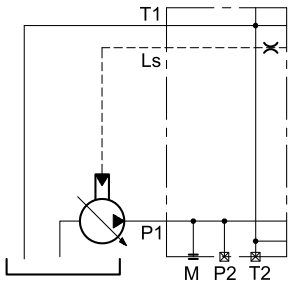
1	Mounting surface with sealing rings: n° 4 OR 2056 (14x1.78) 90 shore
2	A and B ports: 1/2” BSPP
3	Locking ring with standard manual override
4	Coil removal space
5	Electrical connector type EN 175301-803 (formerly DIN 43650) only supplied together with proportional modules. (drawing with standard connection type K1 - for K7 connection see point 6)
6	Connector removal space

8.2 - Inlet plate without compensator

dimensions in mm



BLS6-C00

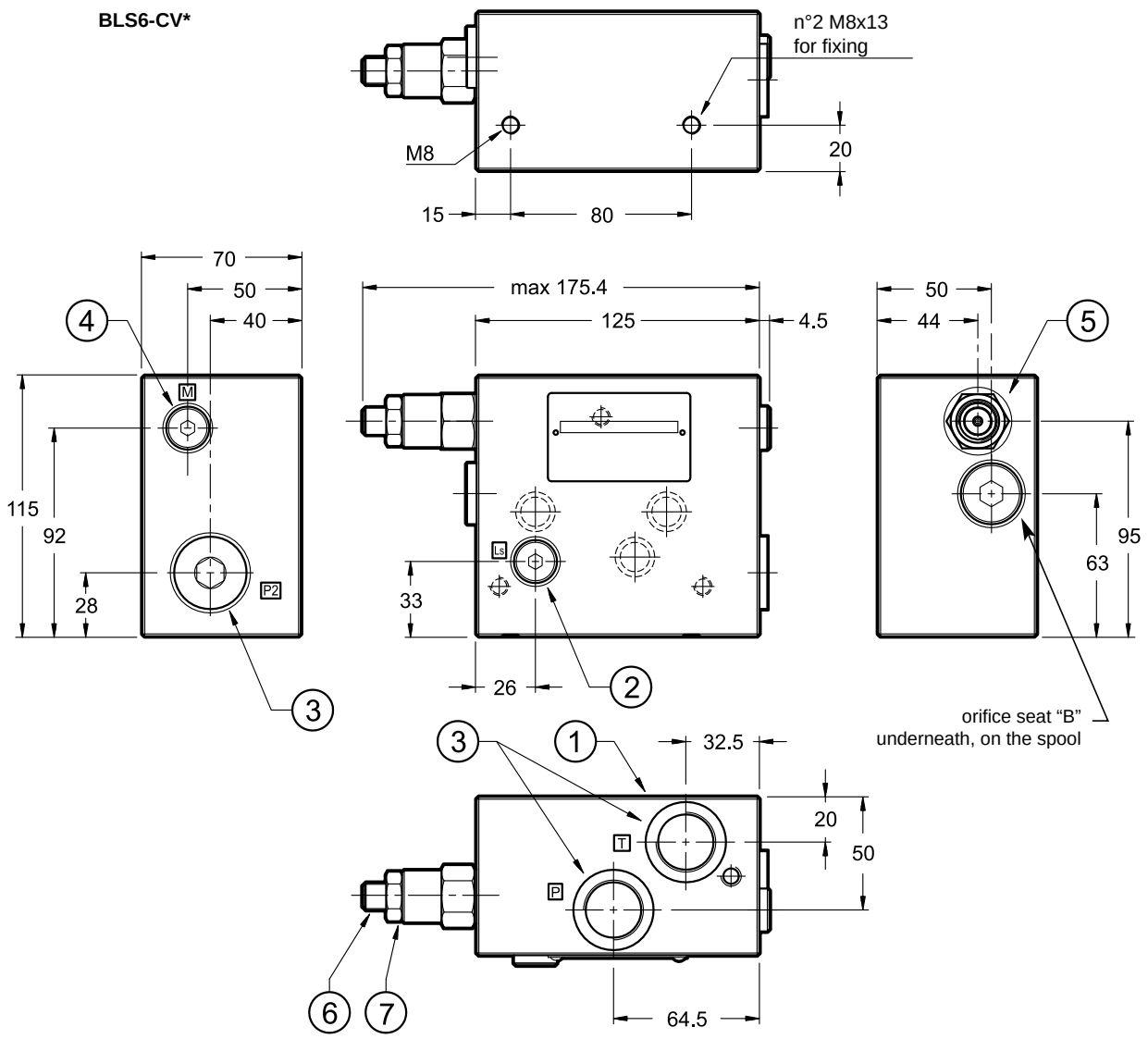


1	Mounting surface with sealing rings: n° 4 OR 2056 (14x1.78) 90 shore
2	Load Sensing port: 1/4” BSPP with orifice
3	P1, P2 and T1 ports: 3/4” BSPP
4	Pressure gauge port: 1/4” BSPP

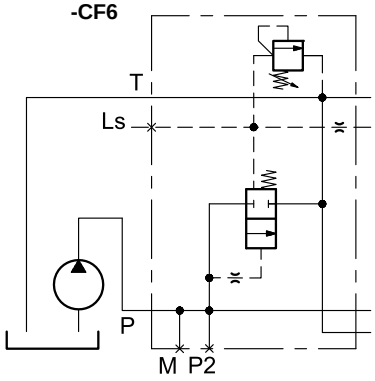
8.2 - Inlet plates with compensator, for fixed pump and for variable pump

dimensions in mm

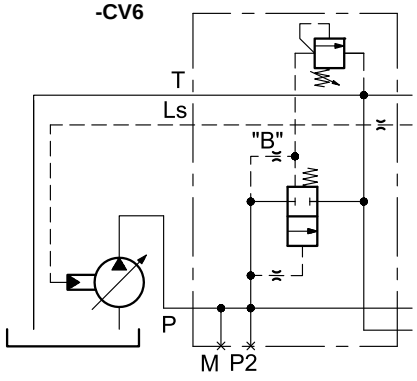
BLS6-CF*
BLS6-CV*



BLS6-CF5
-CF6

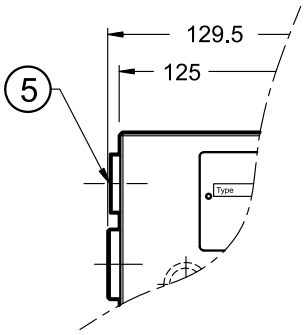


BLS6-CV5
-CV6

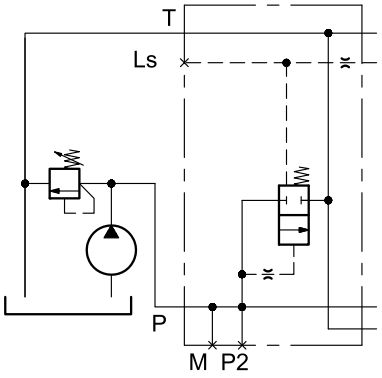


1	Mounting surface with sealing rings: n° 4 OR 2056 (14x1.78) 90 shore
2	Load Sensing port: 1/4” BSPP
3	P, P2 and T ports: 3/4” BSPP
4	Pressure gauge port: 1/4” BSPP
5	Pressure relief valve. **For BLS6-CF0 only:** See drawings to the next page. plug 3/4”-16 UNF.
6	Socket hex adjustment screw: Hex key 6.
7	Locking nut: spanner 19

dimensions in mm



BLS6-CF0

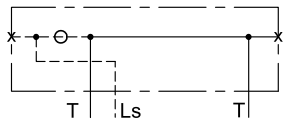


5	**For BLS6-CF0 :** plug 3/4”-16 UNF

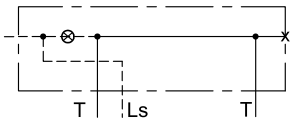
8.3 - End plates

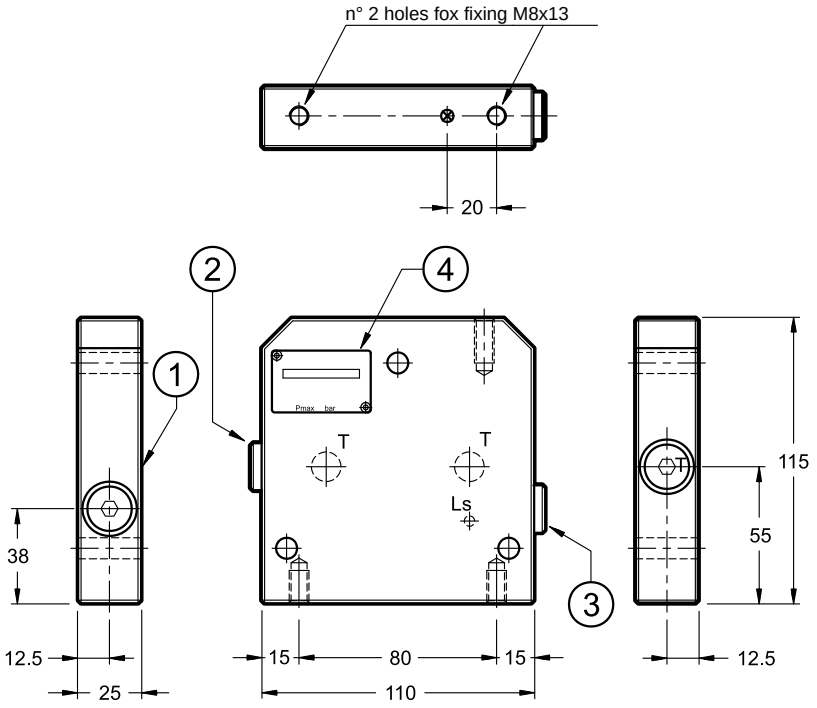
dimensions in mm

BLS6-C91



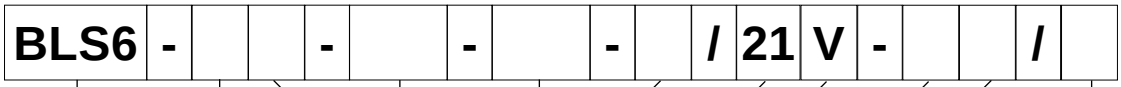
BLS6-C92





1	Mounting surface with no sealing rings
2	T1 outlet: 3/8” BSPP
3	Load Sensing port: 1/4” BSPP
4	Identification label

9 - IDENTIFICATION CODE OF THE ASSEMBLED VALVE



Compensated proportional directional valve, direct operated

Inlet plate:
C0 = without compensator (**NOTE**)
CF = for fixed pump
CV = for variable pump

Pressure adjustment range:
0 = no pressure relief valve
5 = from 12 to 210 bar
6 = from 15 to 315 bar

Working sections:
Choose the spool type and the rated flow as in code at point 1.1.
Repeat for each working section: min 2, max 8 sections.

End plate:
C91 = without load sensing port
C92 = with load sensing port

Series no.: (the overall and mounting dimensions remain unchanged from 20 to 29)

Seals: FPM seals

Coil type:
D12 = Nominal solenoid voltage 12V DC
D24 = Nominal solenoid voltage 24V DC

Coil electrical connection:
(see point 6)
K1 = plug for connector type EN 175301-803 (ex DIN 43650) (**standard**)
K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S

Option:
Manual override **on every working section** (see point 11)

NOTE: The C0 version is available without the pressure relief valve only, with code BLS6-C00/12V.

Code example:

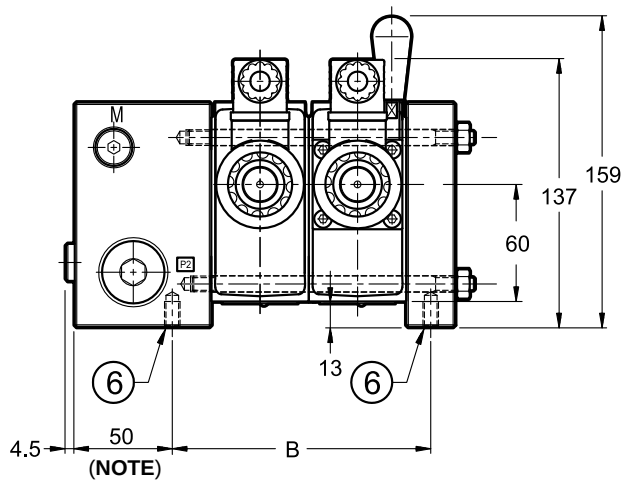
BLS6-C00-PC30/30-PC30/30-C92/21V-D24K1: assembled valve made of inlet plate without compensator; 2 proportional working sections, closed center spool, flow rate 30/30; end plate with load sensing port; FPM seals, 24V DC coils and K1 connection.

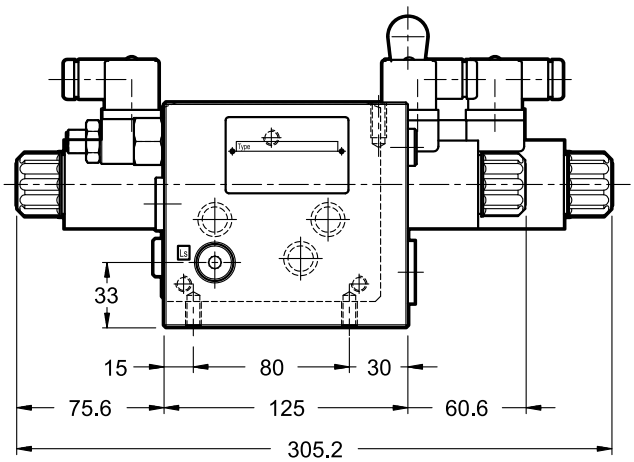
BLS6-CF5-PA45/30-PA45/30-PC30/30-PAB15/15-C91/21V-D12K1: assembled valve made of inlet plate for fixed pump (max pressure 210 bar); 2 proportional working sections, open center spool, flow rate 45/30; 1 proportional working section, closed center spool, flow rate 30/30 and 1 proportional working section with one solenoid only on side B, open center spool, flow rate 15/15; end plate without load sensing port; FPM seals; 12V DC coils with K1 connection.

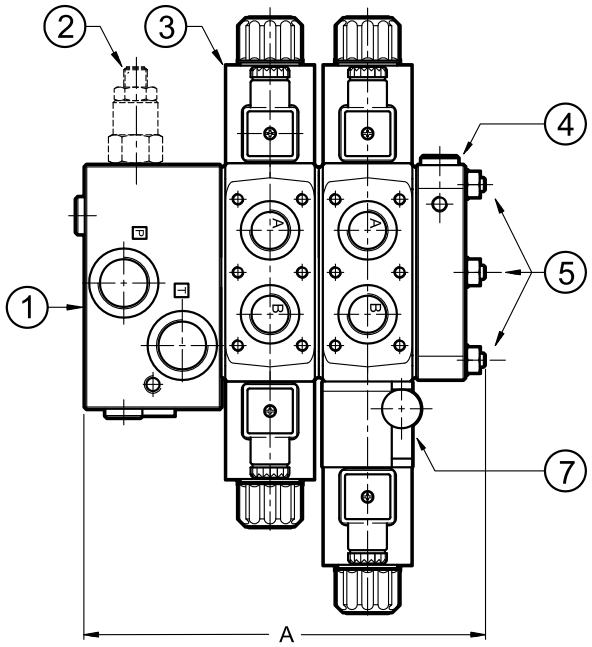
NOTE: For best performance, it is recommended to place the spool with the highest flow rate first, the others to follow, in descending order.

10 - INSTALLATION AND OVERALL DIMENSIONS OF THE ASSEMBLED VALVE

dimensions in mm







Modules	A (**NOTE**)	B
2	212	132,5
3	262	182,5
4	312	232,5
5	362	282,5
6	412	332,5
7	462	382,5
8	512	432,5

NOTE: 10 mm shorter with BLS6-C00 inlet plate

1	Inlet plate
2	Pressure relief valve
3	Proportional working section
4	End plate
5	Fixing studs
6	Fixing holes
7	Working section with lever override

Fixing kit

The fixing kit includes, all zinc-coated

3 studs,
3 nuts
3 washers

Tightening torque: 25 Nm

Please order using these codes:

No. of working sections	**Code**
2	3404150010
3	3404150011
4	3404150012
5	3404150013
6	3404150014
7	3404150015
8	3404150016

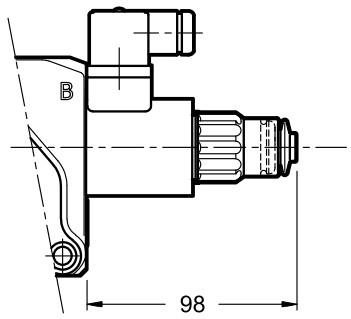
11 - MANUAL OVERRIDE

The standard working section has solenoids whose pin for the manual operation is integrated in the tube. The operation of this device must be done with a suitable tool, minding not to damage the sliding surface.

The following manual overrides are available:

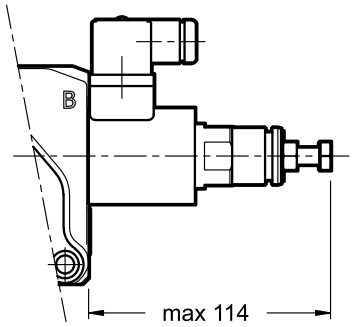
- **CM** version, boot protected.
- **CS** version, with metal ring nut provided with a M8 screw and a blocking locknut.
- **CK1** version, turning knob override.
- **CH** lever manual override.

CM Version



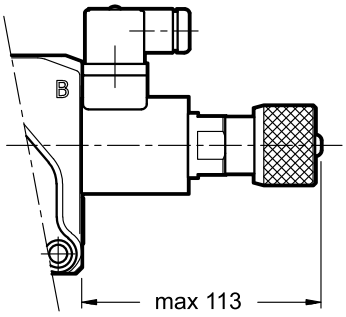
Code: 3401150006

CS Version



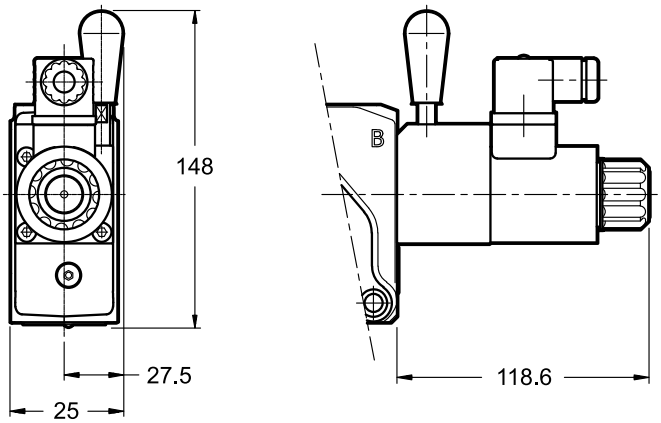
Code: 3803210006

CK1 Version



Code: 3401150031

CH Version



12 - ELECTRONIC CONTROL UNITS

One solenoid

EDC-111	for solenoid 24V DC	plug version	see cat. 89 120
EDC-141	for solenoid 12V DC		
EDM-M111	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 252
EDM-M141	for solenoid 12V DC		

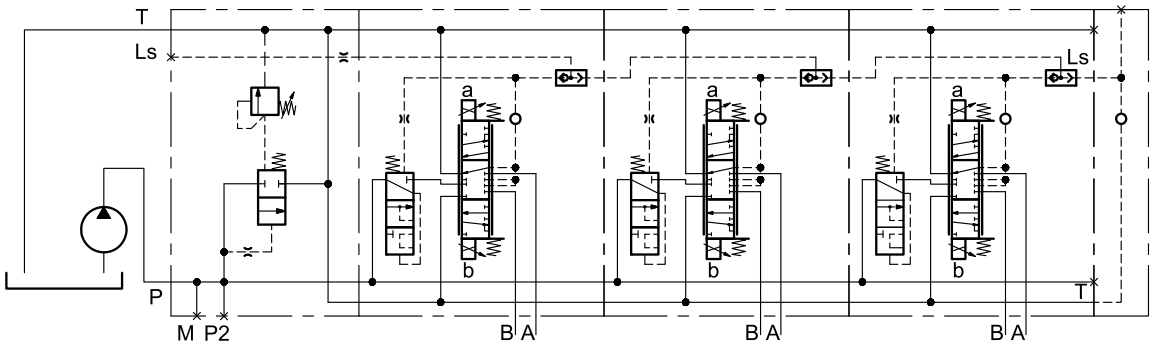
Two solenoids

EDM-M211	for solenoid 24V DC	rail mounting DIN EN 50022	see cat. 89 252
EDM-M241	for solenoid 12V DC		

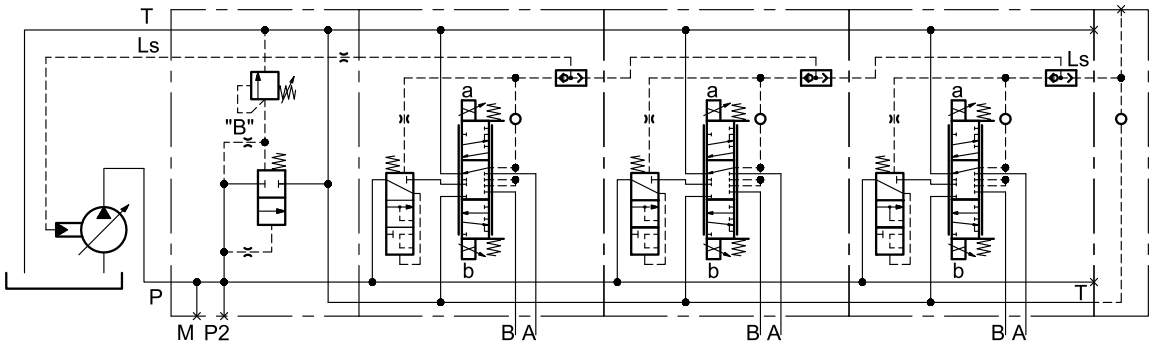
These cards can drive only a working section at once.

Every working section to be driven by electronic card must have its own.

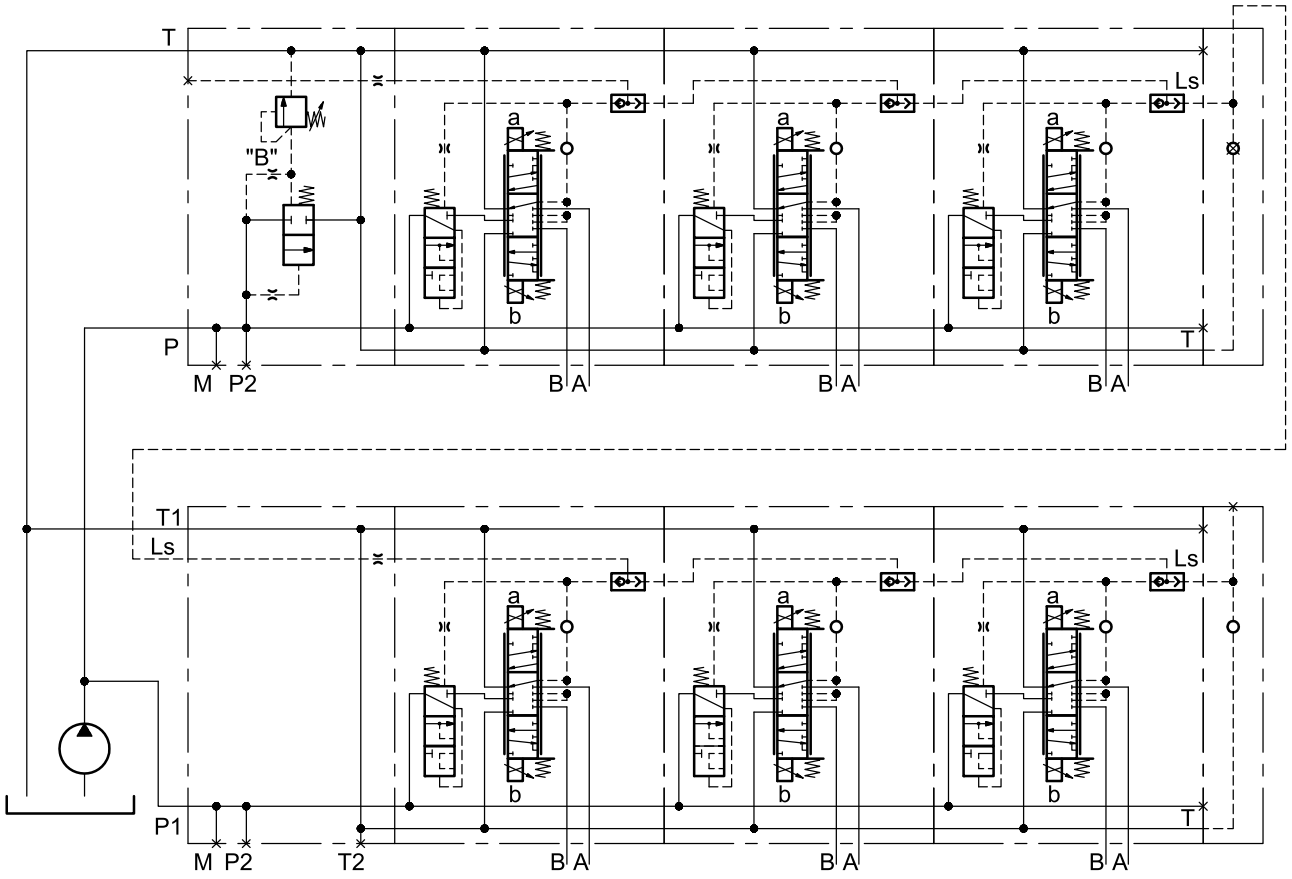
13 - APPLICATION EXAMPLES



BLS6 assembly with pressure relief valve, for fixed displacement pumps.



BLS6 assembly for systems with LS pump. The system is equipped with a pilot operated pressure relief valve, protecting the pump.



Example of BLS6 assemblies, parallel-linked to the pump and series-linked to LS line.

DUPLOMATIC
MOTION SOLUTIONS
a member of DAIKIN group

DUPLOMATIC MS Spa
via Mario Re Depaolini, 24 | 20015 Parabiago (MI) | Italy
T +39 0331 895111 | E vendite.ita@duplomatic.com | sales.exp@duplomatic.com
duplomaticmotionsolutions.com

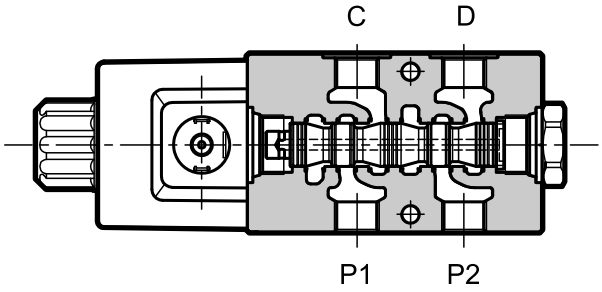


BFD*
SIX-PORTS FLOW DIVERTER

SERIES 10

p max **320** bar
Q max **90** l/min

OPERATING PRINCIPLE



— The BFD* modular solenoid valve is a six-port flow diverter that allows the simultaneous connection of two of the four working lines, switching between them by solenoid actuation.

— They are available in two sizes, depending on the flowrate, and they are used mainly for compact applications in mobile sector.

— Up to 5 diverters can be fastened together in stacked assemblies, working in series.

— The external drain is available as option on both sizes.

— The standard valve BFD06 is suitable to ensure a salt spray resistance up to 240 hours. To reach 600 hours of resistance WK* type coils with zinc-nickel treatment are needed.

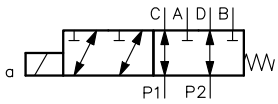
— The standard valve BFD10 is suitable to ensure a salt spray resistance up to 600 hours.

PERFORMANCES
(obtained with mineral oil with viscosity of 36 cSt at 50°C)

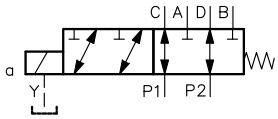
		BFD06	BFD10
Maximum operating pressure: - with drain Y - with drain Y1	bar	250 320 80	250 320 -
Maximum flow	l/min	60	90
Pressure drops Δp - Q	see point 3		
Electrical features	see point 6		
Operating limits	see point 4		
Electrical connections	see point 11		
Ambient temperature range	°C	-20 / +50	
Fluid temperature range	°C	-20 / +80	
Fluid viscosity range	cSt	10 ÷ 400	
Fluid contamination degree	according to ISO 4406:1999 class 20/18/15		
Recommended viscosity	cSt	25	
Mass	kg	3	3.5
Surface treatment	zinc-nickel		

HYDRAULIC SYMBOL

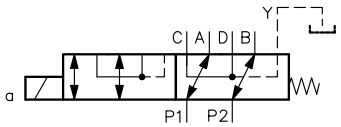
TA6 standard



TA6 with external drain Y

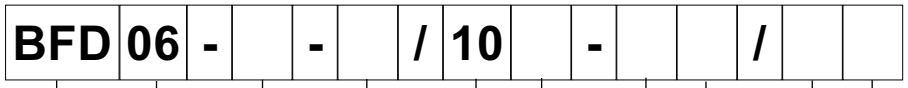


RTA69



1 - IDENTIFICATION CODE

1.1 - BFD06



Six-ports flow diverter, stackable

Nominal size 60 l/min

Ports:
G038 = 3/8" BSP
G012 = 1/2" BSP
S08 = 3/4" 16 UNF

Spool type (see point 2):
TA6
only for BFD06-G038. Mandatory Y1 option :
RTA69
RTB69

Series: (the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Coil type:
D12 = 12 V
D24 = 24 V
D28 = 28 V
D00 = valve without coils. The locking rings of the coils and the relevant O-Rings are supplied together with valves.

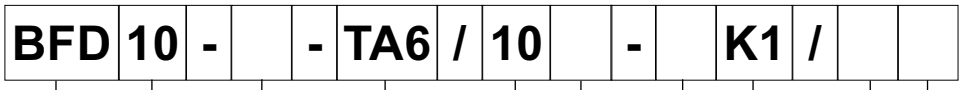
Option:
Y = drain port in mounting surface (see point 13.1)
For spool RT*69 only:
Y1 = BSP port for internal leakages drain (mandatory, see point 13.2)

Manual override: (see point 14)
Omit for override integrated in the tube (**standard**)
CM = boot protected
CK1 = knob

Coil electrical connection
WK1, WK7 and WK7D connections are available on D12 and D24 coils only (see point 6 and 11).
K1 = plug for EN 175301-803 connector (ex DIN 43650) (**standard**)
K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S

To obtain a salt spray resistance up to 600 hours, choose coil type:
WK1 = plug for EN 175301-803 connector (ex DIN 43650)
WK7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S.
WK7D = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S, with diode.
With WK * type coils, the CM manual override is standard, to protect the solenoid tube.

1.2 - BFD10



Six-ports flow diverter, stackable

Nominal size 90 l/min

Ports:
G012 = 1/2" BSP
S08 = 3/4" 16 UNF

Spool type (see point 2)

Series:
(the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Coil type:
D12 = 12 V
D24 = 24 V
D00 = valve without coils. The locking rings of the coils and the relevant O-Rings are supplied together with valves.

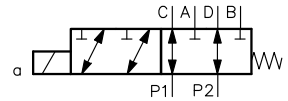
Coil connection with plug for EN 175301-803 connector (ex DIN 43650)

Option:
Y = drain port in mounting surface (see point 13.1)

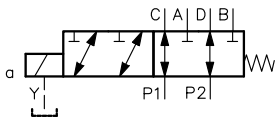
Manual override: (see point 14)
Omit for override integrated in the tube (**standard**)
CM = boot protected

2 - SPOOL TYPE

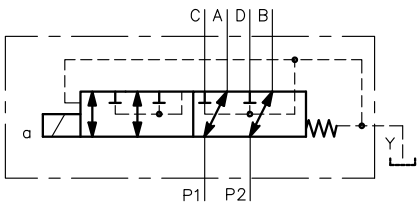
TA6



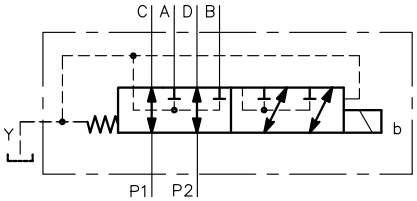
TA6 with external drain Y



RTA69 with external drain Y1



RTB69 with external drain Y1



2 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

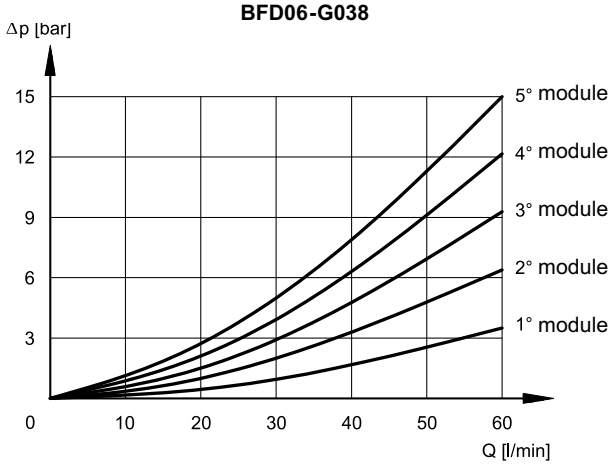
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

3 - CHARACTERISTIC CURVES

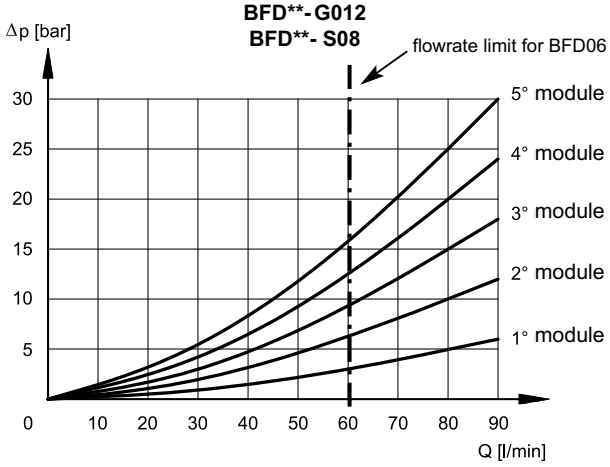
(obtained with viscosity 36 cSt at 50 °C)

Pressure drops Δp-Q at initial position

BFD06-G038



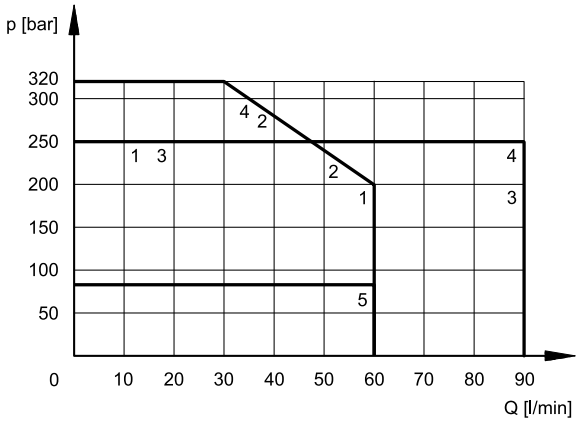
BFD- G012**
BFD- S08**



4 - OPERATING LIMITS

The curves define the flow rate operating fields according to the valve pressure of the different versions.

The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage. The values have been obtained with mineral oil, viscosity 36 cSt, temperature 50 °C and filtration according to ISO 4406:1999 class 18/16/13.



VALVE	CURVE
BFD06*	1
BFD06*/Y	2
BFD06- RT*69/Y1	5
BFD10*	3
BFD10*/Y	4

5 - SWITCHING TIMES

The indicated values have been obtained according to ISO 6403 standard, with mineral oil viscosity 36 cSt at 50 °C.

TIMES ms (±10%)	ENERGIZING	DE-ENERGIZING
BFD06	25 ÷ 75	20 ÷ 50
BFD10	50 ÷ 100	20 ÷ 40

6 - ELECTRICAL CHARACTERISTICS

6.1 - Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation.

Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP grade, correctly connected and installed.

electric connection	electric connection protection	whole valve protection
K1	IP65	IP65
WK1	IP66	IP66
K7	IP65/67	IP65
WK7, WK7D	IP66/IP68/IP69, IP69K*	

(*) The IP69K protection degree is not taken into account in IEC 60529 but it is included in ISO 20653.

SUPPLY VOLTAGE FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY	10.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC) (**NOTE**)	In compliance with 2014/30/EU
LOW VOLTAGE	In compliance with 2014/35/EU
CLASS OF PROTECTION Coil insulation (VDE 0580) Impregnation	 class H class F (BFD06) class H (BFD10)

NOTE: In order to further reduce the emissions, use of type H connectors is recommended. These prevent voltage peaks on opening of the coil supply electrical circuit (see cat. 49 000).

6.2 - Current and absorbed power

WK1, WK7 and WK7D coils have a zinc-nickel surface treatment and are specific for the high resistant version to salt spray.

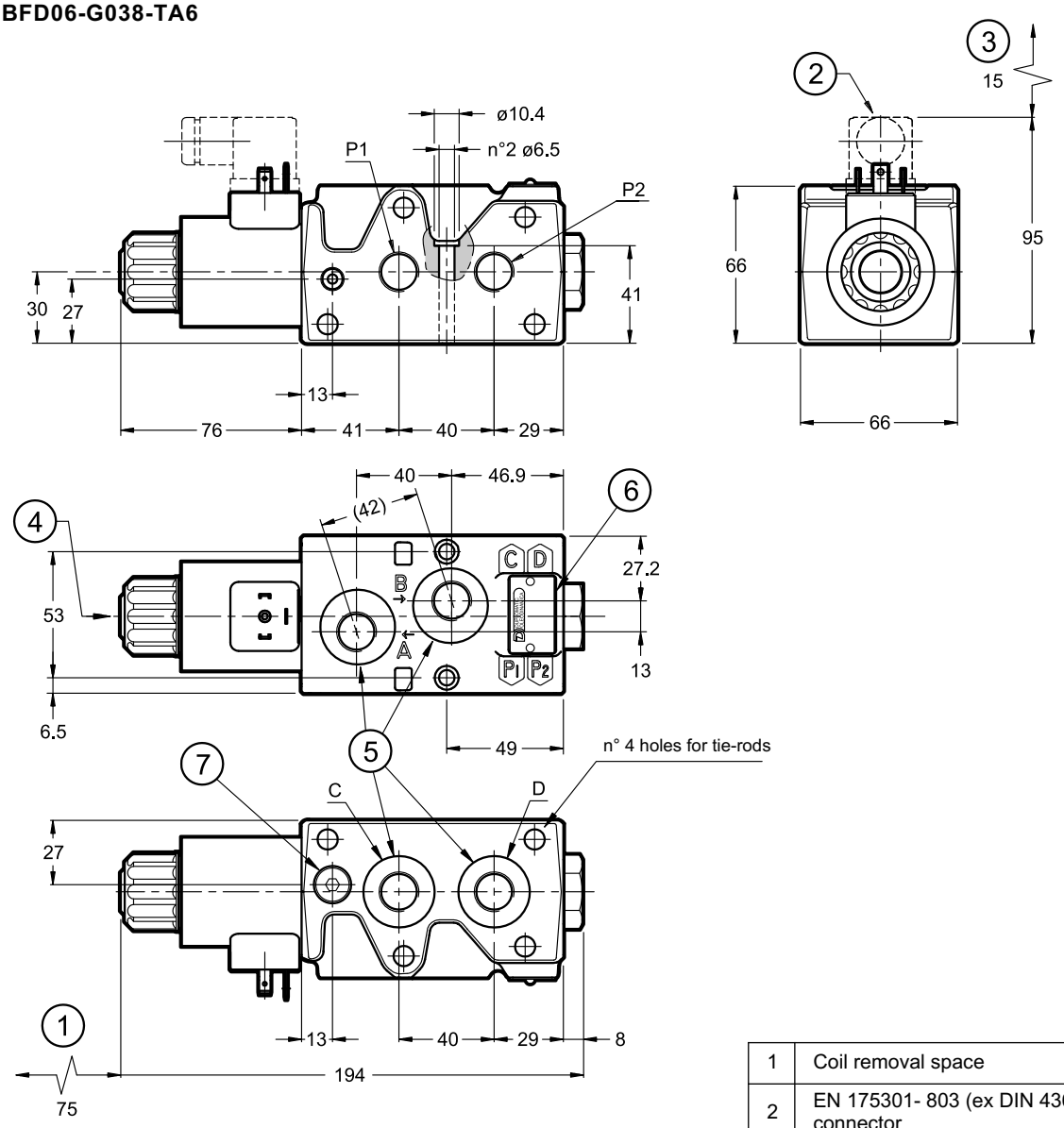
The WK7D coil includes a suppressor diode of pulses for protection from voltage peaks during switching. During the switching the diode significantly reduces the energy released by the winding, by limiting the voltage to 31.4V in the D12 coil and to 58.9 V in the D24 coil.

Valve	Coil	Resistance at 20°C [Ω] (±5%)	Current consumption [A] (±10%)	Absorbed power [W] (±10%)	Coil code				
					K1	WK1	K7	WK7	WK7D
BFD06	**D12**	4 ÷ 5	2,72	32,7	1903080	1903590	1902940	1903580	1903600
	D24	18 ÷ 19,5	1,29	31	1903081	1903591	1902941	1903581	1903601
	D28	24,5 ÷ 27	1,11	31	1903082				
BFD10	**D12**	2,9	4,14	50	1903150				
	D24	12,3	1,95	47	1903151				

7 - BFD06-G038 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

BFD06-G038-TA6

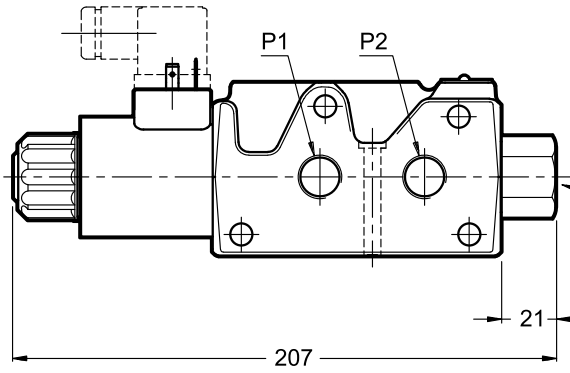


1	Coil removal space
2	EN 175301- 803 (ex DIN 43650) electrical connector
3	Connector removal space (shown with standard connection type K1 - for K7 connection see point 11)
4	Standard manual override included in the solenoid tube
5	Ports: 3/8” BSP
6	Identification label
7	Option: external drain port Y 1/8” BSP

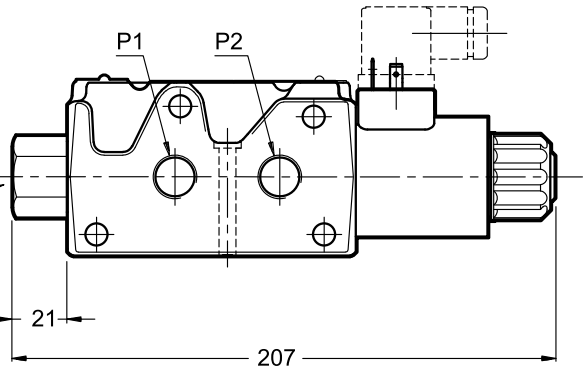
Fastening of single valve: 4 SHC screws ISO 4762 M6x50
Tightening torque: 8 Nm (A8.8 screws)
Threads of mounting holes: M6x12

7.1 - Versions with external drain Y1

BFD06-G038-RTA69/*/Y1



BFD06-G038-RTB69/*/Y1



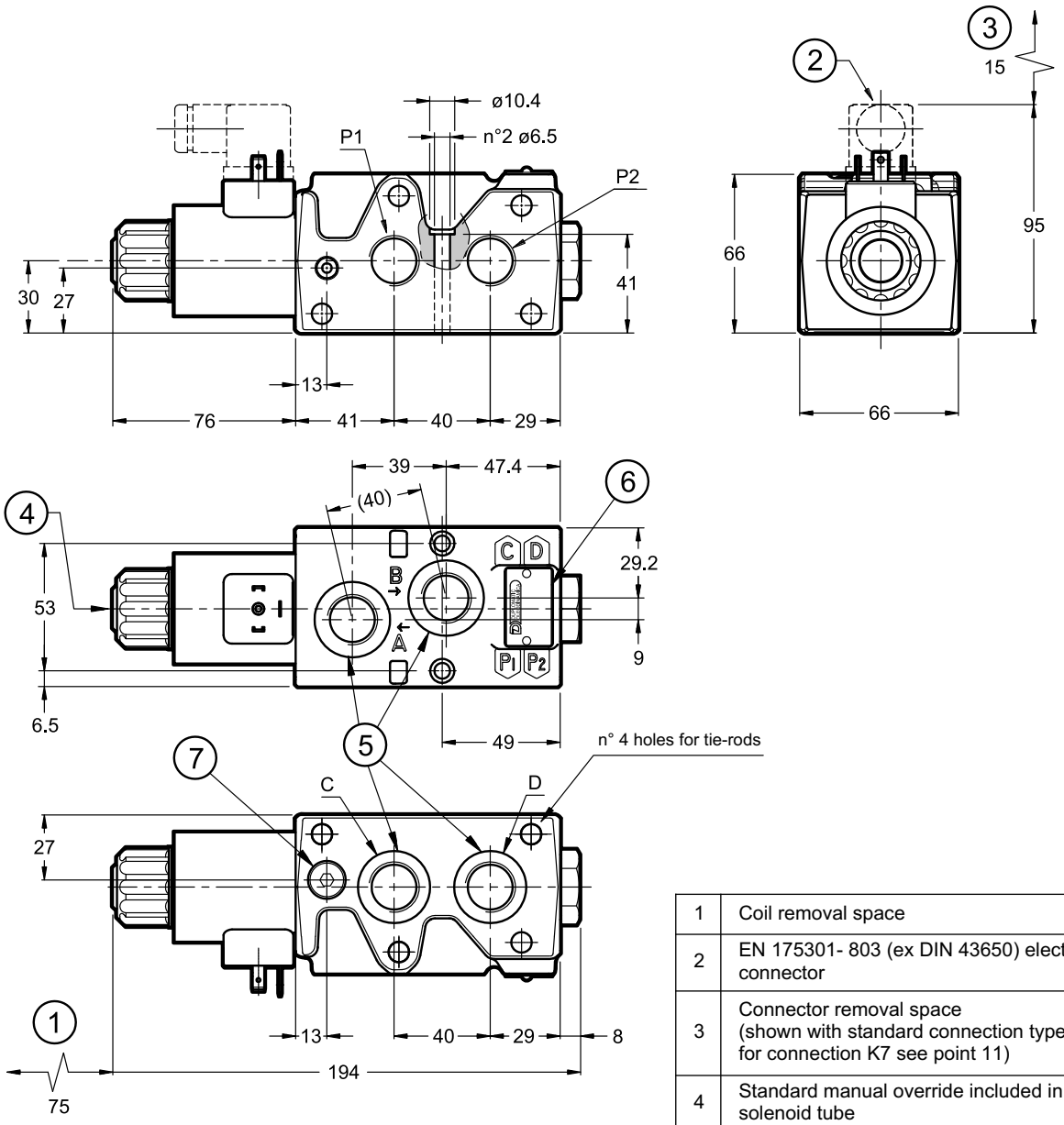
dimensions in mm

NOTE: refer to the overall dimensions on page 5 for the missing dimensions.

1	Y1 drain port in the cap: 1/4” BSP

8 - BFD06-G012 AND BFD06-S08 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

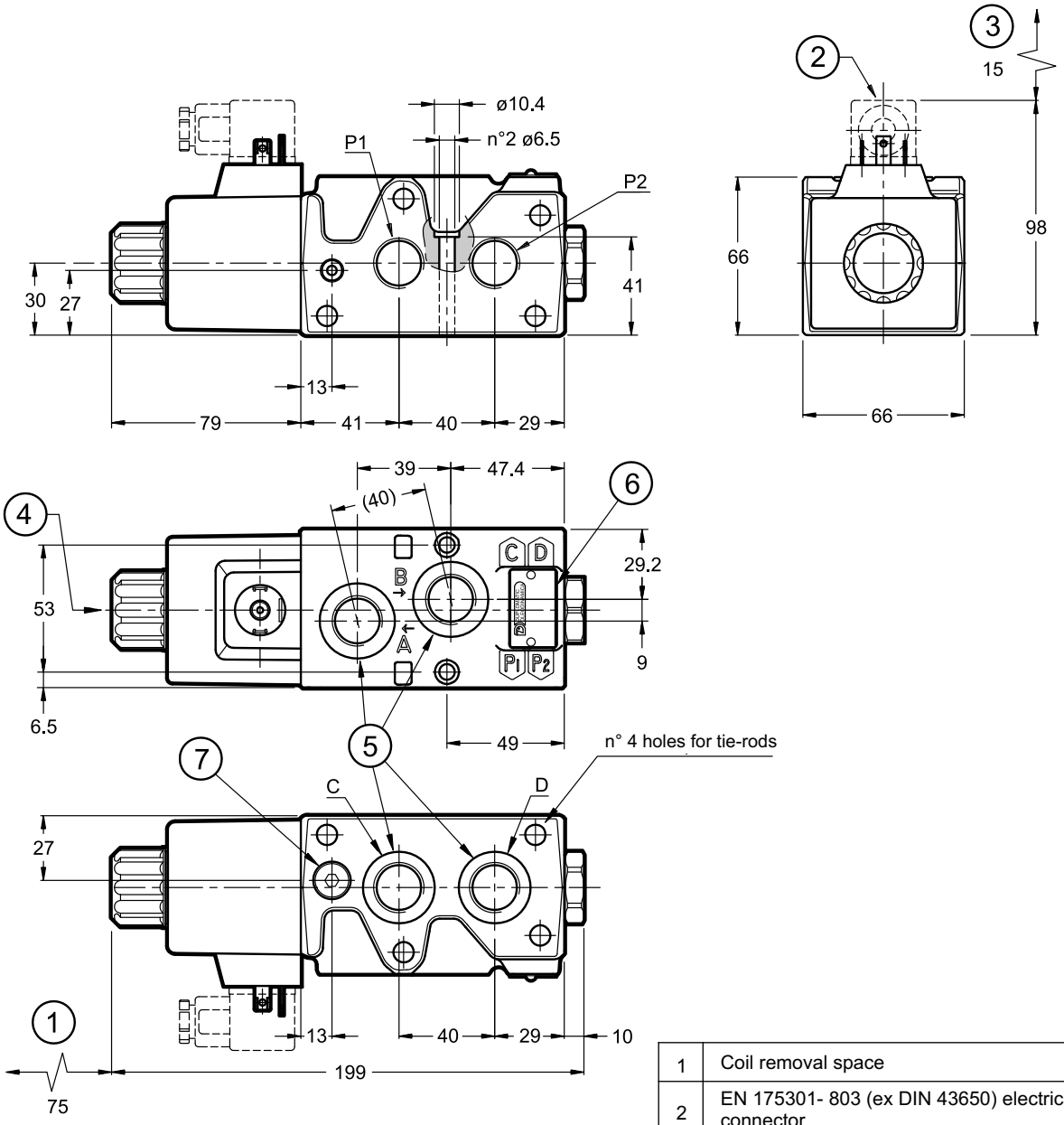


1	Coil removal space
2	EN 175301- 803 (ex DIN 43650) electrical connector
3	Connector removal space (shown with standard connection type K1 - for connection K7 see point 11)
4	Standard manual override included in the solenoid tube
5	BFD06-G012: ports 1/2” BSP BFD06-S08: ports 3/4”-16UNF-2B
6	Identification label
7	Option: external drain port Y 1/8” BSP

Fastening of single valve: 4 SHC screws ISO 4762 M6x50
Tightening torque: 8 Nm (A8.8 screws)
Threads of mounting holes: M6x12

9 - BFD10 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	Coil removal space
2	EN 175301- 803 (ex DIN 43650) electrical connector
3	Connector removal space
4	Standard manual override included in the solenoid tube
5	BFD10-G012: ports 1/2” BSP BFD10-S08: ports 3/4”-16UNF-2B
6	Identification label
7	Option: external drain port Y 1/8” BSP

Fastening of single valve: 4 SHC screws ISO 4762 M6x50
Tightening torque: 8 Nm (A8.8 screws)
Threads of mounting holes: M6x12

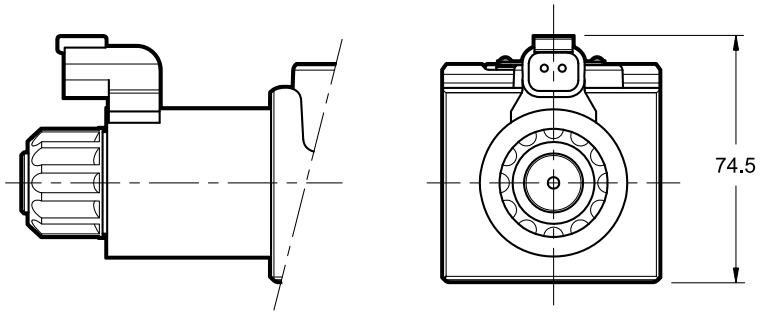
10 - INSTALLATION

The solenoid valve can be installed in any position without affecting its operation.

11 - ELECTRICAL CONNECTIONS

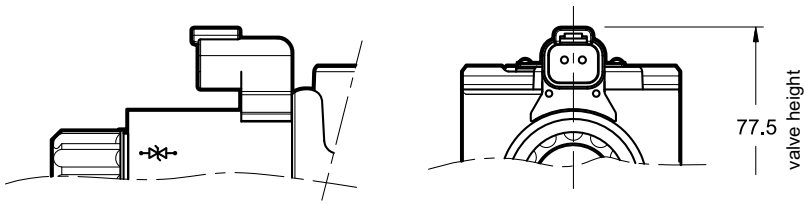
K1 and WK1 connections (for EN 175301- 803 connector) are described in the dimension drawings. K7, WK7 and WK7D connections are available for BFD06* valves only.

connection for plug DEUTSCH DT04-2P
for connector type DEUTSCH DT06-2S,
male
code **K7**



W7 versions:
connection for plug DEUTSCH DT04-2P
for connector type DEUTSCH DT06-2S,
male

code **WK7**
code **WK7D** coil with diode



12 - ELECTRICAL CONNECTORS

The solenoid valves are supplied without connectors. For coils with standard electrical connection K1 type EN 175301- 803 (ex DIN 43650) the connectors can be ordered separately: see catalogue 49 000.

13 - OPTIONS

13.1 - Subplate external drain port (option Y)

This version allows the operation with pressures up to 320 bar on the ports.

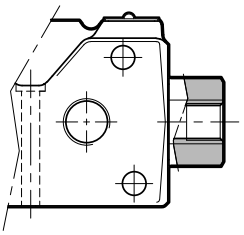
It consists in a Y drain hole realized on the valve interface, where the Y port is connected with the solenoid tubes: in this way the tubes are not stressed by the pressure operating on the valve ports.

13.2 - External drain through plug (Y1)

This version is used for interchange function in the control circuits of the pilot lines: it drains the inactive lines through the 1/4 "BSP side drain plug (Y1 connection)

This ensures that loads on idle lines are not subjected to unwanted movement.

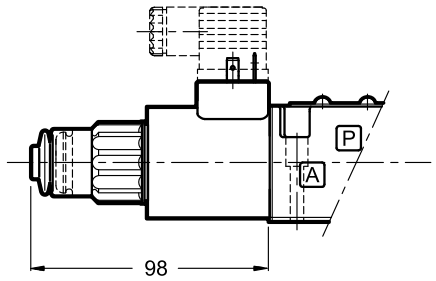
Connect Y1 port to an appropriate drain line.



14 - MANUAL OVERRIDES

These valves have solenoids whose pin for manual operation is integrated in the tube. Actuate this override by pushing it with a suitable tool, minding not to damage the sliding surface.

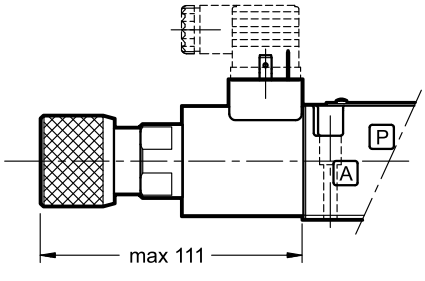
14.1 - CM manual override boot protected.



Code: 3401150006

14.2 - CK1 turning knob override.

Available for BFD06 only



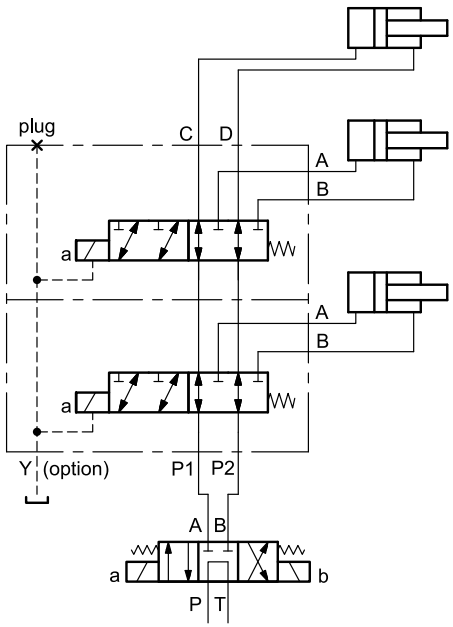
Code: 3403350002

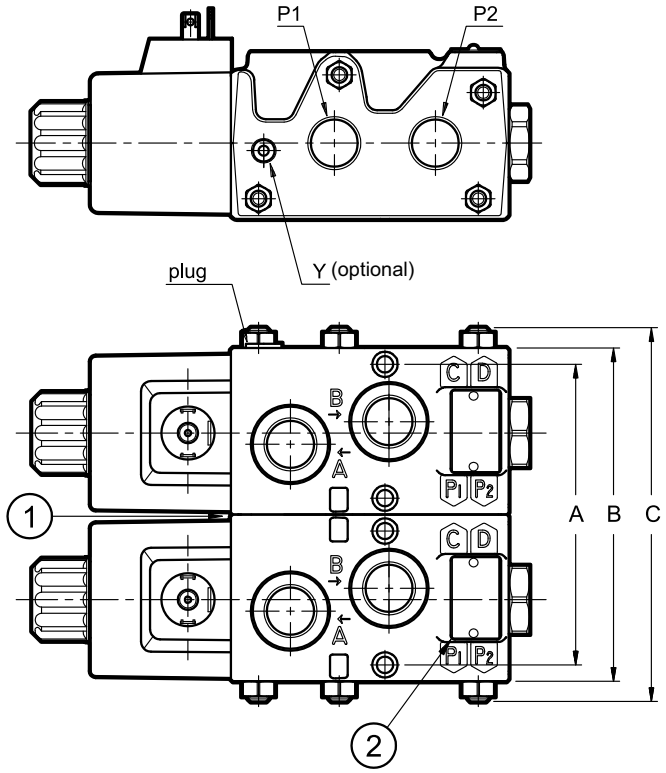
15 - SERIES CONFIGURATION

The BFD* valves can also be assembled in series, bundled up to 5 modules. The fixing kit must be ordered separately.
It includes: rods and screws, nuts, security washers and OR, as indicated in the table below.

15.1 - Hydraulic scheme, dimensions and installation

MOUNTING EXAMPLE





1	Mounting surface with sealing rings: OR 2106 (26.7x1.78) 90 shore Additional for Y version only: OR 2050 (12,42x1,78) 90 shore
2	Identification label

Tightening torque: 17 Nm

modules no.	ways no.	A	B	C	bolts or tie-rods	nuts & washers	Qty. OR 2106	Qty. OR 2050	kit BFD*/10N	kit BFD*/10V
2	8	119	132	156	4 bolts M8x145	4+4	2	1	3404200002	3404200012
3	10	185	198	220	4 tie-rods M8x200	8+8	4	2	3404200003	3404200013
4	12	251	264	285	4 tie-rods M8x265	8+8	6	3	3404200004	3404200014
5	14	317	330	350	4 tie-rods M8x330	8+8	8	4	3404200005	3404200015

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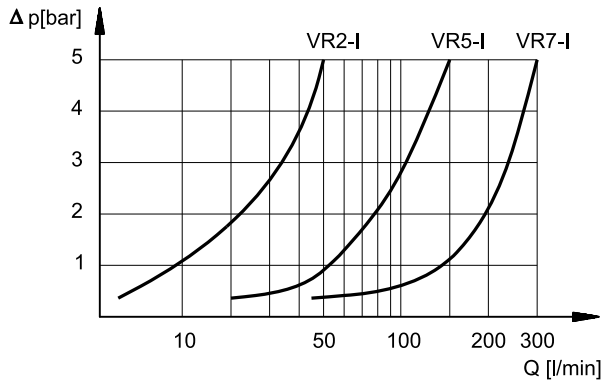


VR*-I
CHECK VALVES
SERIES 32

CARTRIDGE TYPE

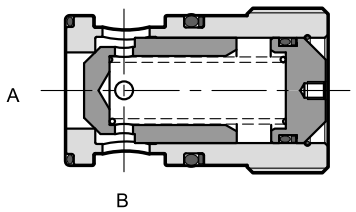
p max (see table of performances)
Q max (see table of performances)

PRESSURE DROPS ΔP-Q



– Add the cracking pressure to the values shown in the diagram.
– Curves measured using mineral oil with viscosity of 36 cSt at 50 °C.

OPERATING PRINCIPLE



— VR*-I valves are one-way check valves with spring, cartridge type, that can be used in blocks or panels.
— In rest conditions, the valve poppet, which is a cone on edge seal type, is kept closed by a spring with fixed setting.
— The poppet opens when the pressure at the inlet port “A” exceeds the set value of the spring, additional to any pressure in the outlet port “B”.
— Available in three sizes for flow rates of up to 300 l/min. Three cracking pressures values available.
— The zinc-nickel finishing treatment makes the VR*-I suitable to withstand exposure to salt spray for 600 hours. (value established according to UNI EN ISO 9227 and UNI EN ISO 10289)

PERFORMANCES

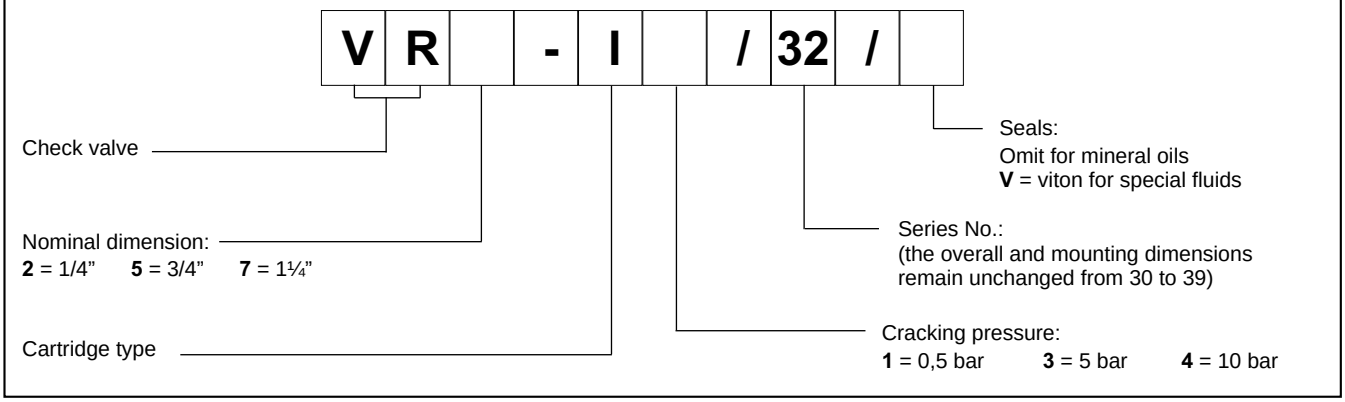
valve code	nominal dimension	maximum flow rate [l/min]	mass [kg]	max operating pressure [bar]	
				continuous	peak
VR2-I	1/4”	50	0,1	320	320
VR5-I	3/4”	150	0,2	250	320
VR7-I	1¼”	300	0,8		

Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	according to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Surface finishing	zinc-nickel surface treatment	

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE



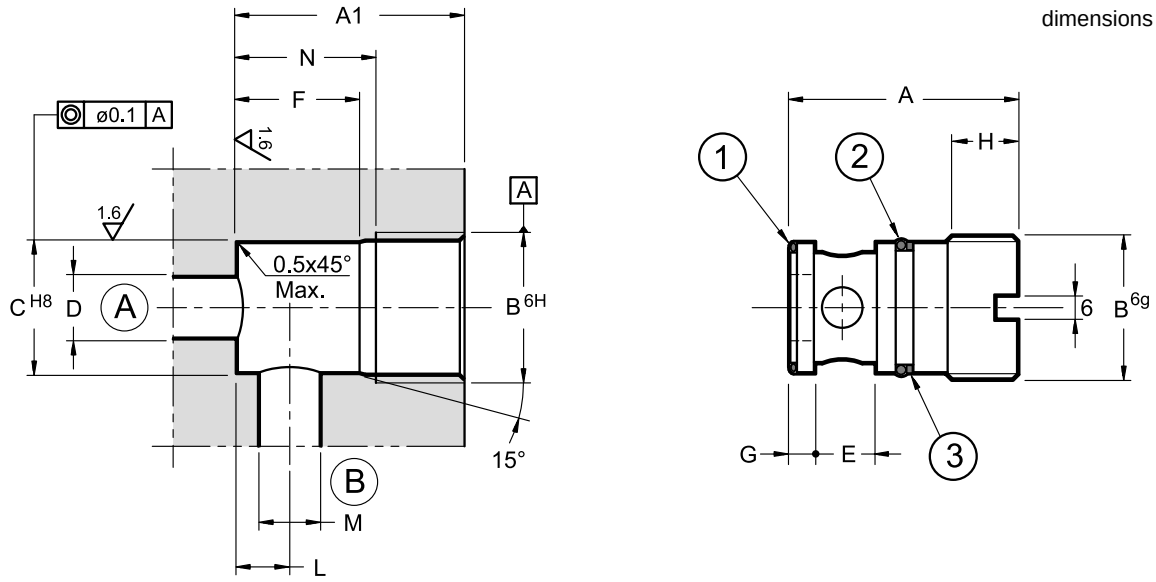
2 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

3 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



NOTE: the dimension **A1** must be at least 1 mm higher than the dimension **A** indicated in the table here below.

	A	B	ØC	ØD max	E	F	G	H	L	ØM max	N	1	2	3	tightening torque
VR2-I	41	M24x1,5	22	9	10	22	4	14	9	9	26	OR 119 (15.08x2.62) 70 Sh	OR 3068 (17.13x2.62) 70 Sh	Parbak 8-115	25 Nm
VR5-I	43	M30x1,5	27	15	13,5	26	4,5	12,5	11	12	30	OR 3081 (20.24x2.62) 90 Sh	OR 2093 (23.52x1.78) 70 Sh	Parbak 8-021	50 Nm
VR7-I	72	M45x2	41	21	20	40	7,5	22	16,5	16	49	OR 3137 (34.60x2.62) 70 Sh	OR 4137 (34.52x3.53) 90 Sh	Parbak 8-220	80 Nm

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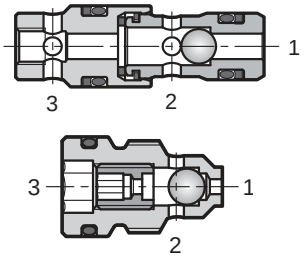


VSK*
SHUTTLE VALVE
SERIES 10

CARTRIDGE TYPE

p max **350** bar
Q max (see table of performances)

OPERATING PRINCIPLE



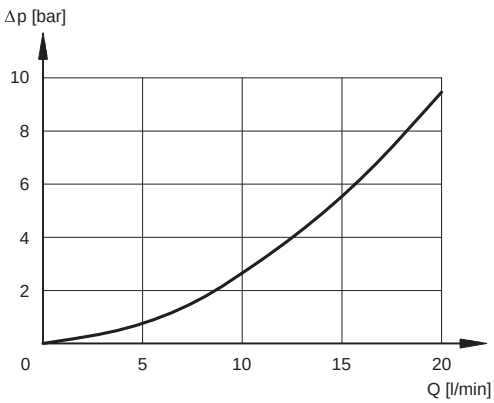
— The VSK* valves are shuttle type, cartridge version and it can be used in panels and blocks.

— The valve select the higher pressure signal between “1” and “3” through the output port “2”

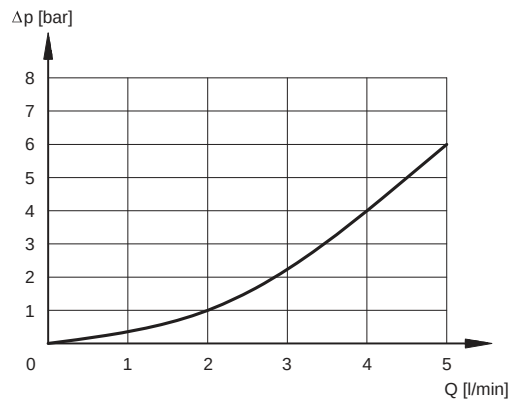
— The VSK1 reachs flows up to 20 l/min.

— The VSK2 is a shuttle valve for pilot signals up to a 3 l/min flows.

VSK1 PRESSURE DROPS Δp-Q



VSK2 PRESSURE DROPS Δp-Q

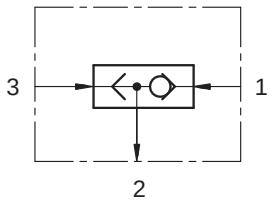


PERFORMANCES

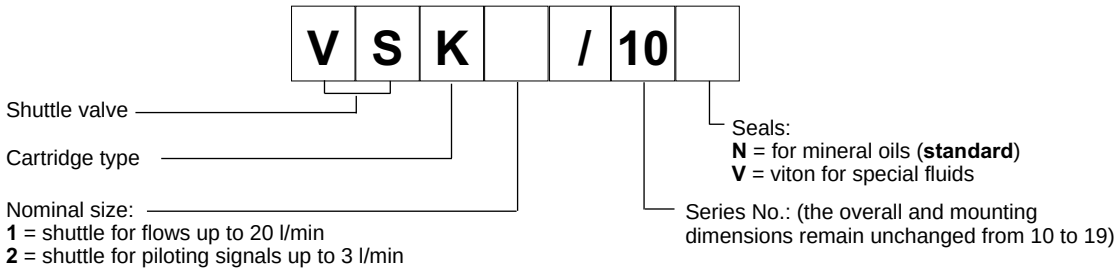
valve	max flow [l/min]	mass [kg]
VSK1	20	0,013
VSK2	3	0,013

Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25

HDRAULIC SYMBOL



1 - IDENTIFICATION CODE

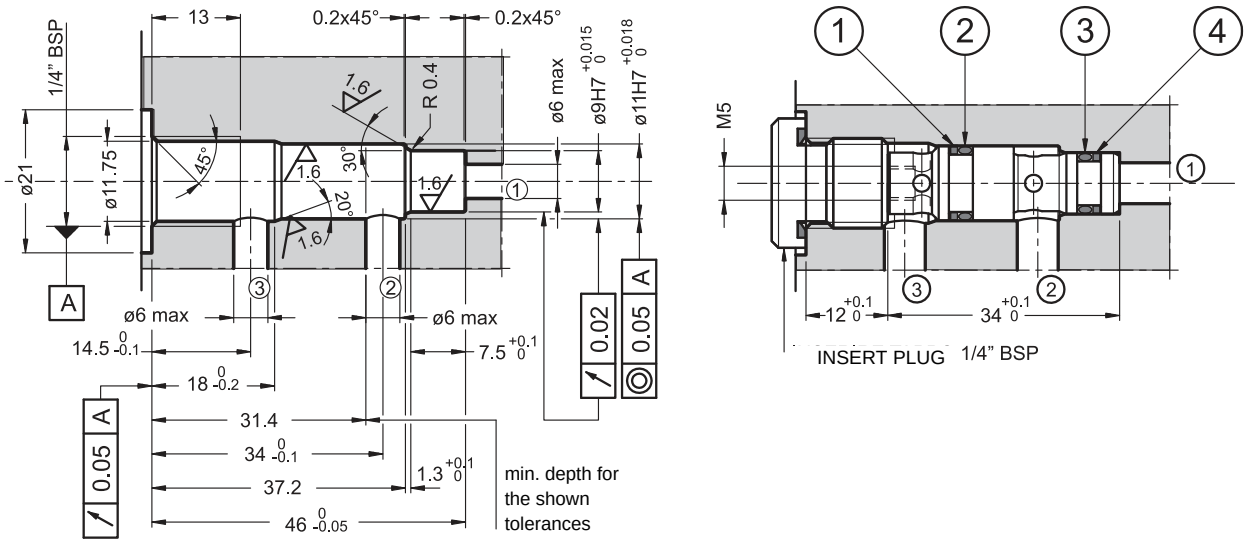


2 - HYDRAULIC FLUIDS

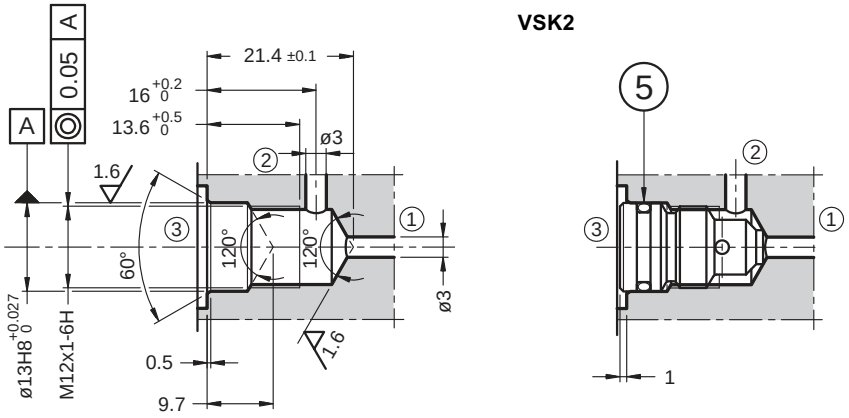
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

3 - OVERALL AND MOUNTING DIMENSIONS

VSK1



VSK2



dimensions in mm

1	Parbak 8-011 (8.36x1.14x1.35)
2	OR type 2031 (7.66x1.78)
3	OR type 2025 (6.07x1.78)
4	Parbak 8-010 (6.78x1.14x1.35)
5	N. 5 OR type 2037 (9.25x1.78)

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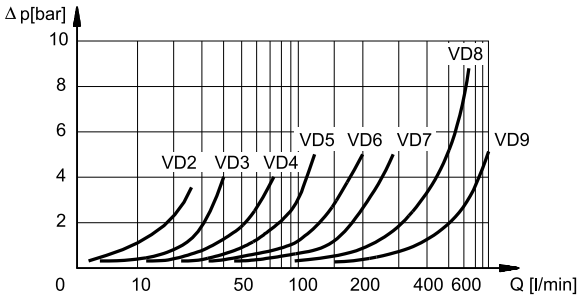
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VD*-W*
CHECK VALVES
SERIES 30

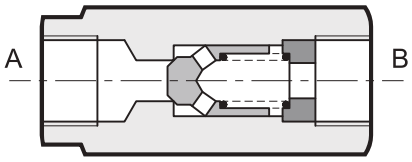
p max **400** bar
Q max (see table of performances)

PRESSURE DROPS Δp-Q



– Add the cracking pressure to the values shown in the diagram.
– Curves measured using mineral oil with viscosity of 36 cSt at 50°C.

OPERATING PRINCIPLE



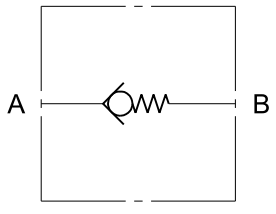
— VD*-W* valves are check valves with threaded “BSP” ports for mounting in-line on hydraulic lines.
— They allow the flow to pass freely in one direction, blocking it in the opposite direction.
— In rest conditions, the valve poppet is kept closed by a spring. The poppet opens when the pressure in the intake line “A” exceeds the set value of the spring, added to any pressure in the outlet line “B”.
— Available in eight sizes for flow rates of up to 850 l/min and with five different cracking pressures.

PERFORMANCES

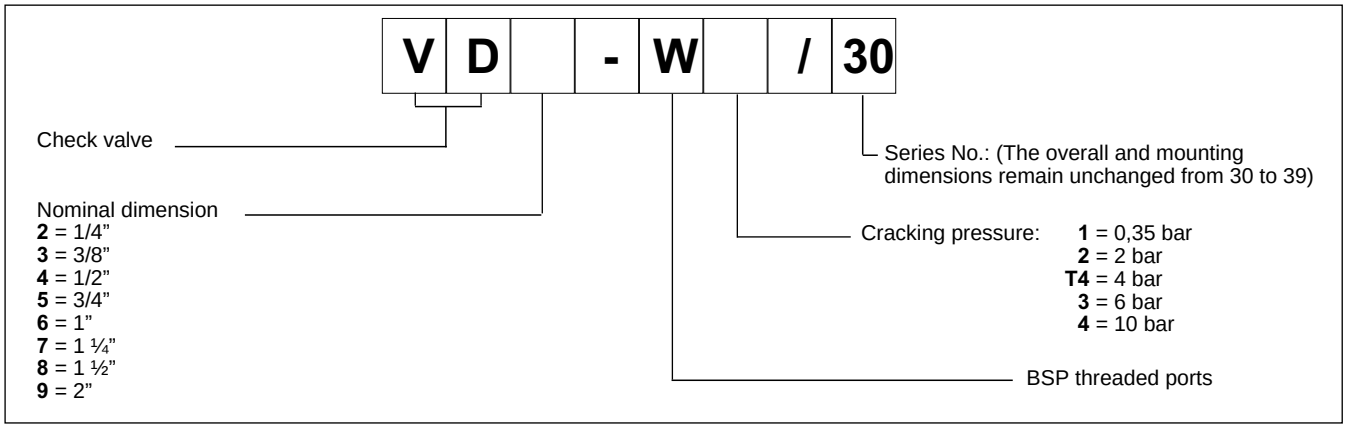
Valve	BSP port dimension	Maximum flow rate [l/min]	Mass [kg]	Max operating pressure [bar]
VD2-W*	1/4”	25	0,17	400
VD3-W*	3/8”	40	0,26	
VD4-W*	1/2”	75	0,41	
VD5-W*	3/4”	125	0,6	
VD6-W*	1”	200	1,2	320
VD7-W*	1 ¼”	280	1,8	
VD8-W*	1 ½”	650	3,2	
VD9-W*	2”	850	4,8	

Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	cSt	25
Recommended viscosity	acc. to ISO 4406:1999 class 20/18/15	

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

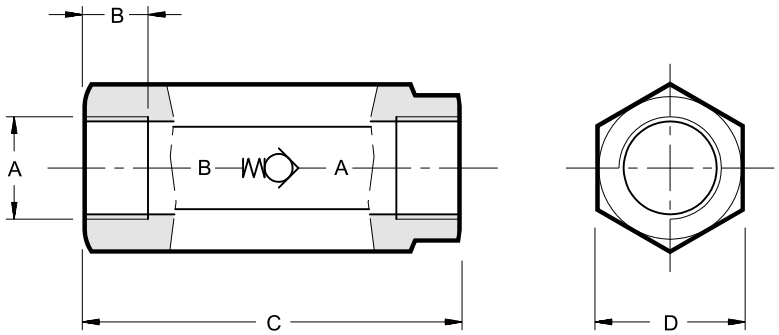


2 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4.
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

3 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



Valve	A BSP	B	C	D
VD2-W*	1/4”	12,5	63	22
VD3-W*	3/8”	12,5	69	27
VD4-W*	1/2”	15,5	80,5	32
VD5-W*	3/4”	17	99,5	36
VD6-W*	1”	20	117	46
VD7-W*	1 ¼”	22	134,5	55
VD8-W*	1 ½”	24	159	65
VD9-W*	2”	31	198	75

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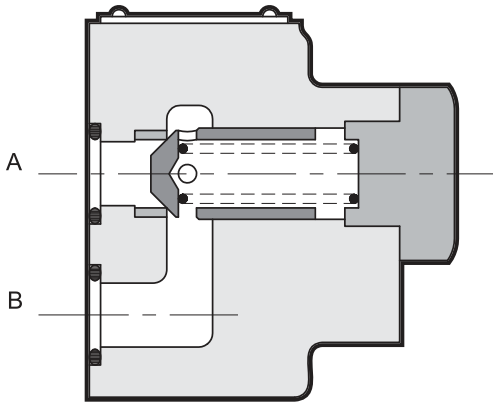


VR*-P
CHECK VALVES

SUBPLATE MOUNTING

p max (see table of performances)
Q max (see table of performances)

OPERATING PRINCIPLE



— VR*-P valves are one-way check valves constructed in the subplate mounting version.

— In rest conditions, the valve poppet, which is a cone on edge seal type, is kept closed by a spring with fixed setting.

— The shutter opens when the pressure in the intake line “A” exceeds the set value of the spring, added to any pressure in the outlet line “B”.

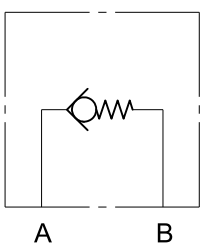
— Available in three sizes for flow rates up to 400 l/min and with three different cracking pressures.

TECHNICAL SPECIFICATIONS

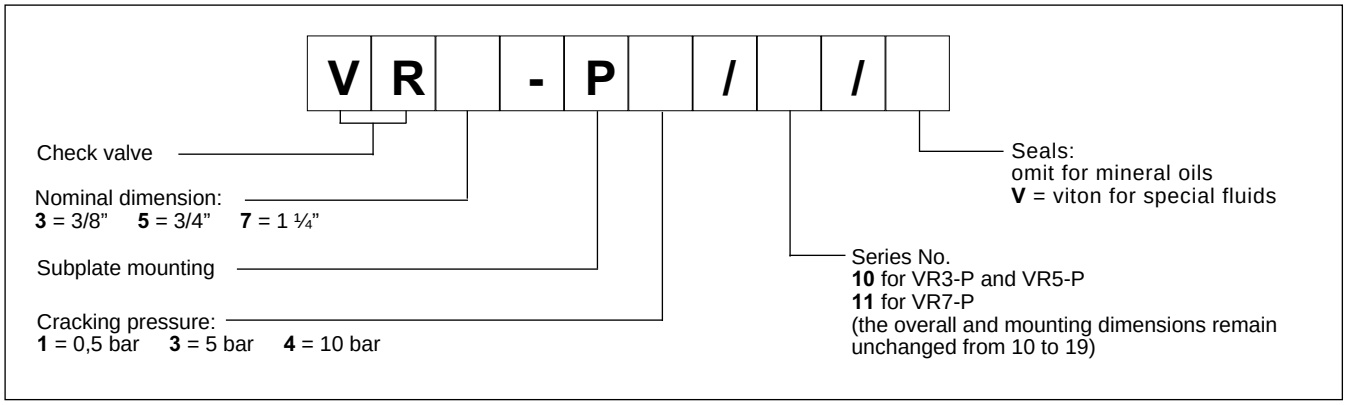
Valve code	Nominal dimension	Maximum flow rate [l/min]	Mass [kg]	Max. operating pressure [bar]
VR3 - P	3/8”	100	2,3	350
VR5 - P	3/4”	200	4,8	350
VR7 - P	1¼”	400	9	250

Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25

HYDRAULIC SYMBOL

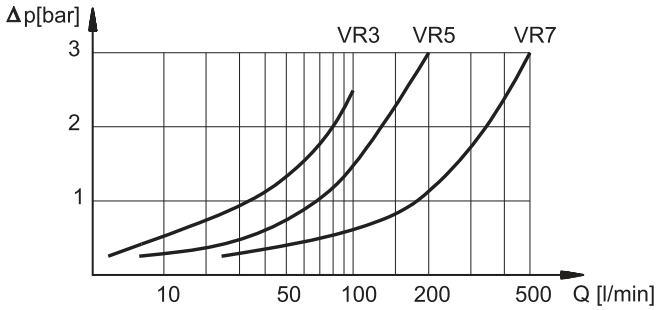


1 - IDENTIFICATION CODE



2 - CHARACTERISTIC CURVES (values obtained with viscosità 36 cSt at 50°C)

. **PRESSURE DROPS Δp - Q**



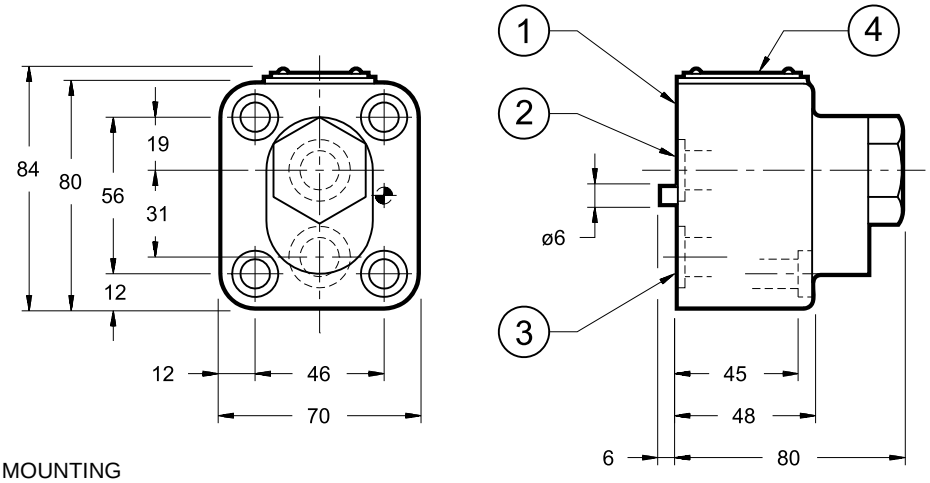
NOTE: Add the cracking pressure to the values shown in the diagram.

3 - HYDRAULIC FLUIDS

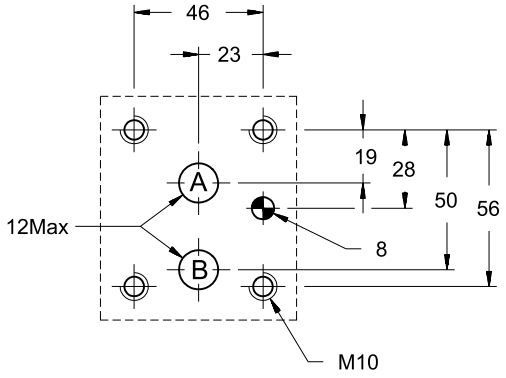
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

4 - VR3-P OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



MOUNTING SURFACE

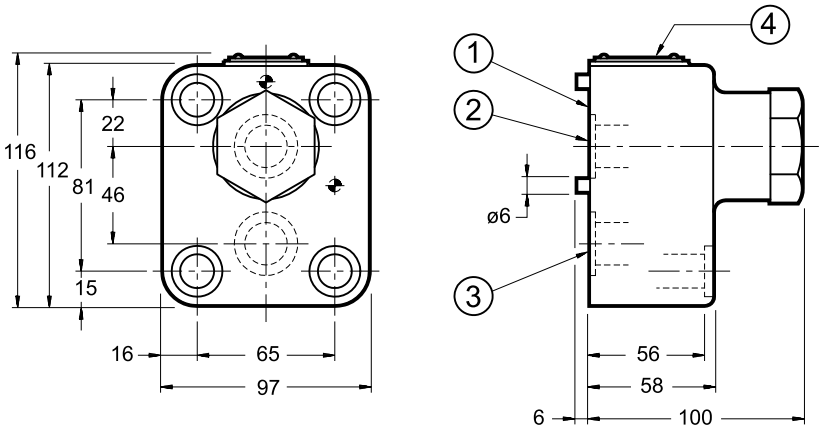


FASTENING BOLTS
4bolts M10x60
Torque: 40 Nm

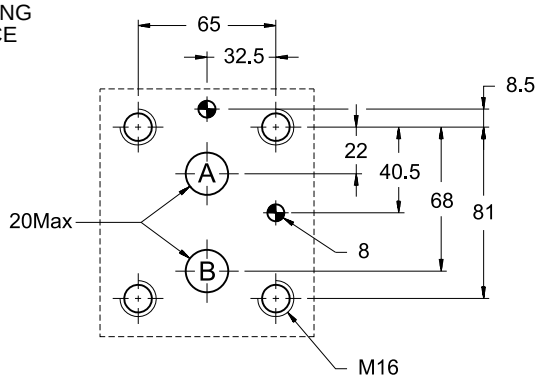
1	Mounting surface with sealing rings: 2 OR type 3068 (17.13x2.62)
2	Intake port A
3	Outlet port B
4	Identification label

5 - VR5-P OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



MOUNTING SURFACE

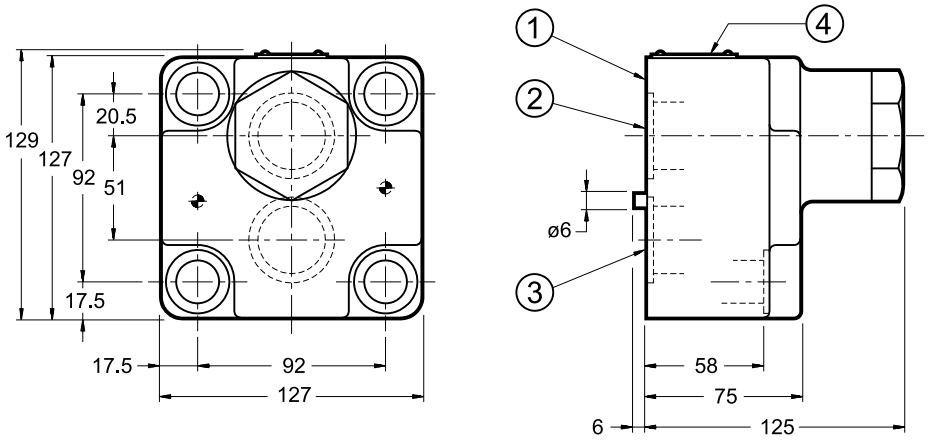


FASTENING BOLTS
4 bolts M16x80
Torque: 170 Nm

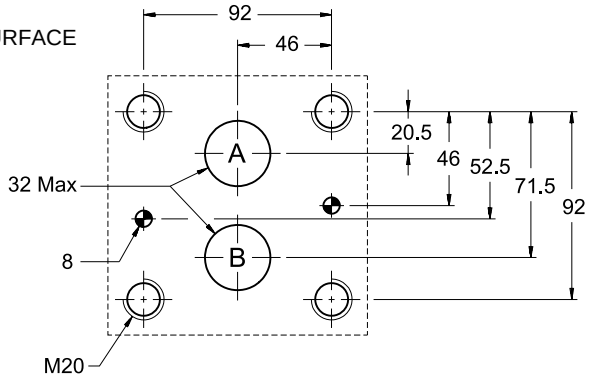
1	Mounting surface with sealing rings: 2 OR type 3100 (25.07x2.62)
2	Intake port A
3	Outlet port B
4	Identification label

6 - VR7-P OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



MOUNTING SURFACE



FASTENING BOLTS
4 bolts M20x90
Torque: 285 Nm

1	Mounting surface with sealing rings: N. 2 OR type 4137 (34.52x3.53) Shore 90
2	Intake port A
3	Outlet port B
4	Identification label

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VP*-P*-MU

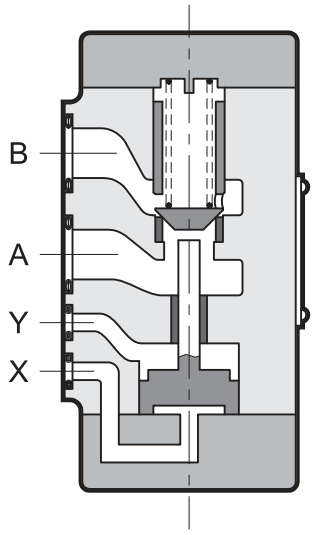
HYDRO-PILOT OPERATED CHECK VALVES

SERIES 12

SUBPLATE MOUNTING
ISO 5781 (CETOP 06 07)

p max **320** bar
Q max (see table of performances)

OPERATING PRINCIPLE



— VP*-P*-MU valves are check valves with hydraulic release, constructed in a version with subplate mounting in accordance with ISO 5781 (CETOP RP 121H) standards.

— They incorporate the functions of a normal one-way check valve with the facility, by means of external piloting, to release the poppet and allow the oil to pass also in the direction opposite to the free flow, from B to A.

— In rest conditions, the valve poppet, which is a cone on edge seal type, is kept closed by a spring with fixed setting. When piloting pressure is sent to port X, the release piston is operated, thus opening the main poppet and allowing the free flow from B to A.

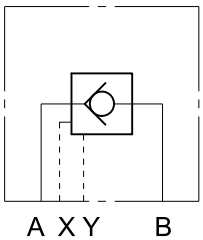
— The drainage port Y isolates the front face of the control piston from chamber A.

— They are available in two sizes for flow rates up to 100 l/min and with different cracking pressures in the free flow direction.

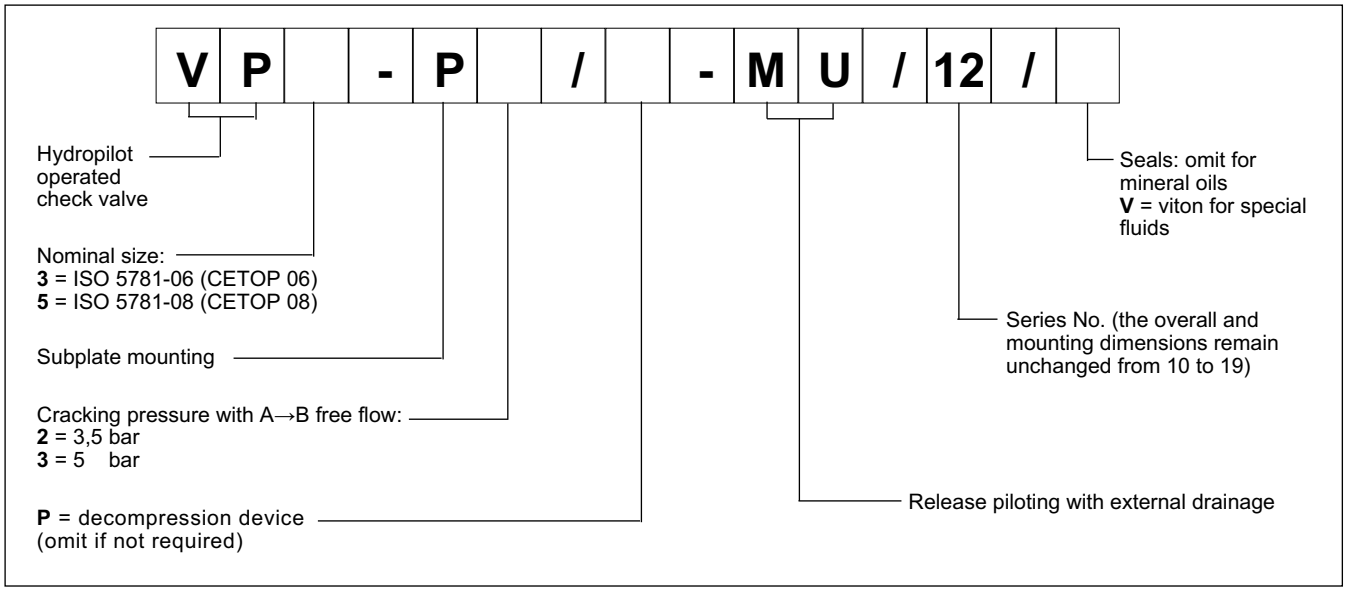
PERFORMANCES (working with mineral oil of viscosity of 36 cSt at 50°C)

		VP3	VP5
Maximum operating pressure	bar	320	320
Nominal flow rate	l/mn	50	100
Piloting ratio between release piston and sealed chamber areas	VP*-P*-MU	3,4:1	2,7:1
Piloting ratio with decompression device	VP*-P*/P-MU	12:1	14:1
Ambient temperature range	°C	-20 / +50	
Fluid temperature range	°C	-20 / +80	
Fluid viscosity range	cSt	10 ÷ 400	
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15		
Recommended viscosity	cSt	25	
Mass:	kg	3,7	6

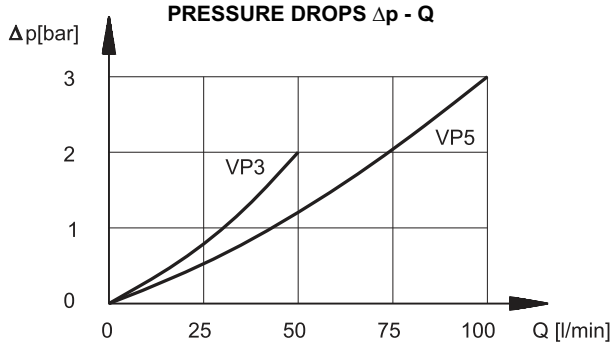
HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE



2 - CHARACTERISTIC CURVES (values obtained with viscosity 36 cSt at 50°C)



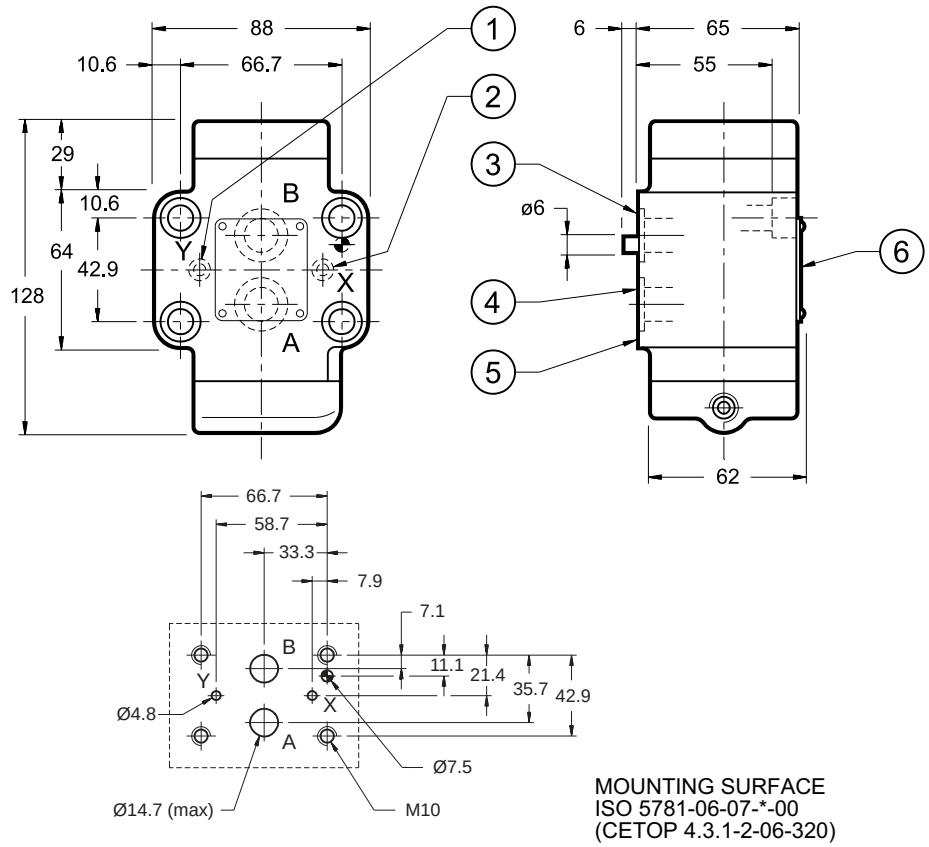
NOTE: The curves shown in the graph refer to B→A and A→B flow with the valve released hydraulically.
For A→B flow, with the valve not released hydraulically, add the cracking pressure to the values shown.

3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

4 - VP3-P*-MU OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



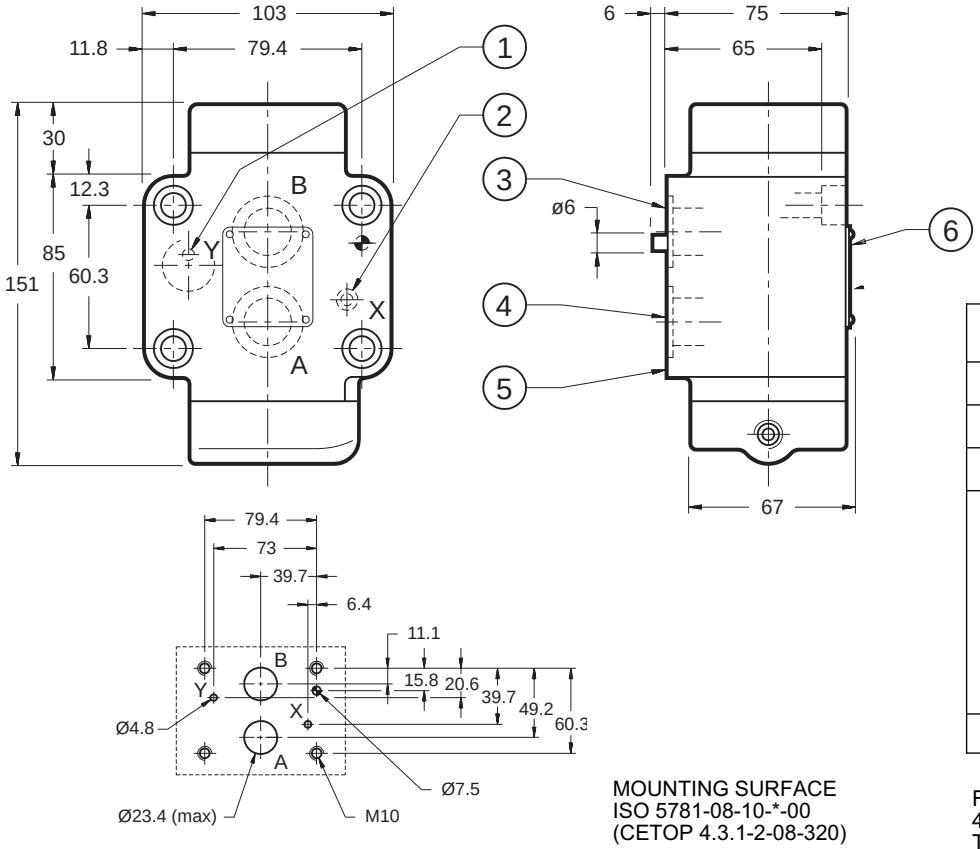
1	External drainage port Y
2	Piloting X
3	Outlet port B
4	Inlet port A
5	Mounting surface with sealing rings: N. 2 OR type 3068 (17.13x2.62) N. 2 OR type 2021 (5.28x1.78) - Shore 90
6	Identification label

MOUNTING SURFACE
ISO 5781-06-07-*-00
(CETOP 4.3.1-2-06-320)

FASTENING BOLTS
4 bolts M10x70
Torque: 40 Nm

5 - VP5-P*-MU OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	External drainage port Y
2	Piloting X
3	Outlet port B
4	Inlet port A
5	Mounting surface with sealing rings: N. 2 OR type 3100 (27.07x2.62) N. 1 OR type 3068 (17.13x2.62) N. 1 OR type 2021 (5.28x1.78) - Shore 90
6	Identification label

MOUNTING SURFACE
ISO 5781-08-10-*-00
(CETOP 4.3.1-2-08-320)

FASTENING BOLTS
4 bolts M10x80
Torque: 40 Nm

6 - USE

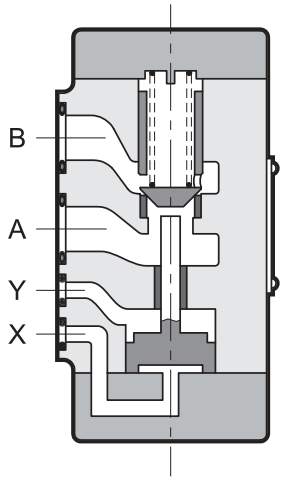
The VP*-P*-MU check valves with hydraulic release are used in circuits where the position of the actuators must be maintained even in the absence of hydraulic power.
They are available in two versions with the following characteristics:

VP*-P*-MU

The VP*-P*-MU valves are check valves with hydraulic release that incorporate the functions of a normal one-way check valve with the possibility to release the poppet by means of external piloting, thus allowing flow of the oil also in the opposite direction of the free flow, from B to A. The valve poppet, a cone on edge seal type, is kept closed by a spring with fixed setting during rest conditions. When pilot pressure is sent to port X, the release piston is activated and opens the main poppet, thus allowing the reverse flow.

These valves have hydraulic isolation of the front face of the release piston from chamber A of the valve, by external drainage Y. This solution eliminates problems which can occur if, during the release phase of the valve, pressure builds up in chamber A near to or greater than the piloting pressure X, causing a backward movement of the piston and thus unwanted closure of the valve.

VP*-P*-MU



VP*-P*/P-MU

The VP*-P*/P-MU valves are check valves with hydraulic release that, in addition to the characteristics of the preceding version, are equipped with a decompression device.

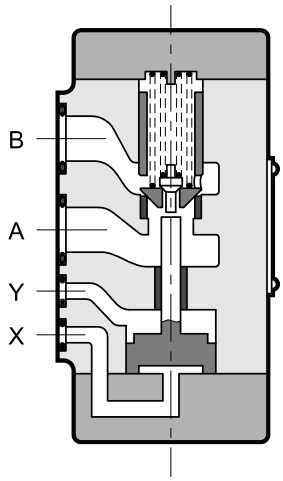
They are recommended when operating with high working pressures or with high loads that act as pressure multipliers.

The circuit (chamber B) is decompressed prior to complete opening of the valve during the release phase.

This prevents pressure shocks in the circuit and because of the high ratio existing between the areas of the control piston and the decompression device, release can occur even at a low piloting pressure.

Pilot pressure to port X operates the release piston which first opens the pre-opening poppet, causing decompression of the sealed chamber, it then opens the main poppet, allowing free flow from B to A.

VP*-P*/P-MU



7 - SUBPLATES (see catalogue 51 100)

	VP 3	VP 5
Type	PMSZ3 - AI 4G with rear ports PMSZ3 - AL4G with side ports	PMSZ5 - AI5G with rear ports PMSZ5 - AL5G with side ports
A - B port dimensions	1/2” BSP	3/4” BSP
X - Y port dimensions	1/4” BSP	1/4” BSP

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LOGIC ELEMENTS

LC* CARTRIDGE VALVES ISO 7368 - DIN 24342

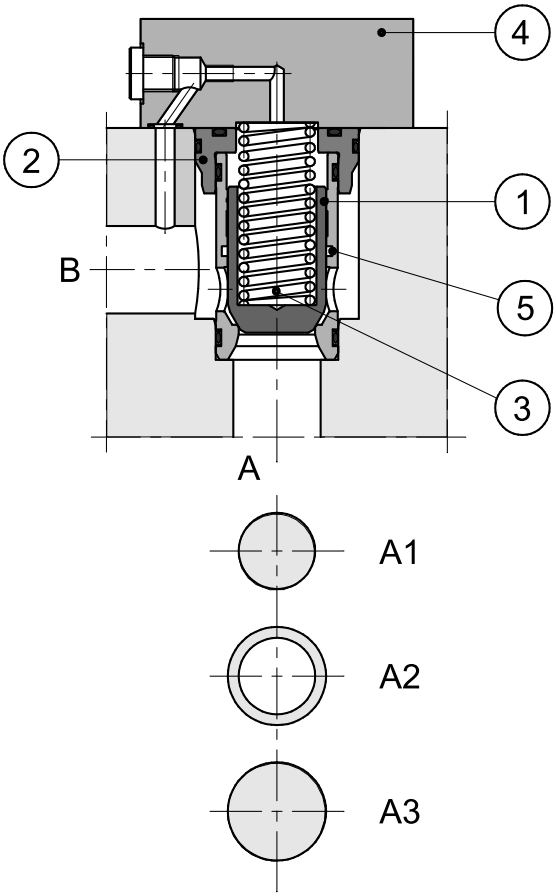
LP* COVERS

LCM* MONITORED LOGIC EL.

ND 16 - 25 - 32 - 40 - 50 - 63

p max **420** bar
Q max (see table of performances)

OPERATING PRINCIPLE



— Logic elements are cartridge valves suitable for installation in blocks or manifolds. They are available in six different sizes: ND 16 - 25 - 32 - 40 - 50 - 63.

— They are engineered to create complex hydraulic circuits using compact functional blocks, ensuring high flow rates combined with low pressure drops.

— They comprise a cartridge valve with ISO 7368 / DIN 24342 cavity bore, and a control cover (4). The cover incorporates the pilot lines for the cartridge valves; certain versions allow for the mounting of ISO 4401-03 valves, to achieve different control functions (see point 8 for diagrams and functional descriptions).
A low leakage version, featuring a seal integrated into seat no. 5, is also available.

— The cartridge valves consists of a jacket (2), a poppet (1), and a closing spring (3). The poppet is available in either a standard (S) configuration or with a damping nose (D), the latter being ideal for smooth flow control during opening and closing sequences.

— Two types of cartridge valves are available:

- **Q** type: used for flow and directional control, or as a check valve.

  The areas involved are:

  A1 - corresponding to the seat diameter area, considered as reference area = 1

  A3 - corresponding to the jacket internal diameter area.

  A2 - corresponding to the difference between A3 - A1. The area ratio A1/A3 is 1:1.66.

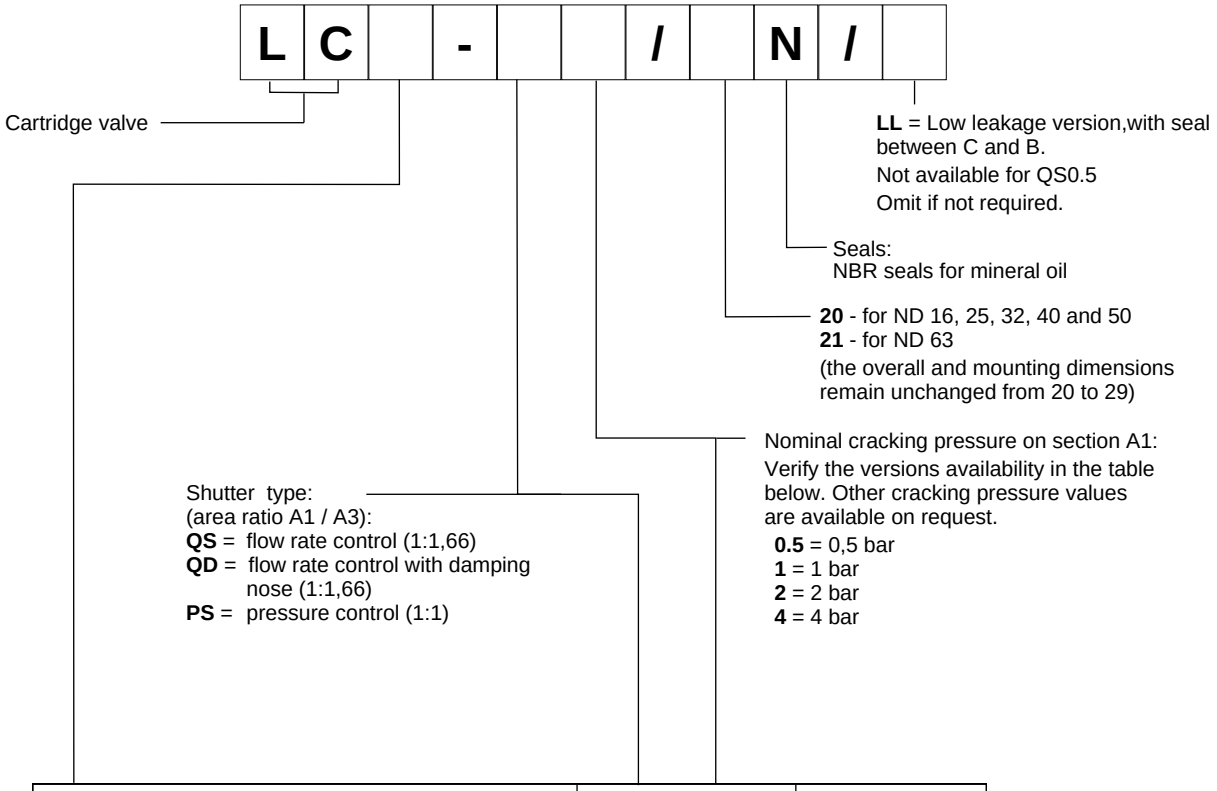
  The valve opens when the pressure acting on area A1 (flow from A to B) or area A2 (flow from B to A) exceeds the pressure acting on area A3, plus the spring force.

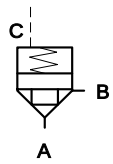
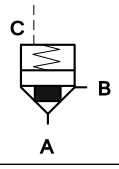
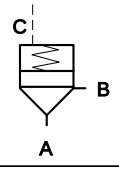
- **P** type: used for pressure control.

  In this configuration, areas A1 and A3 are equal (1:1 area ratio); therefore, the valve permits flow from A to B only.

— **LCM*** are logic elements equipped with spool position monitoring, suitable for directional and flow control, piloting, or as check valves.
They are TÜV certified.
Available sizes include ND 16, 25, 32, 40, and 50.

1 - IDENTIFICATION CODE FOR CARTRIDGE VALVES



AVAILABLE NOMINAL SIZES						VERSIONS	SYMBOL
16 ND16	**25** ND25	**32** ND32	**40** ND40	**50** ND50	**63** ND63		
x	x	x	x	x		**QS0.5**	
x	x	x	x	x	x	**QS2**	
x	x	x	x	x		**QD4**	
					x	**PS1**	
x	x	x	x	x		**PS2**	

2 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

3 - TECHNICAL CHARACTERISTICS

(cartridge valve with control cover)

Max operating pressure LC cartridge valve	bar	420
Max operating pressure limit of covers type DP*, DPE*, DF1, DF2, LCM	bar	350
Max operating pressure with distributor installed on cover	See technical characteristics of the distributor	
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25

3.1 - Cartridge valves type Q performances

(flow control function)

				NOMINAL SIZE					
				16	**25**	**32**	**40**	**50**	**63**
Area A1			cm^2	1,54	3	6	8,76	14,8	24,6
Area A2			cm^2	1	2	4	5,76	9,7	16,1
Area A3			cm^2	2,54	4,9	10	14,3	24,3	40,7
Version S:	opening stroke h		cm	0,8	1	1,25	1,6	1,8	2,3
	opening volume		cm^3	2,03	4,9	12,5	22,88	43,74	96,26
	max recommended flow		l/min	250	500	900	1300	2000	3000
Version D:	opening stroke h		cm	0,8	1,15	1,5	1,8	2,2	2,7
	opening volume		cm^3	2,03	5,63	15	25,74	53,46	110
	max recommended flow		l/min	200	450	800	1100	1700	2700
Cracking pressure	A→B	spring 0,5	bar	0,5	0,5	0,5	0,5	0,5	-
		spring 2		2	2	2	2	2	2
		spring 4		4	4	4	4	4	-
	B→A	spring 0,5		0,9	1,1	0,7	0,76	0,8	-
		spring 2		3,1	3	3,1	3	3,2	3,2
		spring 4		6,15	5,9	5,4	5,9	5,9	-
Mass			Kg	0,25	0,5	1,1	1,9	3,9	7,8

3.2 - Cartridge valves type P performances

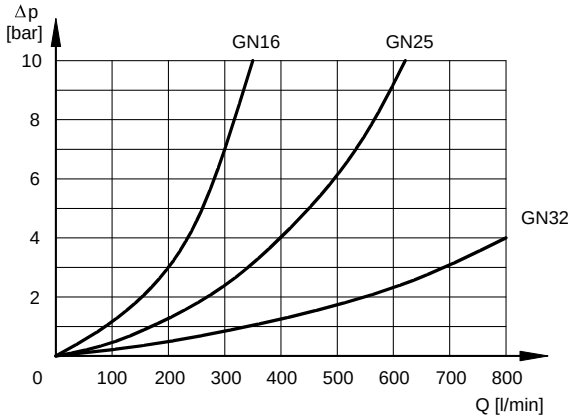
(pressure control function)

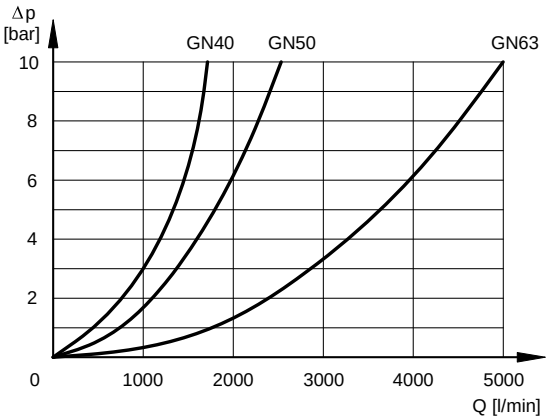
				NOMINAL SIZE					
				16	**25**	**32**	**40**	**50**	**63**
Area A1 = Area A3			cm^2	2,54	4,9	10	14,4	24,3	40,7
Version S:	max recommended flow		l/min	200	400	900	1000	1500	2500
Cracking pressure		spring 1	bar	-	-	-	-	-	1
		spring 2		2	2	2	2	2	-
Mass			Kg	0,25	0,5	1,1	1,9	3,9	7,8

4 - CHARACTERISTIC CURVES

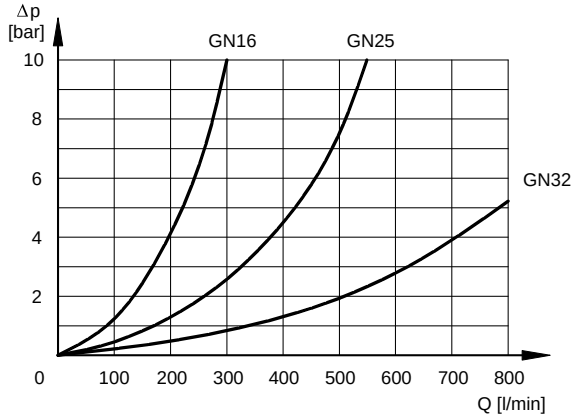
(values obtained with viscosity 36 cSt at 50°C)

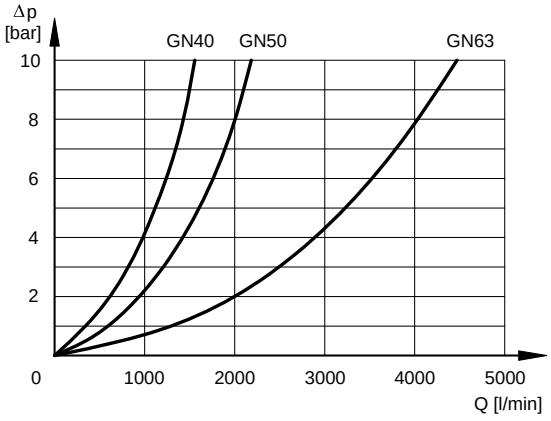
4.1 - LC*- QS flow control function and LC*-PS pressure control function



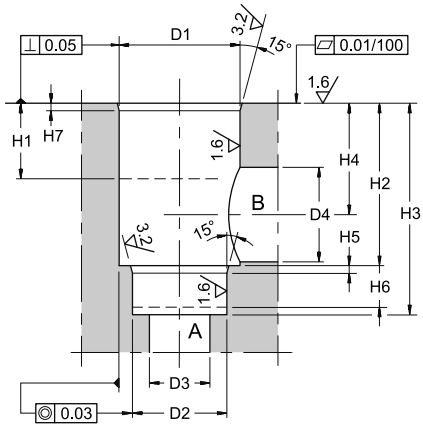


4.2 - Flow control function with damping nose LC*- QD



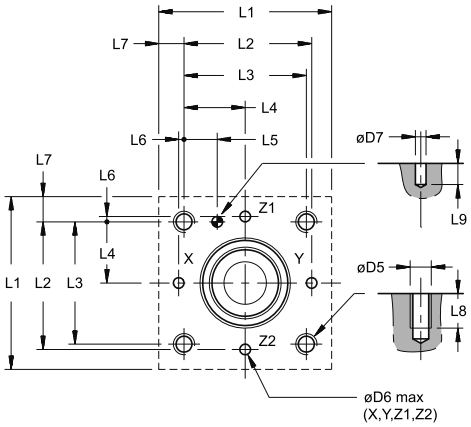


5 - LC CARTRIDGE VALVES SEAT DIMENSIONS ACCORDING TO ISO 7368 / DIN 24342



	LC CARTRIDGE VALVES NOMINAL SIZE					
	16	**25**	**32**	**40**	**50**	**63**
ØD1 ^{H7}	32	45	60	75	90	120
ØD2 ^{H7}	25	34	45	55	68	90
ØD3 max	16	25	32	40	50	63
ØD4	16	25	32	40	50	63
ØD4 max	25	32	40	50	63	80
H1 min	20	30	30	30	35	40
H2 ± 0,1	43	58	70	87	100	130
H3 $^{+0,1}_{0}$	56	72	85	105	122	155
H4 referred to diameter ØD4	34	44	52	64	72	95
H4 referred to diameter ØD4 max	29,5	40,5	48	59	65,5	86,5
H5	2	2,5	2,5	3	3	4
H6 min	11	12	13	15	17	20
H7	2	2,5	2,5	3	4	4

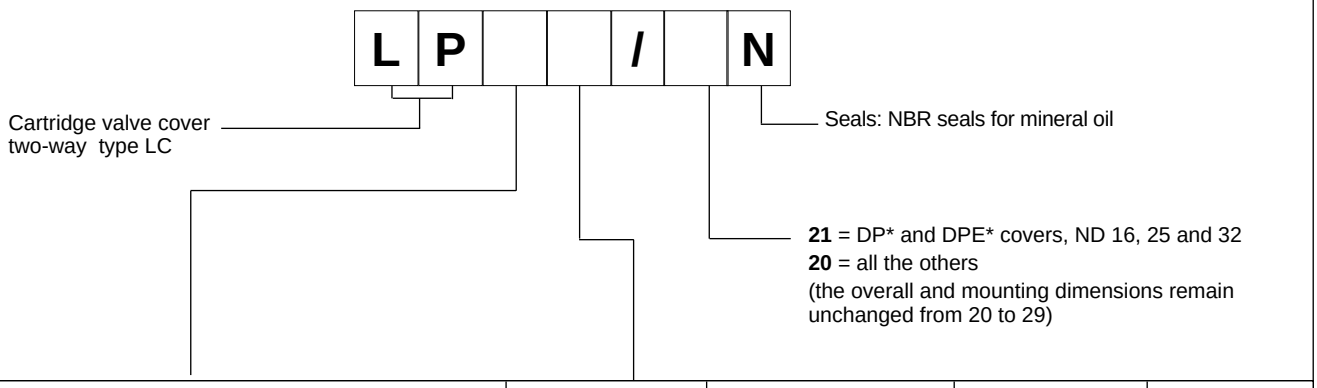
6 - LP CONTROL COVERS INTERFACE DIMENSIONS ACCORDING TO ISO 7368 / DIN 24342

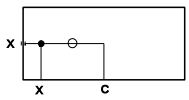
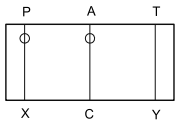
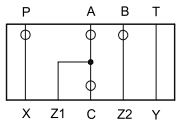
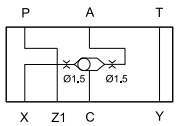
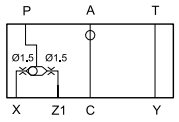
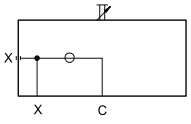
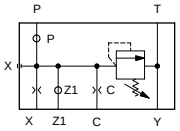
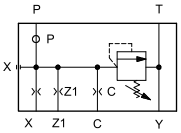


	LP CONTROL COVERS NOMINAL SIZE					
	16	**25**	**32**	**40**	**50**	**63**
ØD5	M8	M12	M16	M20	M20	M30
ØD6 max	4	6	8	10	10	12
ØD7 ^{H13}	4	6	6	6	8	8
L1	*	85	102	125	140	180
L2 ± 0,1	48	62	76	92,5	108	137,5
L3 ± 0,1	46	58	70	85	100	125
L4 ± 0,1	23	29	35	42,5	50	62,5
L5 ± 0,1	12,5	13	18	19,5	20	24,5
L6 ± 0,1	2	4	6	7,5	8	12,5
L7	*	13,5	16	20	20	27,5
L8 min	15	20	28	35	35	52
L9 min	8	8	8	8	8	8

* = cover with special dimensions (see par. 10.2 ÷ 10.7)

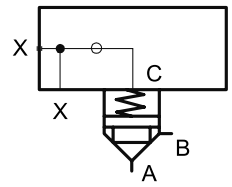
7 - COVERS IDENTIFICATION CODE



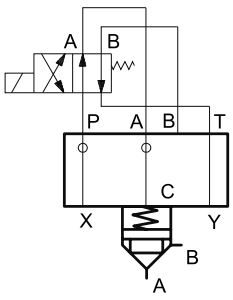
AVAILABLE NOMINAL SIZES						COVER NAME	SYMBOL	DIAGRAM PARAGRAPH	OVERALL DIMENSIONS PARAGRAPH
16 ND16	**25** ND25	**32** ND32	**40** ND40	**50** ND50	**63** ND63				
x	x	x			x	**R**		8.1	10.1
x	x	x	x	x	x	**D**		8.2	10.2
x	x	x	x			**DZ**		8.3	10.3
x	x	x	x	x		**DF1**		8.4	10.4
x	x	x	x	x		**DF2**		8.5	10.5
x	x	x	x	x	x	**Q**		8.6	10.6
x	x	x	x	x	x	**DP***		8.7	10.7
x	x	x	x	x		**DPE***		8.8	10.7

8 - FUNCTIONAL DIAGRAMS

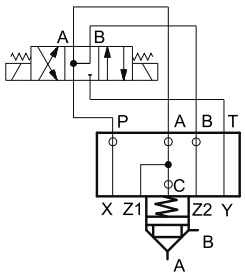
8.1 - R cover for directional control and check valve function with external pilot X

Functional diagrams	Description
	Piloting of the cartridge valve through the X port, available on the mounting surface or with pipe connection 1/4" BSP. For ND 40 and ND 50 sizes, the external piloting function can be realised by using control cover type D, with blanking plate code **1950751** (to be ordered separately).

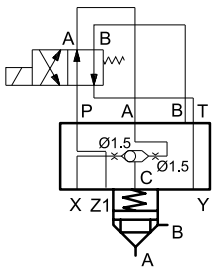
8.2 - D cover for directional control and check valve function

Functional diagrams	Description
	Piloting of the cartridge valve by means of solenoid valve type **DS3-TA** (to be ordered separately - see catalogue 41 150) - solenoid valve OFF = A ↔ B intercepted flow - solenoid valve ON = A ↔ B free flow

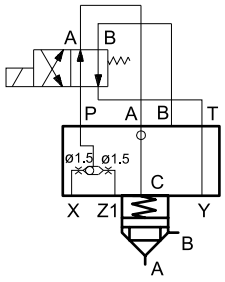
8.3 - DZ cover for directional control with possibility to pilot other cartridges in line

Functional diagrams	Description
	The DZ cover enables the piloting of its cartridge valves and also of other valves connected to Z1 and Z2 pilot lines. The solenoid valve type **DS3-S10** must be ordered separately (see catalogue 41 150).

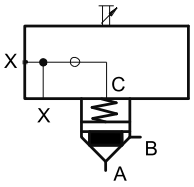
8.4 - DF1 cover for directional control and check function with double pilot line

Functional diagrams	Description
	The DF1 cover gives the possibility of a double pilot line through X and Z1 ports. The solenoid valve type **DS3-TA** must be ordered separately (see catalogue 41 150). - solenoid valve OFF = A↔B intercepted flow - solenoid valve ON = A→B free flow , B→A intercepted (if pilot line X is connected with B and if Z1 is connected with A).

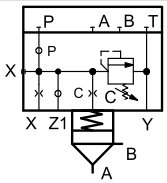
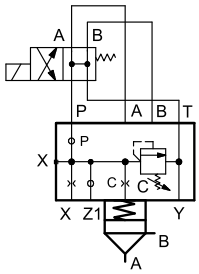
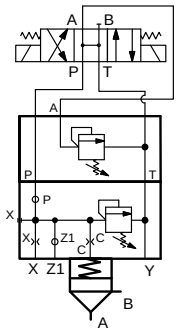
8.5 - DF2 cover for directional control and check function with priority piloting from two external lines

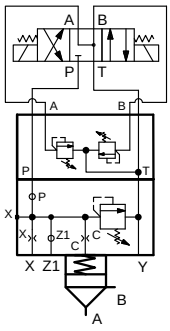
Functional diagrams	Description
	The cartridge valve can be simultaneously piloted from X and Z1 lines. The shuttle valve, integrated in the cover, enables the automatic selection of the pilot line which has the higher pressure (priority line). The solenoid valve type **DS3-TA** must be ordered separately (see catalogue 41 150). - solenoid valve OFF = A ↔ B intercepted flow - solenoid valve ON = A ↔ B free flow

8.6 - Q cover for flow control function

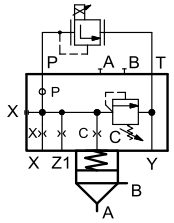
Functional diagrams	Description
	Flow control function by means of cover with stroke limiter. For a better flow control and to avoid the wear of the valve seat, this cover is normally used with a QD4 cartridge type.

8.7 - DP* cover for pressure control function

Functional diagrams	Description
	Pressure control function with a built-in relief valve. - max. adjustment pressure **DP4** = 140 bar - **DP6** = 350 bar The top blanking plate code 1950591 must be ordered separately.
	Pressure control function with electrical unloading by means of **DS3-SA2** solenoid valve (to be ordered separately - see catalogue 41 150). - solenoid valve OFF = unloading at minimum pressure - solenoid valve ON = pressure controlled by the built-in relief valve.
	Pressure control function with electrical unloading and two step pressure by means of the solenoid valves **DS3-S2** (to be ordered separately - see catalogue 41 150), **PLM3-AT*/10** (for 16, 25 and 32 sizes - to be ordered separately) and **MCD*-SAT** (for 40, 50 and 63 sizes to be ordered separately - see catalogue 61 200) - solenoid valve OFF = unloading at minimum pressure - solenoid valve ON side a = pressure controlled by the relief valve integrated in the cover - solenoid valve ON side b = pressure controlled by the relief valve (**PLM3** or **MCD***)

	Pressure control function with electrical control and three steps pressure by means of the solenoid valves **DS3-S3** (to be ordered separately - see catalogue 41 150), **PLM3-DT/10** (for 16 - 25 and 32 sizes - to be ordered separately) and **MCD*-DT/51** (for 40 and 50 sizes - to be ordered separately - see catalogue 61 200) - solenoid valve OFF = pressure controlled by the cover relief valve. - solenoid valve ON side a = pressure controlled by the relief valve on side b. - solenoid valve ON side b = pressure controlled by the relief valve on side a.

8.8 - DPE* cover for pressure control function

Functional diagram	Description
	Pressure control function by means of **PDE3** proportional valve (to be ordered separately, see catalogue 81 211). - max. adjustment pressure **DPE4** = 140 bar - **DPE6** = 350 bar - proportional valve OFF = unloading at minimum pressure - proportional valve ON = proportional control of pressure

9 - TIGHTENING TORQUES FOR COVERS

Tightening torques in the chart below were calculated for screws with class A10.9, applying a total friction coefficient μ = 0,15.

We recommend these tightening torques for screws suitable for the specified friction coefficient and for tightenings done with manual torque wrench.

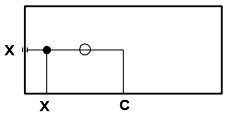
Size	Screws type (no. 4 pcs.)	Tightening torque (±10%) [Nm]
16	M8	32
25	M12	110
32	M16	270
40	M20	530
50	M20	530
63	M30	1900

NOTE: Screws characteristics for each type of cover are described in paragraph 10.

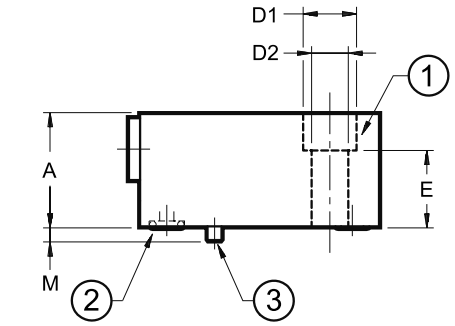
10 - OVERALL AND MOUNTING DIMENSIONS FOR CONTROL COVERS

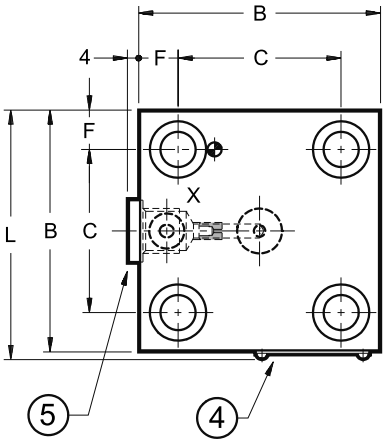
10.1 - R type covers

dimensions in mm



LP16R
LP25R
LP32R
LP63R





	NOMINAL SIZE			
	16	**25**	**32**	**63**
A	30	30	40	70
B	65	85	102	180
C	46	58	70	125
D1	13,5	19	25	46
D2	8,5	13	17	31
E	19	17	22	35
F	9,5	13,5	16	27,5
L	67,5	87,5	104,5	182,5
M	4	5	5	5

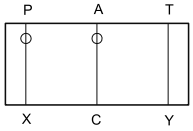
ports ready for restrictors	port X			
restrictors	M6x8			M10x10
Mass [kg]	1,20	2,30	4,00	17,5

1	N. 4 fastening bolts (**NOTE**): **16** = M8x30 **25** = M12x35 **32** = M16x45 **63** = M30x80
2	N. 1 sealing ring 90 Shore: **16** = OR type 2025 (6.07x1.78) **25** = OR type 2037 (9.25x1.78) **32** = OR type 2043 (10.82x1.78**)** **63** = OR type 3062 (15.54x2.62)
3	Locating pin: **16** = Ø3x10 **25** = Ø5x14 **32** = Ø5x14 **63** = Ø6x14
4	Identification label
5	Plug X: 1/4” BSP

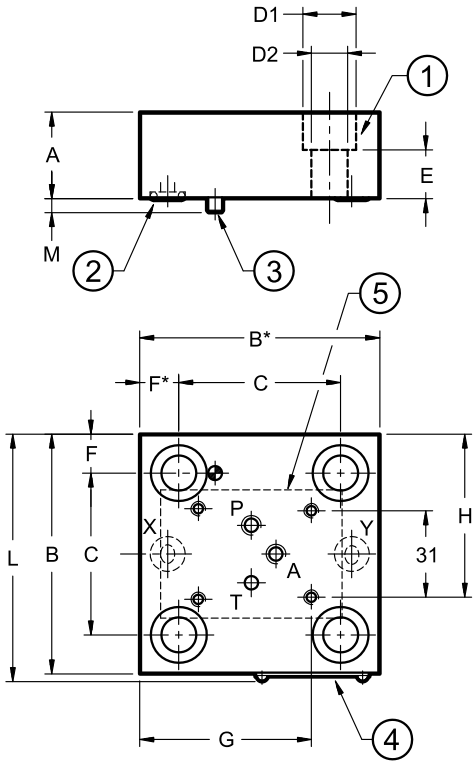
NOTE: Fastening bolts class 10.9 ISO 4762 are recommended for the installation of the cover (to be ordered separately).
Tightening torques at par. 9

10.2 - Covers type D

dimensions in mm



LP16D
LP25D
LP32D
LP40D
LP50D
LP63D



	NOMINAL SIZE					
	16	**25**	**32**	**40**	**50**	**63**
A	30	30	40	40	50	70
B	65	85	102	125	140	180
B*	75	85	102	125	140	180
C	46	58	70	85	100	125
D1	13,5	19	25	31	31	46
D2	8,9	13	17	21	21	31
E	19	17	22	30	30	35
F	9,5	13,5	16	20	20	27,5
F*	19,5	13,5	16	20	20	27,5
G	52	60,2	68.7	73,2	82,7	111,5
H	48	58	66.5	78	85,5	105,5
L	67,5	87,5	104.5	127,5	142,5	182,5
M	4	5	5	5	5	7

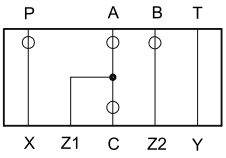
ports ready for restrictors	P, A					
restrictors	M6x8					M8x8
Mass [kg]	1,20	2,30	4,00	4,80	7,6	17,5

1	N. 4 fastening bolts (**NOTE**): **16** = M8x30 **25** = M12x35 **32** = M16x45 **40** = M20x50 **50** = M20x60 **63** = M30x80
2	n° 2 sealing rings 90 Shore : **16** = OR type 2025 (6.07x1.78) **25** = OR type 2037 (9.25x1.78) **32** = OR type 2043 (10.82x1.78) **40** = OR type 2050 (12.42x1.78) **50** = OR type 2050 (12.42x1.78) **63** = OR type 3062 (15.54x2.62)
3	Locating pin: **16** = Ø3x10 **25** = Ø5x14 **32** = Ø5x14 **40** = Ø5x14 **50** = Ø6x14 **63** = Ø6x14
4	Identification label
5	Mounting surface ISO 4401-03 (CETOP 4.2-4-03-350)

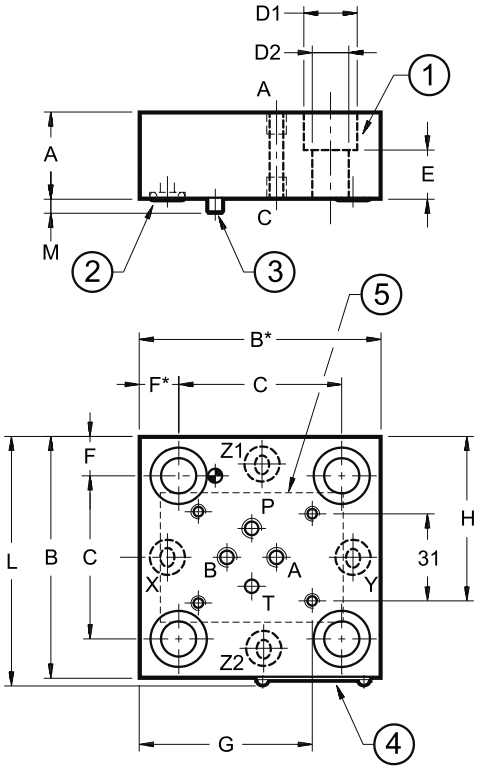
NOTE: Fastening bolts class 10.9 ISO 4762 are recommended for the installation of the cover (to be ordered separately).
Tightening torques at par. 9

10.3 - Covers type DZ

dimensions in mm



LP16DZ
LP25DZ
LP32DZ
LP40DZ



	NOMINAL SIZE			
	16	**25**	**32**	**40**
A	30	30	40	40
B	65	85	102	125
B*	75	85	102	125
C	46	58	70	85
D1	13,5	19	25	31
D2	8,9	13	17	21
E	19	17	22	20
F	9,5	13,5	16	20
F*	19,5	13,5	16	20
G	52	60,2	66.2	73,2
H	48	58	66.5	78
L	67,5	87,5	104.5	127,5
M	4	5	5	5

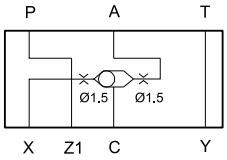
ports ready for restrictors M6x8	P, A, B, C			
Mass [kg]	1,2	2,3	2,8	4,1

1	N. 4 fastening bolts (**NOTE**): **16** = M8x30 **25** = M12x35 **32** = M16x45 **40** = M20x50
2	n° 4 sealing rings 90 Shore : **16** = OR type 2025 (6.07x1.78) **25** = OR type 2037 (9.25x1.78) **32** = OR type 2043 (10.82x1.78) **40** = OR type 2050 (12.42x1.78)
3	Locating pin: **16** = Ø3x10 **25** = Ø5x14 **32** = Ø5x14 **40** = Ø5x14
4	Identification label
5	Mounting surface ISO 4401-03 (CETOP 4.2-4-03-350)

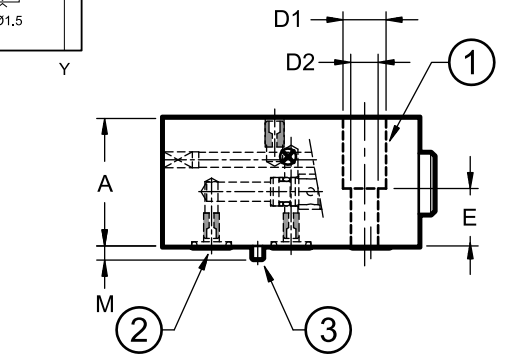
NOTE: Fastening bolts class 10.9 ISO 4762 are recommended for the installation of the cover (to be ordered separately). Tightening torques at par. 9

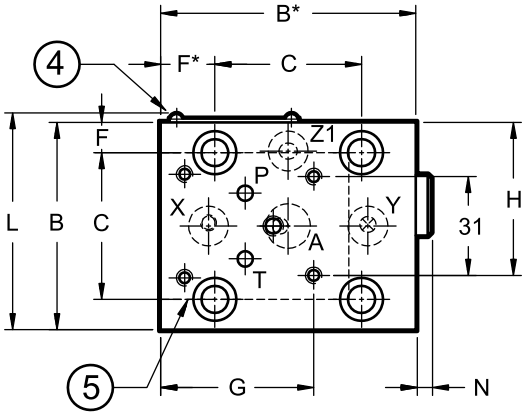
10.4 - Covers type DF1

dimensions in mm

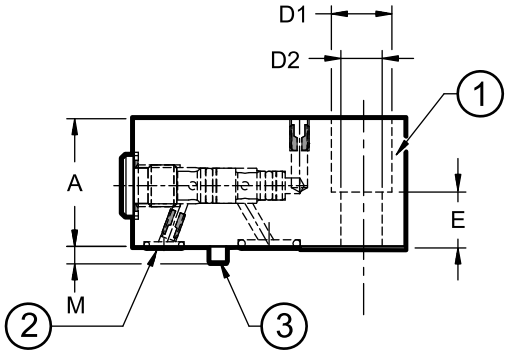


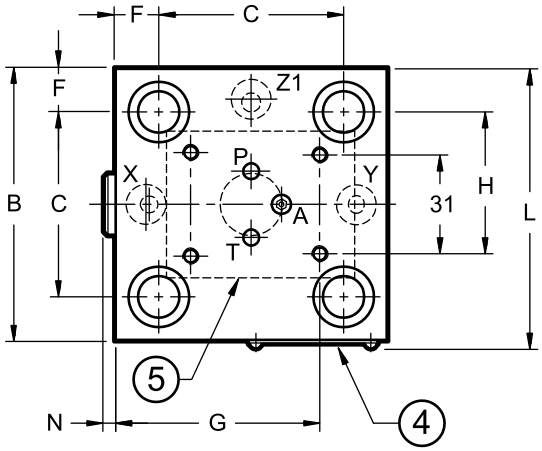
LP16DF1





LP25DF1
LP32DF1
LP40DF1
LP50DF1





	NOMINAL SIZE				
	16	**25**	**32**	**40**	**50**
A	40	40	40	50	50
B*	80	85	102	125	140
B	65	85	102	125	140
C	46	58	70	85	100
D1	13,5	19	25	31	31
D2	8,5	13	17	21	21
E	18	17	22	30	30
F*	17	13,5	16	20	20
F	9,5	13,5	16	20	20
G	47,5	64	72,5	84	91,5
H	48	58	66,5	78	85,5
L	67,5	87,5	104,5	127,5	142,5
M	4	5	5	5	5
N	4,5	3,5	3,5	-	-

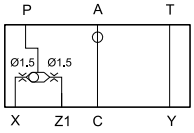
Mass [kg]	1,8	2,3	3	6,7	7,6

1	N. 4 fastening bolts (**NOTE**): **16** = M8x30 **25** = M12x35 **32** = M16x45 **40** = M20x60 **50** = M20x60
2	N° 3 sealing rings 90 Shore: **16** = OR type 2037 (9.25x1.78) **25** = OR type 2037 (9.25x1.78) **32** = OR type 2043 (10.82x1.78) **40** = OR type 2050 (12.42x1.78) **50** = OR type 2050 (12.42x1.78)
3	Locating pin **16** = Ø3x10 **40** = Ø5x14 **25** = Ø5x14 **50** = Ø6x14 **32** = Ø5x14
4	Identification label
5	Mounting surface ISO 4401-03 (CETOP 4.2-4-03-350)

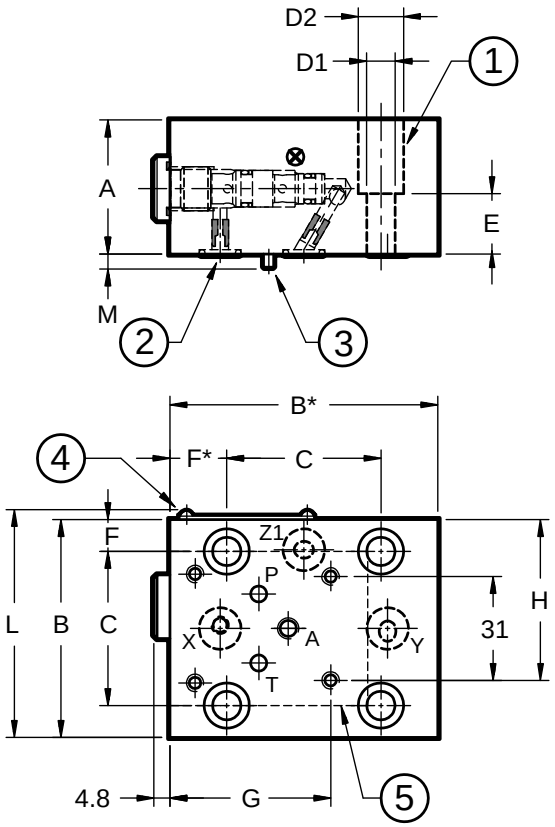
NOTE: Fastening bolts class 10.9 ISO 4762 are recommended for the installation of the cover (to be ordered separately).
Tightening torques at par. 9

10.5 - Covers type DF2

dimensions in mm



LP16DF2
LP25DF2
LP32DF2
LP40DF2
LP50DF2



	NOMINAL SIZE			
	16	**25**	**32**	**40**
A	40	40	40	50
B	65	85	102	125
B*	80	85	102	125
C	46	58	70	85
D1	13,5	19	25	31
D2	8,5	13	17	21
E	18	17	22	30
F	9,5	13,5	16	20
F*	17	13,5	16	20
G	48	61	68,7	81
H	48	58	71.2	73
L	67,5	87,5	104.5	127.5
M	4	5	5	5

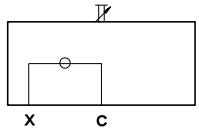
ports ready for restrictors M6x8	A			
Mass [kg]	1,8	2,3	3	6,7

1	N. 4 fastening bolts (**NOTE**): **16** = M8x30 **25** = M12x35 **32** = M16x45 **40**, **50** = M20x60
2	N° 3 sealing rings 90 Shore: **16**, **25** = OR type 2037 (9.25x1.78) **32** = OR type 2043 (10.82x1.78) **40**, **50** = OR type 2050 (12.42x1.78)
3	Locating pin **16** = Ø3x10 **32** = Ø5x14 **25** = Ø5x14 **40** = Ø5x14 **50** = Ø6x14
4	Identification label
5	Mounting surface ISO 4401-03 (CETOP 4.2-4-03-350)

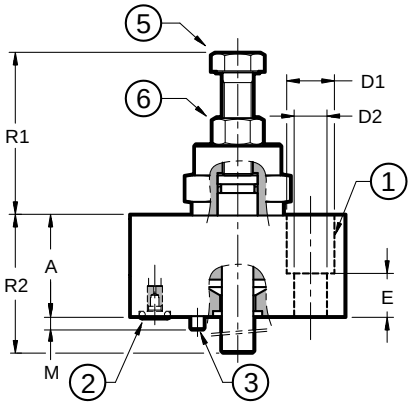
NOTE: Fastening bolts class 10.9 ISO 4762 are recommended for the installation of the cover (to be ordered separately). Tightening torques at par. 9

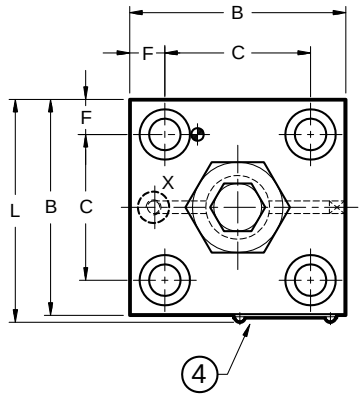
10.6 - Covers type Q

dimensions in mm



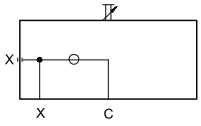
LP16Q
LP25Q
LP32Q



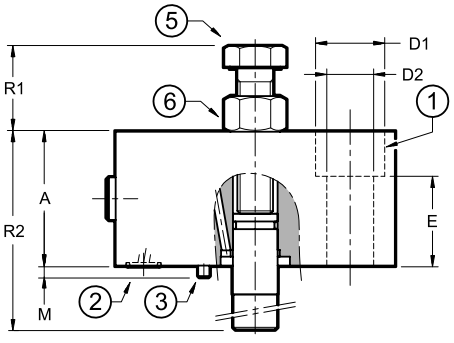


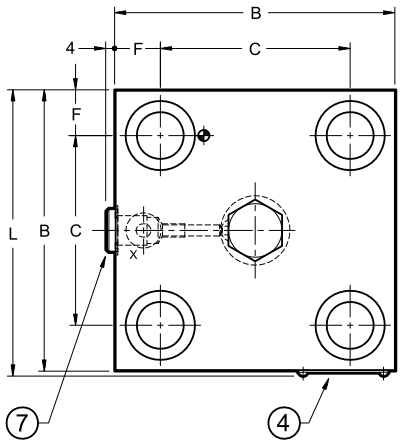
	NOMINAL SIZE					
	16	**25**	**32**	**40**	**50**	**63**
A	35	40	40	60	60	80
B	65	85	102	125	140	180
C	46	58	70	85	100	125
D1	13,5	19	25	31	31	46
D2	8,5	13	17	21	21	31
E	18	17	22	30	30	45
F	9,5	13,5	16	20	20	27,5
L	67,5	87,5	104,5	127,5	142,5	182,5
M	4	5	5	5	5	5
R1	55,5 ÷ 63,5	62,5 ÷ 74	58,5 ÷ 73,5	38,5 ÷ 57	44,5 ÷ 66,5	52 ÷ 81
R2	45÷ 51,5	45÷ 51,5	45÷ 51,5	44 ÷ 52	44 ÷ 52	165 ÷ 194

ports ready for restrictors	port X					
	M5x8	M6x8				M10x10
Mass [kg]	1,6	3	5	8,9	11,7	18



LP40Q
LP50Q
LP63Q



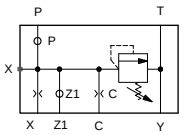


1	N. 4 fastening bolts (**NOTE**): **16** = M8x30 **25** = M12x35 **32** = M16x35 **40** = M20x70 **50** = M20x70 **63** = M30x90
2	n° 1 sealing ring 90 Shore: **16** = OR type 2025 (6.07x1.78) **25** = OR type 2037 (9.25x1.78) **32** = OR type 2043 (10.82x1.78) **40** = OR type 2050 (12.42x1.78) **50** = OR type 2050 (12.42x1.78) **63** = OR type 3062 (15.54x2.62)
3	Locating pin: **16** = Ø3x10 **25** = Ø5x14 **32** = Ø5x14 **40** = Ø5x14 **50** = Ø6x14 **63** = Ø6x14
4	Identification label
5	Stroke limiter clockwise rotation to reduce stroke **16** = 1 turn: 1,25 mm - spanner 18 **25** = 1 turn: 1,25 mm - spanner 18 **32** = 1 turn: 1,25 mm - spanner 18 **40** = 1 turn: 2,00 mm - spanner 24 **50** = 1 turn: 2,50 mm - spanner 30 **63** = 1 turn: 2,00 mm - spanner 36
6	Locking nut: **16** = spanner 18 **25** = spanner 18 **32** = spanner 18 **40** = spanner 24 **50** = spanner 30 **63** = spanner 36
7	Plug X: **40** = 1/4" BSP **50** = 1/4" BSP **63** = 1/4" BSP

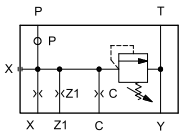
NOTE: Fastening bolts class 10.9 ISO 4762 are recommended for the installation of the cover (to be ordered separately).
Tightening torques at par. 9

10.7 - Covers type DP* and DPE*

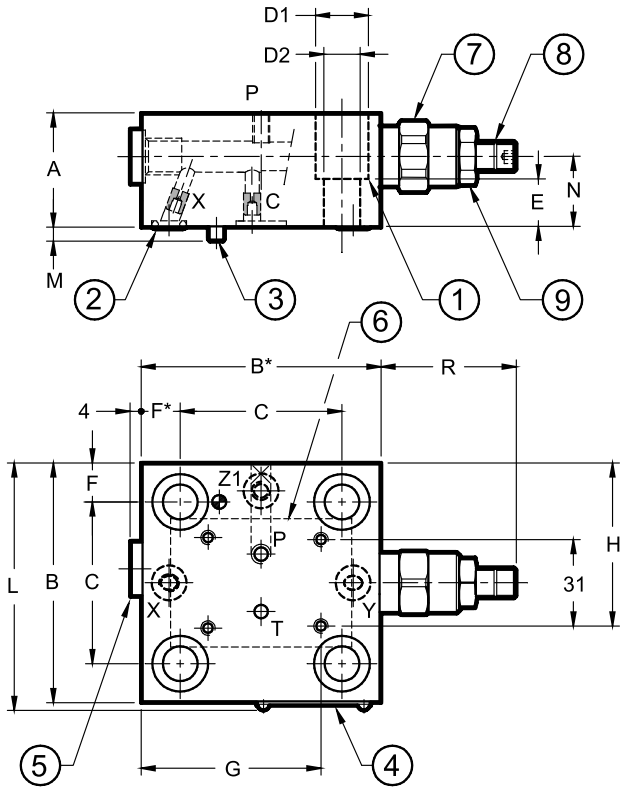
dimensions in mm



LP16DP*
LP25DP*
LP32DP*
LP40DP*
LP50DP*
LP63DP*



LP16DPE*
LP25DPE*
LP32DPE*
LP40DPE*
LP50DPE*



	NOMINAL SIZE					
	16	**25**	**32**	**40**	**50**	**63**
A	40	40	40	50	50	70
B	65	85	102	125	140	180
B*	75	85	102	125	140	180
C	46	58	70	85	100	125
D1	13,5	19	25	31	31	46
D2	8,5	13	17	21	21	31
E	18	17	22	30	30	35
F	9,5	13,5	16	20	20	27,5
F*	19,5	13,5	16	20	20	27,5
G	52	64	72,5	84	91,5	111,5
H	48	58	66,5	78	85,5	105,5
L	67,5	87,5	104,5	127,5	142,5	182,5
M	4	5	5	5	5	5
N	22	23	22	25	25	35
R	45÷50,5	45÷50,5	45÷50,5	44 ÷ 52	44 ÷ 52	44 ÷ 52

Mass [kg]	1,2	2,4	4	7,4	10,5	17,5

DP* restrictors

	M5x6	M6x8			M8x8
X	Ø1,2	Ø1,2	Ø1,2	Ø2,0	Ø2,0	Ø2,0
C	Ø0,7	Ø0,7	Ø1,5	Ø1,2	Ø1,5	Ø1,5

DPE* restrictors

	M5x6	M6x8	M6x8	M6x8	M6x8
X	Ø0,8	Ø0,7	Ø1	Ø1	Ø1
C	Ø0,6	Ø0,6	Ø0,8	Ø0,8	Ø0,8
Z1	Ø0,6	Ø0,6	Ø0,6	Ø0,6	Ø0,6

1	N. 4 fastening bolts (**NOTE**): **16** = M8x30 **25** = M12x35 **32** = M16x45 **40** = M20x50 **40** = M20x60 **63** = M30x80
2	n° 3 90 Shore sealing rings : **16** = OR type 2025 (6.07x1.78) **25** = OR type 2037 (9.25x1.78) **32** = OR type 2043 (10.82x1.78) **40** and **50** = n° 3 OR type 2050 (12.42x1.78) **63** = OR type 3062 (15.54x2.62)
3	Locating pin: **16** = Ø3x10 **25, 32** and **40** = Ø5x14 **50** and **63** = Ø6x14

4	Identification label
5	Plug X: 1/4” BSP
6	Mounting surface ISO 4401-03
7	Pressure control valve
8	Countersunk hex adjustment screw: Allen key 6 Clockwise rotation to increase pressure
9	Locking nut: spanner 19

NOTE: Fastening bolts class 10.9 ISO 4762 are recommended for the installation of the cover (to be ordered separately).
Tightening torques at par. 9

11 - MONITORED LOGIC ELEMENTS

Monitored logic elements are made of a cartridge valve with directional function and of a cover with built-in inductive proximity sensor. The PNP type sensor with closed contact states the condition of A↔B intercepted flow.

WARNING ! These valves must be installed and commissioned by qualified personnel only. Before starting any installation, commissioning or maintenance, it is mandatory to read the *Manual of Use and Maintenance*, delivered together with the valve.

These components bear the CE marking as they comply with the essential requirements of the Machinery Directive 2006/42/EC.

More specifically, they comply with the following EU Directives and harmonised standards:

- Machinery Directive 2006/42/EC: EN ISO 12100:2010 (Risk assessment and risk reduction); EN ISO 13849-2:2012 (Validation, Tables C.1 and C.2); EN ISO 4413:2010 (Requirements for hydraulic fluid power systems).
- Electromagnetic Compatibility Directive 2014/30/EU.

NOTE: Components may be considered 'well-tried' if they comply with the basic safety principles and the 'well-tried' safety principles specified in Tables C.1 and C.2 of EN ISO 13849-2:2012, depending on the specific application.

Products in the LCM* family may be used in safety-related parts of control systems in Category 1 (or higher), as specified in standard EN ISO 13849-1:2023.

Product conformity has been verified by TÜV Italia S.r.l. - TÜV SÜD Group, certificate TUV IT 26 MAC 539.

11.2 - Identification code of monitored logic elements

L	C	M			-	Q	D	4	/	21	N	

Logic element (cartridge and cover) with closed position electric monitoring

Nominal dimension:
16 = ND 16
25 = ND 25
32 = ND 32
40 = ND 40
50 = ND 50

Cover functions
(for details, see par. 10.3 and 10.4)
D = directional control and check valve function
Z = directional control and piloting of other cartridges
Q = flow control (not available for ND 32 and ND 40)

Cartridge valve area ratio (A_1 / A_3) = 1:1,66

Version with damping nose

Nominal cracking pressure on section A_1 = 4 bar

Series no.:
(the overall and mounting dimensions remain unchanged from 20 to 29)

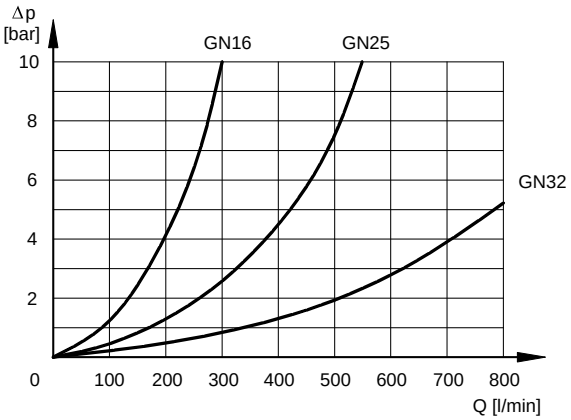
Seals: NBR seals for mineral oil

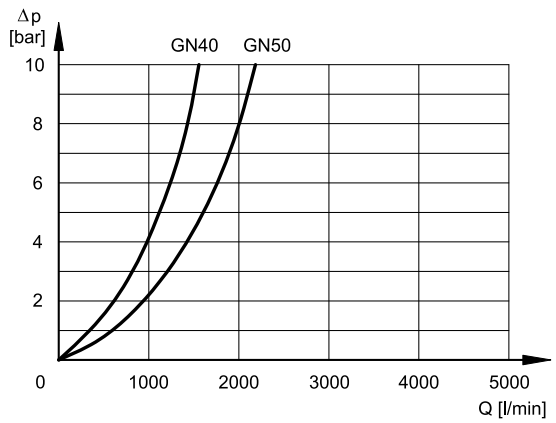
Option:
LL = Low leakage version, with seal between C and B.
Omit if not required.

p max 350 bar

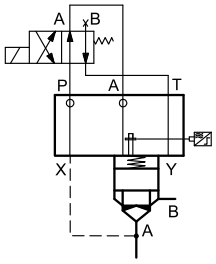
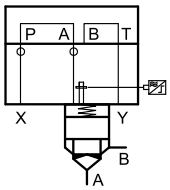
11.3 - Characteristic curves

(values obtained with viscosity 36 cSt at 50°C)

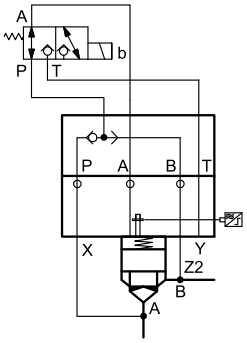
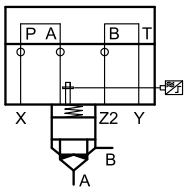




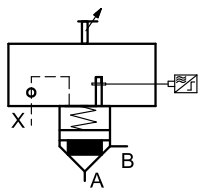
11.4 - Functional diagram of logic element type D, for directional control and check valve function.

Functional diagram	Description
	Piloting of cartridge valve by means of a solenoid valve type DS3-TA (to be ordered separately - see catalogue 41 150) - solenoid valve OFF = A → B intercepted flow - solenoid valve ON = A ↔ B free flow
	Piloting of cartridge valve by means of connection plate code 1950751 to be ordered separately.

11.5 - Functional diagrams of logic element type Z, for directional control and piloting of other cartridges

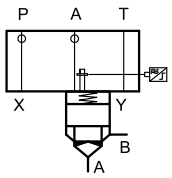
Functional diagram	Description
	Piloting of cartridge valve by means of a solenoid poppet valve type **DT03-3A** (to be ordered separately - see catalogue 42 200). ISO 4401-03 manifold type **DN6** (cod.0294329 - to be ordered separately) that allows to intercept the flow from two lines, obtaining a tight or the free flow. - solenoid valve OFF = sealing tight - A ↔ B locked flow - solenoid valve ON = flow A ↔ B free flow
	Piloting of cartridge valve by means of connection plate code 1950751, to be ordered separately.

11.6 - Functional diagrams of logic element type Q, for flow control function

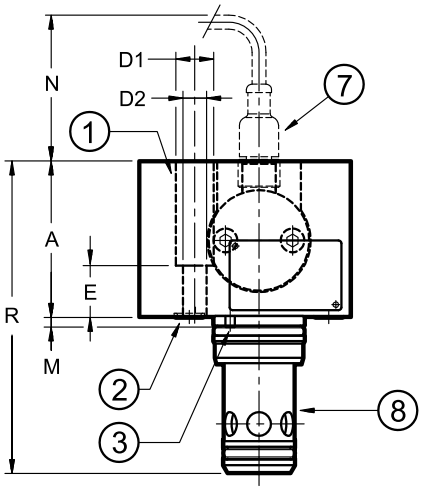
Functional diagram	Description
	Flow control function by means of cover with stroke limiter. This cover is coupled with a cartridge QD4 type, in order to obtain a better flow control and to avoid the wear of the seat.

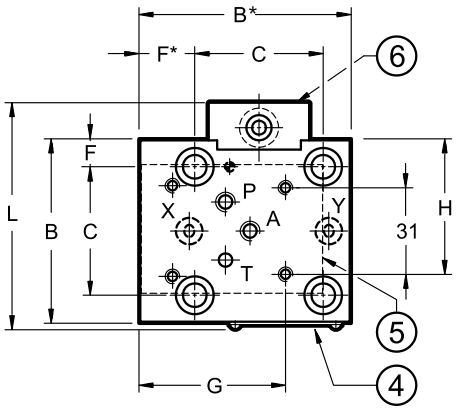
11.7 - Overall and mounting dimensions of monitored logic elements types D and Z

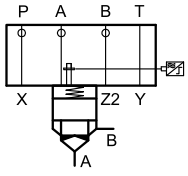
dimensions in mm



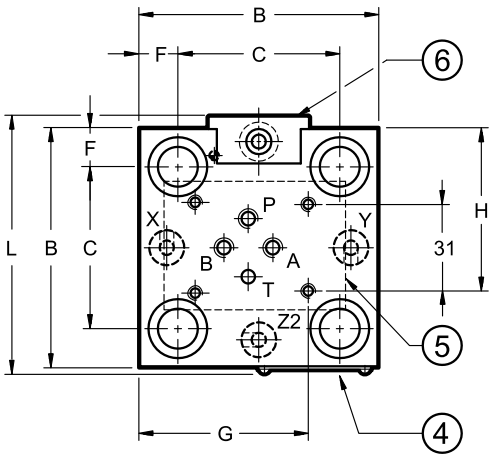
LCM16D-QD4
LCM25D-QD4
LCM32D-QD4
LCM40D-QD4
LCM50D-QD4







LCM16Z-QD4
LCM25Z-QD4
LCM32Z-QD4
LCM40Z-QD4
LCM50Z-QD4



	NOMINAL SIZE				
	16	**25**	**32**	**40**	**50**
A (**NOTE 1**)	55	60	70	75	90
B	65	85	102	125	140
B*	75	-	-	-	-
C	46	58	70	85	100
D1	13,5	19	25	31	31
D2	8,5	12,5	17	21	21
E	18	17	22	30	30
F*	19,5	-	-	-	-
F	9,5	13,5	16	20	20
G	52	60,2	68,7	80,2	87,7
H	48	58	66,5	105	85,5
L	81	92	104,5	127,5	142,5
M	4	5	5	5	5
N	70	70	65	60	55
R (**NOTE 1**)	111	132	155	180	212

ports ready for restrictors M6x8.5	P, A B (on cover Z only)				
Mass [kg]	2,1	3,3	5,3	9,5	14,5

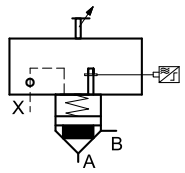
1	N. 4 fastening bolts (**NOTE**): **16** = M8x30 **40** = M20x60 **25** = M12x35 **50** = M20x60 **32** = M16x45
2	n° 3 sealing rings 90 Shore : **16** = OR type 2025 (6.07x1.78) (ND 16 requires 2x OR only) **25** = OR type 2037 (9.25x1.78) **32** = OR type 2043 (10.82x1.78) **40** and **50** = OR type 2050 (12.42x1.78)
3	Locating pin: **16** = Ø3x10 **40** = Ø5x14 **25** = Ø5x14 **50** = Ø6x14 **32** = Ø5x14
4	Identification label
5	Mounting surface ISO 4401-03 (CETOP 4.2-4-03-350)
6	Proximity sensor
7	Connector for proximity sensor (to be ordered separately see par. 11.9)
8	Slip-in cartridge valve always supplied with the cover

NOTE 1: For LCM16Z-QD4 only: add 10 mm to the indicated value.

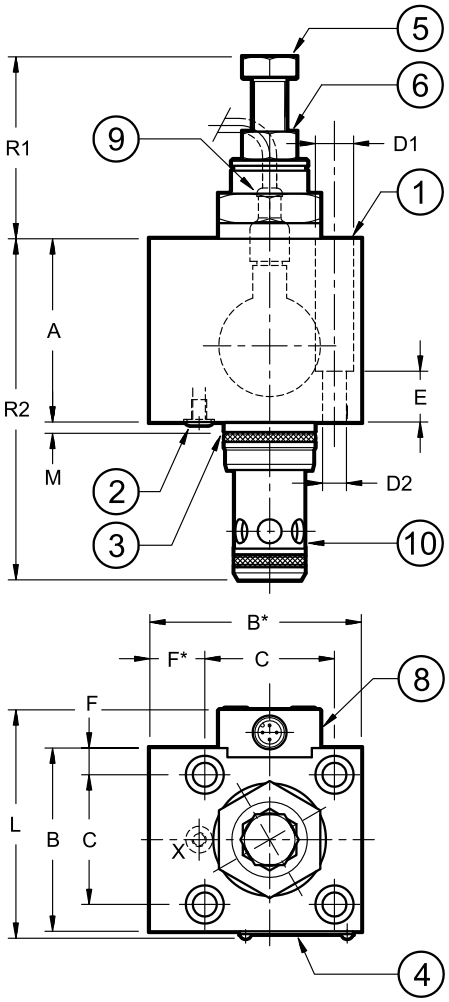
NOTE 2: Fastening bolts class 10.9 ISO 4762 are recommended for cover installation (to be ordered separately). Tightening torques at par. 9. standardized dimensions at par. 6. Dimensions of the cartridge valve seat at par. 5.

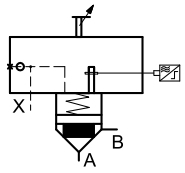
11.8 - Overall and mounting dimensions of monitored logic elements type Q

dimensions in mm

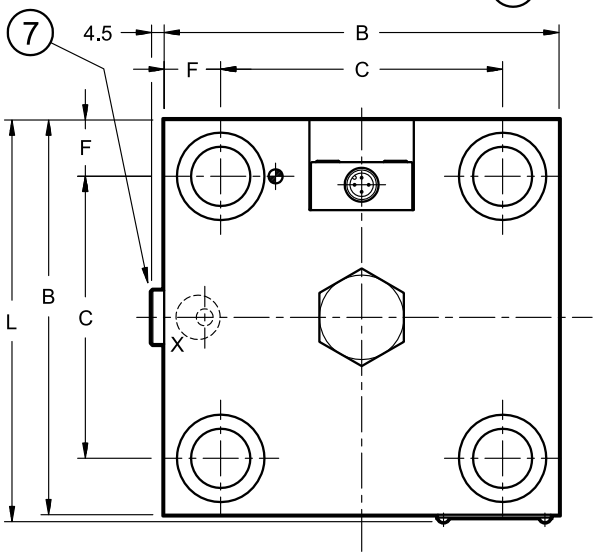


LCM16Q-QD4
LCM25Q-QD4





LCM50Q-QD4



	NOMINAL SIZE		
	16	**25**	**50**
A	65	70	130
B	65	85	140
B*	75	-	-
C	46	58	100
D1	13,5	19	31
D2	8,5	12,5	21
E	18	17	30
F*	19,5	-	-
F	9,5	13,5	20
L	81	92	142,5
M	4	5	5
R1	52 ÷ 64,5	48,3 ÷ 64,5	38,7 ÷ 62,5
R2	121	142	152

ports ready for restrictors	port X		
	M5x8	M6x8	
Mass [kg]	2,1	4,0	19,3

1	N. 4 fastening bolts (**NOTE**): **16** = M8x30 **25** = M12x35 **50** = M20x60
2	Sealing rings 90 Shore: **16** = n° 1 OR type 2025 (6.07x1.78) **25** = n° 1 OR type 2037 (9.25x1.78) **40** = n° 1 OR type 2050 (12.42x1.78)
3	Locating pin: **16** = Ø3x10 **25** = Ø5x14 **50** = Ø6x14
4	Identification label
5	Stroke limiter clockwise rotation to reduce stroke **16** = 1 turn: 1,25 mm - spanner 18 **25** = 1 turn: 1,25 mm - spanner 18 **50** = 1 turn: 2,50 mm - spanner 30
6	Locking nut: **16** = spanner 19 **25** = spanner 19 **50** = spanner 30
7	Plug X: **50** = 1/4" BSP
8	Proximity sensor
9	Connector for proximity sensor (to be ordered separately see par. 11.9)
10	Slip-in cartridge valve always supplied with the cover

NOTES: Fastening bolts class 10.9 ISO 4762 are recommended for cover installation (to be ordered separately). Tightening torques at par. 9. standardized dimensions at par. 6. Dimensions of the cartridge valve seat at par. 5

11.9 - Technical characteristics of proximity sensor and connector

PROXIMITY SENSOR
PNP TYPE

Rated voltage	V DC	24
Power supply voltage range	V DC	10 ÷ 30
Absorbed current	mA	200
Output	normally open contact	
Electric protection	polarity inversion short circuit overvoltage	
Electric connection	with connector	
Max operating pressure	bar	350
Operating temperature range	°C	-25 / +80
Class of protection according to IEC EN 60529 standards (atmospheric agents)		IP68
Spool position LED		NO

ELECTRIC CONNECTOR (to be ordered separately)

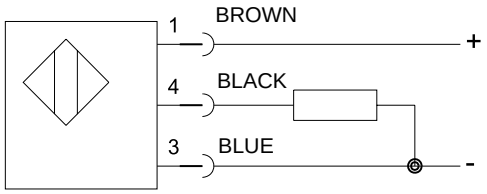
code: ECM3S/M12L/10/L5

connector: pre-wired connector M12 - IP68
cable: with 3 conductors 0.34 mm^2 - length 5 mt
cable material: polyurethane resin (oil resistant)

GREEN LED: indicates power supply voltage to the connector. If the LED is off, the connector is not powered.

YELLOW LED: show the valve status.
- valve at initial position yellow led ON - green led ON
- switched valve yellow led OFF - green led ON

CONNECTION SCHEME



valve closed = closed contact (A↔B intercepted flow)
valve open = open contact (A↔B free flow)

SIGNAL STATUS

In accordance with safety standards, the position signal must change state prior to the actual opening of the valve.

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duplomaticmotionsolutions.com

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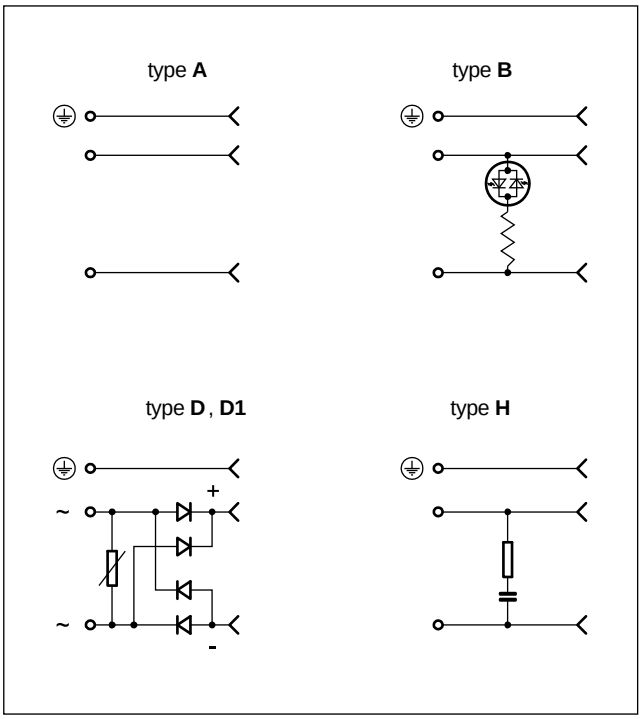


EC*
ELECTRIC CONNECTORS
SERIES 10

EN 175301-803
(ex DIN 43650 / ISO 4400)

type A

ELECTRICAL DIAGRAM



DESCRIPTION

— The EC* connectors are made according to EN 175301-803 standard, form “A” for socket mounting. They are for the electrical connection of solenoid valves.

— When correctly installed and coupled, they provide protection according to IEC EN 60529 standards, class of protection IP65/67.

— The class of insulation is in compliance with IEC 60664-1 2007 specifications, with operating voltage up to 250 V, overvoltage category II, operating degree 3.

— The wire terminal block is removable from the external housing for simplifying the wire connection to the clamps, and it allow the electrical contacts to be turned through 90° (except H and D1 versions) if required.

— Four different types with specific functions are available:

type **A**, connector two poles + ground
type **B***, with LED
(available voltages: 10÷50 V and 70÷250 V)
type **D** and **D1**, with bridge rectifier
type **H**, with RC damping circuit

— The A type is also available in gray colour, to differentiate the solenoids mounted on the side “a” or “b”.

— They are supplied with M3 fixing screw and NBR gasket.

TECHNICAL CHARACTERISTICS

		type A	type B*	type D / D1	type H
Voltage supply	V DC/AC	up to 230	10÷50 / 70÷250	up to 230	up to 230
Number of poles		2 + ground			
Current on connections: nominal maximum	A	10 16			
Contact resistance	mΩ	≤ 4			
Maximum conductor size	mm	1,5			
Cable exit		Pg9 / Pg11 unified			
Electromagnetic compatibility (EMC)		according to 2014/30/EU			
Low voltage		according to 2014/35/EU			
Protection degree		IP 65/67 - IEC 60529			
Insulation class		class C (IEC 60664-1:2007-04)			
Operating temperature	°C	-40 / +90			

1 - IDENTIFICATION CODE

E	C		/		/	10

Electric connector
EN 175301-803 (ex DIN 43650 / ISO 4400)

Connector type

A = two poles + ground

B1 = two poles + ground with led which burns when the solenoid is energized
power supply voltage 10 ÷ 50 V AC/DC

B2 = two poles + ground with led which burns when the solenoid is energized
power supply voltage 70 ÷ 250 V AC/DC

D = two poles + ground with Graetz bridge rectifier:
for alternating current power supply source with direct current coils.
Max current consumption 1 ampere.

D1 = two poles + ground with Graetz bridge rectifier:
for alternating current power supply source with direct current coils.
Max current consumption 3 ampere.

H = two poles + ground with RC damping circuit, to avoid voltage peaks as
circuit opening, suitable for alternating and direct current coils.

Series No.
(the overall and mounting dimensions
remain unchanged from 10 to 19)

Colour:

Type A
B = black (**standard**)
A = grey

Type B
N = transparent

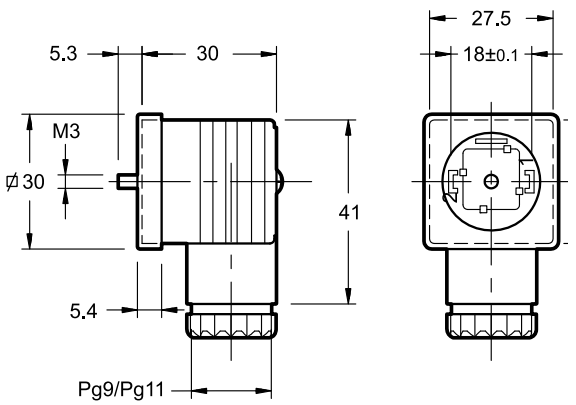
Types D, H
B = black

NOTE: It is not necessary to specify the supply voltage for connectors type A, D, D1 and H,
as they are suitable for supply voltages up to 230 V.

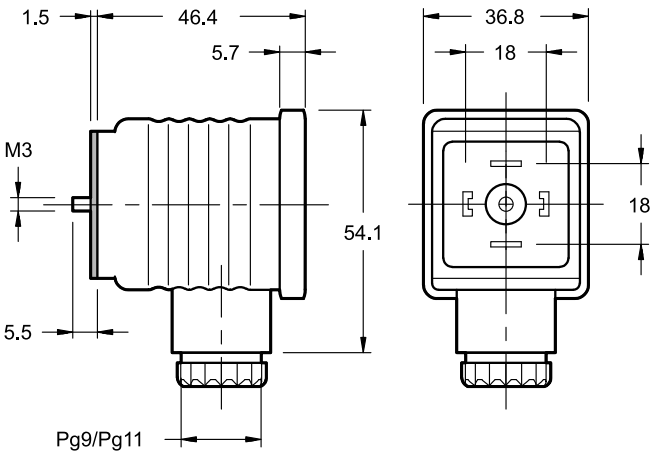
2 - OVERALL AND MOUNTING DIMENSIONS

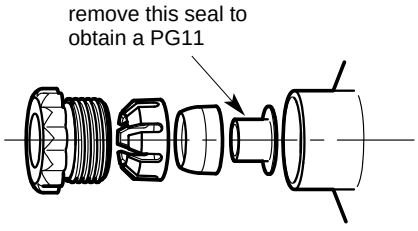
dimensions in mm

type **A, B1, B2, D**



type **H** and **D1**





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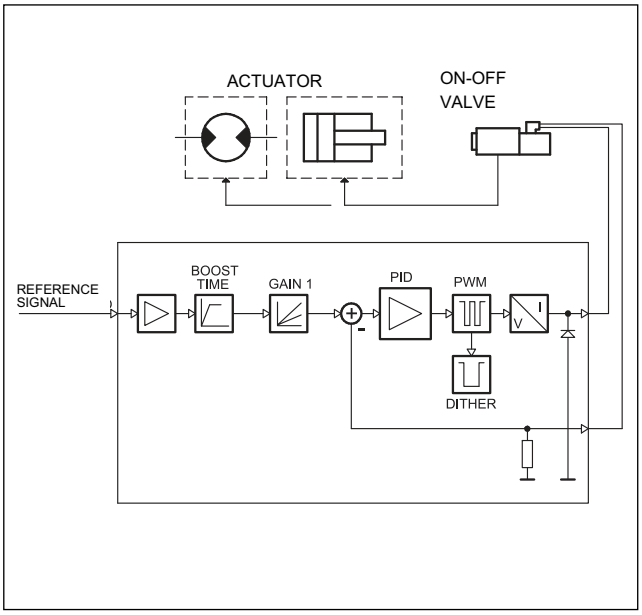
ECL

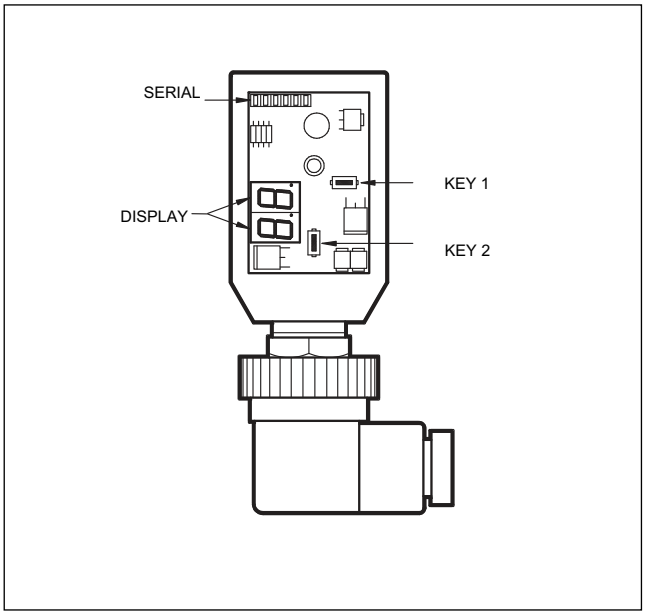
POWER SAVING DEVICE FOR ON-OFF SOLENOID VALVES

SERIES 20

PLUG VERSION

OPERATING PRINCIPLE

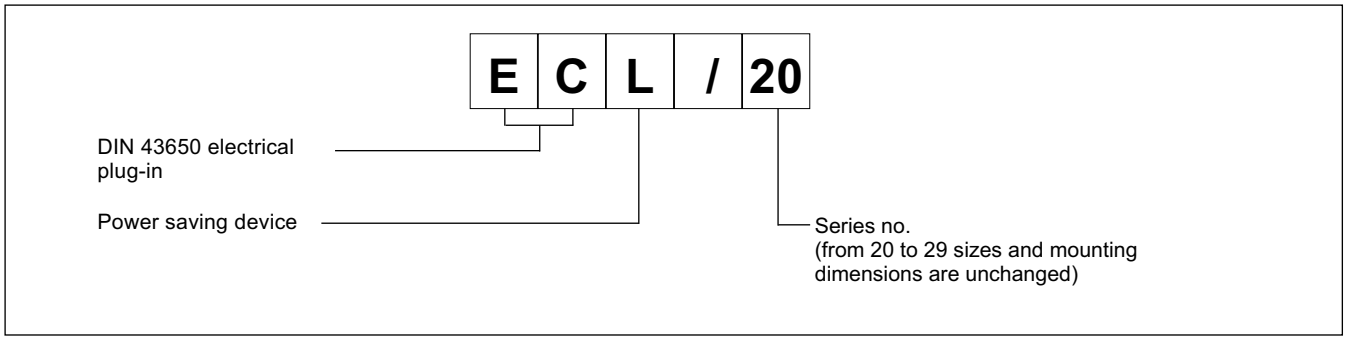




TECHNICAL CHARACTERISTICS

Power supply	V DC	8 ÷ 30 Ripple included
Max current	A	2,60
Absorbed current with valve not switched	mA	40
Current absorbed by the switching command (at 30 VDC)	mA	10 max
Full power feeding time	ms	50
Holding current regulating range	% I MAX	50 ÷ 100
Holding current default	% I MAX	40
Connector type		DIN 43650
Electromagnetic compatibility (EMC) - emissions CEI EN 61000-6-4 - immunity CEI EN 61000-6-2		according to 2004/108/CE standards (see paragraph 5 - **NOTE**)
Protection to atmospheric agents		IP 65 - 67
Operating temperature range	°C	-20 / +70
Mass	kg	0,10

1 - IDENTIFICATION CODE



The ECL connector is a digital amplifier controlling open loop on-off valves directly from PLC.

The unit supplies a set current independently from temperature variations or load impedence.

Setting is possible by buttons and display inside the case, or with a PC by RS232 with the software EDC-PC/10, (see paragraph 6.2).

2 - FUNCTIONAL SPECIFICATIONS

2.1 - Electric power supply

The connector requires a power supply of 24V DC (pin 1 and 2). The power supply voltage must be rectified and filtered, and it has not to be higher than 6A.

N.B. The value of the power supply voltage on the connector must be higher than the rated working voltage of the solenoid to be controlled.

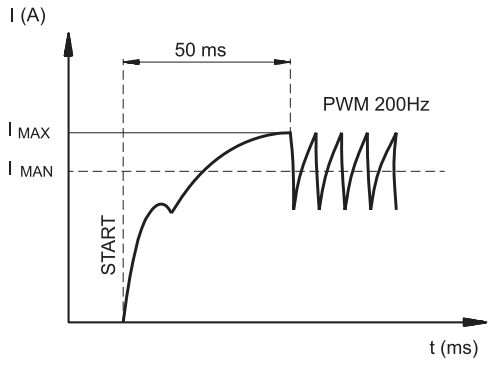
The power required by the card depends on the power supply voltage and on the maximum value of the supplied current.

2.2 - Electrical protection

The connector is protected against overvoltage and polarity inversion. On the output a protection against any short circuit is foreseen.

2.3 - Functioning

This device operates by feeding the solenoid valve at the max current value for a time sufficient to guarantee the complete valve energizing (50 ms). The current is therefore automatically reduced at holding.



I_{MAX} = max current
I_{MAN} = holding current

default vales: I_{MAN} = 1A
threshold : 200 mV
freq: 200 Hz

3 - SIGNALS

3.1 - POWER ON (Power supply)

Displays indicate the connector is ON and with +24 V DC.

4 - ADJUSTMENTS

There are two way adjustments: variables view and parameters editing. The first one enables the real time monitoring of the control values, for both required and read current, on both channels. The second modality enables the operating parameters view and editing.

4.1 - Variables view

The card is switched on at the variables view modality, and it shows the first variable value, that is the C1 parameter, current solenoid.

C1: current supplied from ECL to the solenoid read on real time

U1: Threshold reference signal.
9.9 = Threshold active

4.2 - Parameters editing

To access the parameter editing, press the key (2) for at least 3 seconds.
The first parameter displayed is G1. To modify it, press the key (1) for two seconds, until the display starts blinking. Use the key (2) to increase the value and the key (1) to decrease it. To save the new value, press both the keys. The display stops blinking.
Pressing the key (2) again is possible to scroll all the parameters. To modify the other parameters, repeat the steps above-mentioned for the G1 parameter.

The variables that can be selected are:

G1: "I Max" current, expressed in milliAmpere.
It sets the maximum current to the solenoid, when the reference signal is at the maximum value. It is used to limit the maximum value of the supplied current.
Default value of Imax = 1000 mA
Range = 50 ÷ 100% of Imax

Fr: PWM frequency, in Hertz.
It sets the PWM frequency, which is the pulsating frequency of the solenoid current.
Default value = 200
Range = 100 ÷ 500 Hz

DISPLAY VIEW EXAMPLE:

REFERENCE (V)	VARIABLE U1 (V)	VARIABLE C1
0	00	40. (mA)
10	10.	2.6 (A)

5 - INSTALLATION

The connector type electronic unit is suitable for direct assembly on the solenoid of the relative on-off valve. With the 4-core connector for supply and for the reference signal.

NOTE: To observe EMC requirements it's important that the control unit electrical connection is in compliance with the wiring diagram of chapter 7.

As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources as power wires, electrical motors, inverters and electrical switches.

In environments where there are critical electromagnetic interferences, a complete protection of the connection wires can be requested.

6 - START UP, CONTROL SETTINGS AND SIGNAL

6.1 - Set up

Settings can be changed by either acting on the (1) and (2) keys located on the card front panel, or using the EDC-PC software kit.

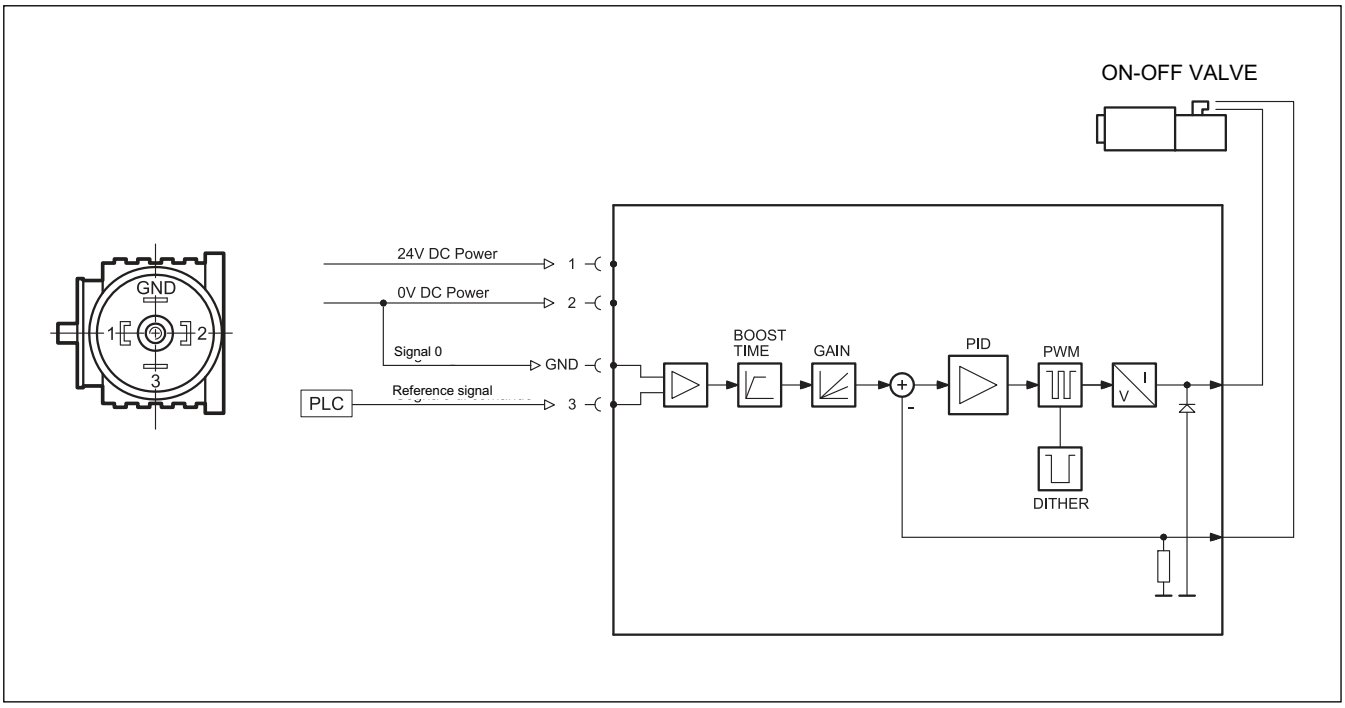
6.2 - EDC-PC/10 Software (code 3898301001)

The relevant hardware and software kit (to be ordered separately) allows to read the values and to set the connector easily.

The software communicates, through a flat cable, to the ECL; the connector is behind the protecting gate.

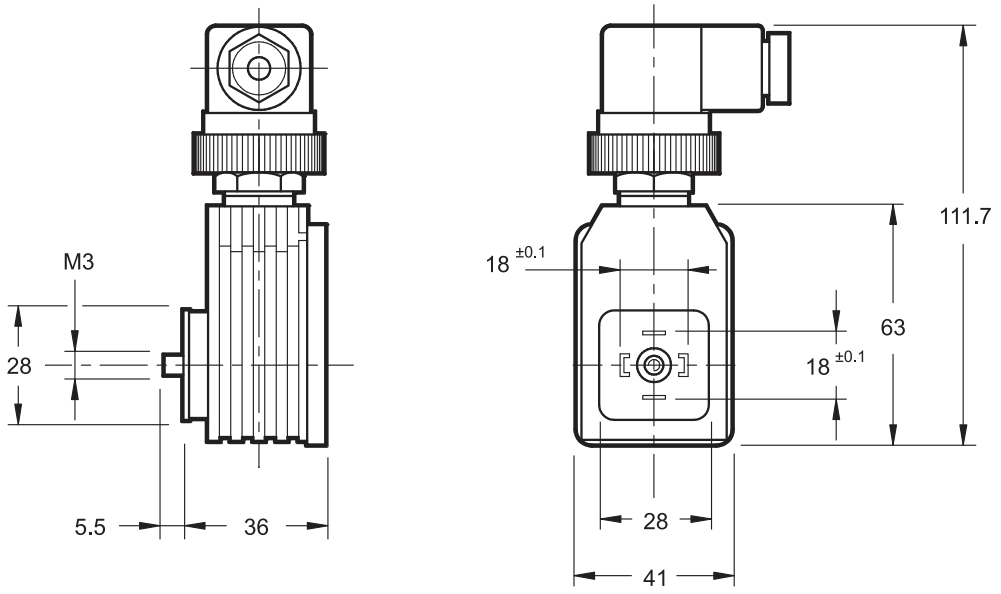
The EDC-PC/10 software compatibility is guaranteed only on Windows XP® operating systems.

7 - WIRING DIAGRAM



8 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



DUPLOMATIC OLEODINAMICA

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www.duplomatic.com • e-mail: sales.exp@duplomatic.com

681 / 1494



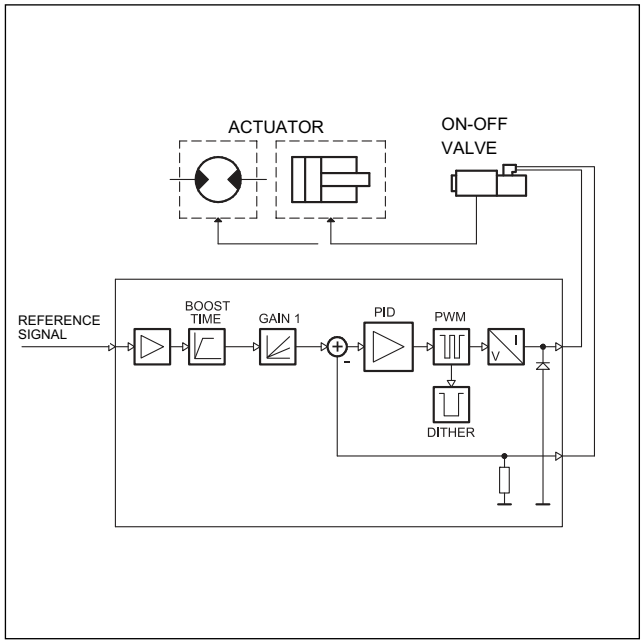
ECF

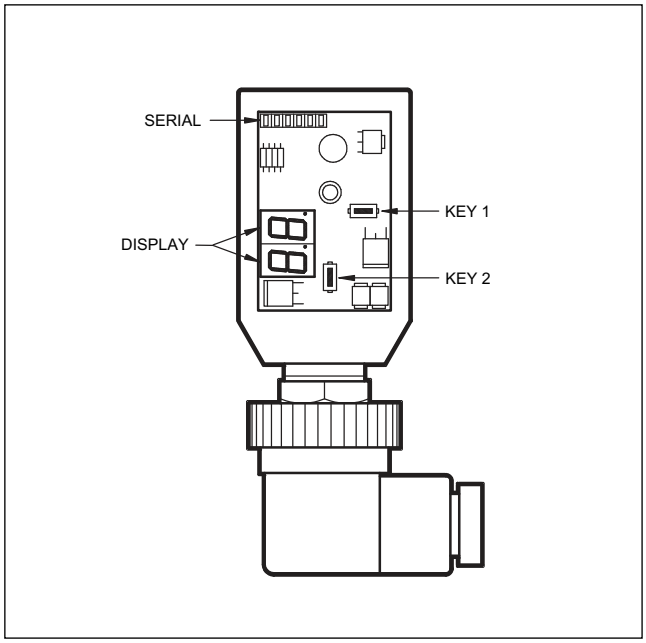
AMPLIFIED CONNECTOR FOR FAST COMMAND (RAPID) ON-OFF VALVES

SERIES 20

PLUG VERSION

OPERATING PRINCIPLE

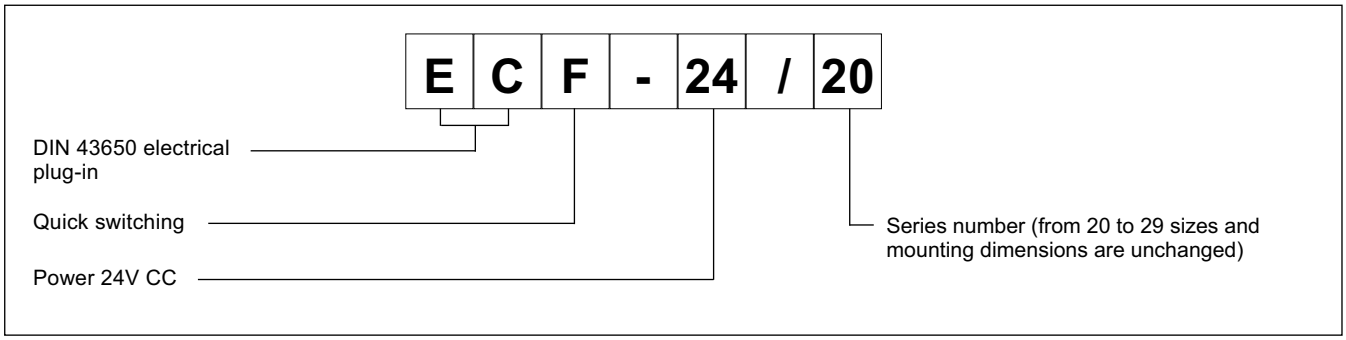




TECHNICAL CHARACTERISTICS

Power supply	V DC	24 ÷ 30 ripple included
Required power	W	min 50 - max 150 (see paragraph 2.1)
Output current	mA	max 3000 (see paragraph 1)
Power supply electrical protections		– overload over 33V – polarity inversion
Output electrical protections		Short-circuit
Analogue electrical protections		up to 30 V DC
Reference signal	V DC	24
Connector type		DIN 43650
Electromagnetic compatibility (EMC) - emissions CEI EN 61000-6-4 - immunity CEI EN 61000-6-2		according to 2004/108/CE standards (see paragraph 5 - **NOTE 1**)
Protection to atmospheric agents		IP 65 - 67
Operating temperature range	°C	-20 / +70
Mass	kg	0,10

1 - IDENTIFICATION CODE



The ECF connector is a digital amplifier controlling open loop on-off valves.

The unit supplies a set current independently from temperature variations or load impedance.

A quick solenoid energizing is possible in two different ways, according to the used coil type (12V o 24V)

Setting is possible by buttons and display inside the case, or with a PC by RS232 with the software EDC-PC, (see paragraph 6.2).

2 - FUNCTIONAL SPECIFICATIONS

2.1 - Electric power supply

The connector requires a power supply of 24V DC (terminals 1 and 2). The power supply voltage must be rectified and filtered, and it has not to be higher than 6A.

N.B. The value of the power supply voltage on the connector must be higher than the rated working voltage of the solenoid to be controlled.

The power required by the card depends on the power supply voltage and on the maximum value of the supplied current.

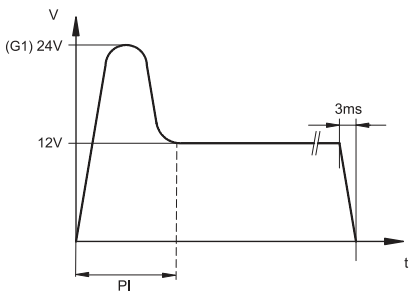
2.2 - Electrical protection

The connector is protected against overvoltage and polarity inversion. On the output a protection against any short circuit is foreseen.

2.3 - Functioning with 12V coils

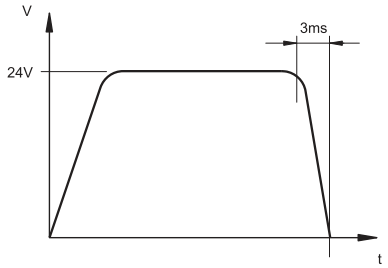
With the employment of 12V coils, the ECF valve allows a quick solenoid energizing (G1), overboosting the solenoid just the time to energize it (PI). Then, the voltage will be lowered at the rated value. The de-energizing is fast, and is 3 ms.

At overboosting time, the power-supply unit must be able to provide a 6 A intensity current strength.



2.4 - Functioning with 24V coils

24V coils do not require overboosting. A quick de-energizing is guaranteed.



3 - SIGNALS

3.1 - POWER ON (Power supply)

Displays indicate the connector is ON and with +24 V DC.

4 - ADJUSTMENTS

There are two way adjustments: variables view and parameters editing. The first one enables the real time monitoring of the control values, for both required and read current, on both channels. The second modality enables the operating parameters view and editing.

4.1 - Variables view

The card is switched on at the variables view modality, and it shows the first variable value, that is the C1 parameter, current solenoid.

C1: current supplied from ECF to the solenoid read on real time

4.2 - Parameters editing

To access the parameter editing, press the key (2) for at least 3 seconds.
The first parameter displayed is G1. To modify it, press the key (1) for two seconds, until the display starts blinking. Use the key (2) to increase the value and the key (1) to decrease it. To save the new value, press both the keys. The display stops blinking.
Pressing the key (2) again is possible to scroll all the parameters. To modify some the parameter, repeat the steps above-mentioned for the G1 parameter.

DISPLAY VIEW EXAMPLE:

REFERENCE (V)	VARIABLES (Ampere)
0	0.0 (mA)
24	2.6 (A)

The variables that can be selected are:

G1: "I Max" current, expressed in Ampere.

It sets the maximum current to the solenoid, when the reference signal is at the maximum value +24 V. It is used to limit the maximum value of the supplied current.

Default value = 2000 mA

Range = 0 ÷ 3000 mA

PI: Overboosting time.

It determines the regulation of solenoid overboosting time and it is measured by milliseconds.

Default value = 40 ms

Range = 0 ÷ 500 ms

Fr: PWM frequency, in Hertz.

It sets the PWM frequency, which is the pulsating frequency of the solenoid current.
Default value = 200

Range = 100 ÷ 500Hz

5 - INSTALLATION

The connector type electronic unit is suitable for direct assembly on the solenoid of the relative on-off valve. With the 4-core connector for supply and for the reference signal.

NOTE: To observe EMC requirements it's important that the control unit electrical connection is in compliance with the wiring diagram of chapter 7.

As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources as power wires, electrical motors, inverters and electrical switches.

In environments where there are critical electromagnetic interferences, a complete protection of the connection wires can be requested.

6 - START UP, CONTROL SETTINGS AND SIGNAL

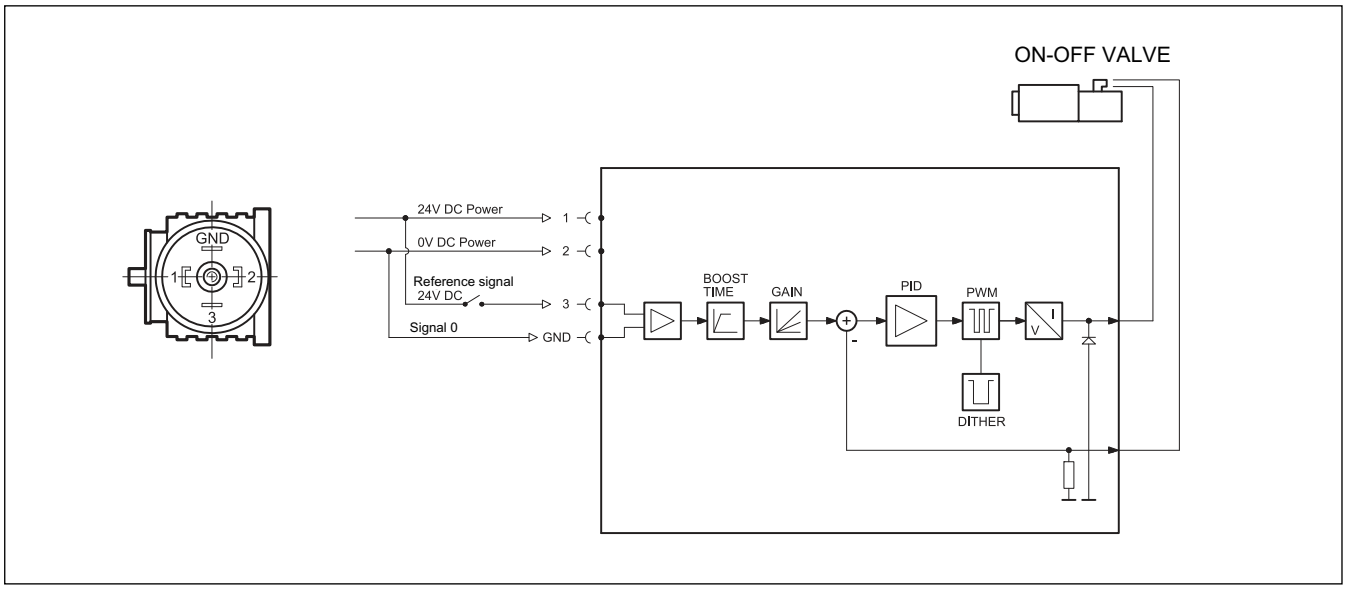
6.1 - Set up
Settings can be changed by either acting on the (1) and (2) keys located on the card front panel, or using the EDC-PC software kit.

6.2 - EDC-PC Software (code 3898301001)
The relevant hardware and software kit (to be ordered separately) allows to read the values and to set the connector easily.

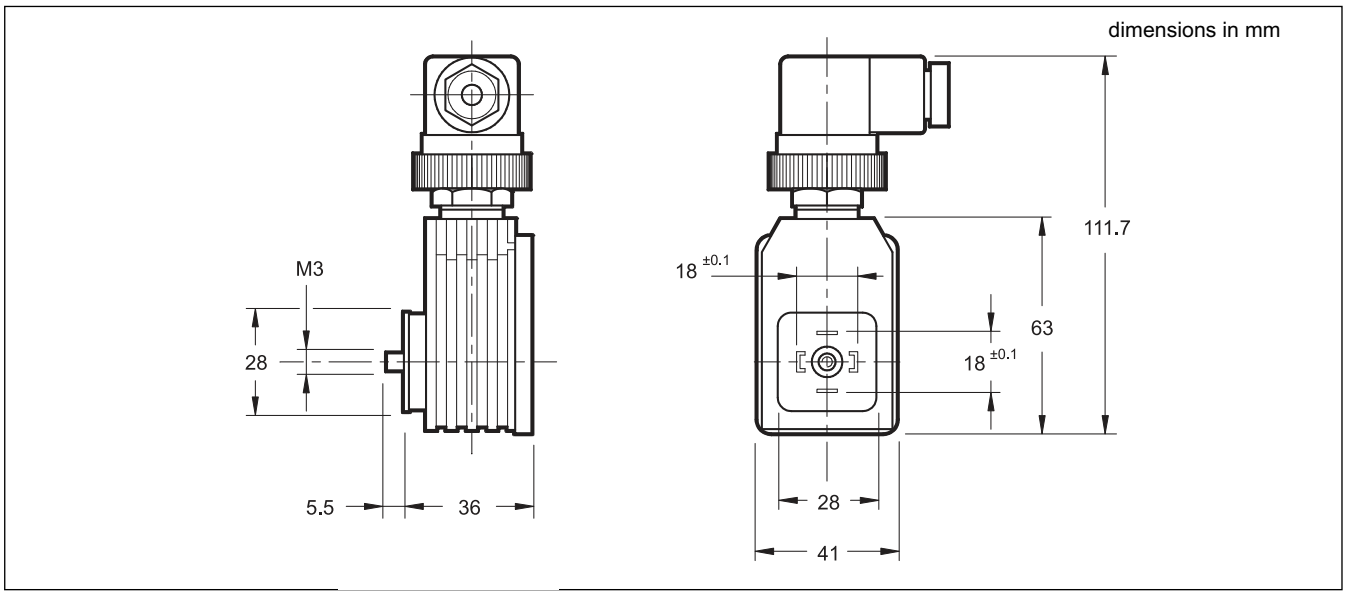
The software communicates, through a flat cable, to the ECF; the connector is behind the protecting gate.

The EDC-PC software compatibility is guaranteed only on Windows XP® operating systems.

7 - WIRING DIAGRAM



8 - OVERALL AND MOUNTING DIMENSIONS



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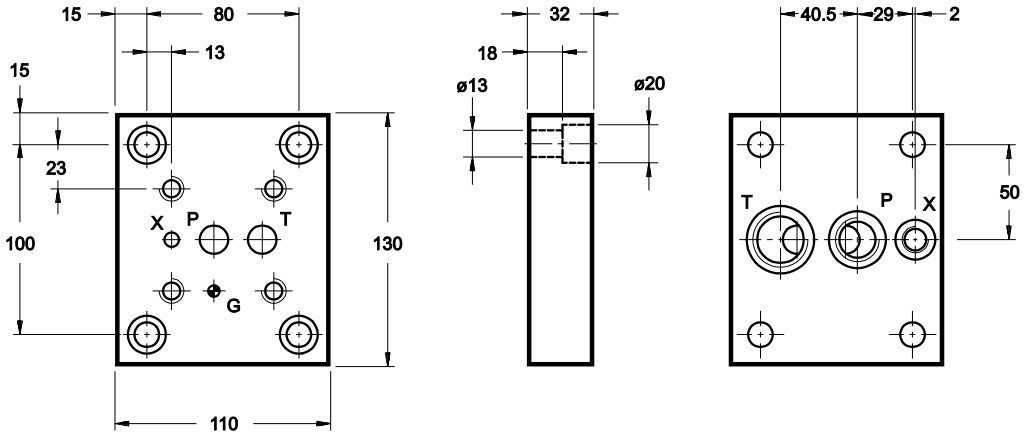
8 catalogue documents | 36 original technical pages

SUBPLATES
PMRQ*
SUBPLATES FOR PRESSURE CONTROL VALVES

1 - OVERALL AND MOUNTING DIMENSIONS PMRQ3-AI4G/20 (cod. 1961211)

ISO 6264-06-09-*-97
(CETOP 4.4.2-2-R06-350)

dimensions in mm



Ports on rear.
Threading of ports: P 1/2” BSP; T 3/4” BSP; X 1/4” BSP

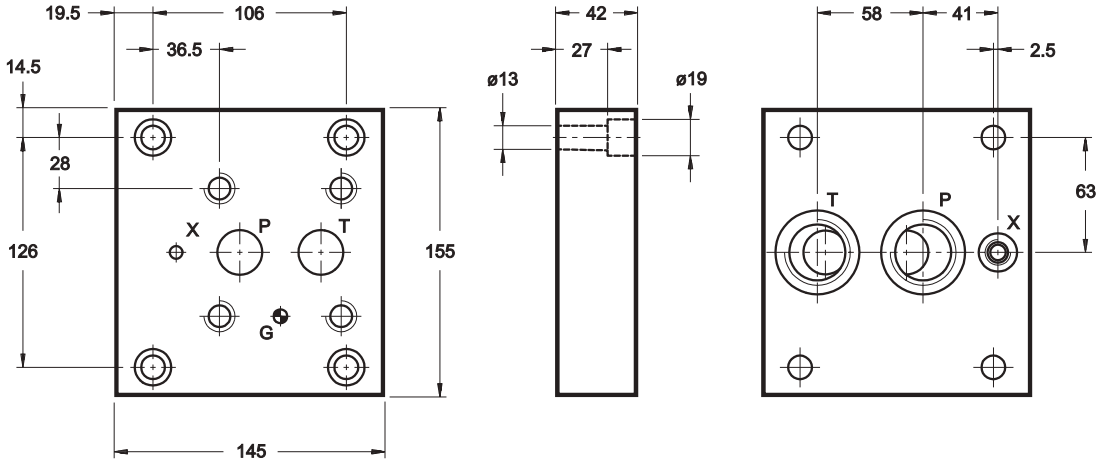
p max **350** bar

Mass: kg 3,0

2 - OVERALL AND MOUNTING DIMENSIONS PMRQ5-AI5G/20 (cod. 1961221)

ISO 6264-08-13-*-97
(CETOP 4.4.2-2-R08-350)

dimensions in mm



Ports on rear.
Threading of ports: P-T 1” BSP; X 1/4” BSP

p max **350** bar

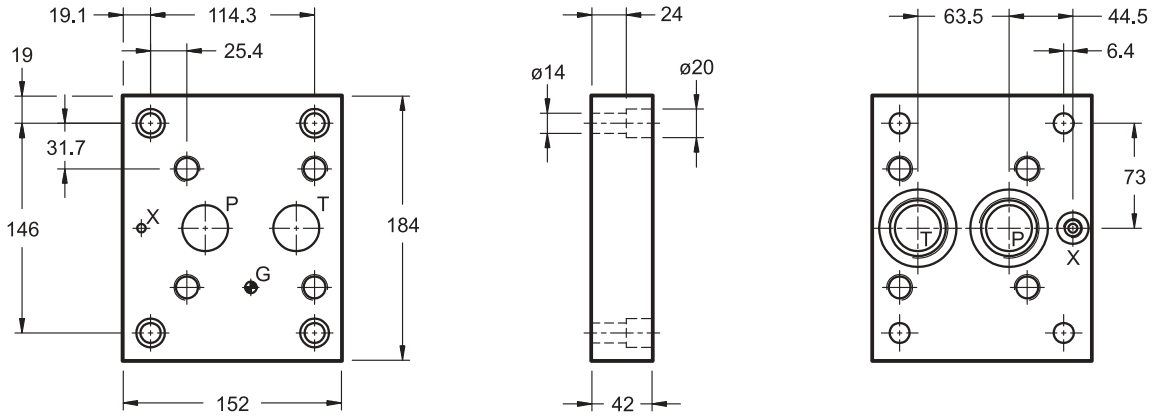
Mass: kg 6,5

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3 - OVERALL AND MOUNTING DIMENSIONS PMRQ7-AI7G/10 (cod. 1960051)

ISO 6264-10-17-*-97
(CETOP 4.4.2-2-R10-350)

dimensions in mm



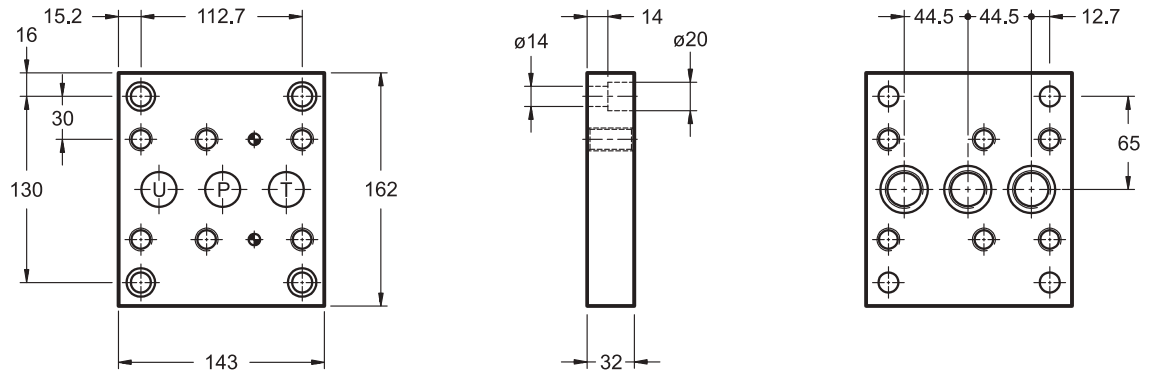
Ports on rear. Threading of ports: P-T 1” 1/4 BSP; X 1/4” BSP

p max **350** bar

Mass: kg 7,1

4 - OVERALL AND MOUNTING DIMENSIONS PMRQA5-AI5G/10 (cod. 1960070)

dimensions in mm



Ports on rear. Threading of ports: P - T - U 3/4” BSP

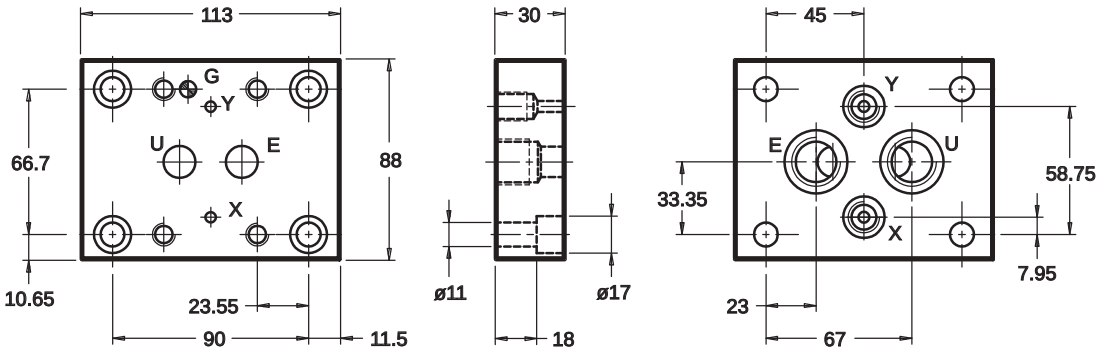
p max **350** bar

Mass: kg 6,5

5 - OVERALL AND MOUNTING DIMENSIONS PMSZ3-AI4G/20 (cod. 1961231)

ISO 5781-06-07-*-00
(CETOP 4.4.4-2-06-320)

dimensions in mm



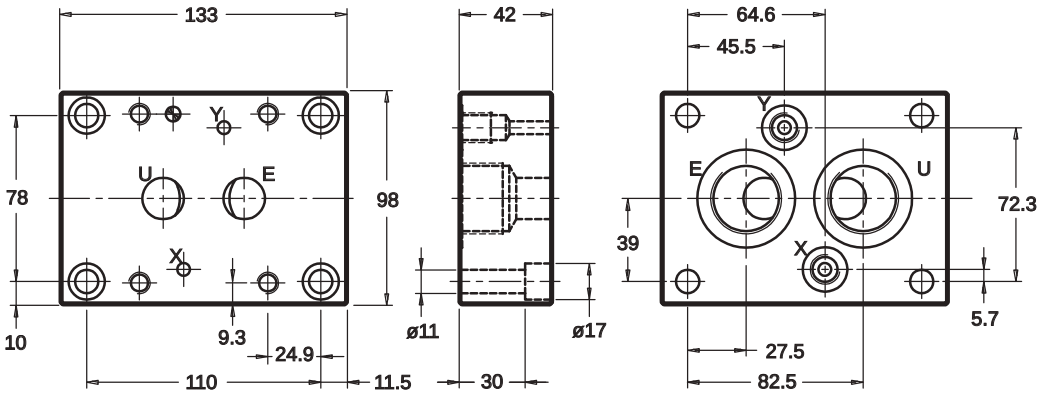
Ports on rear.
Threading of ports: E-U 1/2" BSP; X-Y 1/4" BSP

p max **320** bar Mass: kg 2,0

6 - OVERALL AND MOUNTING DIMENSIONS PMSZ5-AI6G/20 (cod. 1961241)

ISO 5781-08-10-*-00
(CETOP 4.4.5-2-08-320)

dimensions in mm



Ports on rear.
Threading of ports: E-U 1" BSP; X-Y 1/4" BSP

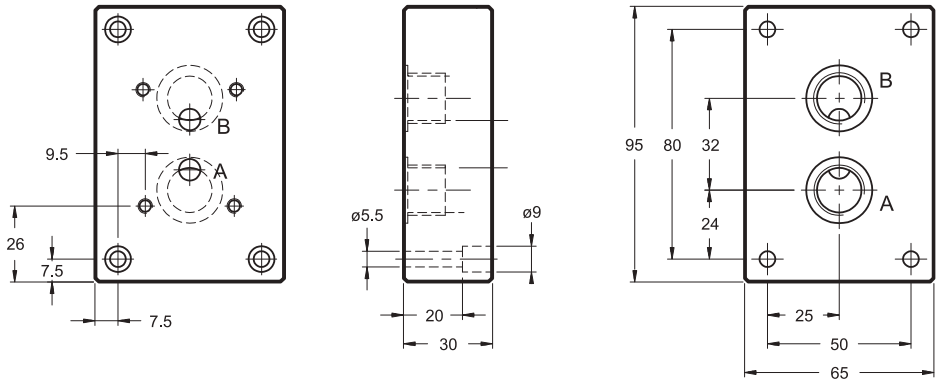
p max **320** bar Mass: kg 4,0

PMRPC*
SUBPLATES
FOR FLOW CONTROL VALVES

7 - OVERALL AND MOUNTING DIMENSIONS PMRPC1-AI3G/10 (cod. 1961045)

ISO 6263-03-03-*-97
(CETOP 4.5.2-2-03-250)

dimensions in mm



Ports on rear. Threading on ports: A - B 3/8” BSP

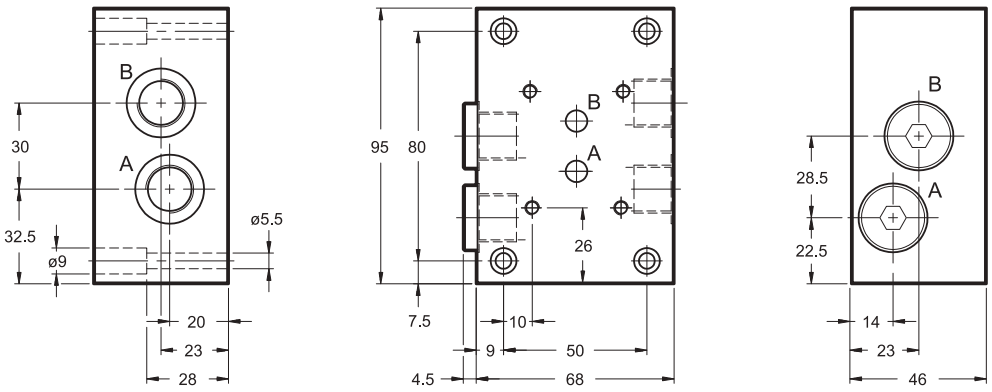
p max **250** bar

Mass: kg 1,2

8 - OVERALL AND MOUNTING DIMENSIONS PMRPC1-AL3G/10 (cod. 1961051)

ISO 6263-03-03-*-97
(CETOP 4.5.2-2-03-250)

dimensions in mm



Side ports. Threading on ports: A - B 3/8” BSP

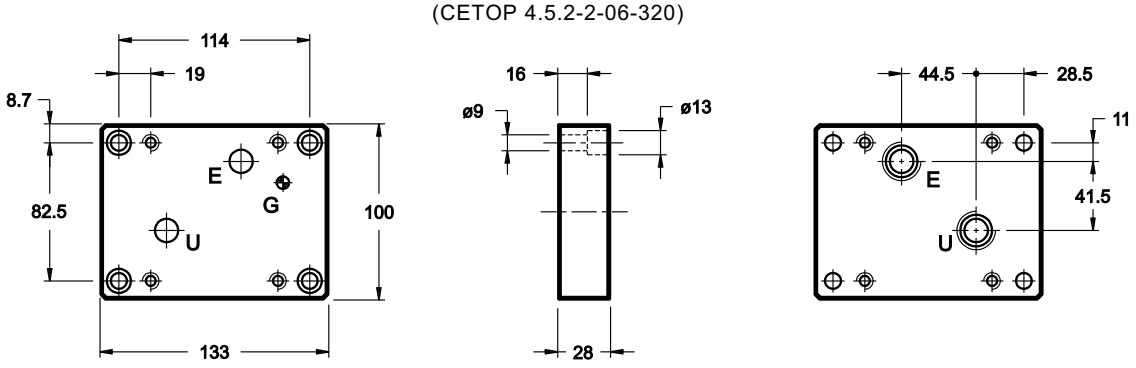
p max **250** bar

Mass: kg 1,9

9 - OVERALL AND MOUNTINGDIMENSIONS PMRPC2-AI4G/10 (cod. 1960330)

ISO 6263-06-05-*-97
(CETOP 4.5.2-2-06-320)

dimensions in mm



Ports on rear. Threading ports: E - U 1/2” BSP

p max **320** bar

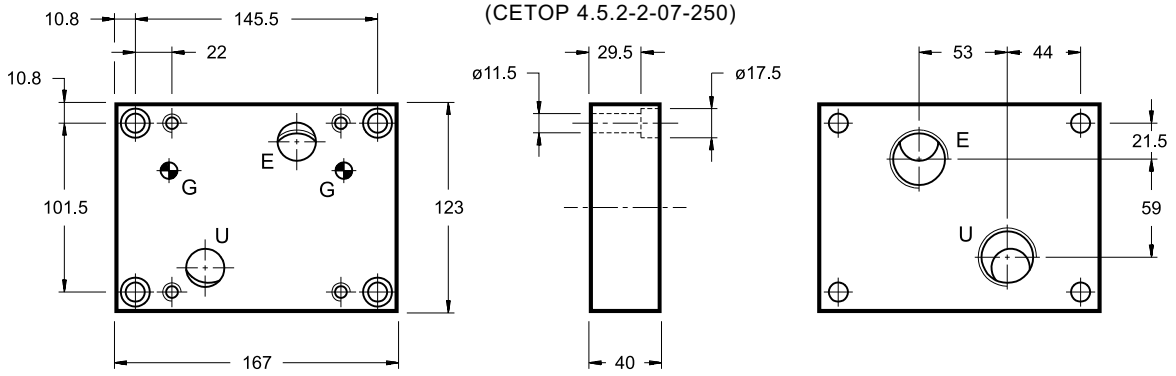
Mass: kg 2,5

PMRPC*
SUBPLATES
FOR FLOW CONTROL VALVES

10 - OVERALL AND MOUNTING DIMENSIONS PMRPC3-AI6G/10 (cod. 1960511)

ISO 6263-07-09-*-97
(CETOP 4.5.2-2-07-250)

dimensions in mm



Ports on rear. Threading of ports: E - U 1” BSP

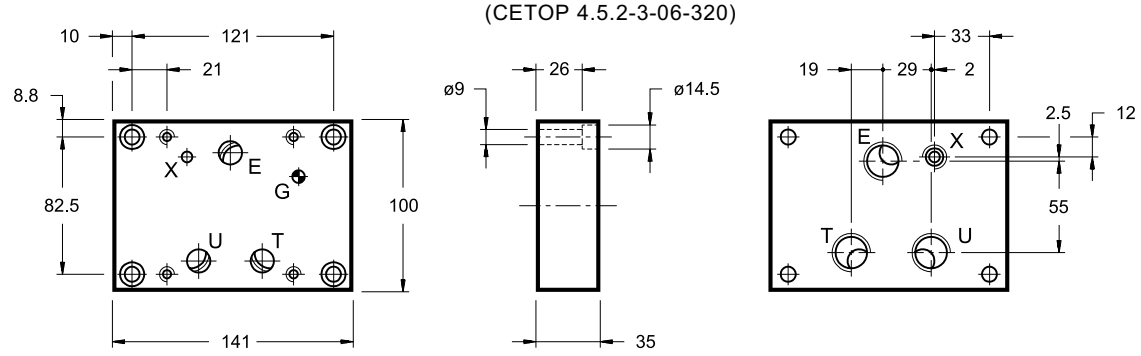
p max **250** bar

Mass: kg 5,5

11 - OVERALL AND MOUNTING DIMENSIONS PMRPCQ2-AI4G/10 (cod. 1960526)

ISO 6263-06-07-*-97
(CETOP 4.5.2-3-06-320)

dimensions in mm



Ports on rear. Threading of ports: E - U - T 1/2” BSP; X 1/4” BSP

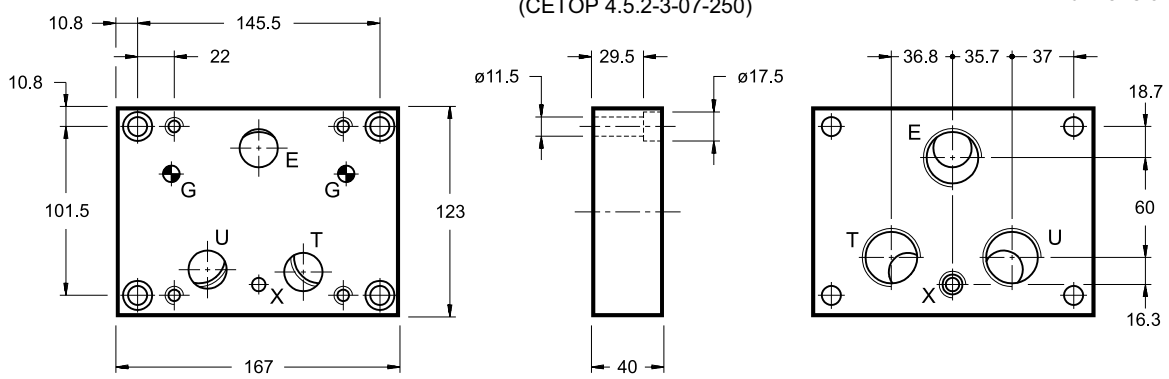
p max **320** bar

Mass: kg 3,3

12 - OVERALL AND MOUNTING DIMENSIONS PMRPCQ3-AI6G/10 (cod. 1960423)

ISO 6263-07-11-*-97
(CETOP 4.5.2-3-07-250)

dimensions in mm



Ports on rear. Threading of ports: E - U - T 1” BSP; X 1/4” BSP

p max **250** bar

Mass: kg 5,8

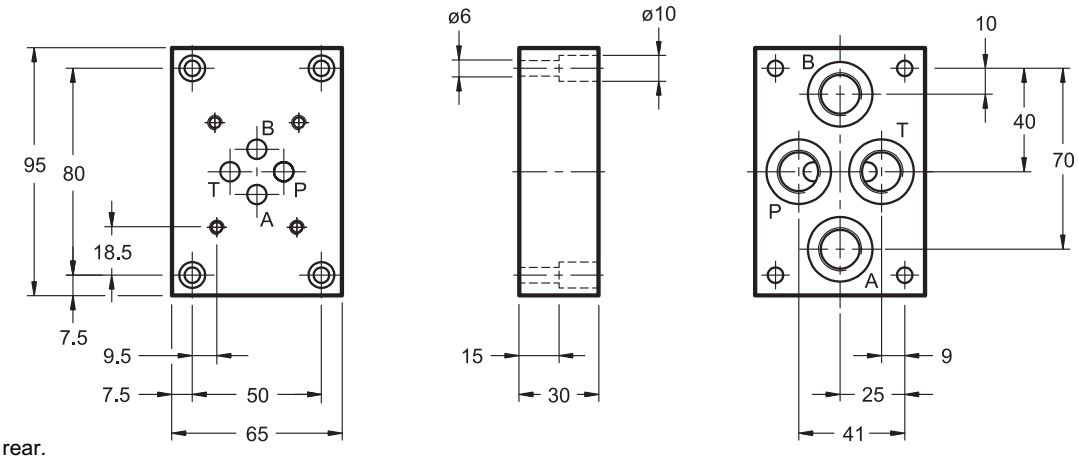
PMMD

SUBPLATES FOR ISO 4401-03 (CETOP 03) VALVES

13 - OVERALL AND MOUNTING DIMENSIONS PMMD-AI3G/20 (cod. 1961261)

ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)

dimensions in mm



Ports on rear.

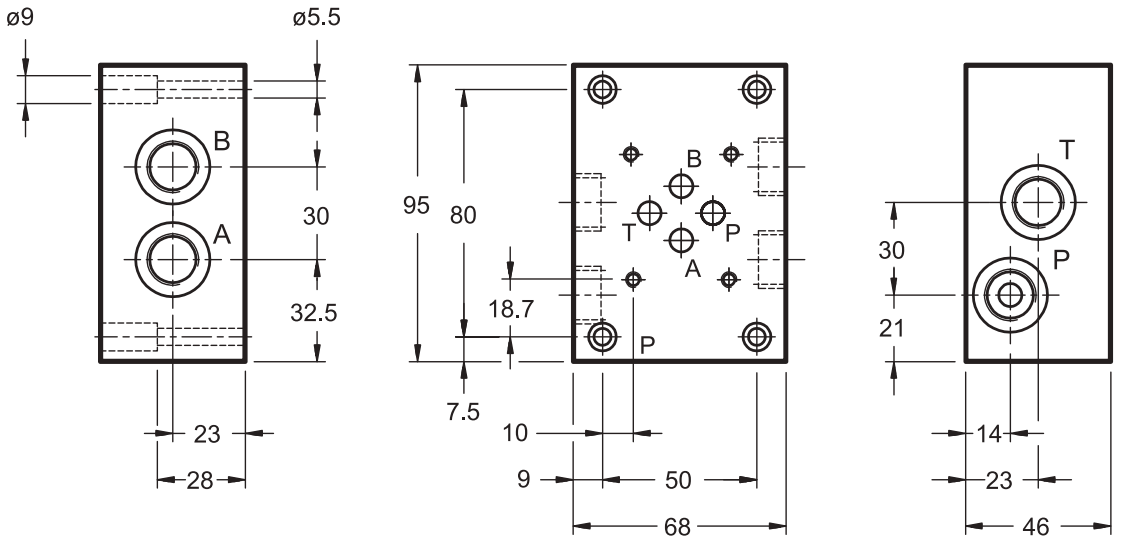
Threading on ports: P - T - A - B 3/8" BSP

p max **350** bar Mass: kg 1,2

14 - OVERALL AND MOUNTING DIMENSIONS PMMD-AL3G/11 (cod. 1961251)

ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)

dimensions in mm



Side ports.

Threading of ports: P - T - A - B 3/8" BSP

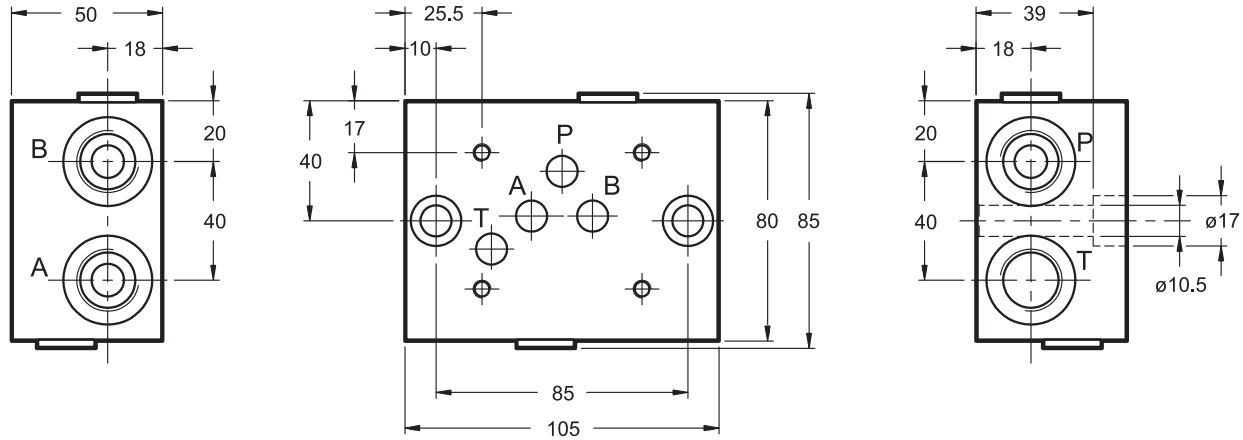
p max **350** bar Mass: kg 2,2

PMD4
SUBPLATES FOR ISO 4401-05 (CETOP 05) VALVES

15 - OVERALL AND MOUNTING DIMENSIONS PMD4-AL4G/10 (cod. 1960981)

ISO 4401-05-04-0-05
(CETOP 4.2-4-05-350)

dimensions in mm



Side ports.

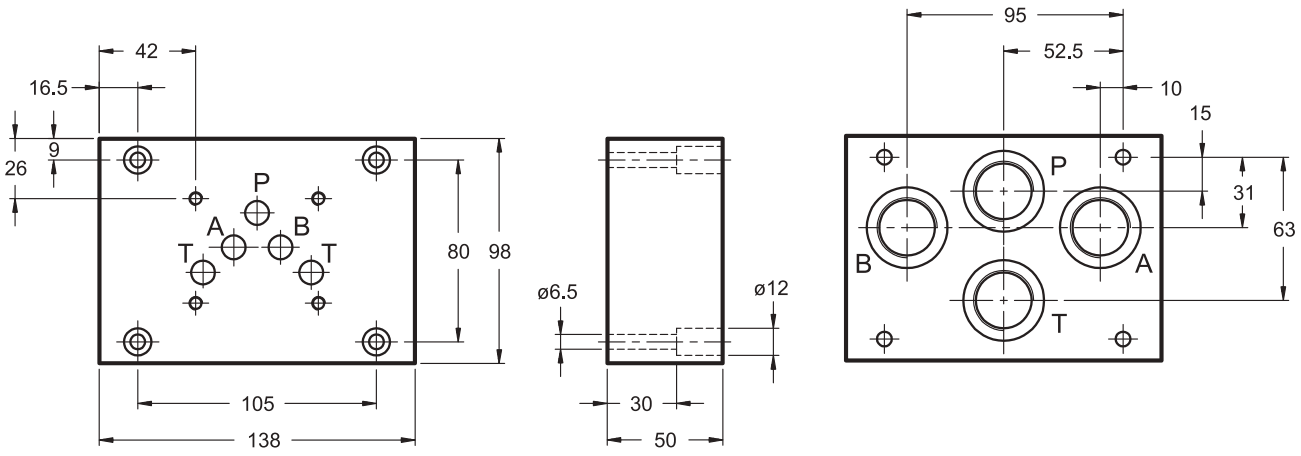
Threading of ports: P-T-A-B 1/2" BSP

p max **350** bar Mass: kg 2,2

16 - OVERALL AND MOUNTING DIMENSIONS PMD4-AI4G/20 (cod. 1961271)

ISO 4401-05-04-0-05
(CETOP 4.2-4-05-350)

dimensions in mm



Ports on rear.

Threading of ports: P-T-A-B 3/4" BSP

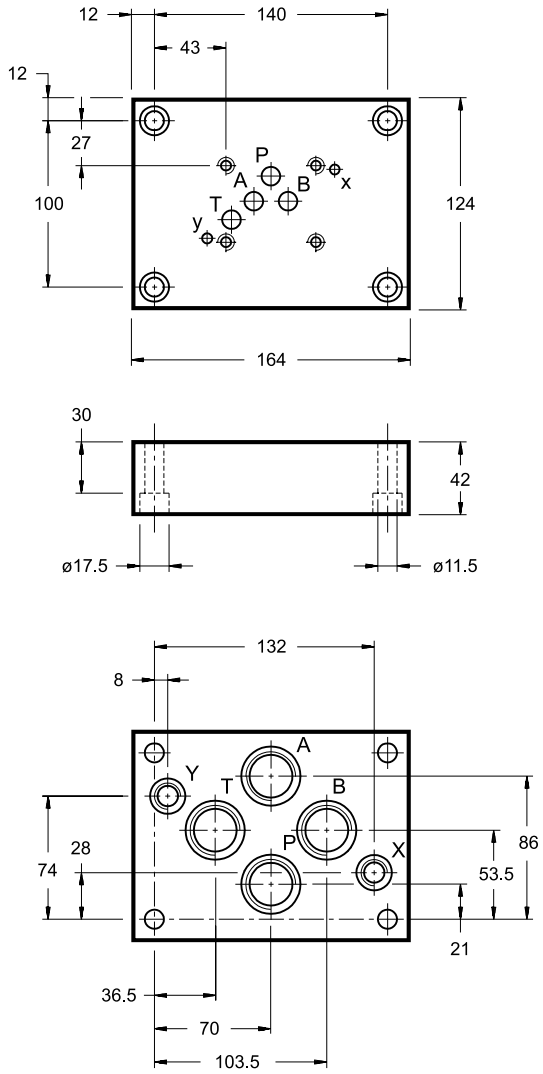
p max **350** bar Mass: kg 4,2

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17 - OVERALL AND MOUNTING DIMENSIONS PME4-AI5G/10 (cod. 1961181)

CETOP 4.2-4-P05-320

dimensions in mm



Ports on rear.
Threading of ports:
P-T-A-B 3/4" BSP
X-Y 1/4" BSP

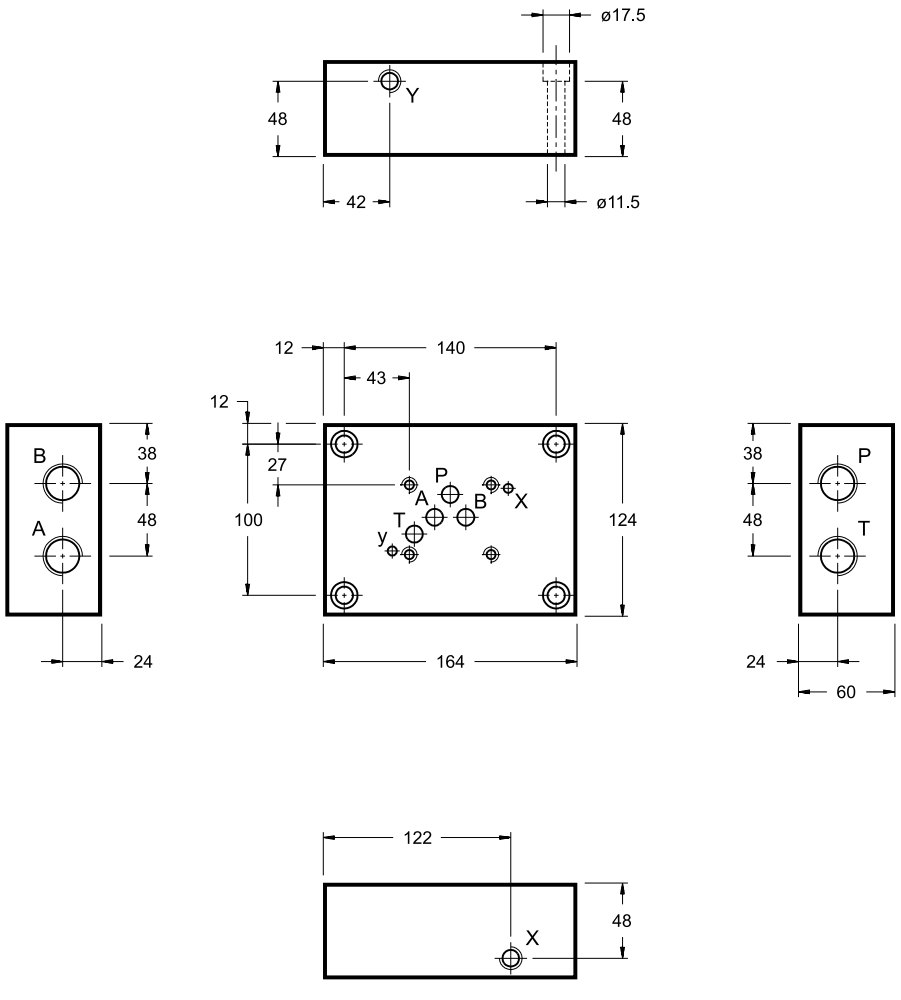
p max **320** bar Mass: kg 5,3

PME4
SUBPLATES FOR CETOP P05 VALVES

18 - OVERALL AND MOUNTING DIMENSIONS PME4-AL5G/10 (cod. 1961201)

CETOP 4.2-4-P05-320

dimensions in mm



Side ports.
Threading of ports:
P-T-A-B 3/4" BSP
X-Y 1/4" BSP

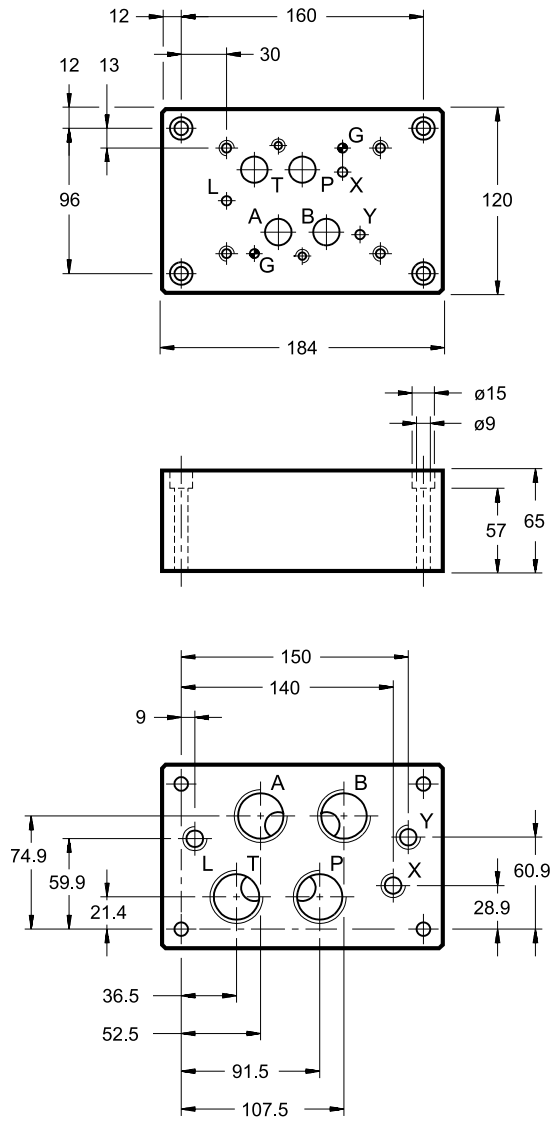
p max **320** bar Mass: kg 5,3

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19 - OVERALL AND MOUNTING DIMENSIONS PME07-AI6G/10 (cod. 1961071)

dimensions in mm

ISO 4401-07-07-0-05
(CETOP 4.2-4-07-350)



Ports on rear.
Threading of ports:
P-T-A-B 1” BSP
X-Y-L 1/4” BSP

p max **350** bar

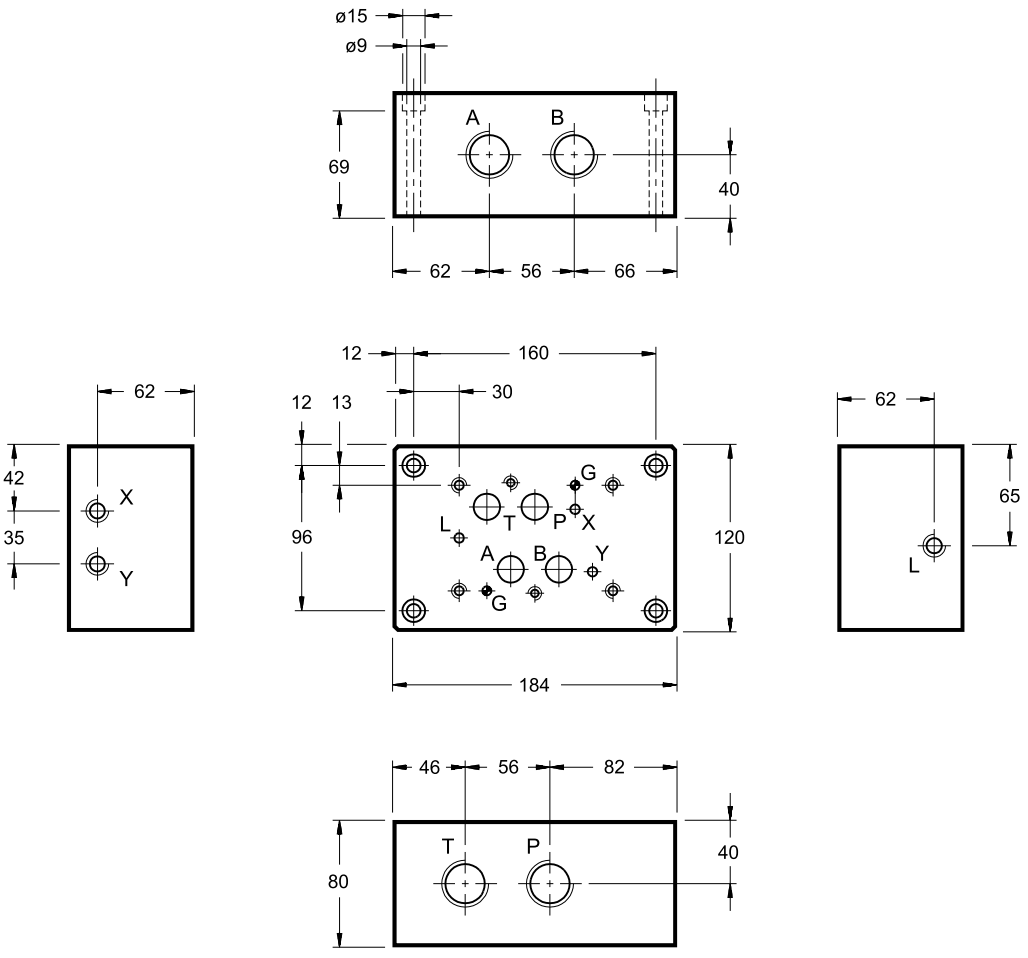
Mass: kg 9

PME07
SUBPLATES FOR ISO 4401-07 (CETOP 07) VALVES

20 - OVERALL AND MOUNTING DIMENSIONS PME07-AL6G/10 (cod. 1961111)

dimensions in mm

ISO 4401-07-07-0-05
(CETOP 4.2-4-07-350)



Side ports.
Threading of ports:
P-T-A-B 1” BSP
X-Y-L 1/4” BSP

p max **350** bar

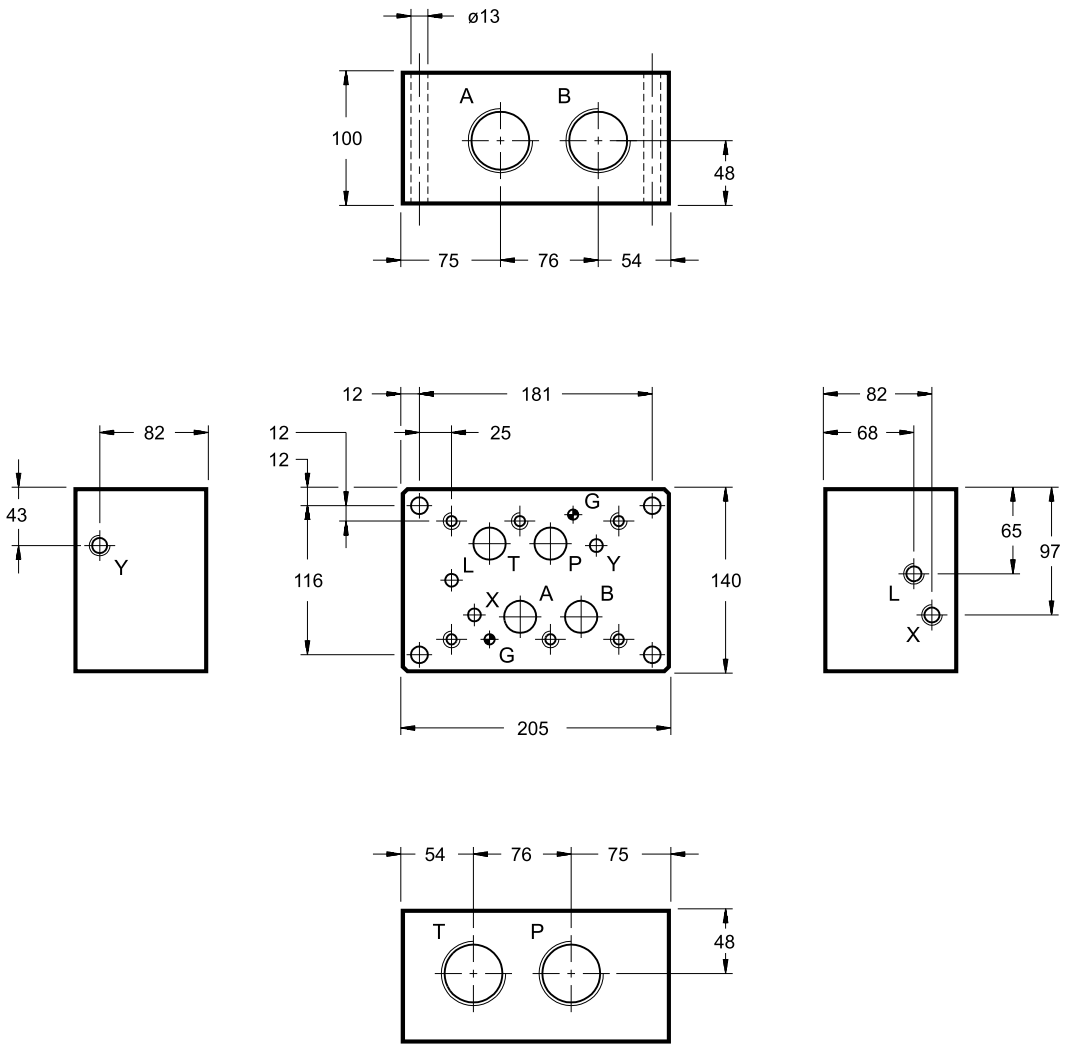
Mass: kg 11,5

PME5
SUBPLATES FOR ISO 4401-08 (CETOP 08) VALVES

21 - OVERALL AND MOUNTING DIMENSIONS PME5-AL8G/10 (cod. 1961141)

ISO 4401-08-08-0-05
(CETOP 4.2-4-08-320)

dimensions in mm



Side ports.
Threading of ports:
P-T-A-B 1” 1/2 BSP
X-Y-L 1/4” BSP

Mass: kg 19

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P2*
MODULAR SUBPLATES FOR ISO 4401-03 (CETOP 03) VALVES

This series of modular subplates has been designed to make hydraulic circuits and can be used directly on power packs or on any other section of the machine.

The subplates are assembled by means of 4 tie-rods with seal seats incorporated in the subplate.

The above assembly achieves compact units (including pressure and discharge manifolds): one face per subplate is used for connection to services and the other to mount ISO 4401-03 (CETOP 03) valves.

Complex circuits can also be set up using modular valves.

The recommended mounting configuration for **P2*** subplates on hydraulic power packs is with the main axis positioned vertically to obtain the bundle of pipes to utilities in two vertical rows; however assembly is not restricted to this configuration.

p max **350** bar

Q max **50** l/min

TECHNICAL SPECIFICATIONS

Maximum operating pressure - ports P - A - B - port T	bar	see paragraph 11 140
Maximum flow	l/min	50
Port dimensions: P - pressure T - lower drainage T - upper drainage A/B - users	BSP	 3/8” 1/2” 3/8” 3/8”
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	cSt	25
Recommended viscosity	According to ISO 4406:1999 class 20/18/15	

1 - IDENTIFICATION CODE

P	2	D	-		/	21

Subplate

Dimension for ISO 4401-03 (CETOP 03) valves

Single mounting facility

Serial No :
(from 20 to 29 and from 30 to 39 overall and mounting dimensions remain unchanged)

Versions: (omit for standard subplate P2D/21)

F = with P - T threaded ports and additional pressure port.

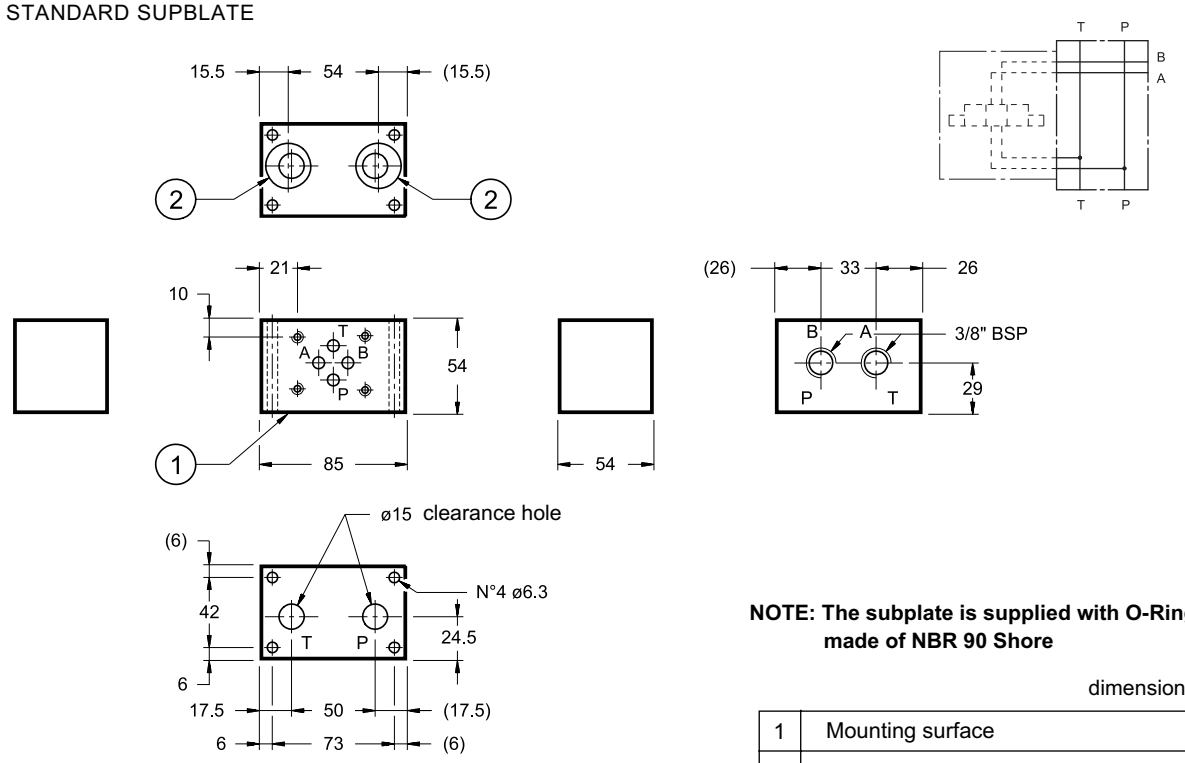
I = intermediate with threaded fastening holes to reduce rods lenght and additional pressure port.

Z = arranged for the installation of an MZD pressure reducing valve

NOTE: identification code of subplates P2*-M*/33 see paragraph 6

2 - OVERALL AND MOUNTING DIMENSIONS P2D/21 (cod. 1560121)

STANDARD SUPBLATE



Mass: kg 1,5

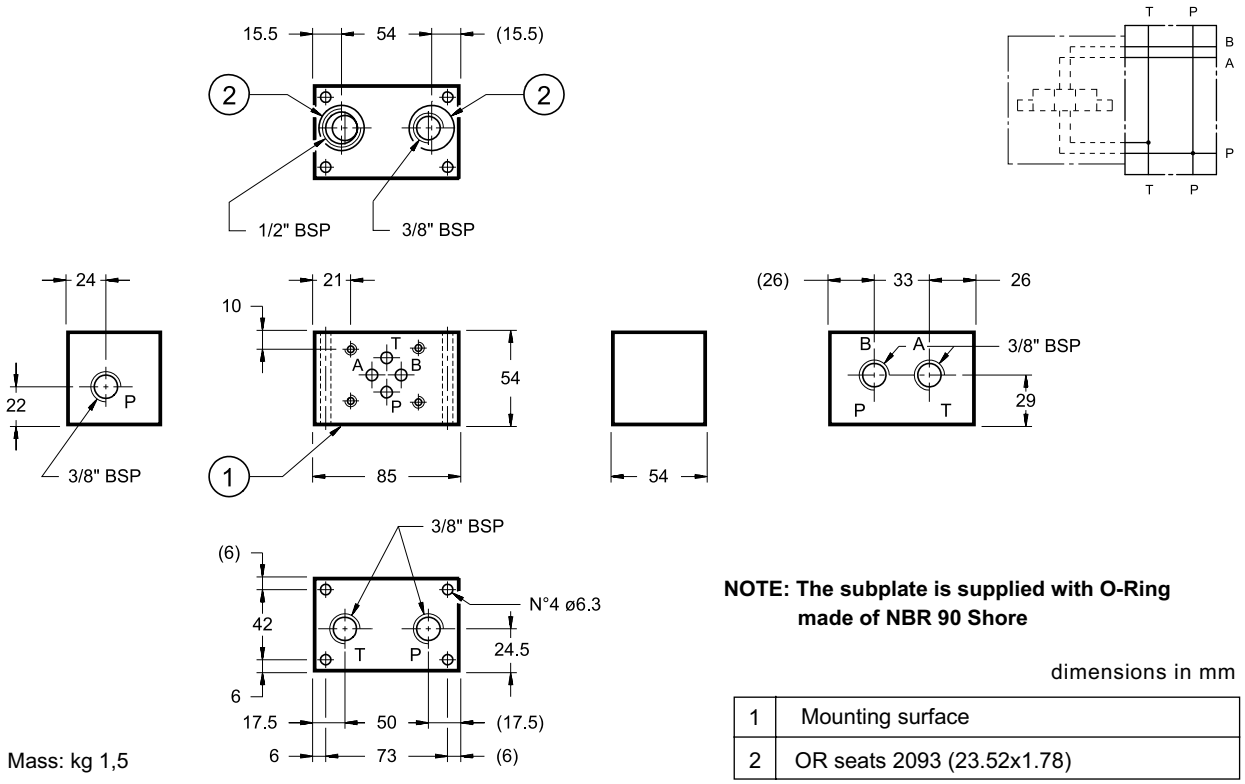
NOTE: The subplate is supplied with O-Ring made of NBR 90 Shore

dimensions in mm

1	Mounting surface
2	OR seats 2093 (23.52x1.78)

3 - OVERALL AND MOUNTING DIMENSIONS P2D-F/21 (cod. 1560122)

P - T THREADED PORTS AND ADDITIONAL PRESSURE PORT SUBPLATE



Mass: kg 1,5

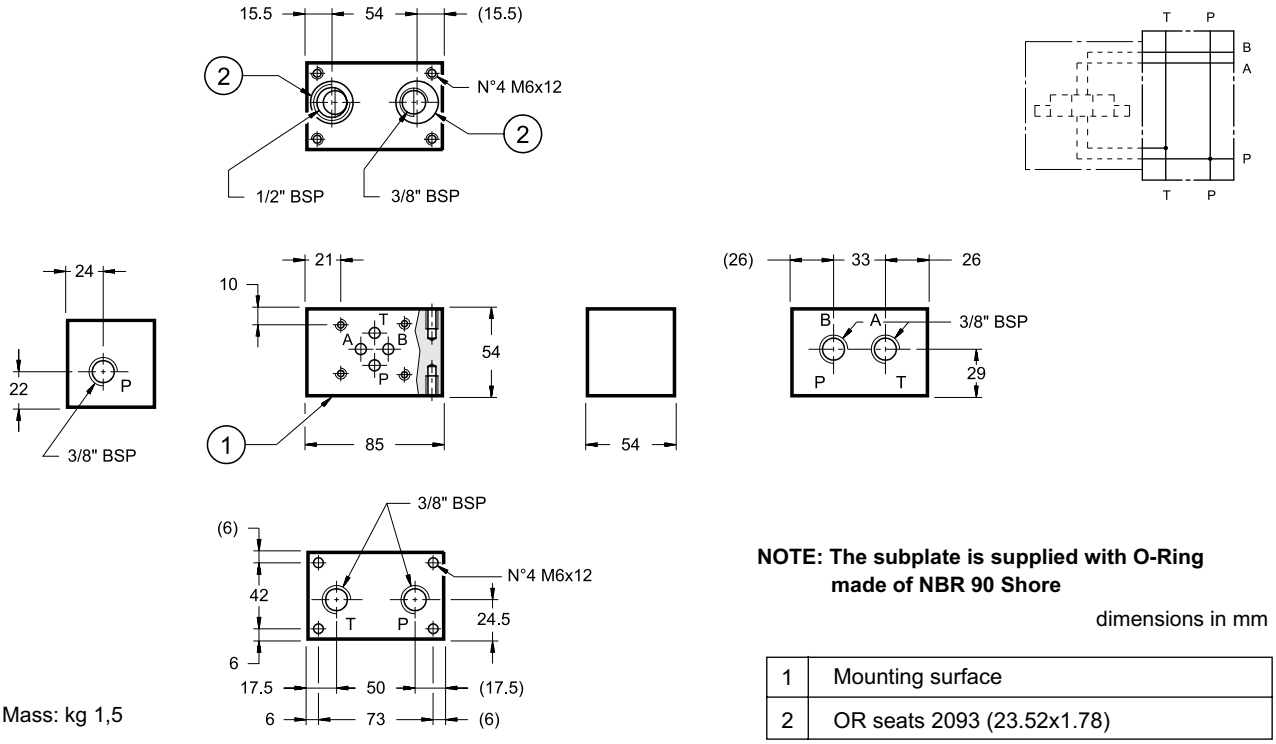
NOTE: The subplate is supplied with O-Ring made of NBR 90 Shore

dimensions in mm

1	Mounting surface
2	OR seats 2093 (23.52x1.78)

4 - OVERALL AND MOUNTING DIMENSIONS P2D-I/21 (cod. 1560123)

INTERMEDIATE SUBPLATE WITH THREADED FASTENING HOLES TO REDUCE ROD LENGHT AND ADDITIONAL PRESSURE PORT



NOTE: The subplate is supplied with O-Ring made of NBR 90 Shore

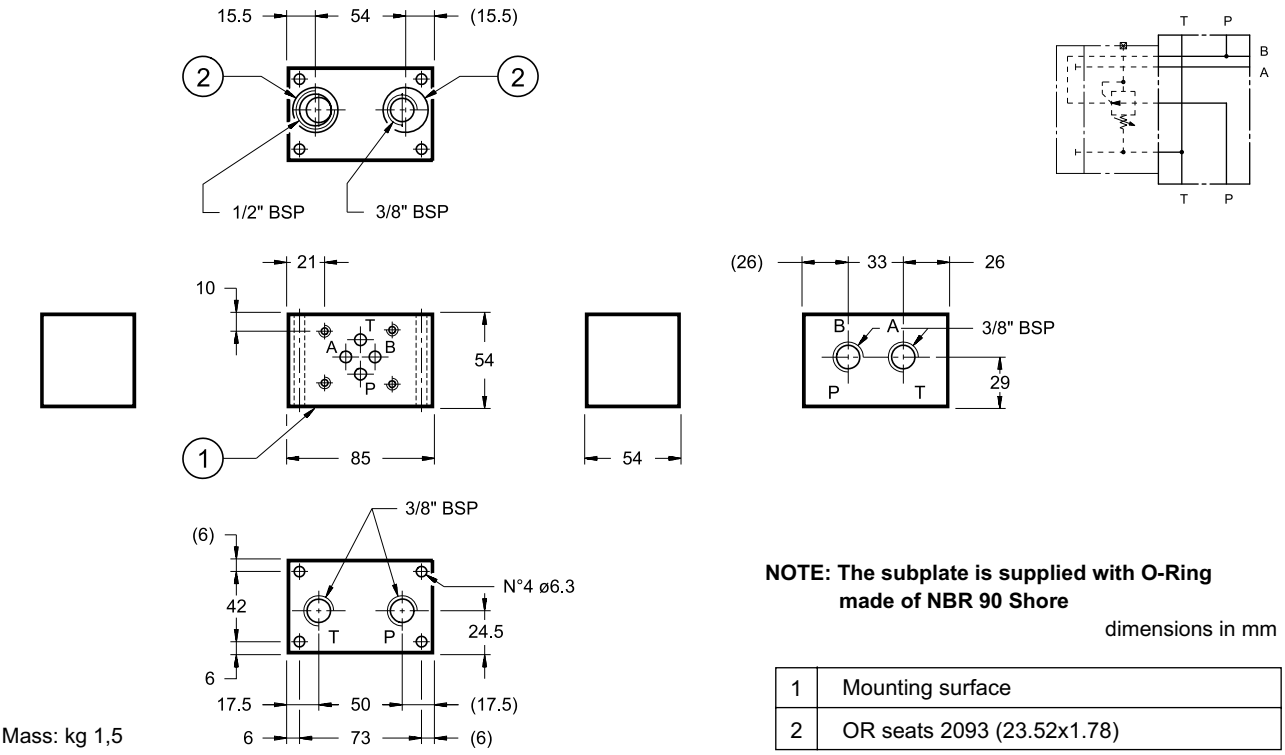
dimensions in mm

1	Mounting surface
2	OR seats 2093 (23.52x1.78)

Mass: kg 1,5

5 - OVERALL AND MOUNTING DIMENSIONS P2D-Z/21 (cod. 1560025)

SUBPLATE ARRANGED FOR THE INSTALLATION OF AN MZD PRESSURE REDUCING VALVE



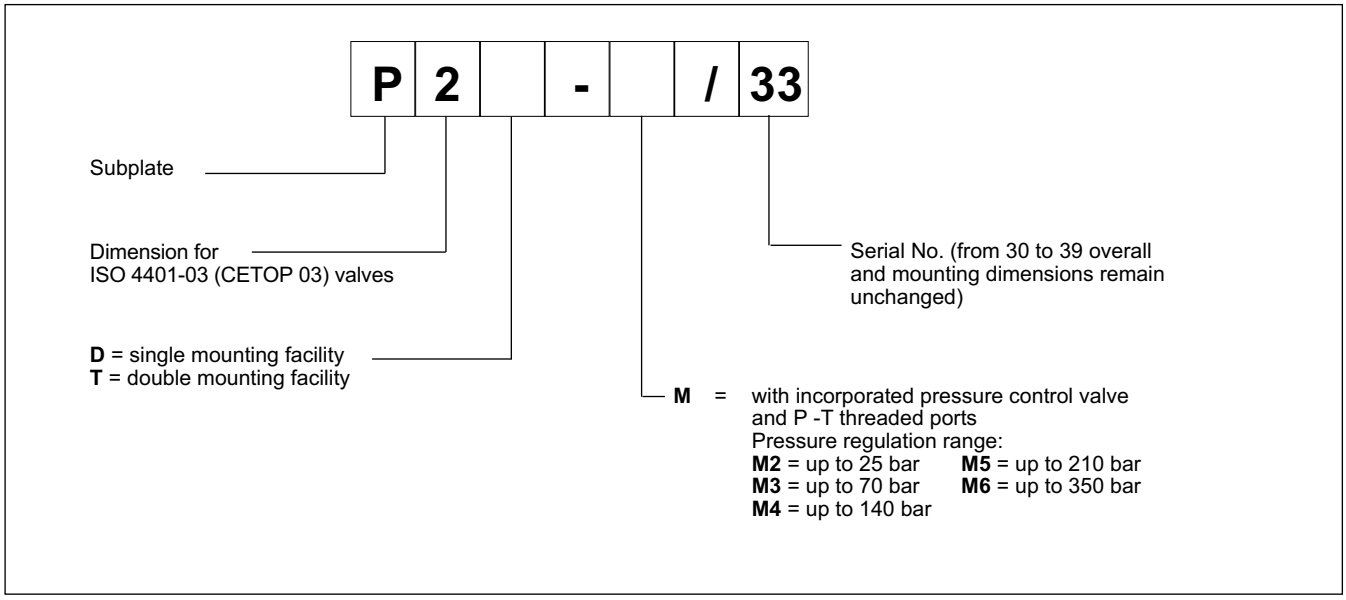
NOTE: The subplate is supplied with O-Ring made of NBR 90 Shore

dimensions in mm

1	Mounting surface
2	OR seats 2093 (23.52x1.78)

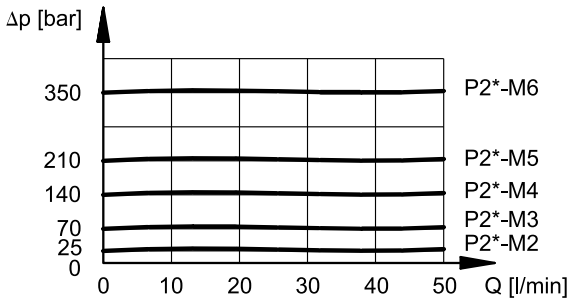
Mass: kg 1,5

6 - IDENTIFICATION CODE subplates with incorporated pressure control valve

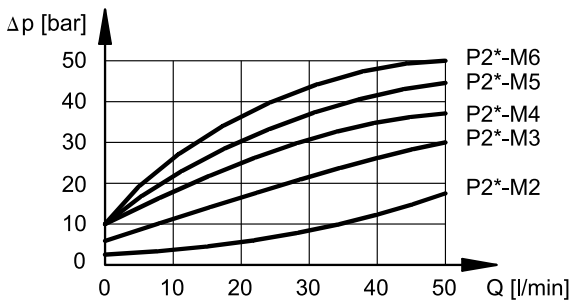


7 - CHARACTERISTIC CURVES FOR P2D-M* E P2T-M* SUBPLATES WITH PRESSURE CONTROL VALVE INCORPORATED (values obtained with viscosity of 36 cSt at 50°C)

ADJUSTMENT

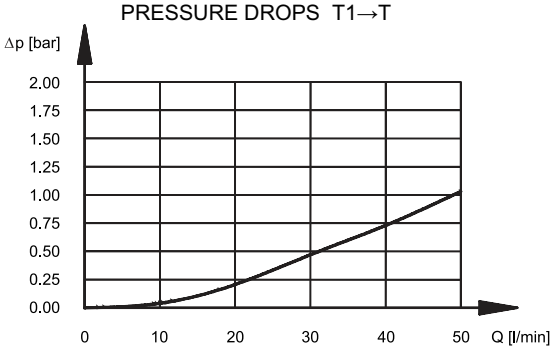


MINIMUM CONTROLLED PRESSURE



pressure drops P-T with calibrated screw at the regulation beginning (minimum controlled pressure)

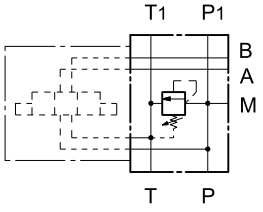
PRESSURE DROPS T1→T

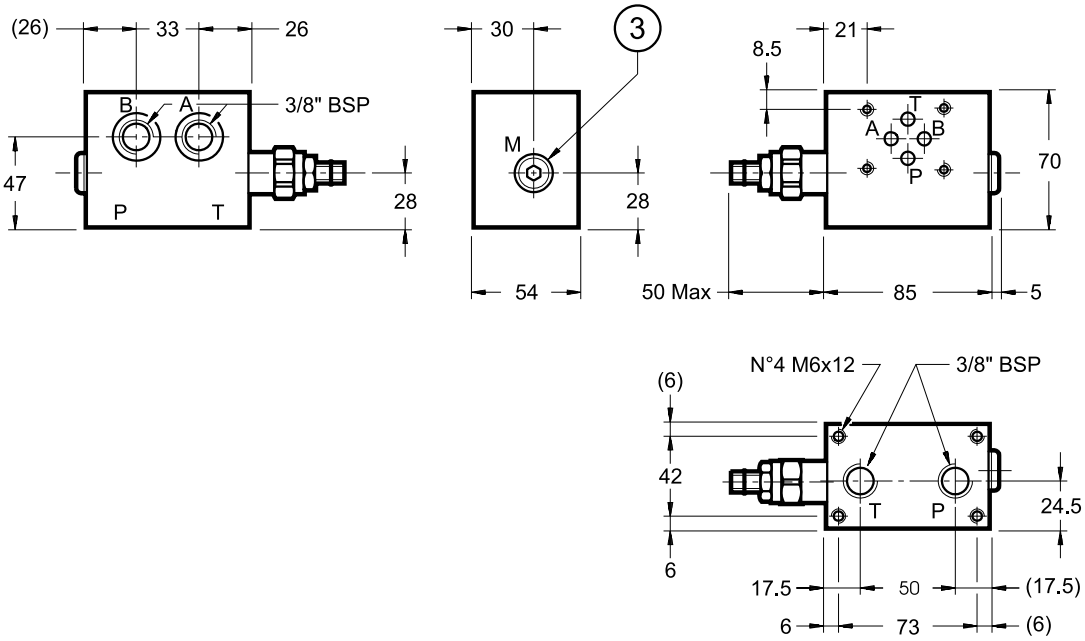


8 - OVERALL AND MOUNTING DIMENSIONS P2D-M*/ 33

SINGLE MOUNTING FACILITY SUBPLATE WITH PRESSURE RELIEF VALVE INCORPORATED

HYDRAULIC SYMBOL





dimensions in mm

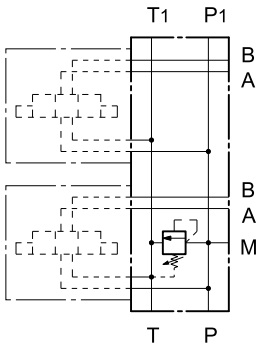
1	Countersunk hex. adjustment screw: spanner 6 Clockwise rotation to increase pressure
2	Locking nut: spanner 19
3	Pressure gauge port 1/4” BSP plugged

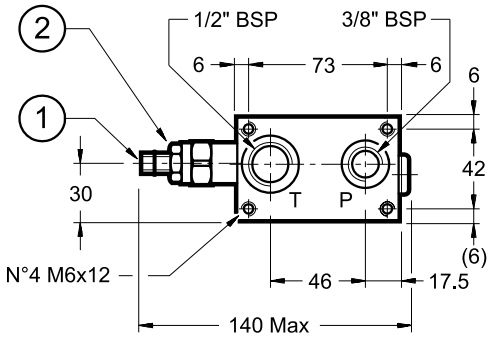
Mass: kg 2,5

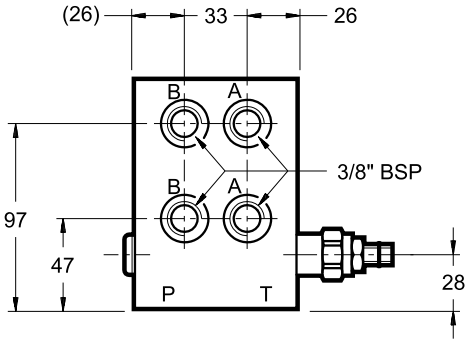
9 - OVERALL AND MOUNTING DIMENSIONS P2T-M* /33

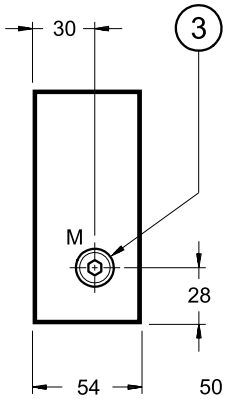
DOUBLE MOUNTING FACILITY SUBPLATE WITH PRESSURE RELIEF VALVE INCORPORATED

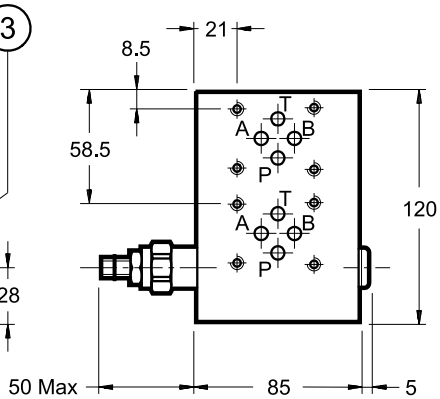
HYDRAULIC SYMBOL

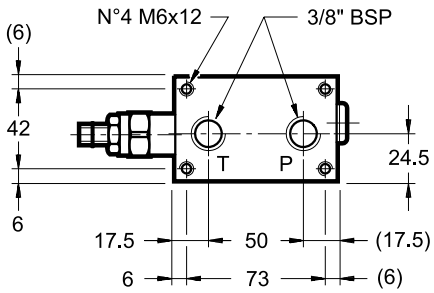












dimensions in mm

1	Countersunk hex adjustment screw: spanner 6 Clockwise rotation to increase pressure
2	Locking nut: spanner 19
3	Pressure gauge port 1/4” BSP plugged

Mass: kg 5

10 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

11 - PRESSURE LIMIT ON P

Depending on the tie-rod type and on the number of assembled suplates it is necessary to pay attention to the maximum pressure on P in order to avoid extruding the O-Rings.

n° of assembled subplates	Threaded bar class B7 DIN 975	Stud class 8.8 UNI 5911	Stud class 12.9
2	350 bar	350 bar	350 bar
3	300 bar	350 bar	350 bar
4	250 bar	300 bar	350 bar
5	200 bar	250 bar	300 bar
6	150 bar	200 bar	250 bar
Tightening torque	8 Nm	8 Nm	12 Nm

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P2A*L

MANIFOLDS WITH SIDE PORTS FOR ISO 4401-03 VALVES

SERIES 11

— The P2A*L series of manifolds is designed for connection in parallel of two or more ISO 4401-03 valves.

— The monocast design enables the simple creation of circuits without the use of pipes and fittings, thereby reducing overall dimensions to a minimum.

— All sections feature a common pressure and discharge fitting on both ends of the subplate.

— Maximum flow rate can be increased up to double the output if the sub-plates are powered at both ends.

— Each section is fitted with work ports A and B positioned on the side of the sub-plate.

— Subplates are available in aluminium.

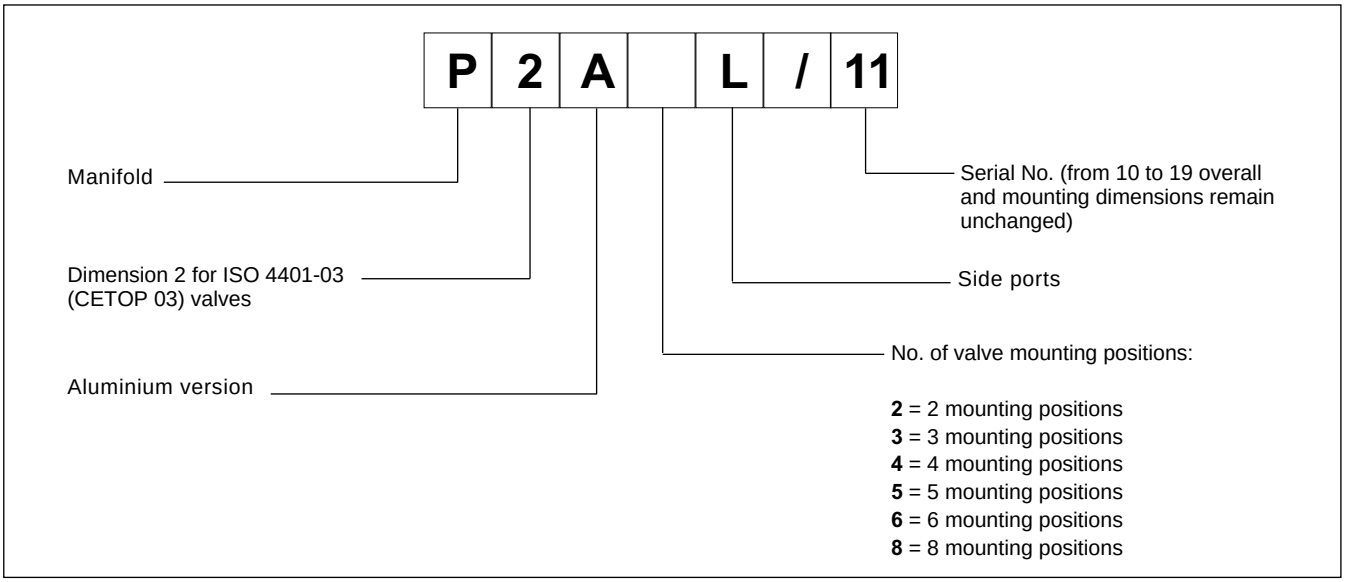
p max **210** bar

Q max **50** l/min

TECHNICAL SPECIFICATIONS

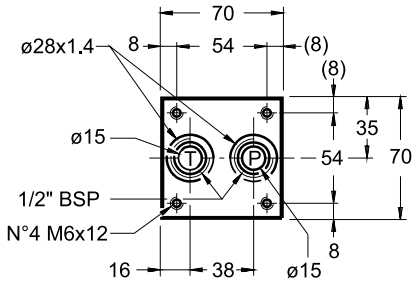
Maximum operating pressure - ports P - A - B - port T	bar	 210 140
Maximum flow	l/min	50
Port dimensions: P - pressure T - lower drainage A/B - working lines	BSP	 1/2” 1/2” 3/8”
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	cSt	25
Recommended viscosity	According to ISO 4406:1999 class 20/18/15	

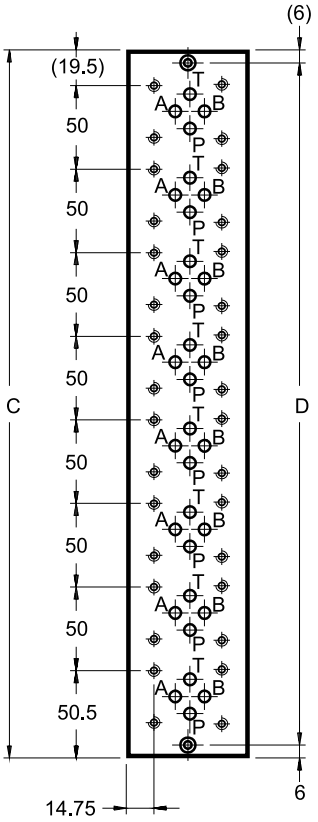
1 - IDENTIFICATION CODE

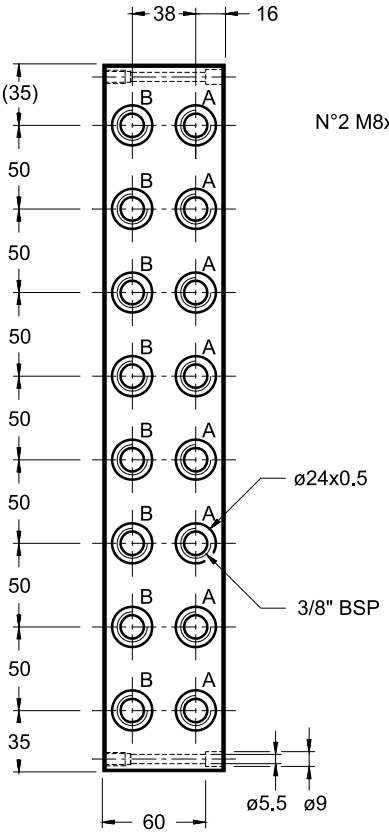


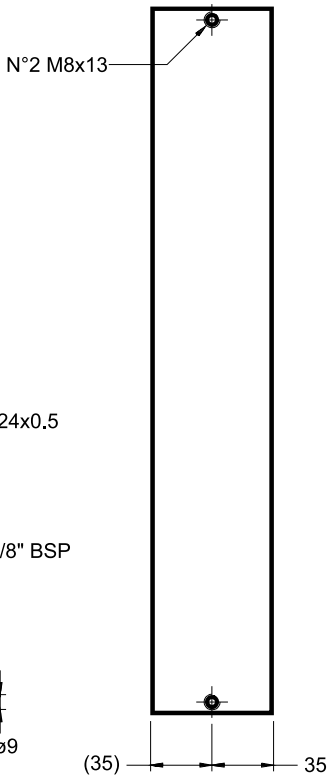
2 - OVERALL AND MOUNTING DIMENSIONS

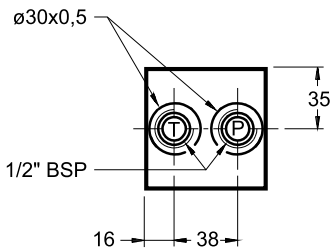
dimensions in mm











Manifold	No. of valve mounting positions	C	D
P2A2L	2	120	108
P2A3L	3	170	158
P2A4L	4	220	208
P2A5L	5	270	258
P2A6L	6	320	308
P2A8L	8	420	408

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P2X*M

MANIFOLDS FOR ISO 4401-03 (CETOP 03) VALVES WITH PORTS ON REAR

SERIES 10

— The P2X*M series of manifolds is designed for connection in parallel of two or more ISO 4401-03 (CETOP 03) valves.

— The monobloc design enables the simple creation of circuits without the use of pipes and fittings, thereby reducing overall dimensions to a minimum.

— Subplates are arranged for the installation of a pressure control valve with cartridge.

— Each section is fitted with work ports A and B positioned on the rear of the subplate.

— Subplates are fitted with additional rear ports P and T.

— Subplates are made of cast iron.

p max **350** bar
Q max **100** l/min

TECHNICAL SPECIFICATIONS

Maximum operating pressure - ports P - A - B - port T	bar	 350 140
Maximum flow	l/min	100
Port dimensions: P - pressure T - drainage B - users A - drainage	BSP	1/2”
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	cSt	25
Recommended viscosity	According to ISO 4406:1999 class 20/18/15	

1 - IDENTIFICATION CODE

P	2	X		M	/	10

Manifold

Dimension 2 for ISO 4401-03 (CETOP 03) valves

Version made of cast iron

No. of mounting positions:
2 = 2 mounting positions
4 = 4 mounting positions
6 = 6 mounting positions

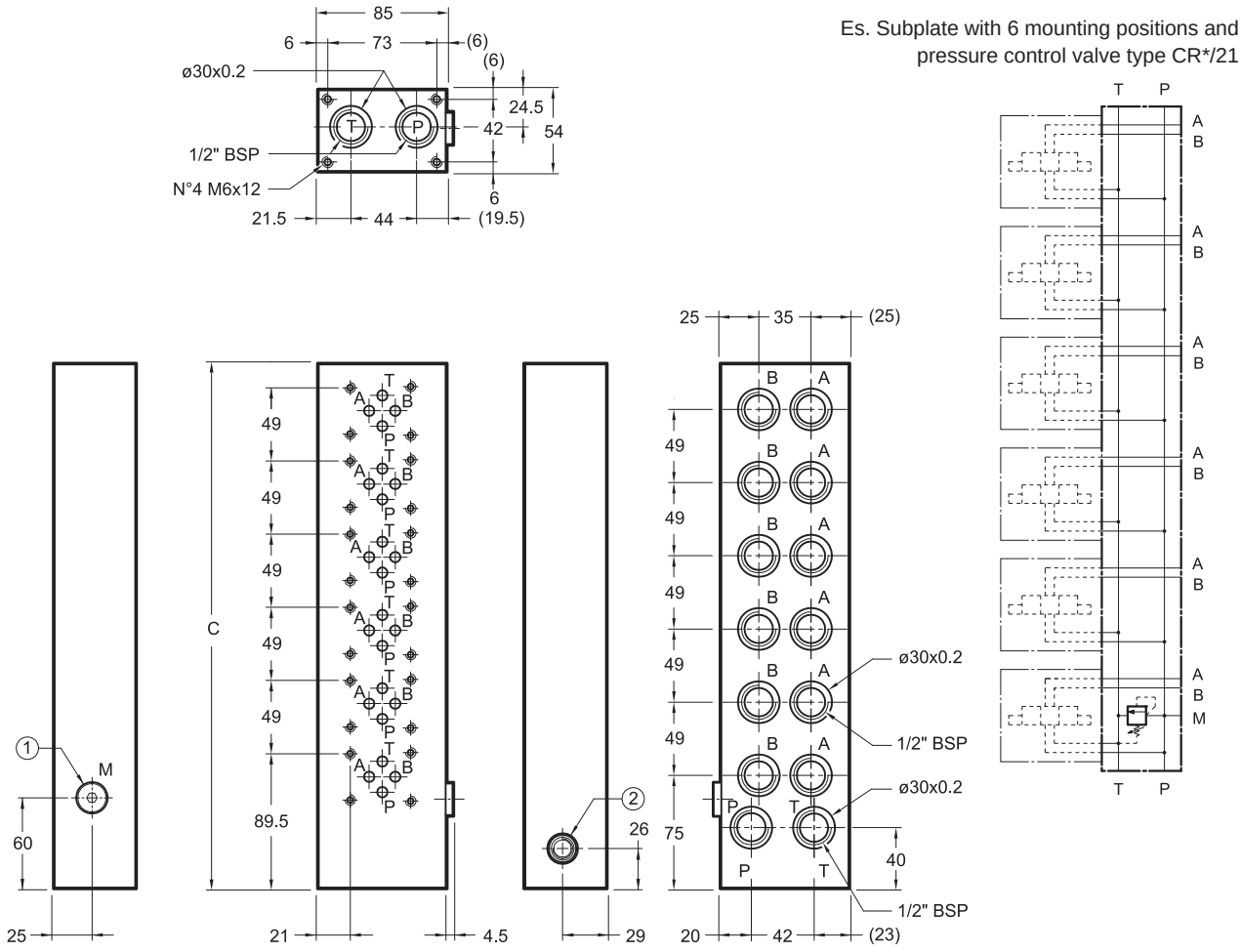
Arrangement for pressure control valve to be ordered separately:

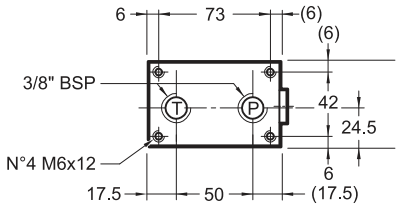
- up to 50 l/min direct operated valve type CR* (see cat. 21100)
- up to 100 l/min pilot operated valve type CRQ (see cat. 21110)

Serial No.
(from 10 to 19 overall and mounting dimensions remain unchanged)

2 - OVERALL AND MOUNTING DIMENSIONS

Es. Subplate with 6 mounting positions and pressure control valve type CR*/21





dimensions in mm

Manifold	No. of valves mounting positions	C
P2X2M/10	2	150
P2X4M/10	4	250
P2X6M/10	6	350

1	Pressure gauge port 1/4” BSP plugged
2	Arranged for the installation of a pressure control valve (to be ordered separately - see par. 1)

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P4D*

MODULAR SUBPLATES FOR ISO 4401-05 (CETOP 05) VALVES

— This series of modular subplates has been designed to make hydraulic circuits and can be used directly on power packs or on any other section of the machine.

— The subplates are assembled by means of 4 tie-rods with seal seats incorporated in the subplate.

— The above assembly achieves compact units (including pressure and discharge manifolds): one face per subplate is used for connection to services and the other to mount ISO 4401-05 (CETOP 05) or ISO 4401-03 (CETOP 03) valves.

— Complex circuits can also be set up using modular valves.

— The recommended mounting configuration for **P4D** subplates on hydraulic power packs is with the main axis positioned vertically to obtain the bundle of pipes to utilities in two vertical rows; however, assembly is not restricted to this configuration.

p max **350** bar
Q max **100** l/min

TECHNICAL SPECIFICATIONS

Maximum operating pressure - ports P - A - B - port T	bar	see paragraph 8 140
Maximum flow	l/min	100
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	cSt	25
Recommended viscosity	According to ISO 4406:1999 class 20/18/15	

1 - IDENTIFICATION CODE

P	4	D	-		/		

Subplate

Dimension for ISO 4401-05 valves

D = single mounting facility

Versions:
F = with P - T threaded ports, mounting interface ISO 4401-05 (CETOP 05) and side ports of 1/2" BSP.
P = with P - T threaded ports, mounting interface ISO 4401-05 (CETOP 05) and A - B rear ports of 3/4" BSP.
D3 = with P - T threaded ports, mounting interface ISO 4401-03 (CETOP 03) and side ports of 3/8" BSP.
D3P = with P - T threaded ports, mounting interface ISO 4401-03 (CETOP 03) and A - B rear ports of 1/2" BSP
M* = with pressure relief valve included and P - T threaded ports.
Pressure adjustment range:
070 = up to 70 bar
140 = up to 140 bar
210 = up to 210 bar
350 = up to 350 bar

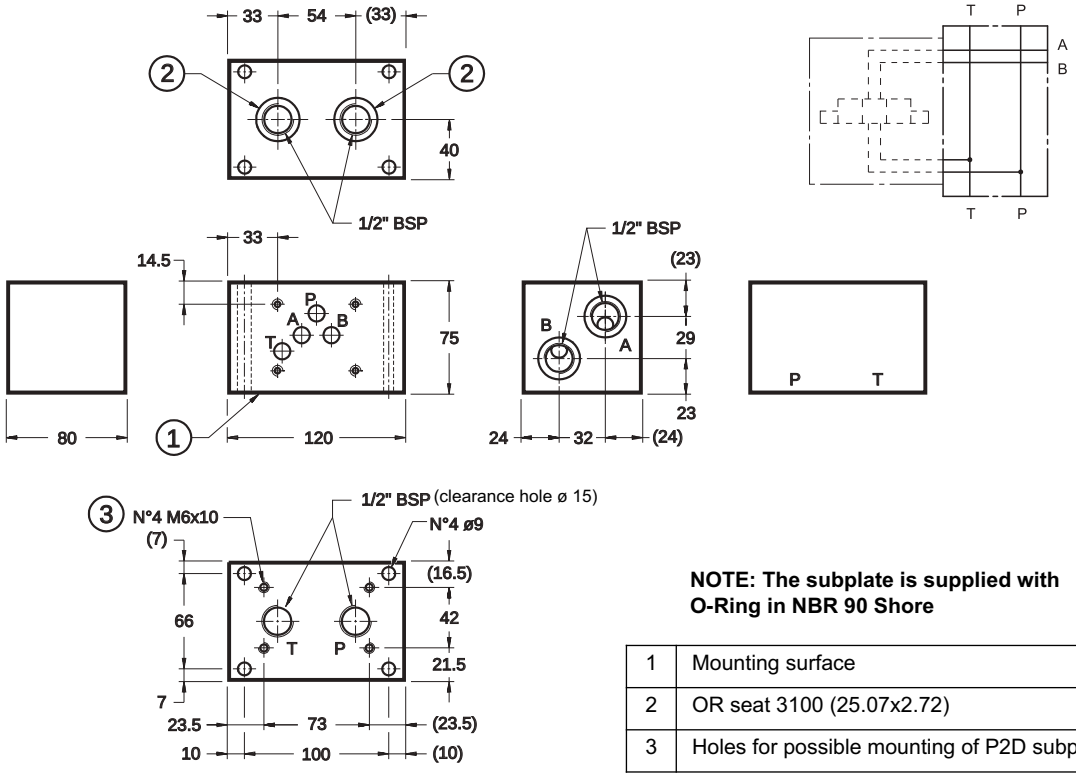
Series No.
30 = for P4D-M*
21 = for all the other versions
(Within the same ten dimensions remain unchanged)

for P4D-M* version only:
Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

2 - OVERALL AND MOUNTING DIMENSIONS P4D-F/21 (COD. 1561441)

P - T THREADED PORTS SUBPLATE, WITH MOUNTING INTERFACE FOR ISO 4401-05 (CETOP 05) VALVE AND A-B SIDE PORTS OF 1/2” BSP

dimensions in mm



NOTE: The subplate is supplied with O-Ring in NBR 90 Shore

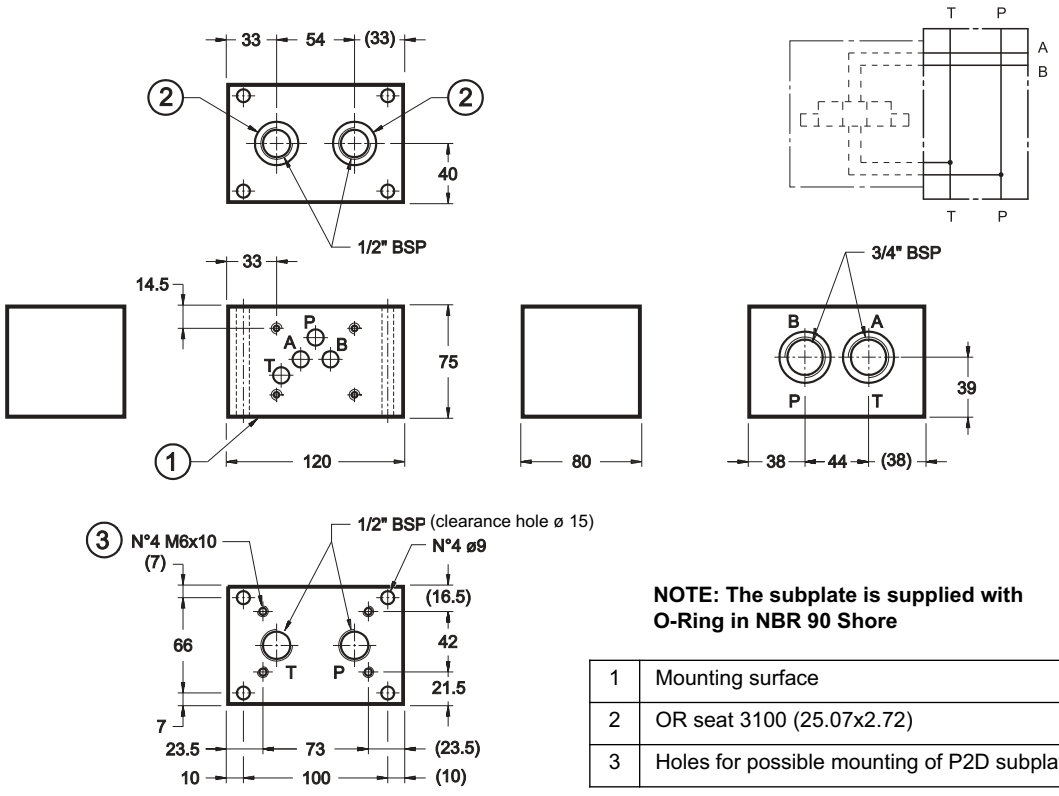
1	Mounting surface
2	OR seat 3100 (25.07x2.72)
3	Holes for possible mounting of P2D subplates

Mass: kg 4,8

3 - OVERALL AND MOUNTING DIMENSIONS P4D-P/21 (COD. 1561461)

P - T THREADED PORTS SUBPLATE WITH MOUNTING INTERFACE FOR ISO 4401-05 (CETOP 05) VALVE AND A -B REAR PORTS OF 3/4” BSP

dimensions in mm



NOTE: The subplate is supplied with O-Ring in NBR 90 Shore

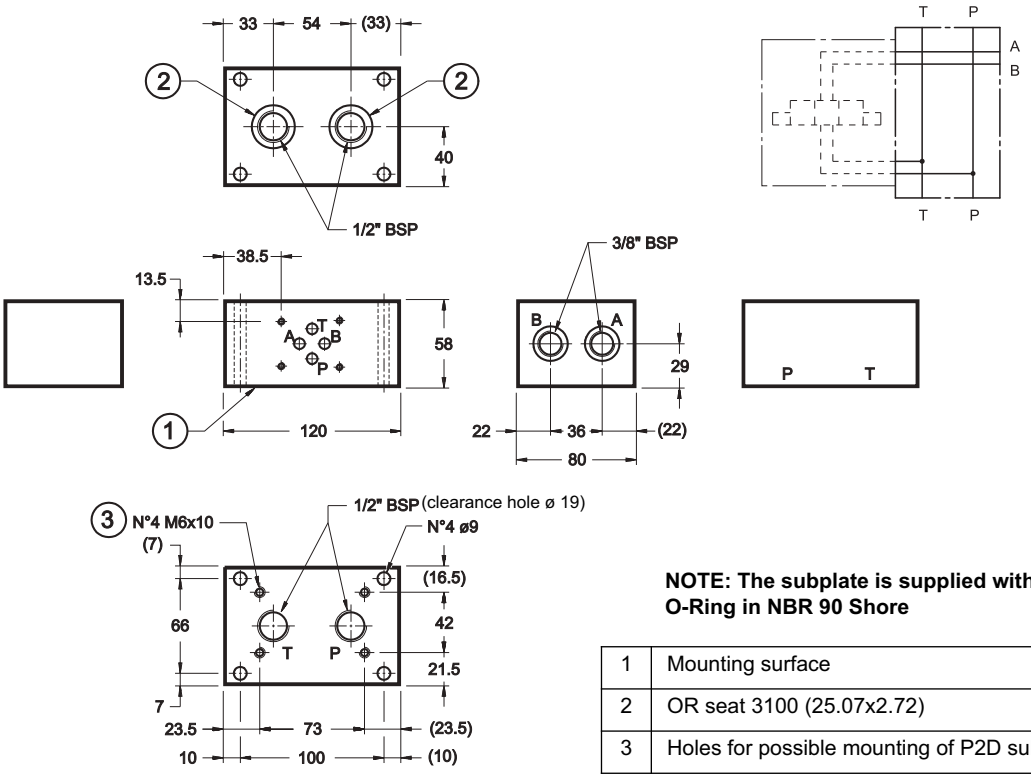
1	Mounting surface
2	OR seat 3100 (25.07x2.72)
3	Holes for possible mounting of P2D subplates

Mass: kg 4,8

4 - OVERALL AND MOUNTING DIMENSIONS P4D-D3/21 (COD. 1561451)

P - T THREADED PORTS SUBPLATE, WITH MOUNTING INTERFACE FOR ISO 4401-03 (CETOP 03) VALVE AND SIDE PORTS OF 3/8" BSP

dimensions in mm



Mass: kg 3,8

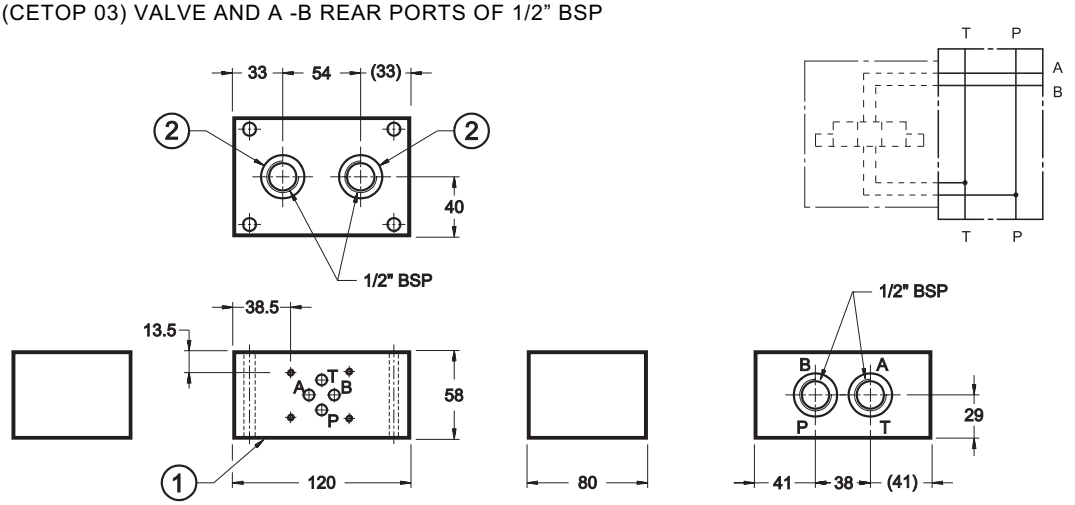
NOTE: The subplate is supplied with O-Ring in NBR 90 Shore

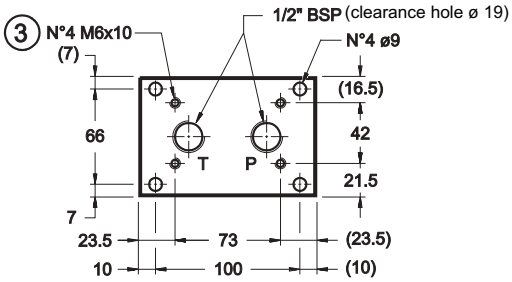
1	Mounting surface
2	OR seat 3100 (25.07x2.72)
3	Holes for possible mounting of P2D subplates

5 - OVERALL AND MOUNTING DIMENSIONS P4D-D3P/21 (COD. 1561481)

P - T THREADED PORTS SUBPLATE, WITH MOUNTING INTERFACE FOR ISO 4401-03 (CETOP 03) VALVE AND A -B REAR PORTS OF 1/2" BSP

dimensions in mm





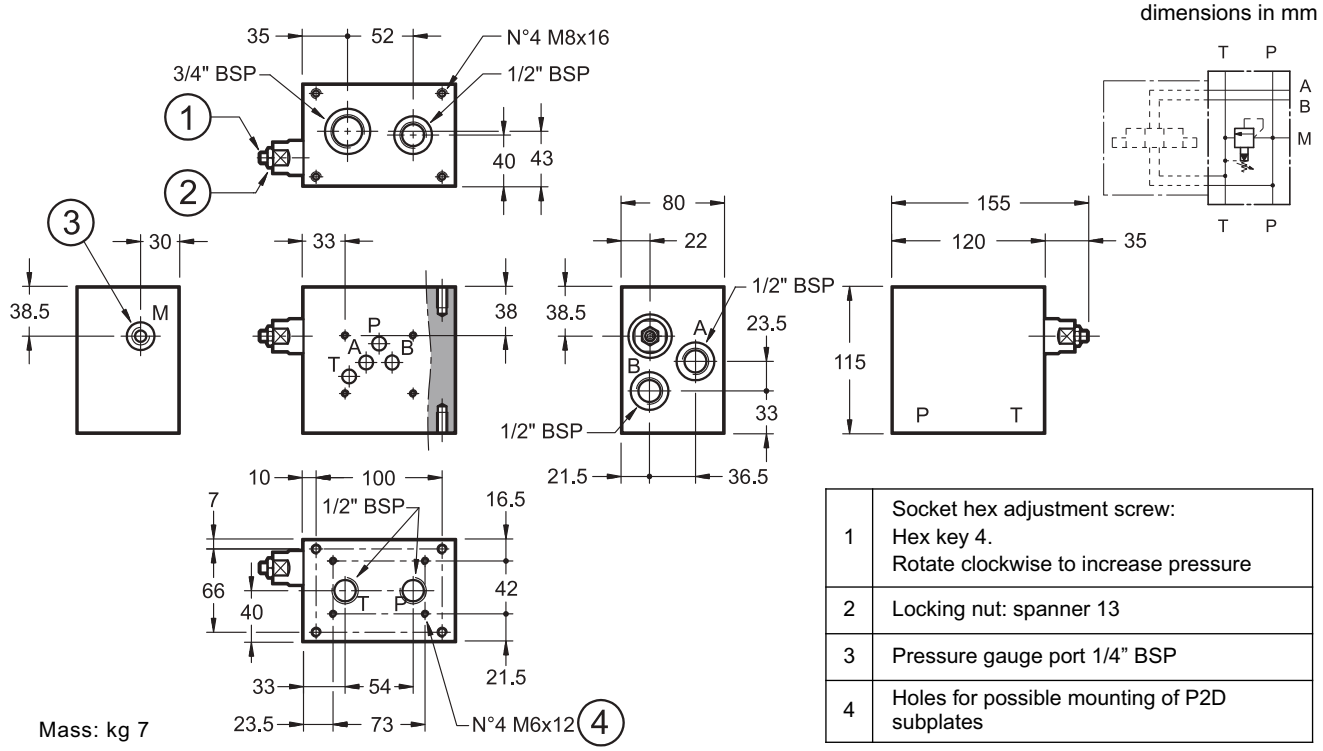
Mass: kg 3,8

NOTE: The subplate is supplied with O-Ring in NBR 90 Shore

1	Mounting surface
2	OR seat 3100 (25.07x2.72)
3	Holes for possible mounting of P2D subplates

6 - OVERALL AND MOUNTING DIMENSIONS P4D-M*/30

dimensions in mm

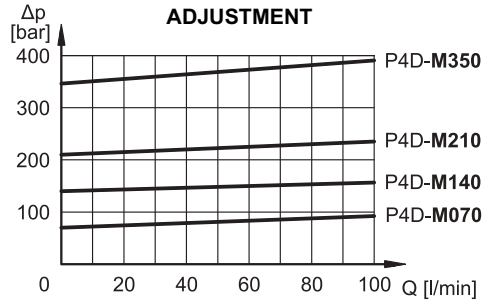


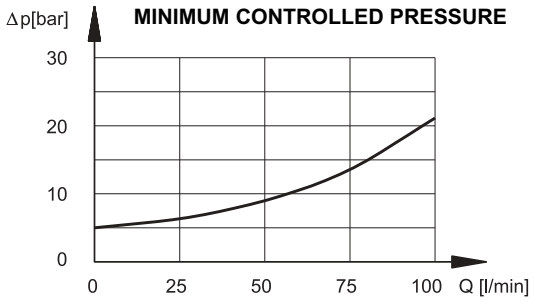
Mass: kg 7

1	Socket hex adjustment screw: Hex key 4. Rotate clockwise to increase pressure
2	Locking nut: spanner 13
3	Pressure gauge port 1/4” BSP
4	Holes for possible mounting of P2D subplates

7 - CHARACTERISTIC CURVES

(values obtained with viscosity of 36 cSt at 50°C)





8 - MAXIMUM PRESSURE ON P

Depending on the tie-rod type and on the number of assembled subplates it is necessary to pay attention to the maximum pressure on P in order to avoid extruding the O-Ring.

No. of assembled subplates	Threaded bar class B7 ISO 6547 (DIN 975)	Stud class 8.8 UNI 5911	Stud class 12.9
2	350 bar	350 bar	350 bar
3	300 bar	350 bar	350 bar
4	250 bar	300 bar	350 bar
5	200 bar	250 bar	300 bar
6	150 bar	200 bar	250 bar
Tightening torque	20 Nm	20 Nm	30 Nm

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RM4-*-MP

SUBPLATE WITH PRESSURE RELIEF VALVE

SERIES 40

— The RM4-*-MP subplate includes a pressure relief valve with P and T threaded ports.

— It is used as mounting surface for P2D and P4D subplates on power packs.

— It is available in four pressure adjustment ranges up to 350 bar.

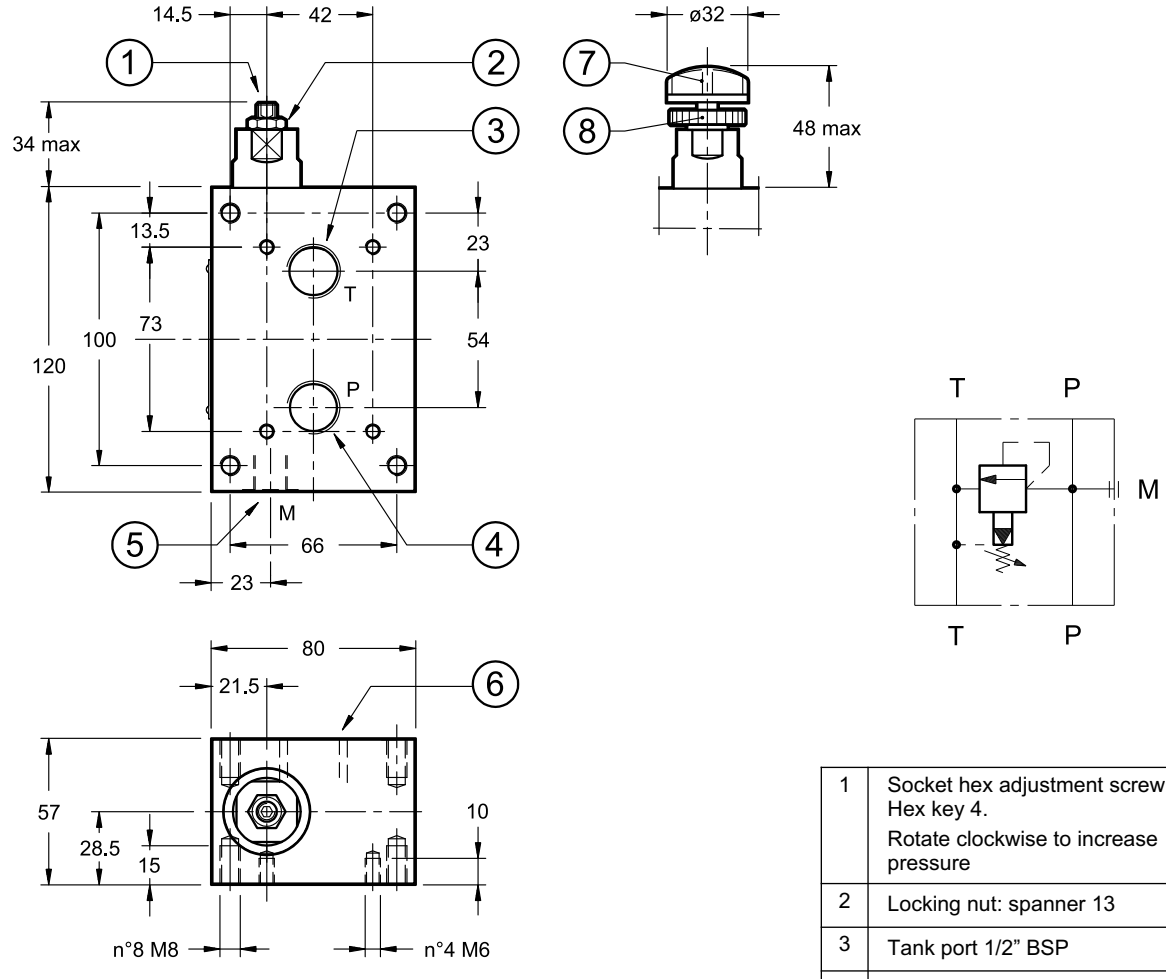
— It is supplied with a socket set screw with locking nut, or alternatively with knob and maximum adjustment limiting device.

THREADED PORTS

p max **350** bar
Q max **100** l/min

1 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	Socket hex adjustment screw: Hex key 4. Rotate clockwise to increase pressure
2	Locking nut: spanner 13
3	Tank port 1/2” BSP
4	Pressure port 1/2” BSP
5	Pressure gauge port 1/4” BSP
6	Tank port 3/4” BSP
7	Locking ring
8	Adjustment knob: K

Mass: kg 3,5

2 - IDENTIFICATION CODE

R	M	4	-		-	M	P	/	40		/	

Subplate with pressure relief valve

For valves of ISO 4401-05 size

Pressure adjustment range:
070 = up to 70 bar (17 bar / turn)
140 = up to 140 bar (32 bar / turn)
210 = up to 210 bar (47 bar / turn)
350 = up to 350 bar (78 bar / turn)

P2 - P4 subplate version

Serial No.
(the overall and mounting dimensions remain unchanged from 40 to 49)

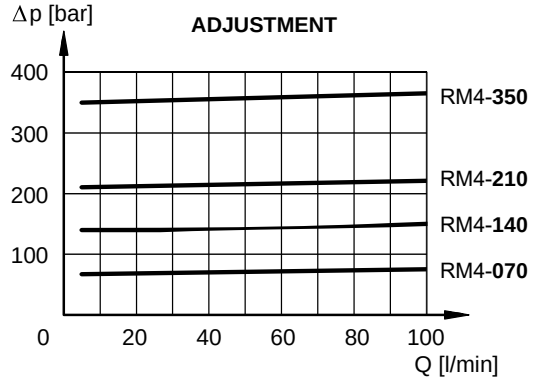
Seals:
N = NBR seals for mineral oils (**standard**)
V = FPM seals for special fluids

Option:
K = Adjustment knob.
Omit for adjustment with hex socket screw

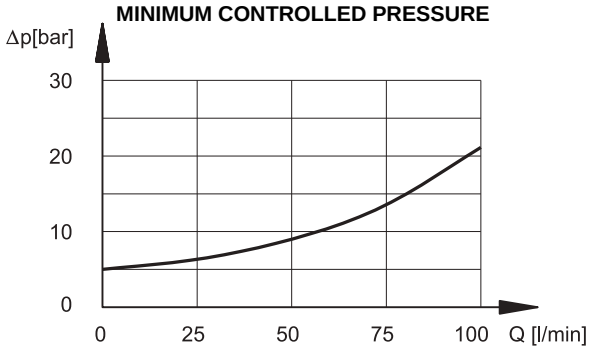
3 - CHARACTERISTIC CURVES

(values obtained with viscosity of 36 cSt at 50°C)

ADJUSTMENT



MINIMUM CONTROLLED PRESSURE



4 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

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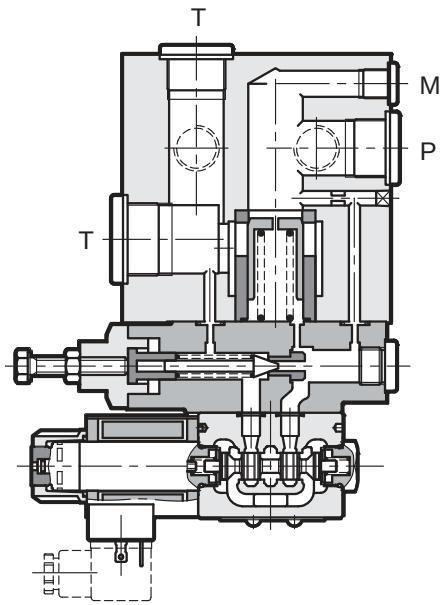
P4D-RQM5

MODULAR SUBPLATE WITH PRESSURE RELIEF VALVE AND UNLOADING SOLENOID VALVE

SERIES 30

p max **350** bar
Q max **250** l/min

OPERATING PRINCIPLE



— The P4D-RQM5 is a compact group that includes a pressure relief valve and it is used as mounting surface for P2D and P4D subplates.

— It also includes a solenoid valve for venting of the total flow at a minimum pressure value.

— It is available in two pressure adjustment ranges up to 350 bar.

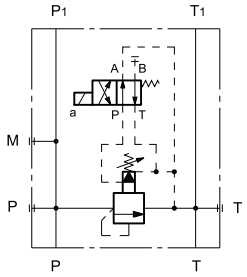
— It is normally supplied with a hexagonal head adjustment screw. Upon request, it can be equipped with a SICBLOC adjustment knob on the main pressure control.

PERFORMANCES (measured with mineral oil of viscosity 36cSt at 50°C)

Maximum operating pressure	bar	350
Maximum flow on P (3/4") and T(1") Maximum flow on P_1 and T_1(1/2") Minimum flow	l/min	250 120 10
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass:	kg	10

NOTE: for the solenoid valve DS3 characteristics see catalogue 41 150

HYDRAULIC SYMBOL



P4D-RQM5
SERIES 30

1 - IDENTIFICATION CODE

P	4	D	-	R	Q	M	5	-		/		/	30		-		K1	/	

Subplate
ISO 4401-05 (CETOP 05)
dimension

Pressure relief valve
with unloading solenoid valve

DN 25 nominal dimension

Pressure adjustment range
5 = 250 bar **6** = 350 bar

M = SICBLOC adjustment knob
(omit for hexagonal head
adjustment screw)

Series: (the overall and mounting dimensions remain unchanged from 30 to 39)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

NOTE: The locking rings of the coils and the relevant O-Rings are supplied together with valves.

Manual override:
omit for override integrated in the tube (**standard**)
CM = manual override, boot protected

Coil electrical connection:
plug for connector type DIN 43650 (**standard**)

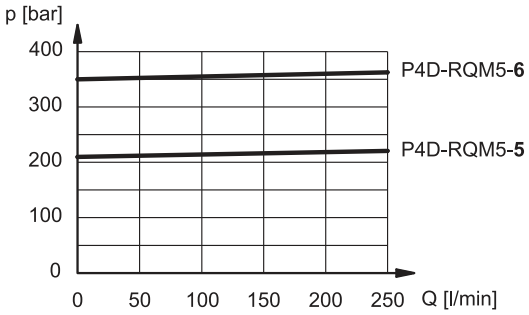
DC power supply
D12 = 12 V
D24 = 24 V
D48 = 48 V
D110 = 110 V
D220 = 220 V
D00 = valve without coils (see **NOTE**)

AC power supply
A24 = 24 V - 50 Hz
A48 = 48 V - 50 Hz
A110 = 110 V - 50 Hz / 120 V - 60 Hz
A230 = 230 V - 50 Hz / 240 V - 60 Hz
A00 = valve without coils (see **NOTE**)

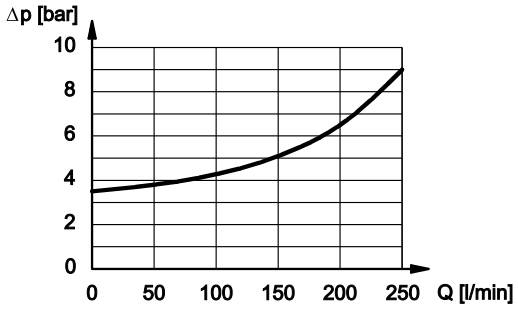
F110 = 110 V - 60 Hz
F220 = 220 V - 60 Hz

2 - CHARACTERISTIC CURVES (values obtained with viscosity of 36 cSt at 50°C)

ADJUSTMENT



MINIMUM CONTROLLED PRESSURE



NOTE: The maximum flow deliverable to P_1 port is 120 l/min (for P2D and P4D modular subplates).
The maximum flow through the pressure relief valve (additional 3/4" BSP P port) is 250 l/min.

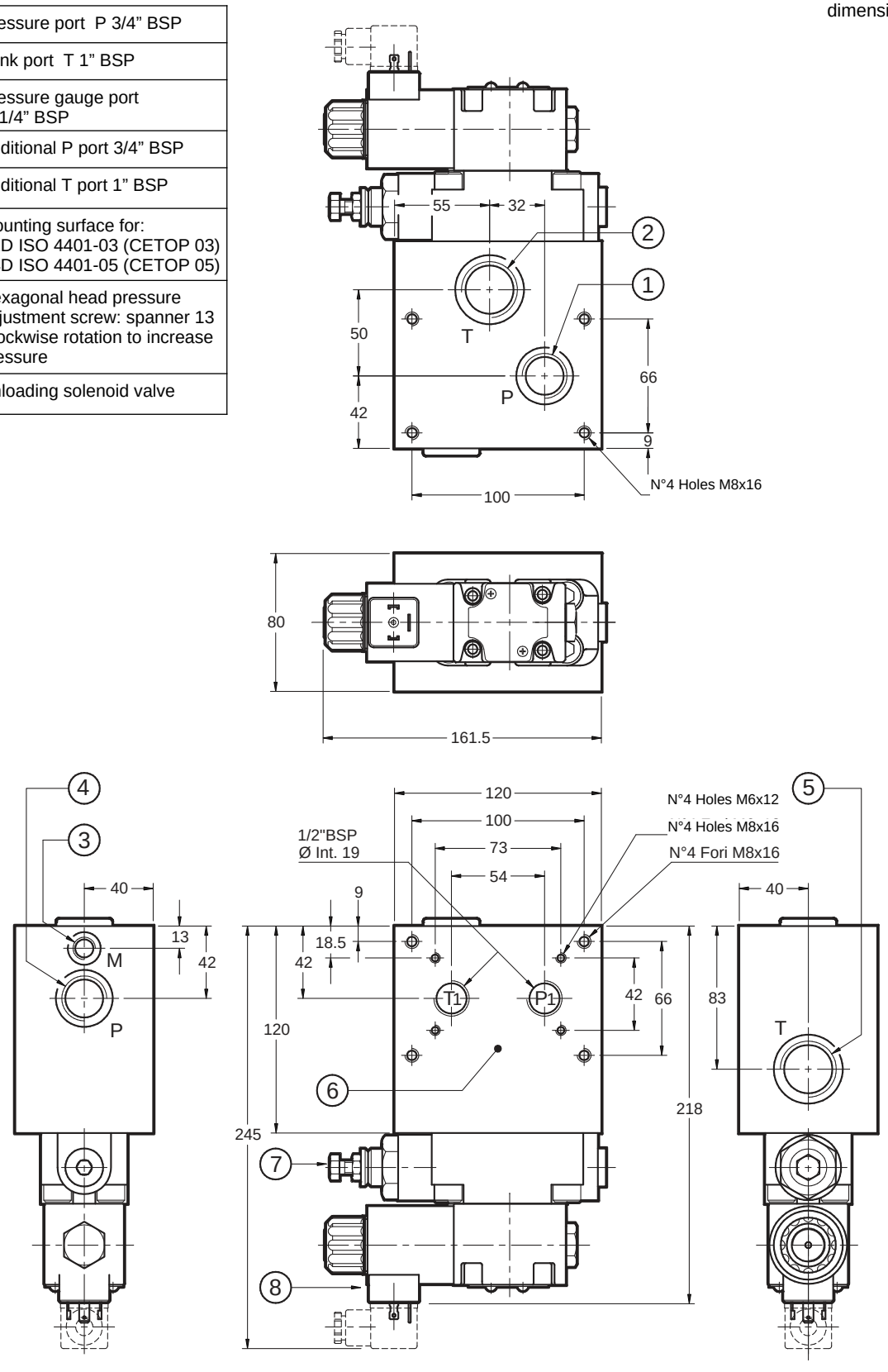
3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

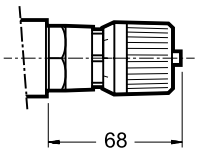
4 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

1	Pressure port P 3/4” BSP
2	Tank port T 1” BSP
3	Pressure gauge port M 1/4” BSP
4	Additional P port 3/4” BSP
5	Additional T port 1” BSP
6	Mounting surface for: P2D ISO 4401-03 (CETOP 03) P4D ISO 4401-05 (CETOP 05)
7	Hexagonal head pressure adjustment screw: spanner 13 Clockwise rotation to increase pressure
8	Unloading solenoid valve



5 - ADJUSTMENT KNOB



The P4D-RQM5 valves can be equipped with a SICBLOC adjustment knob.
To operate it, push and rotate at the same time.
To request this option, add: **/M** (see par.1).

6 - ELECTRIC CONNECTORS

The solenoid valves are never supplied with connector. Connectors must be ordered separately. For the identification of the connector type to be ordered, please see catalogue 49 000.

7 - MANUAL OVERRIDE, BOOT PROTECTED: CM

Whenever the solenoid valve installation may involve exposure to atmospheric agents or utilization in tropical climates, use of the manual override, boot protected, is recommended.
Add the suffix **CM** to request this device (see paragraph 1).
For overall dimensions see catalogue 41 150.

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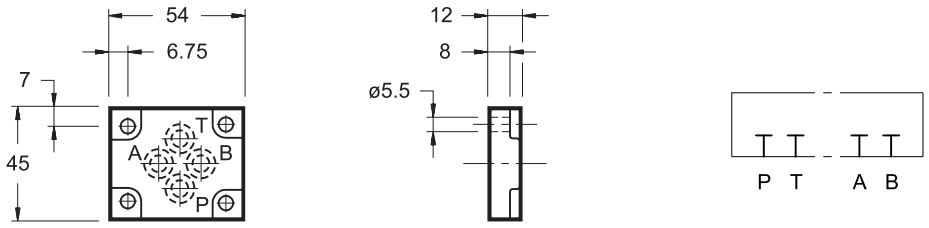
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PE
BLANKING PLATE

p max **350** bar

1 - OVERALL AND MOUNTING DIMENSIONS PE-MD1/20 (cod. 1950591)

dimensions in mm

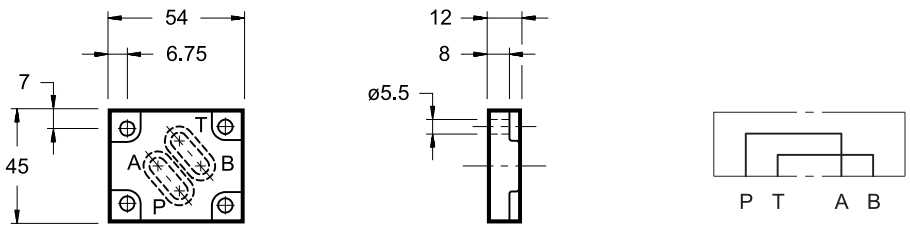


FASTENING BOLTS: 4 bolts M5x16

4 OR type 2037 (9.25x1.78) - 90 Shore

2 - OVERALL AND MOUNTING DIMENSIONS PE-C/PA/MD1/20 (cod. 1950751)

dimensions in mm

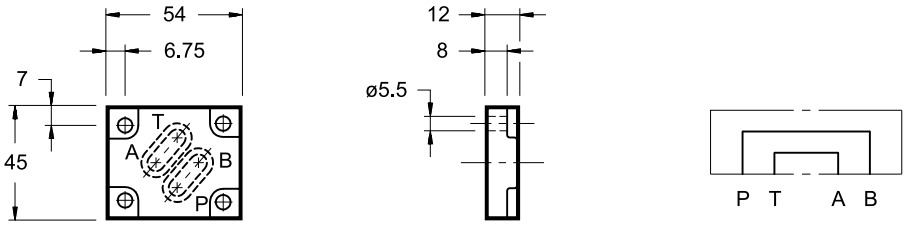


FASTENING BOLTS: 4 bolts M5x16

2 OR type 2068 (17.17x1.78) - 90 Shore

3 - OVERALL AND MOUNTING DIMENSIONS PE-C/PB/MD1/20 (cod. 1950601)

dimensions in mm

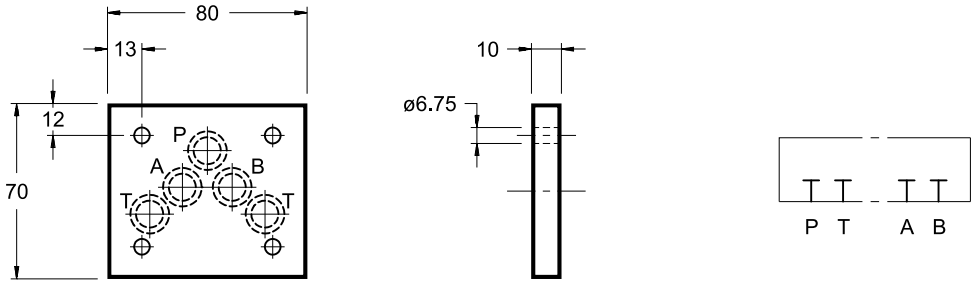


FASTENING BOLTS: 4 bolts M5x16

2 OR type 2068 (17.17x1.78) - 90 Shore

4 - OVERALL AND MOUNTING DIMENSIONS PE/D4-M (cod, 1950042)

dimensions in mm

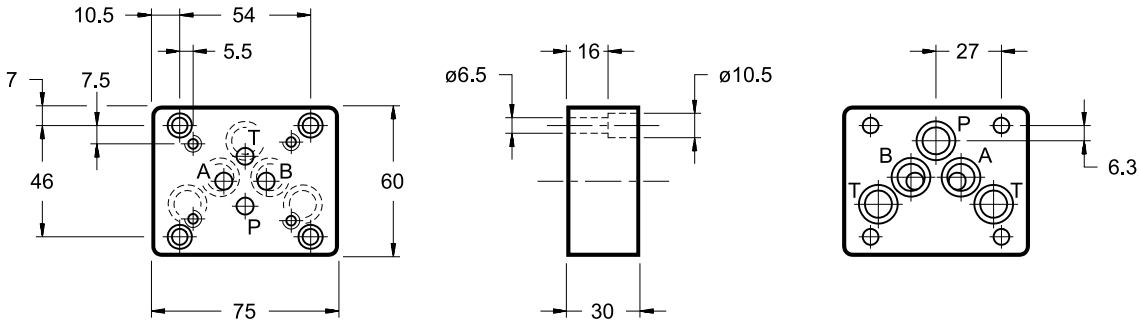


FASTENING BOLTS: 4 bolts M6x20

5 OR type 2050 (12.42x1.78) - 90 Shore

5 - OVERALL AND MOUNTING DIMENSIONS PC-D4/MD1-M (cod. 1950222)

dimensions in mm



FASTENING BOLTS: 4 bolts M6x25

5 OR type 2050 (12.42x1.78) - 90 Shore

NOTE: On request, plates can be supplied with the O-Rings in viton. To order it, please indicate the letter /**V** at the end of the identification code of the plate.

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06

MODULAR VALVES

26 catalogue documents | 74 original technical pages



PRM3

DIRECT OPERATED PRESSURE RELIEF VALVE

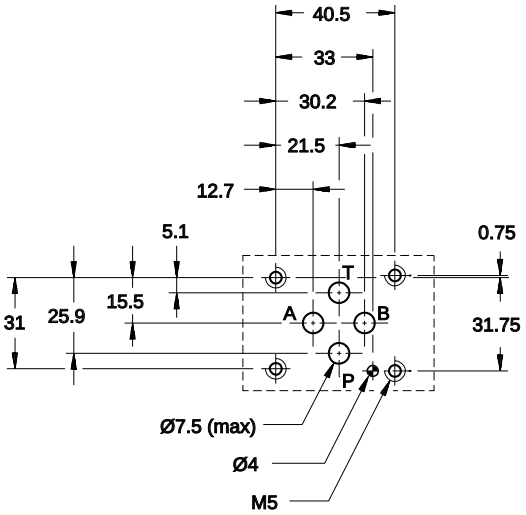
SERIES 10

MODULAR VERSION ISO 4401-03

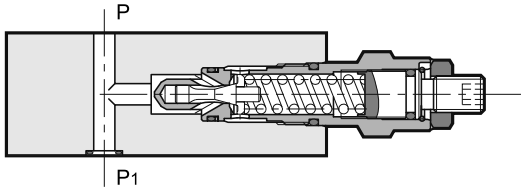
p max **350** bar
Q max (see table of performances)

MOUNTING SURFACE

ISO 4401-03-02-0-05
CETOP 4.2-4-03-350



OPERATING PRINCIPLE



— The PRM3 valve is a direct operated pressure relief valve made as a modular version, with mounting surface according to ISO 4401 standards.

— It can be assembled with all ISO 4401-03 modular valves without the use of pipes, using suitable tie-rods or bolts.

— It is available in versions for single adjustment on one control line, or dual on two control lines, in five different pressure adjustment ranges.

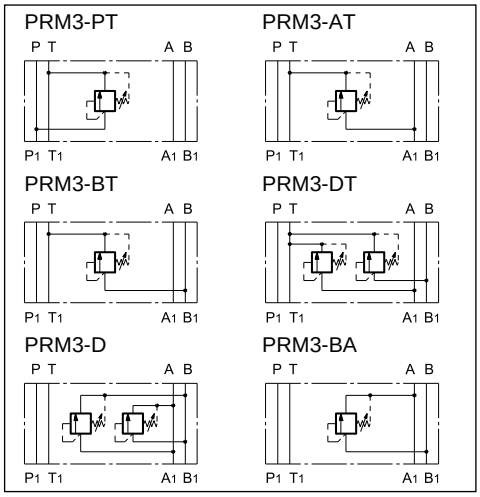
— This valve is used as a hydraulic circuit pressure limiting device or as a limiting device of the pressure peaks generated during the movement of hydraulic actuators.

— It is supplied with a hexagonal head adjustment screw, locking nut and limitation of the maximum adjustment travel. A version with knob is also available.

PERFORMANCES (measured with mineral oil of viscosity 36cSt at 50°C)

Maximum operating pressure	bar	350
Minimum controlled pressure	bar	see Δp - Q diagram
Max flow rate in controlled lines Max flow rate in the free lines	l/min	50 75
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass: PRM3-PT, -AT, -BT, -BA PRM3-DT, -D	kg	1,3 1,8

HYDRAULIC SYMBOLS



1 - IDENTIFICATION CODE

P	R	M	3	-			/	10		/		

Pressure relief valve, direct operated

Modular version

ISO 4401-03 size

Versions:
PT = single on line P with discharge in T
AT = single on line A with discharge in T
BT = single on line B with discharge in T
DT = double on lines A-B with discharge in T
D = double on lines A-B with cross discharge
BA = single on line B with discharge in A

Pressure adjustment range:
025 = up to 25 bar
070 = up to 70 bar
140 = up to 140 bar
210 = up to 210 bar
350 = up to 350 bar

Series No. (the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
N = NBR seals for mineral oils (**standard**)
V = FPM seals for special fluids

Adjustment type (See point 5):
S = with hexagonal socket screw (**standard**)
K = Adjustment knob

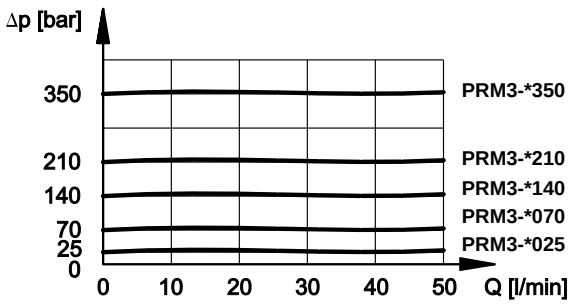
Option: **/W7** surface treatment. Omit if not required (**NOTE**)

NOTE: The standard valve is supplied with surface treatment of phosphating black.
The zinc-nickel finishing on the valve body makes the valve suitable to ensure a salt spray resistance up to **240** hours.
(test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

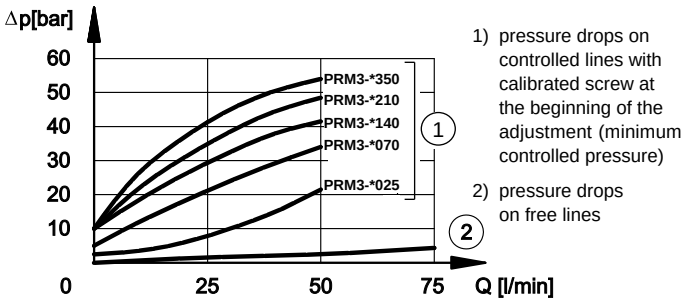
2 - CHARACTERISTIC CURVES

(values obtained with viscosity of 36 cSt at 50°C)

ADJUSTMENT



PRESSURE DROPS Δp - Q



1) pressure drops on controlled lines with calibrated screw at the beginning of the adjustment (minimum controlled pressure)
2) pressure drops on free lines

3 - HYDRAULIC FLUIDS

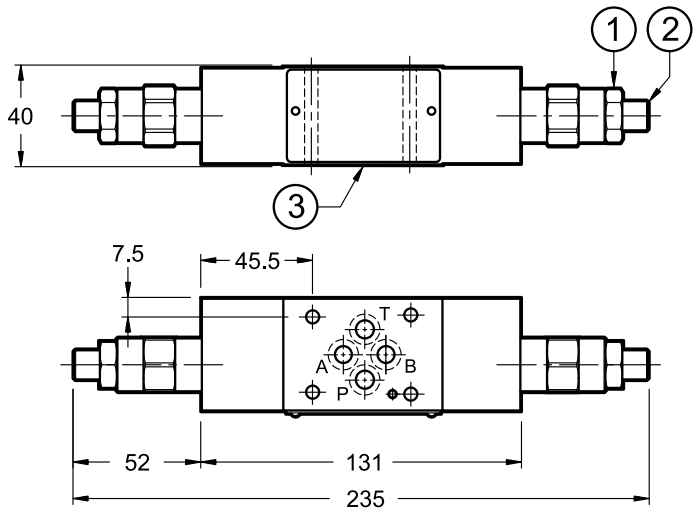
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

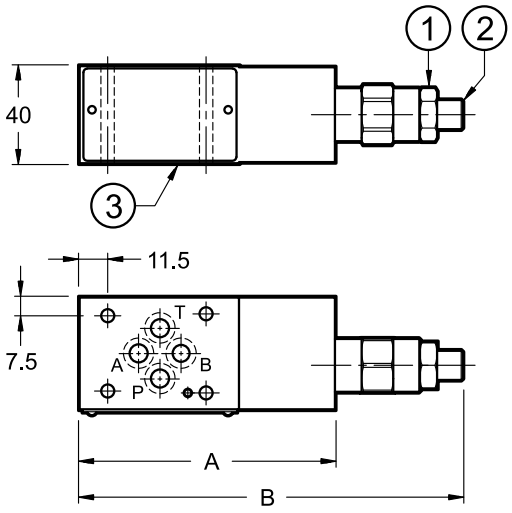
4 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

PRM3-D, PRM3-DT



PRM3-PT, PRM3-BA, PRM3-BT

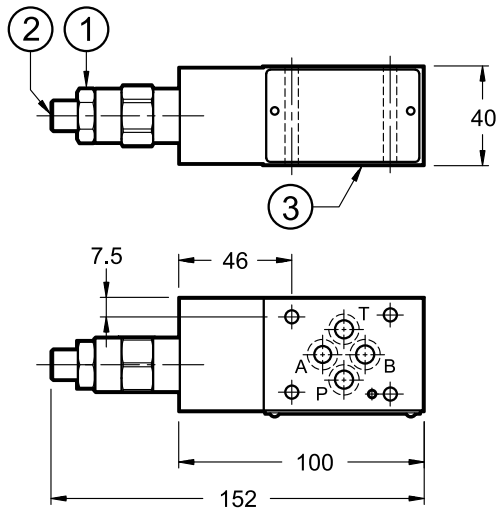


	A	B
PRM3-PT	105	157
PRM3-BA	100	152
PRM3-BT	100	152

1	Locking nut: spanner 19
2	Hex socket adjustment screw: spanner 6 (**standard**) Rotate clockwise to increase pressure
3	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) 90 Shore

dimensions in mm

PRM3-AT



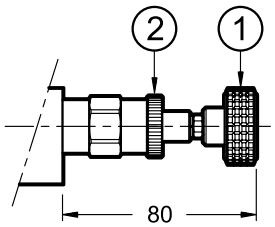
1	Locking nut: spanner 19
2	Hex socket adjustment screw: spanner 6 (**standard**) Rotate clockwise to increase pressure
3	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) 90 Shore

5 - ADJUSTMENT KNOB

The standard valve is supplied with the hex socket adjustment screw. A version with knob is also available.

Use the letter **K** in the identification code to order this version (see point 1).

dimensions in mm



1	Adjustment knob: K
2	Locking ring

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duplomaticmotionsolutions.com

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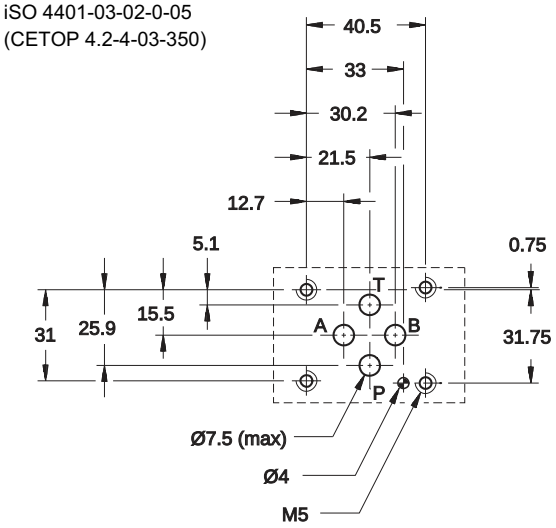


MRQ
PILOT OPERATED PRESSURE RELIEF VALVE
SERIES 51

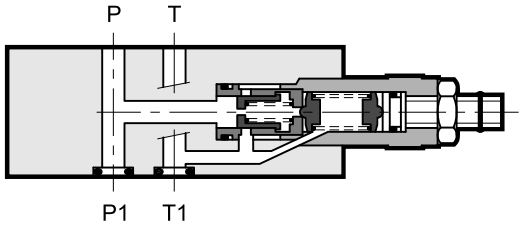
MODULAR VERSION
ISO 4401-03 (CETOP 03)

p max **350** bar
Q max **75** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



— The MRQ valve is a pilot operated pressure relief valve made as a modular version with mounting surface according to ISO 4401 (CETOP RP 121H) standards.
— It can be assembled with all ISO 4401-03 (CETOP 03) modular valves without the use of pipes, using suitable tie-rods or bolts.
— It is available in versions for single adjustment on one control line or dual on two control lines and with four different pressure adjustment ranges.
— This valve is normally used as a hydraulic circuit pressure limiting device.
— It is normally supplied with a hexagonal head adjustment screw, locking nut and limitation of the maximum adjustment travel.

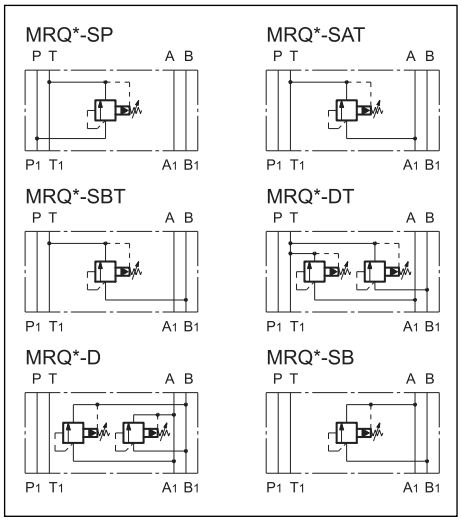
CONFIGURATIONS (see Hydraulic symbols table)

— "SP": controls the pressure on line P with discharge in T.
— "SAT": controls the pressure on line A with discharge in T.
— "SBT": controls the pressure on line B with discharge in T.
— "DT": controls the pressure on lines A-B with discharge in T.
— "D": controls the pressure on lines A-B with crossed discharges.
— "SB": controls the pressure on line B with discharge in A.

PERFORMANCES (measured with mineral oil of viscosity 36cSt at 50°C)

Maximum operating pressure	bar	350
Minimum controlled pressure	see Δp diagram.	
Maximum flow rate in controlled lines and in the free lines	l/min	75
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass: MRQ-SP / MRQ-SAT / MRQ-SBT / MRQ-SB MRQ-DT / MRQ-D	kg	1,4 2,1

HYDRAULIC SYMBOLS



1 - IDENTIFICATION CODE

M	R	Q		-		/		/	51	/	

ISO 4401-03
(CETOP 03) size. Modular version

Pilot operated pressure relief valve

Pressure adjustment range:
3 = up to 70 bar **5** = up to 210 bar
4 = up to 140 bar **6** = up to 350 bar

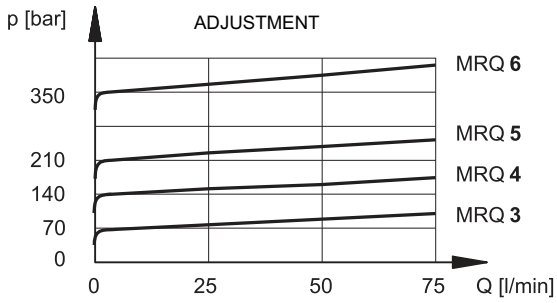
Configurations:
SP: single on line P with discharge in T
SAT: single on line A with discharge in T
SBT: single on line B with discharge in T
DT: double on lines A-B with discharge in T
D: double on lines A-B with crossed discharges
SB: single on line B with discharge in A

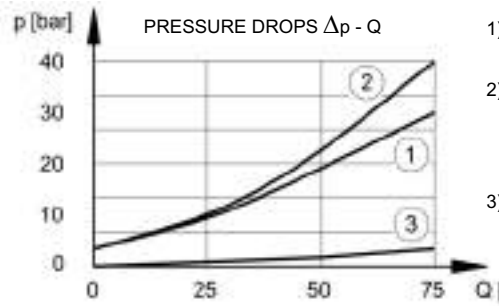
M1 = Adjustment knob
(omit for adjustment with countersunk hex screw)

Series No. (the overall and mounting dimensions remain unchangerd from 50 to 59)

Seals: omit for mineral oils
V = viton for special fluids

2 - CHARACTERISTIC CURVES (values obtained with viscosity of 36 cSt at 50°C)





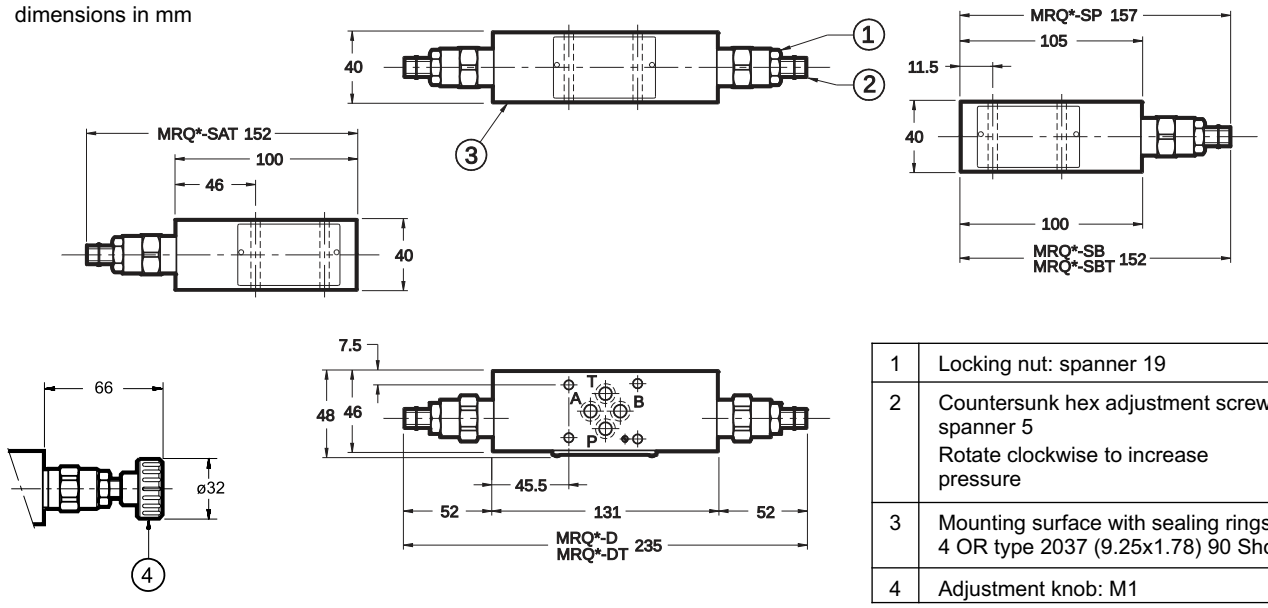
1) pressure drops on controlled lines
2) pressure drops on controlled lines only for MRQ*-D MRQ*-SB
3) pressure drops on free lines

3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

4 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	Locking nut: spanner 19
2	Countersunk hex adjustment screw: spanner 5 Rotate clockwise to increase pressure
3	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) 90 Shore
4	Adjustment knob: M1

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PBM3

BACKPRESSURE VALVE

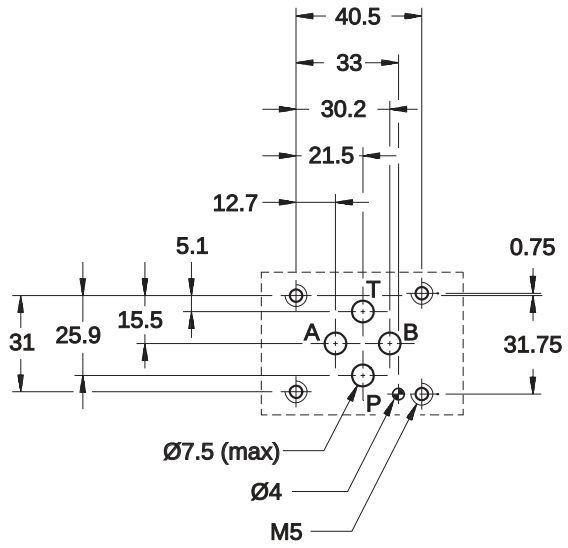
SERIES 10

MODULAR VERSION
ISO 4401-03 (CETOP 03)

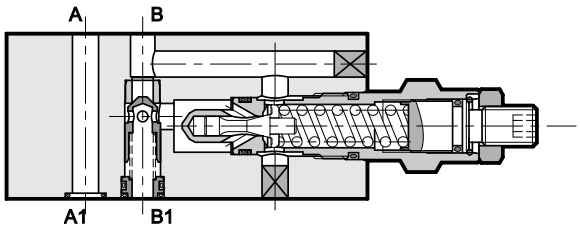
p max **350** bar
Q max (see table of performances)

MOUNTING INTERFACE

ISO 4401-03-02-0-05
CETOP 4.2-4-03-350



OPERATING PRINCIPLE



— The valve PBM3 is a direct operated three-way pressure regulator, developed as a modular version with mounting surface according to the ISO 4401 (CETOP RP121H) standards.

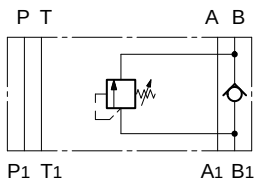
— Its aim is to adjust the output backpressure coming from the actuator, so as to allow the input free flow .

— It is normally used on vertically mounted cylinders where the cancellation of a load weighting on the road of the same cilinder is needed.

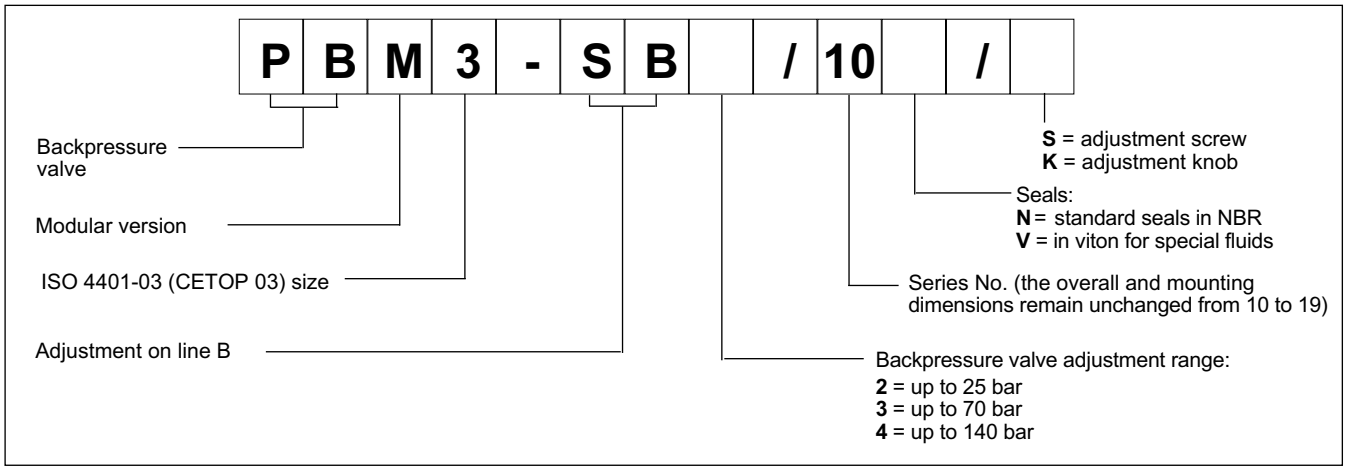
PERFORMANCES (measured with mineral oil of viscosity 36cSt at 50°C)

Maximum operating pressure	bar	350
Check valve cracking pressure	bar	3,5
Max. flow on check valve B→B1 (Δp 8 bar)	bar	50
Maximum flow rate in controlled line B1→B Maximum flow rate in the free lines P, A, T	l/min	50 75
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass:	kg	1,6

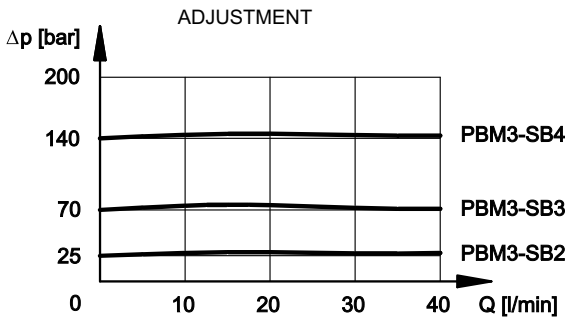
HYDRAULIC SYMBOL

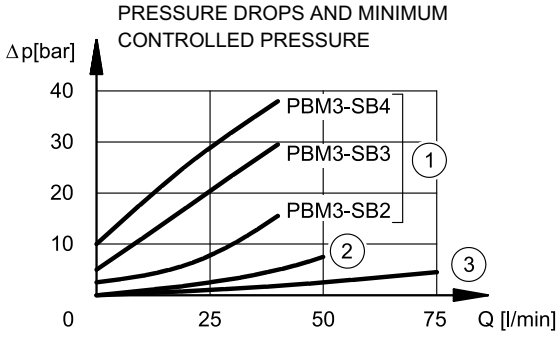


1 - IDENTIFICATION CODE



2 - CHARACTERISTIC CURVES (values obtained with viscosity of 36 cSt at 50°C)





1) pressure drops on line B1→B with calibrated screw at the beginning of the adjustment (min. controlled pressure)

2) pressure drops on line B→B1 to which the cracking pressure of the check valve is to be added

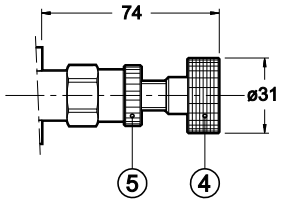
3) pressure drops on free lines

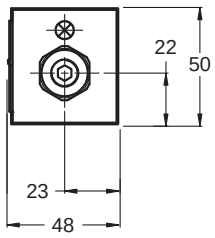
3 - HYDRAULIC FLUIDS

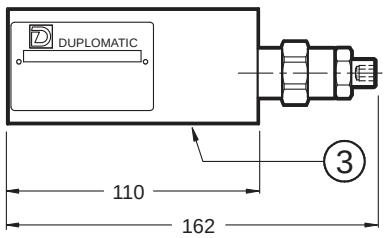
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

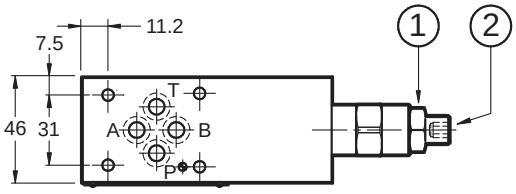
4 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm









1	Locking nut: spanner 19
2	**S** countersunk hex adjustment screw: spanner 6 Rotate clockwise to increase pressure
3	Mounting surface with sealing rings: 4 OR tipo 2037 - 90 shore (9.25 x 1.78)
4	Adjustment knob: **K**
5	Locking ring

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PRM5

PILOT OPERATED PRESSURE RELIEF VALVE

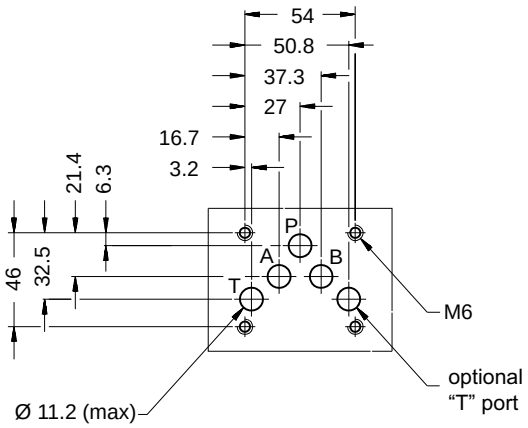
SERIES 10

MODULAR VERSION
ISO 4401-05

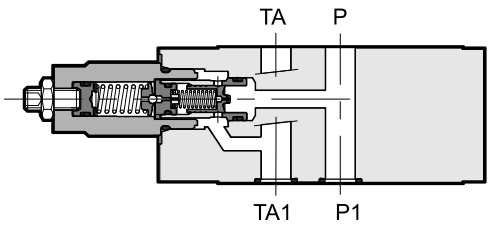
p max **350** bar
Q max **120** l/min

MOUNTING SURFACE

ISO 4401-05-04-0-05
CETOP 4.2-4-05-350



OPERATING PRINCIPLE



— The PRM5 valve is a pilot operated pressure relief valve made as a modular version, with mounting surface according to ISO 4401 standards.

— It can be assembled with all ISO 4401-05 modular valves without the use of pipes, using suitable tie-rods or bolts.

— Versions are available for single adjustment on one control line, or dual on two control lines and with four different pressure adjustment ranges.

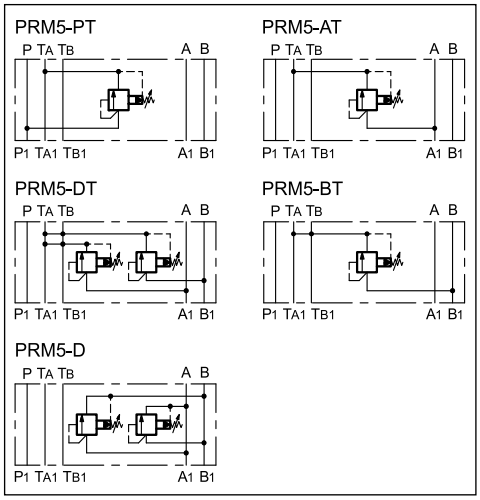
— This valve is used as a hydraulic circuit pressure limiting device.

— It is supplied with an hexagonal head adjustment screw and locking nut. It is also available with knob.

PERFORMANCES (measured with mineral oil of viscosity 36cSt at 50°C)

Maximum operating pressure	bar	350
Minimum controlled pressure	bar	see Δp - Q diagram
Max flow	l/min	120
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass: PRM5-PT, -AT, -BT PRM5-DT, -D	kg	2,8 3

HYDRAULIC SYMBOLS



1 - IDENTIFICATION CODE

P	R	M	5	-			/	10		/		

Pilot operated pressure relief valve

Modular version

ISO 4401-05 size

Versions:
PT: single on line P with discharge in TA
AT: single on line A with discharge in TA
BT: single on line B with discharge in TA and TB
DT: double on lines A-B with discharge in TA and TB
D: double on lines A-B with cross discharge

Pressure adjustment range:
070 = 14 ÷ 70 bar (17 bar/turn)
140 = 14 ÷ 140 bar (32 bar/turn)
210 = 14 ÷ 210 bar (47 bar/turn)
350 = 14 ÷ 350 bar (78 bar/turn)

Seals:
N = NBR seals for mineral oils (**standard**)
V = FPM seals for special fluids

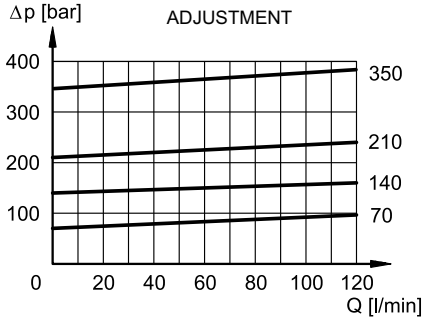
Series No. (the overall and mounting dimensions remain unchanged from 10 to 19)

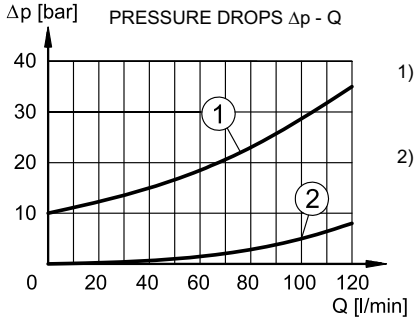
Option:
K = Adjustment knob. Omit for adjustment with hex socket screw (**standard**)

Option: W7 surface treatment.
Omit if not required (**NOTE**)

NOTE: Upon request we can supply these valves completely with zinc-nickel surface treatment on the body. Add the suffix **/W7** at the end of the identification code.

2 - CHARACTERISTIC CURVES (values obtained with viscosity of 36 cSt at 50°C)





1) pressure drop on controlled lines PT, AT, BT, DT

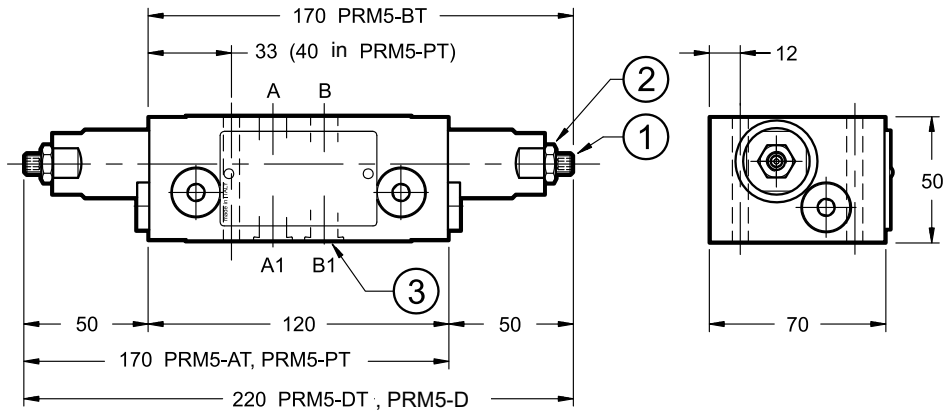
2) pressure drop on free lines

3 - HYDRAULIC FLUIDS

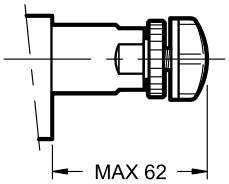
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

4 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



K VERSION

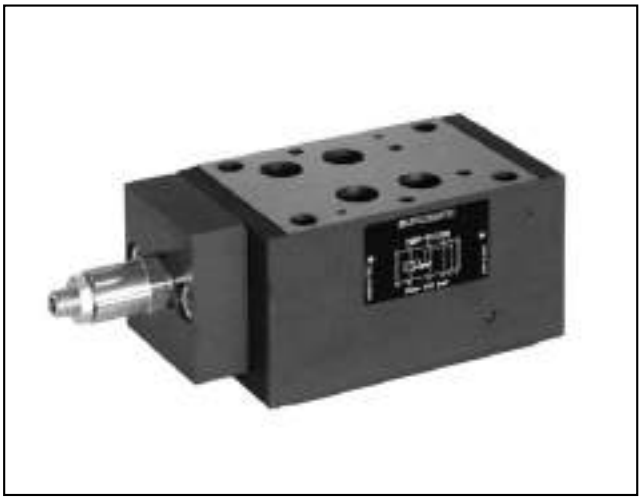


1	Socket hex adjustment screw: Hex key 4. Rotate clockwise to increase pressure
2	Locking nut: spanner 13
3	Mounting surface with sealing rings: 5 OR type 2050 (12.42 x 1.78) 90 Shore

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PRM7

PRESSURE RELIEF VALVE, PILOT OPERATED

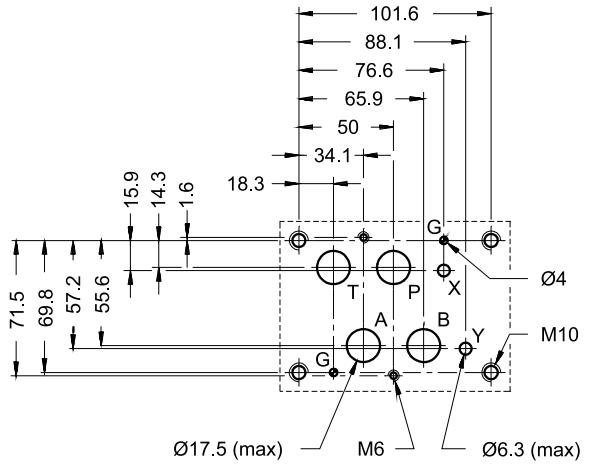
SERIES 20

MODULAR VERSION
ISO 4401-07

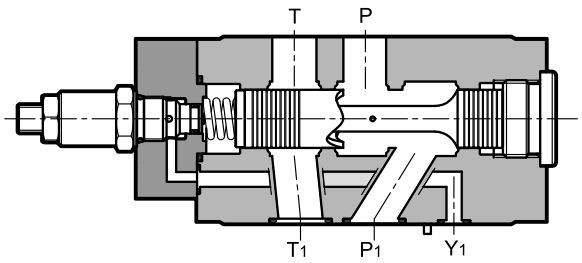
p max **350** bar
Q max **300** l/min

MOUNTING INTERFACE

ISO 4401-07-07-0-05
(CETOP 4.2-4-07)



OPERATING PRINCIPLE



— The PMR7 valve is a pilot operated pressure relief valve made as a modular version with a mounting surface according to ISO 4401-07 standards.

— It can be assembled with all ISO 4401-07 modular valves without the use of pipes, using suitable tie-rods or bolts.

— This valve is used as a hydraulic circuit pressure limiting device.

— It is available with pressure adjustment on port P and relief in T, and five pressure adjustment ranges.

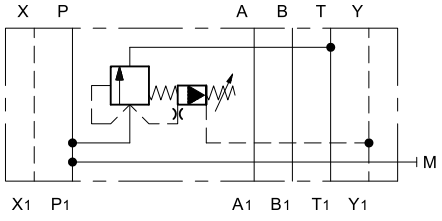
— It is supplied with an adjustment screw. The knob is available as option.

PERFORMANCES

(measured with mineral oil of viscosity 36 cSt at 50°C)

Maximum operating pressure	bar	350
Maximum flow rate	l/min	300
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass	kg	7,5

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

P	R	M	7	-	PT		/	20		/	

Pressure relief valve

Modular version

ISO 4401-07 size

Pressure adjustment on line P with discharge in T

Pressure adjustment range:
035 = 6 ÷ 35 bar
070 = 6 ÷ 70 bar
150 = 8 ÷ 150 bar
250 = 10 ÷ 250 bar
350 = 10 ÷ 350 bar

Series No.
(the overall and mounting dimensions remain unchanged from 20 to 29)

Seals:
N = standard seals in NBR (standard)
V = in viton for special fluids

Omit for adjustment with hex socket set screw (**standard**)
K = adjustment knob

3 - HYDRAULIC FLUIDS

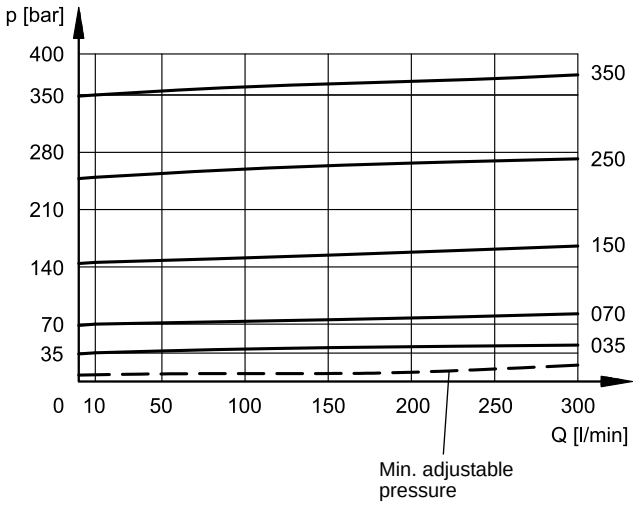
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

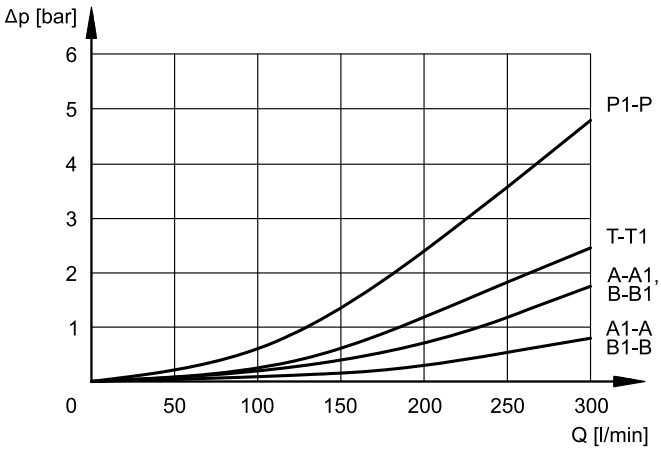
2 - CHARACTERISTIC CURVES

(values obtained with viscosity of 36 cSt at 50°C)

ADJUSTMENT

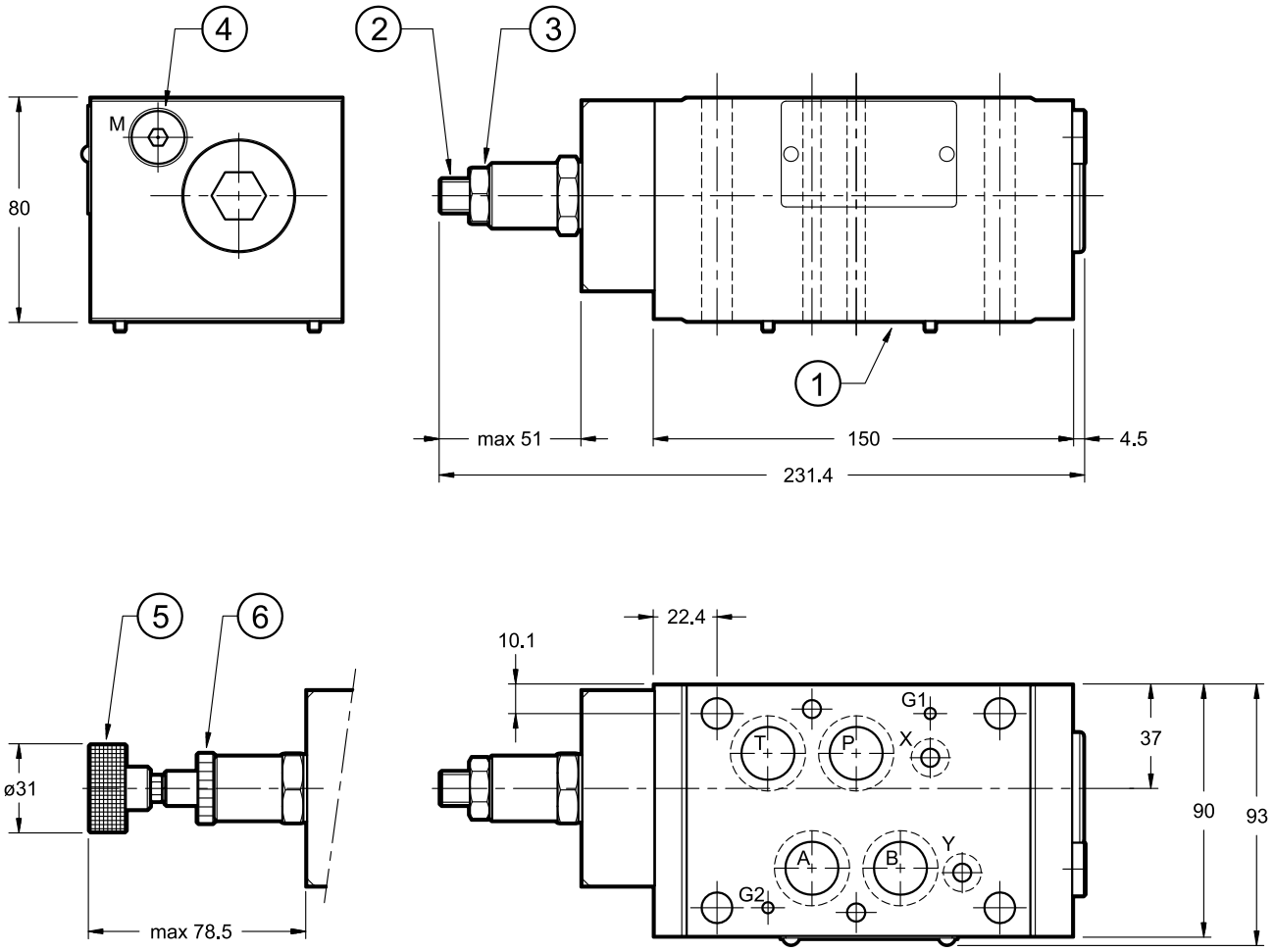


PRESSURE DROPS Δp - Q



4 - OVERALL AND MOUNTING DIMENSIONS

dimension en mm



1	Mounting surface with sealing rings: N. 4 OR type 130 (40x95x2.62) N. 2 OR type 2043 (10.82x1.78)
2	Standard adjustment screw (**standard**). Hex key 6 Rotate clockwise to increase pressure
3	Locking nut: spanner 19
4	Pressure gauge port: 1/4” BSP
5	Adjustment knob: K
6	Locking ring

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PZM3

DIRECT OPERATED THREE-PORT PRESSURE REDUCING VALVE WITH VARIABLE ADJUSTMENT

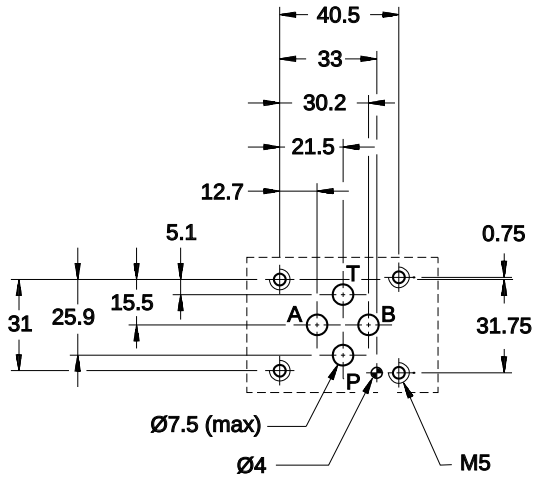
SERIES 10

MODULAR VERSION
ISO 4401-03

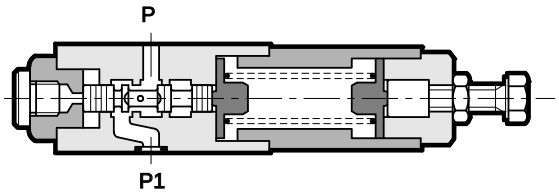
p max **350** bar
Q max (see table of performances)

MOUNTING INTERFACE

ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)



OPERATING PRINCIPLE



— The PZM3 valve is a three-port, spool type, direct operated pressure reducing valve with variable adjustment.

— It is made in modular version according to the ISO 4401-03 standards, it can be assembled quickly under solenoid valves, without the use of pipes.

— It is normally open and the hydraulic fluid flows freely from P1 port to P port.

— The three-way design provides protection of the secondary circuit from pressure surges since it allows a reverse flow from the actuator to the T discharge line.

The spool is subjected to the pressure in the P path but also to the force of the counter spring. When the pressure in P1 exceeds the spring force, the valving element closes until the pressure is reduced to the set pressure value.

— The valve provides good adjustment sensitivity with reduced drain flow. The drain is connected to path T inside the valve.

— The valve can be supplied with adjustment by hexagonal head screw or by knob.

PERFORMANCES

(measured with mineral oil of viscosity 36cSt at 50°C)

Maximum operating pressure Maximum pressure on port T	bar	350 10
Maximum flow rate in the controlled lines Maximum flow rate in the free lines Drainage flow rate	l/min	50 75 ≤ 0.08
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass	kg	1.6

1 - IDENTIFICATION CODE

P	Z	M	3	-			/	10		/		

Pressure reducing valve, direct operated

Modular version

Size ISO 4401-03

Configurations:

P: pressure reduction in P. Internal drain to line T and adjustment on side B

PA: pressure reduction in line P-A and full pressure in line P-B with adjustment on side B

PB: pressure reduction in line P-B and full pressure in line P-A with adjustment on side B

RP: pressure reduction in P. Internal drain to line T and adjustment on side A

RPA: pressure reduction in line P-A and full pressure in line P-B with adjustment on side A

RPB: pressure reduction in line P-B and full pressure in line P-A with adjustment on side A

Pressure adjustment range:

035 = 3 ÷ 35 bar **140** = 30 ÷ 140 bar
070 = 10 ÷ 70 bar **280** = 50 ÷ 280 bar

Series No. (the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:

N = NBR seals for mineral oils (**standard**)
V = FPM seals for special fluids

Adjustment type:

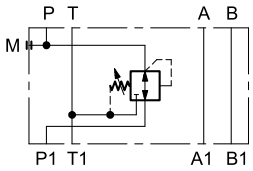
S = with hexagonal head screw (**standard**)
CK3 = with push, adjust, lock knob (see point 6)

Option: **/W7** surface treatment. Available only for PZM3-P and PZM3-RP. Omit if not required (**NOTE**)

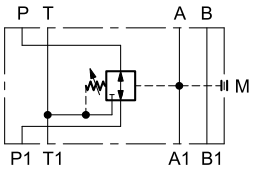
NOTE: The standard valve is supplied with surface treatment of phosphating black.
The zinc-nickel finishing on the valve body makes the valve suitable to ensure a salt spray resistance up to **240** hours.
(test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

2 - HYDRAULIC SYMBOLS

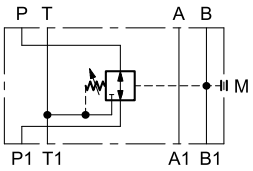
PZM3-P
PZM3-RP



PZM3-PA
PZM3-RPA



PZM3-PB
PZM3-RPB

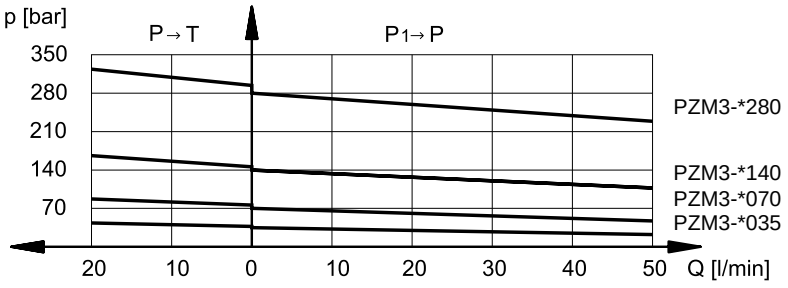


NOTE: The versions RP, RPA and RPB have been made with adjustment on side A, so as to be interchangeable with valves of other companies.
The standard version is equipped with adjustment on side B.

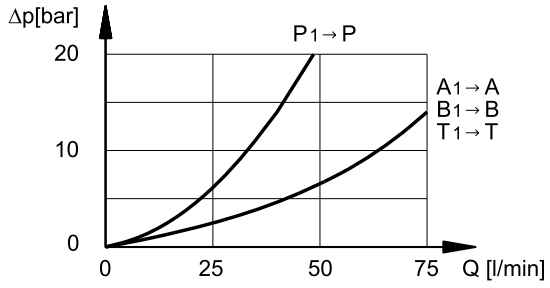
3 - CHARACTERISTIC CURVES

(values obtained with viscosity of 36 cSt at 50°C)

ADJUSTMENT



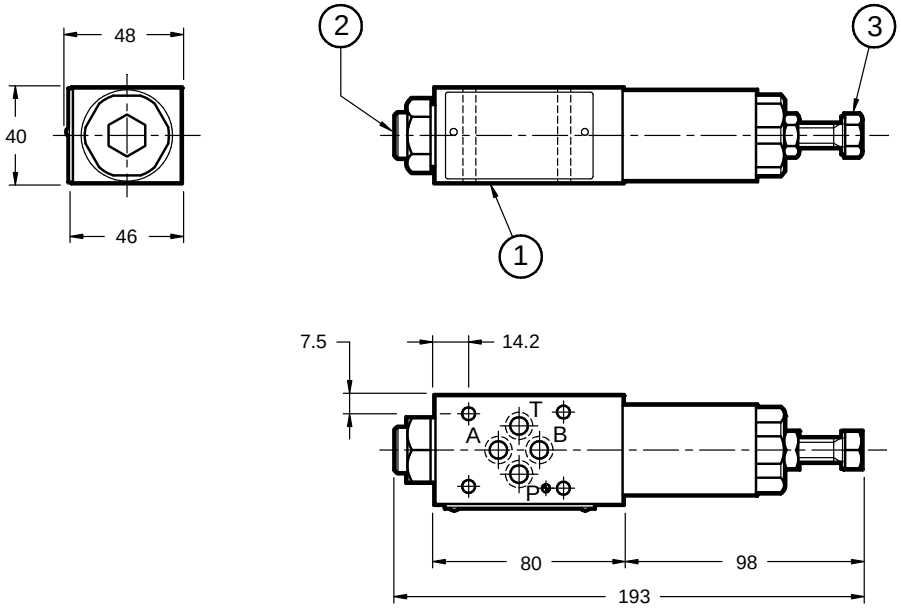
PRESSURE DROPS Δp - Q



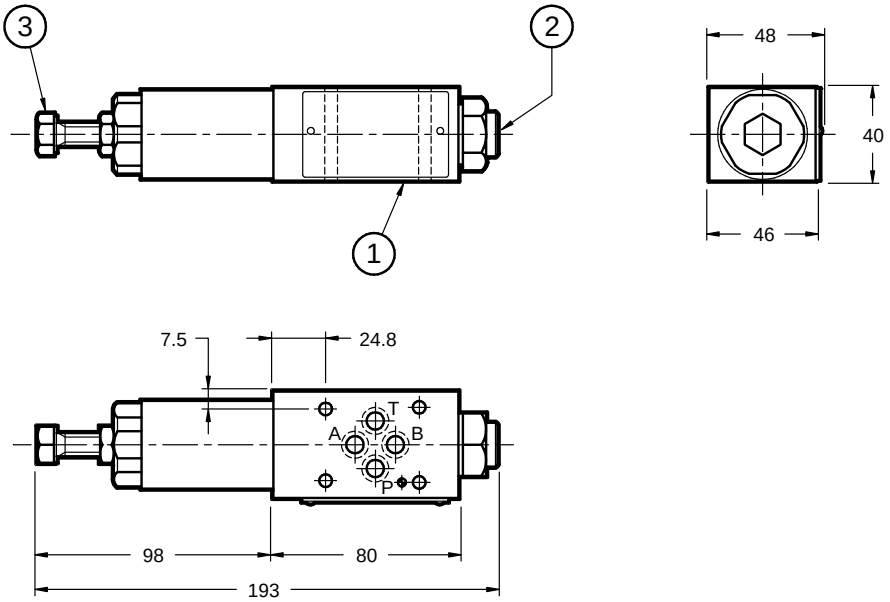
4 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

PZM3-P
PZM3-PA
PZM3-PB



PZM3-RP
PZM3-RPA
PZM3-RPB



1	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) 90 Shore
2	Pressure gauge port 1/4” BSPP
3	Hexagonal head adjustment screw. Spanner 17. Rotate clockwise to increase pressure

5 - HYDRAULIC FLUIDS

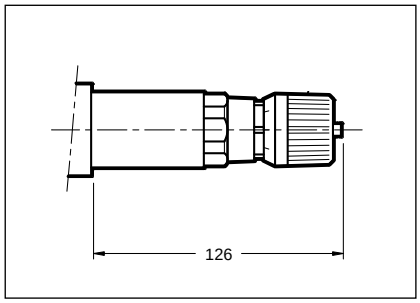
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.The fluid must be preserved in its physical and chemical characteristics.

6 - ADJUSTMENT KNOB

Valves can be supplied with adjustment knob, which is engaged by pushing and twisting at the same time. When released, the knob disengages to secure the adjustment from involuntary tampering.

Add **CK3** in the identification code to order this version (see point 1).



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Z4M

PILOT OPERATED PRESSURE REDUCING VALVE

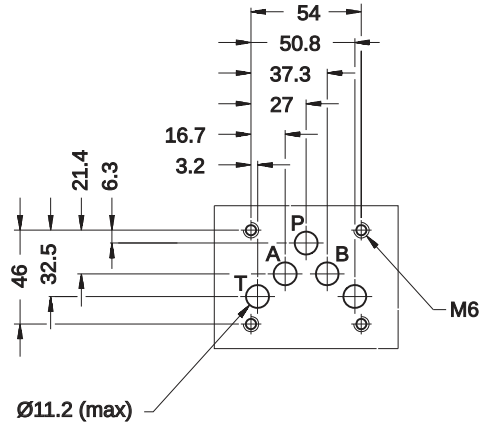
SERIES 50

MODULAR VERSION
ISO 4401-05 (CETOP 05)

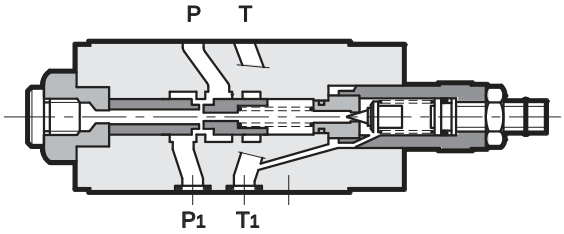
p max **320** bar
Q max (see table of performances)

MOUNTING INTERFACE

ISO 4401-05-04-0-05
(CETOP 4.2-4-05-320)



OPERATING PRINCIPLE



— The Z4M valve is a piloted pressure reducing valve made as a modular version with mounting surface according to the ISO 4401 (CETOP PR 121H) standards.

— It is used to reduce pressure on secondary circuit branches, assuring stability of the controlled pressure and even changing the flow that travels through the valve.

— It can be assembled quickly under the ISO 4401-05 (CETOP 05) directional solenoid valves without use of pipes.

— It is normally supplied with a countersunk hex adjustment screw, locking nut and maximum adjustment travel limiting device.

— It is available in four different pressure adjustment ranges up to 320 bar.

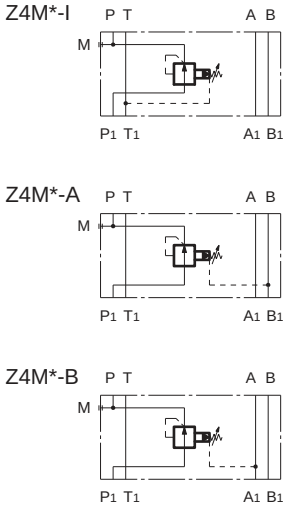
CONFIGURATIONS (see Hydraulic symbols table)

— Z4M*-I: pressure reduction on line P - drainage connected to line T.
— Z4M*-A: pressure reduction on line A and full pressure on line B.
— Z4M*-B: pressure reduction on line B and full pressure on line A.

PERFORMANCES (measured with mineral oil of viscosity 36cSt at 50°C)

Maximum operating pressure	bar	320
Maximum flow rate in the controlled line P Maximum flow rate in the free lines Drainage flow rate	l/min	80 100 ≤ 0,07
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass:	kg	2,7

HYDRAULIC SYMBOLS



1 - IDENTIFICATION CODE

Z	4	M		-		/		/	50	/	

Pressure reducing valve

Size: ISO 4401-05 (CETOP 05)

Modular version

Pressure adjustment range:
3 = 5 ÷ 70 bar
4 = 8 ÷ 140 bar
5 = 10 ÷ 210 bar
6 = 15 ÷ 320 bar

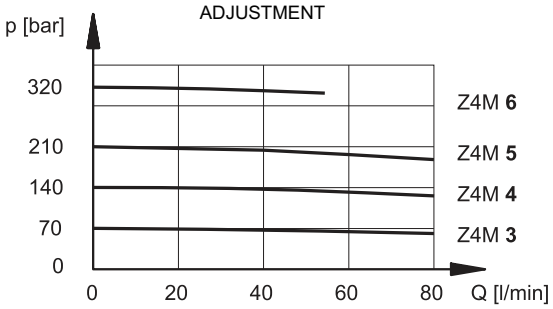
Configurations: **I**: pressure reduction on line P. Internal drainage connected to line T
A: pressure reduction on line A and full pressure on line B
B: pressure reduction on line B and full pressure on line A

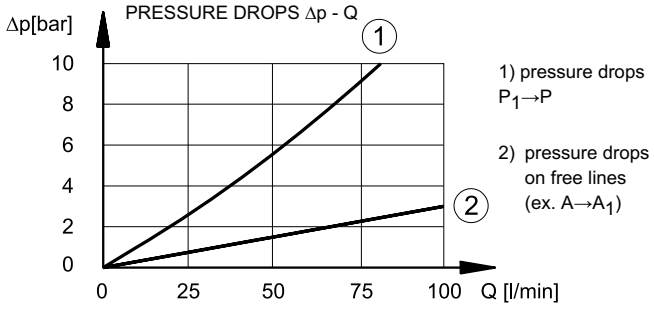
M1 = Adjustment knob
(omit for adjustment with countersunk hex screw)

Series No. (the overall and mounting dimensions remain unchanged from 50 to 59)

Seals: omit for mineral oils
V = viton for special fluids

2 - CHARACTERISTIC CURVES (values obtained with viscosity of 36 cSt at 50°C)



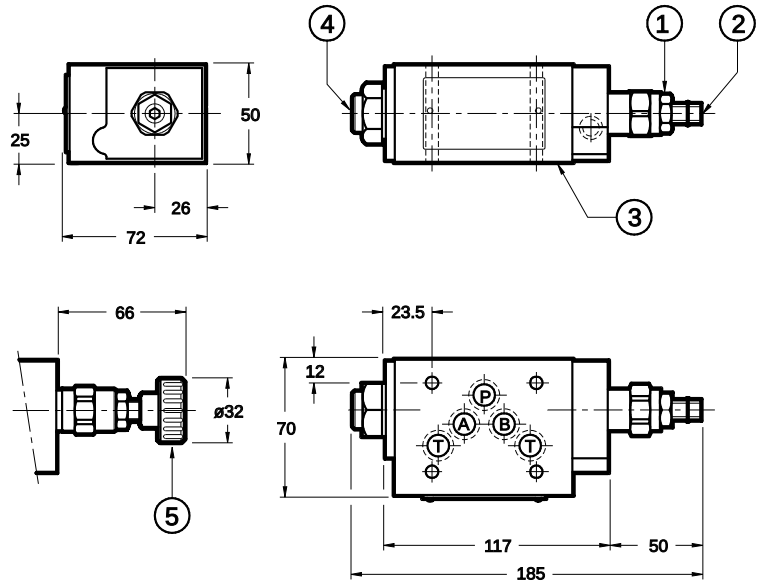


3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

4 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	Locking nut spanner 17
2	Countersunk hex adjustment screw: Spanner 5. Rotate clockwise to increase pressure
3	Mounting surface with sealing rings: 5 OR type 2050 (12.42x1.78) 90 Shore
4	Pressure gauge port 1/4" BSP

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PZM5

PILOT OPERATED PRESSURE REDUCING VALVE

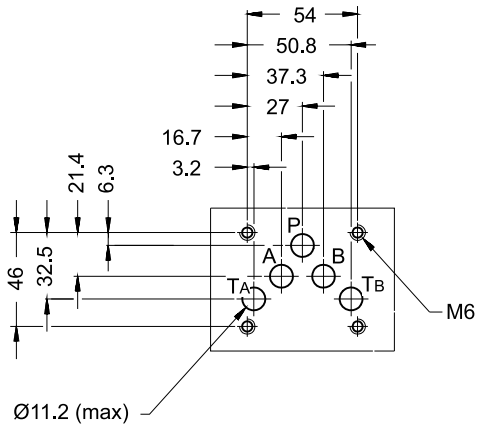
SERIES 10

MODULAR VERSION ISO 4401-05

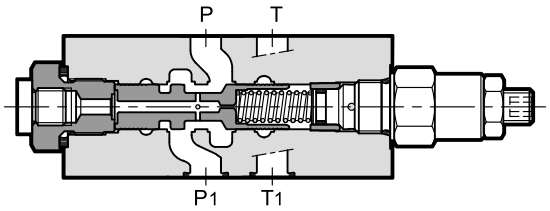
p max **350** bar
Q max (see table of performances)

MOUNTING INTERFACE

ISO 4401-05-04-0-05
(CETOP 4.2-4-05-350)



OPERATING PRINCIPLE



— The PZM5 valve is a pilot operated pressure reducing valve, shaped as modular version with mounting surface according to ISO 4401 standards.

— It reduces pressure on secondary circuit branches, assuring stability of the controlled pressure and even changing the flow that passes through the valve.

— It can be assembled quickly under ISO 4401-05 directional solenoid valves without the use of pipes.

— It is supplied with a hex socket adjustment screw, locking nut and a travel limiting device for maximum adjustment.

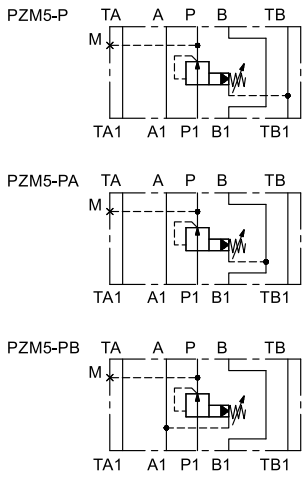
— Three pressure adjustment ranges are available, up to 280 bar.

PERFORMANCES

(measured with mineral oil of viscosity 36 cSt at 50 °C)

Maximum operating pressure	bar	350
Maximum flow rate in the controlled line P Maximum flow rate in the free lines Drain flow rate	l/min	80 100 < 0,8
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Recommended effective viscosity	cSt	25
Fluid contamination degree	according to ISO 4406:1999 class 20/18/15	
Mass	kg	2,7

HYDRAULIC SYMBOLS



1 - IDENTIFICATION CODE

P	Z	M	5	-			/	10		/	

Pressure reducing valve, pilot operated

Modular version

Size ISO 4401-05

Versions:
P = pressure reduction in P. Internal drain to line T_B
PA = pressure reduction in line P-A when line B is connected to the tank; full pressure in line P-B
PB = pressure reduction in line P-B when line A is connected to the tank; full pressure in line P-A.

Pressure adjustment range:
070 = 8 ÷ 70 bar **150** = 8 ÷ 150 bar **280** = 8 ÷ 280 bar

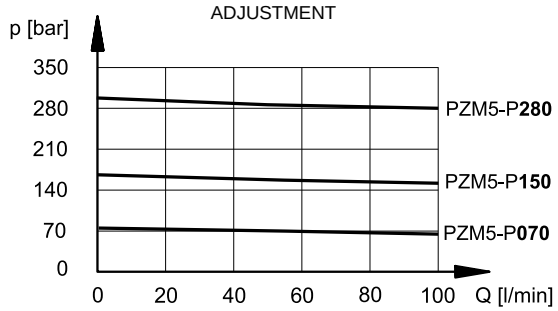
Series No. (the overall and mounting dimensions remain unchanged from 10 to 19)

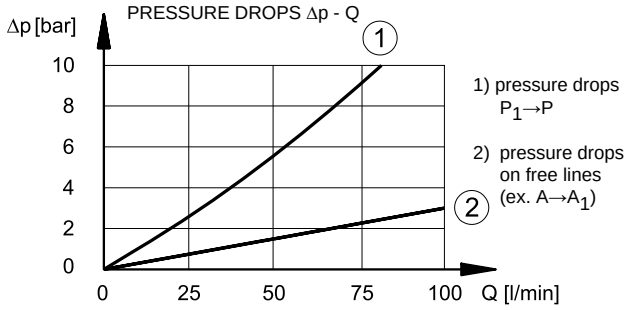
Seals:
N = NBR seals for mineral oils (**standard**)
V = FPM seals for special fluids

Option: **K** = Adjustment knob.
(Omit for adjustment with hex socket screw)

2 - CHARACTERISTIC CURVES

(values obtained with viscosity of 36 cSt at 50 °C)

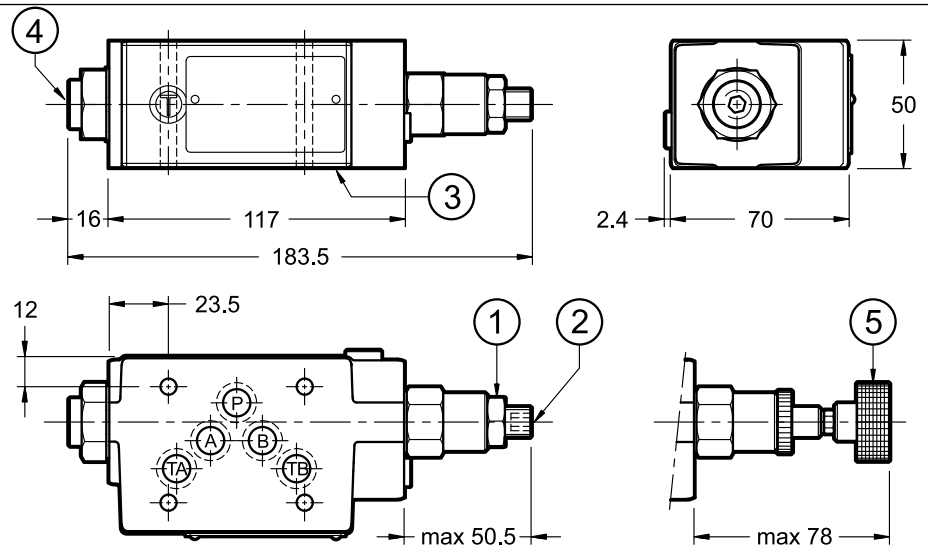




3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

4 - OVERALL AND MOUNTING DIMENSIONS



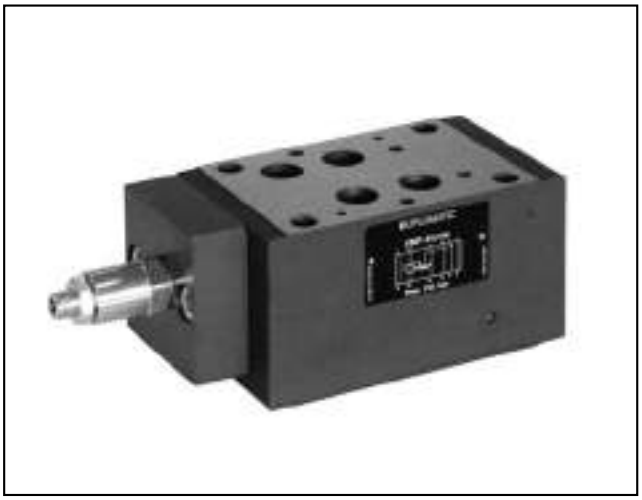
dimensions in mm

1	Locking nut spanner 19
2	Socket hex adjustment screw: Allen key 6. Rotate clockwise to increase pressure
3	Mounting surface with sealing rings: 5 OR type 2050 (12.42x1.78) 90 Shore
4	Pressure gauge port 1/4” BSP
5	Adjustment knob **K**

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duplomaticmotionsolutions.com

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PZM7

PRESSURE REDUCING VALVE

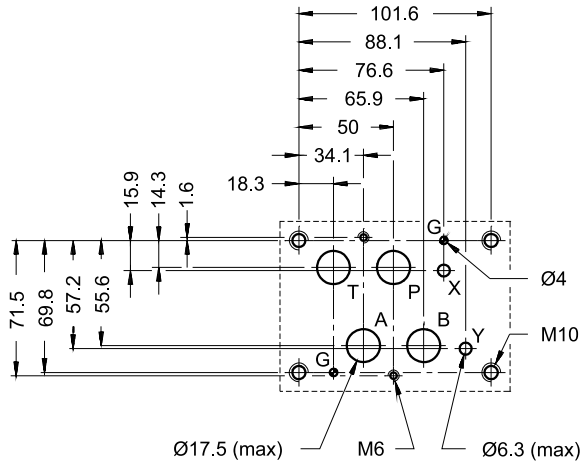
SERIES 20

MODULAR VERSION
ISO 4401-07

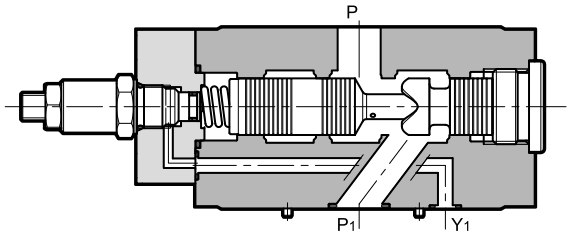
p max **350** bar
Q max **300** l/min

MOUNTING INTERFACE

ISO 4401-07-07-0-05
(CETOP 4.2-4-07)



OPERATING PRINCIPLE



— PZM7 valves are pressure reducing valves for stack mounting, with mounting surface according to ISO 4401-07 standard.

— They are two-stage valves and are employed to assure stability of the controlled pressure, even changing the flow that passes through the valve.

— The PZM7 valves can be assembled quickly under DSP7 directional valves (see catalogue 41 420), without use of pipes, using suitable tie-rods or bolts, forming compact modular groups.

— They are supplied with adjustment screw. Knob is available as option.

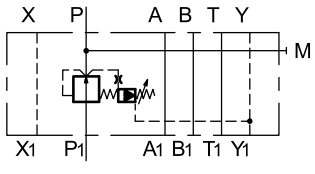
PERFORMANCES

(measured with mineral oil of viscosity 36 cSt at 50 °C)

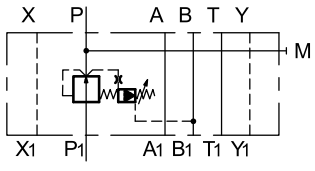
Maximum operating pressure	bar	350
Maximum flow rate	l/min	300
Drainage flow rate	l/min	≤ 0.9
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass	kg	7.5

HYDRAULIC SYMBOLS

PZM7-P



PZM7-PA



1 - IDENTIFICATION CODE

P	Z	M	7	-	P		/	20		/	

Pressure reducing valve

Modular version

ISO 4401-07 size

P = Pressure reduction in P line, with external drain in Y
PA = Pressure reduction in P line, for reduced pressure in the A line of the directional valve downstream.

Pressure adjustment range:
035 = 6 ÷ 35 bar
070 = 6 ÷ 70 bar
150 = 8 ÷ 150 bar
250 = 10 ÷ 250 bar
300 = 10 ÷ 300 bar

Series No.
(the overall and mounting dimensions remain unchanged from 20 to 29)

Seals:
N = seals in NBR for mineral oils (**standard**)
V = seals in FPM for special fluids

Omit for hexagon socket adjustment screw (**standard**)
K = Adjustment knob

2 - HYDRAULIC FLUIDS

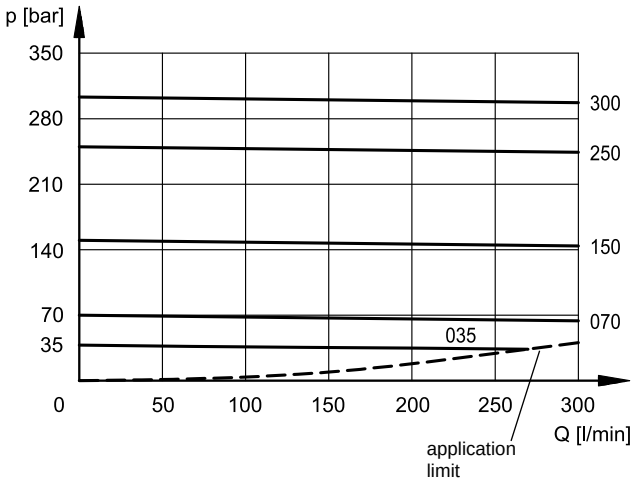
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

3 - CHARACTERISTIC CURVES

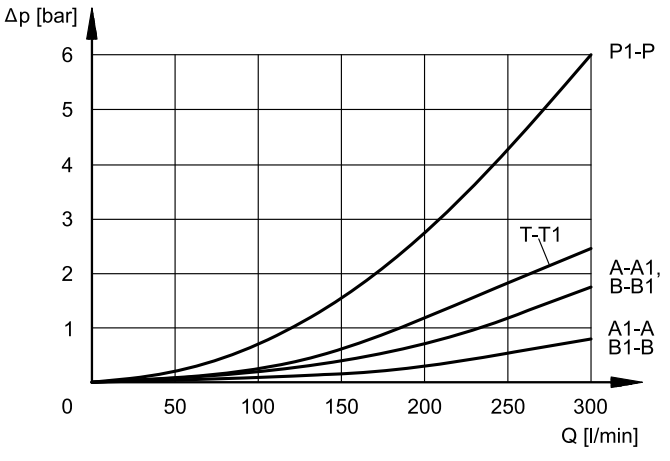
(values obtained with viscosity of 36 cSt at 50°C)

REDUCED PRESSURE



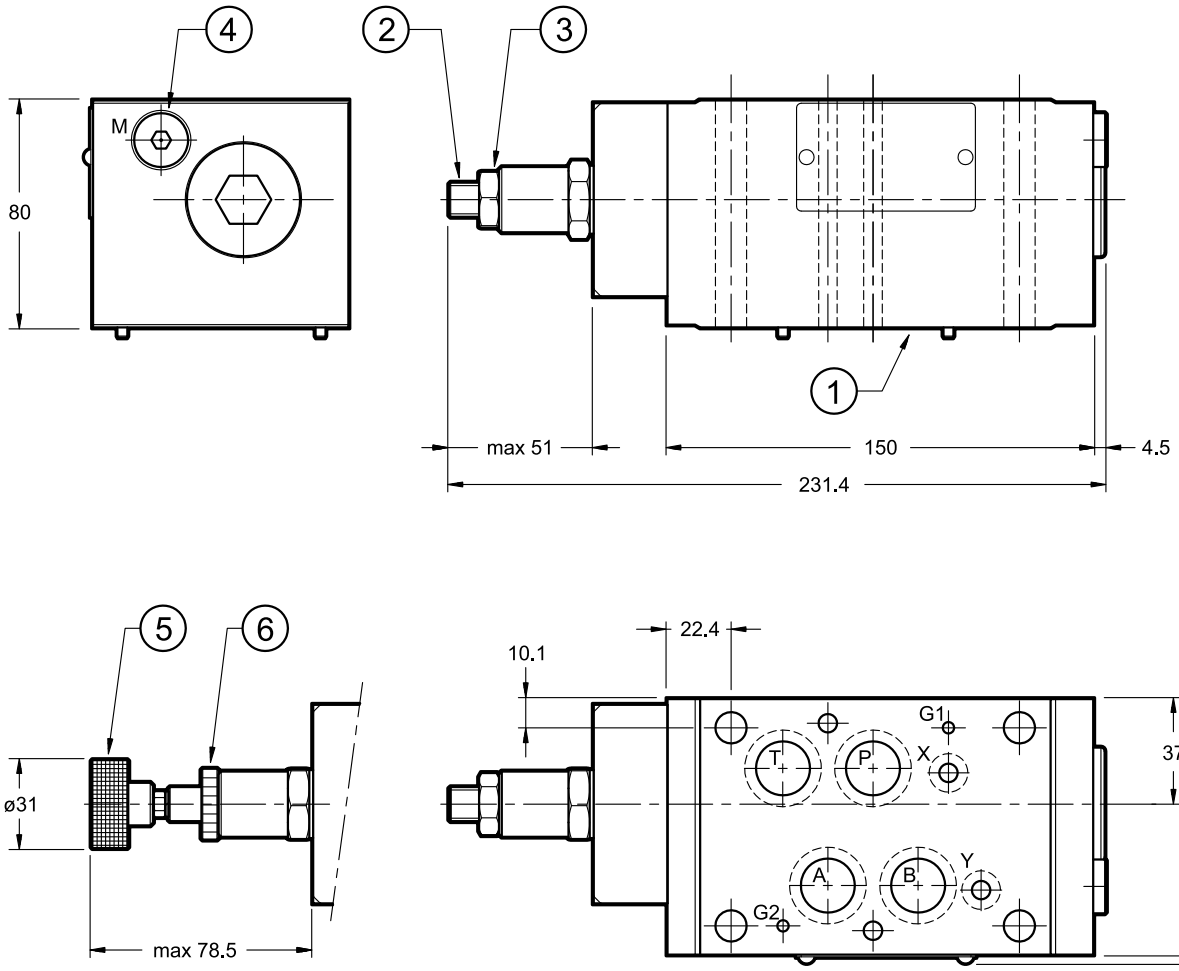
Reduced pressure in P obtained for each adjustment range, with inlet pressure 350 bar and inlet flow 350 l/min.

PRESSURE DROPS Δp - Q



4 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	Mounting surface with sealing rings: N. 4 OR type 130 (40x95x2.62) N. 2 OR type 2043 (10.82x1.78)
2	Hexagon socket adjustment screw (**standard**). Hex key 6 Clockwise rotation to increase pressure.
3	Locking nut: spanner 19
4	Pressure gauge port: 1/4” BSP
5	Adjustment knob: K
6	Locking ring

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duplomaticmotionsolutions.com

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MSD

DIRECT OPERATED SEQUENCE VALVE

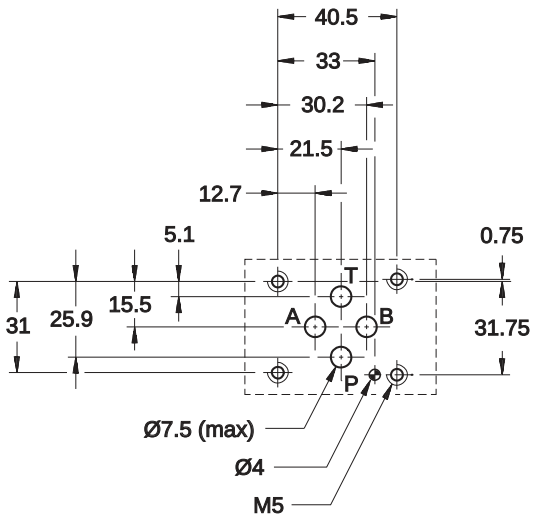
SERIES 50

MODULAR VERSION
ISO 4401-03 (CETOP 03)

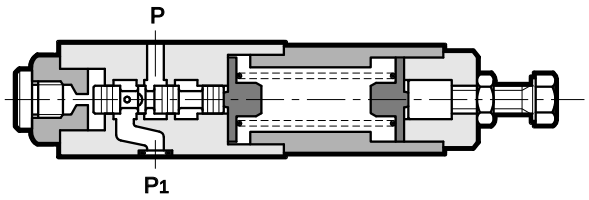
p max **350** bar
Q max (see table of performances)

MOUNTING INTERFACE

ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)



OPERATING PRINCIPLE



— The MSD valve is a direct operated sequence valve of the spool type and is used to control two or more actuators in succession.

At rest position, it is normally closed and the spool is subject to pressure in line P1 on one side and to the adjustment screw on the other side. When the pressure in line P1 reaches the set value of the screw, the valve opens and allows passage of the fluid in the pressure line of the main circuit.

The valve stays open until the pressure in the circuit drops below the calibrated value set by the spring.

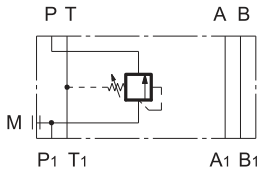
— It is made as a modular version with ports according to the ISO 4401 (CETOP PR 121H) standards and can be assembled quickly without the use of pipes under the ISO 4401-03 (CETOP 03) directional solenoid valves.

— It is normally supplied with a hexagonal head adjustment screw. Upon request, it can be equipped with a SICBLOC adjustment knob with micrometric indication and automatic locking.

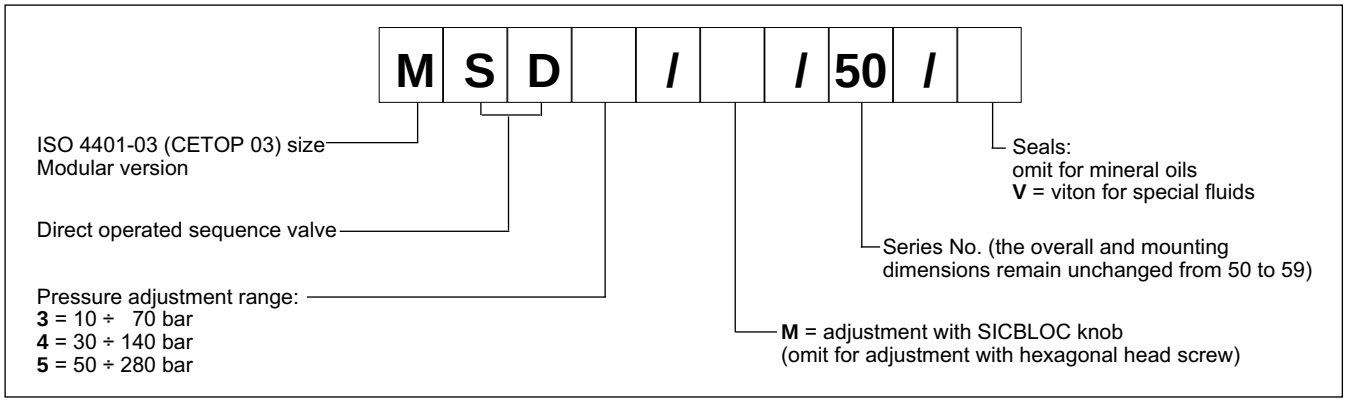
PERFORMANCES (measured with mineral oil of viscosity 36cSt at 50°C)

Maximum operating pressure maximum pressure on port T	bar	350 10
Maximum flow rate in the controlled lines Maximum flow rate in the free lines	l/min	50 75
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass:	kg	1,4

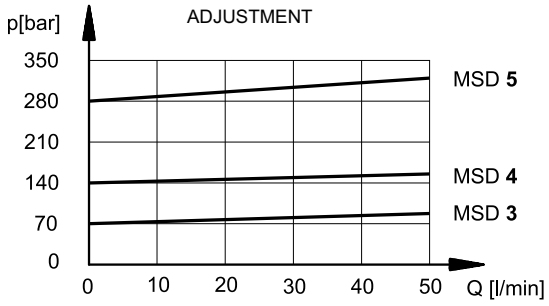
HYDRAULIC SYMBOLS

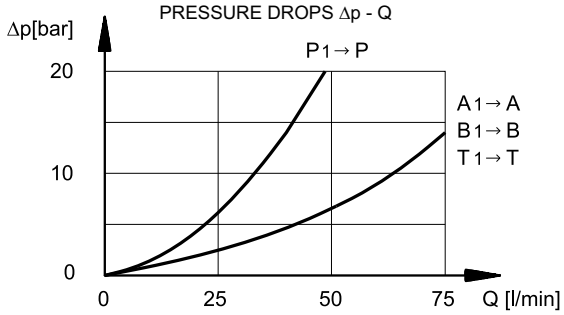


1 - IDENTIFICATION CODE



2 - CHARACTERISTIC CURVES (values obtained with viscosity of 36 cSt at 50°C)

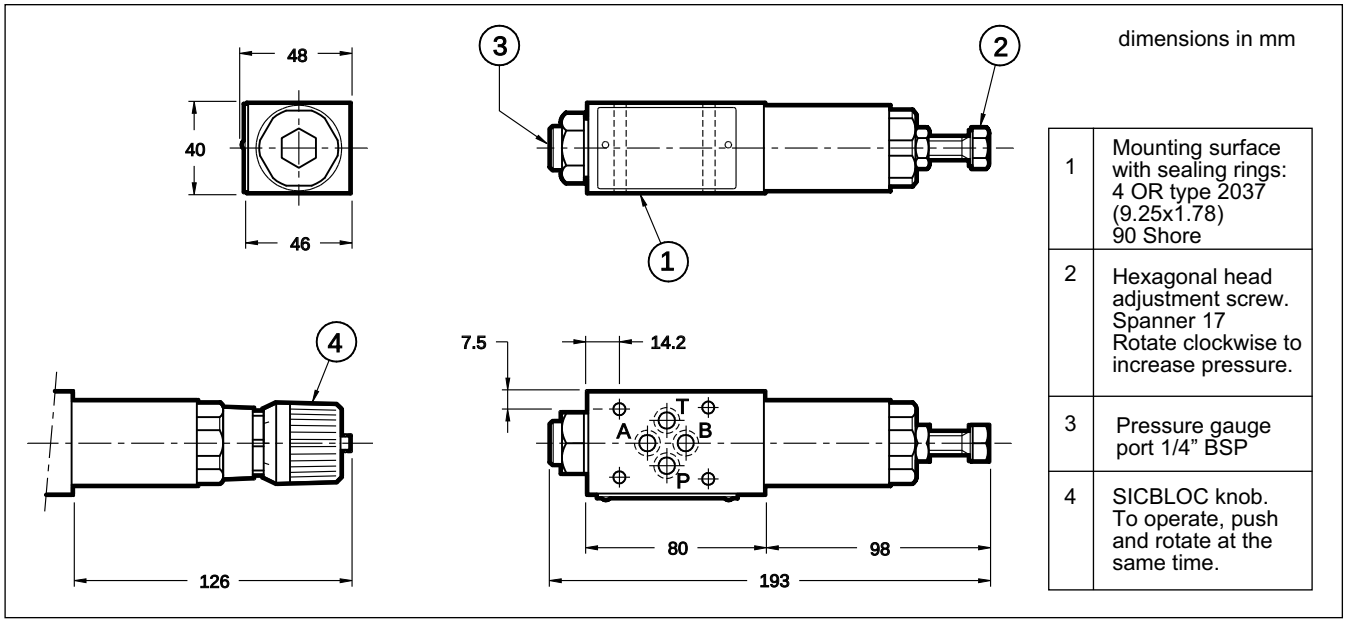




3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

4 - OVERALL AND MOUNTING DIMENSIONS



1	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) 90 Shore
2	Hexagonal head adjustment screw. Spanner 17 Rotate clockwise to increase pressure.
3	Pressure gauge port 1/4” BSP
4	SICBLOC knob. To operate, push and rotate at the same time.

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SD4M

DIRECT OPERATED SEQUENCE VALVE

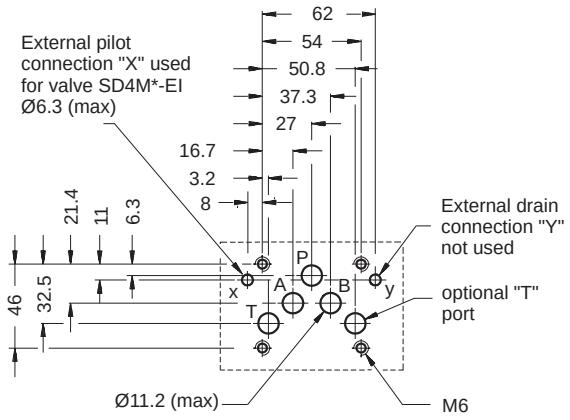
SERIES 50

MODULAR VERSION
ISO 4401-05 (CETOP 05)

p max **320** bar
Q max (see table of performances)

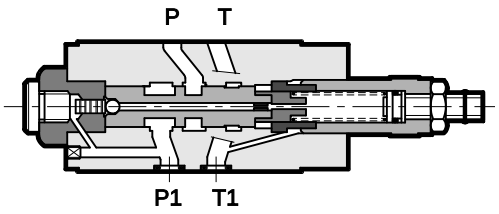
MOUNTING INTERFACE

ISO 4401-05-05-0-05
(CETOP 4.2-4-R05-320)



The internal pilot version of the valve can be installed either on the ISO 4401-05 (CETOP 05) type or ISO 4401-05-05-0-94 (R05) type of mounting interface (ports X and Y of the latter version are not to be used).

OPERATING PRINCIPLE



— The SD4M valve is a direct operated sequence valve of the spool type, made as a modular version with a mounting surface according to the ISO 4401 (CETOP RP 121H) standards.

It is normally used to drive two or more actuators in succession. In the rest position, it is normally closed and, on one side, the spool is subjected to the push of a small piston on which the line (P1) pressure acts and, on the other side, to the adjustment spring. When the pressure in line P1 reaches the calibrated value of the spring, the valve opens and allows passage of the fluid in the controlled line (P). The valve stays open until the pressure in the circuit drops below the set calibration value.

— Made in two versions, with internal or external piloting. The piloting port “X” is according to the CETOP 4.2-4-R05 mounting interface for the latter version.

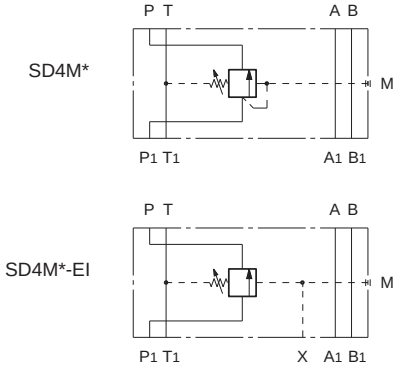
— It can be assembled quickly without use of pipes under the ISO 4401-05 (CETOP 05) directional solenoid valves.

— It is normally supplied with a countersunk hex adjustment screw, locking nut and maximum adjustment travel limiting device.

PERFORMANCES (measured with mineral oil of viscosity 36 cSt at 50°C)

Maximum operating pressure maximum pressure on port T	bar	320 10
Maximum flow rate in the controlled lines Maximum flow rate in the free lines	l/min	80 100
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass:	kg	2,7

HYDRAULIC SYMBOLS



1 - IDENTIFICATION CODE

S	D	4	M		-		/		/	50	/	

Direct operated sequence valve

ISO 4401-05 (CETOP 05) size

Modular version

Pressure adjustment range:
3 = up to 70 bar
4 = up to 140 bar
5 = up to 210 bar

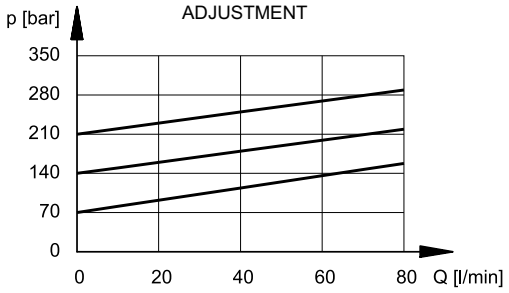
EI = version with external piloting (port "X" position according to mounting interface CETOP 4.2-4-R05) (omit for standard version with internal piloting)

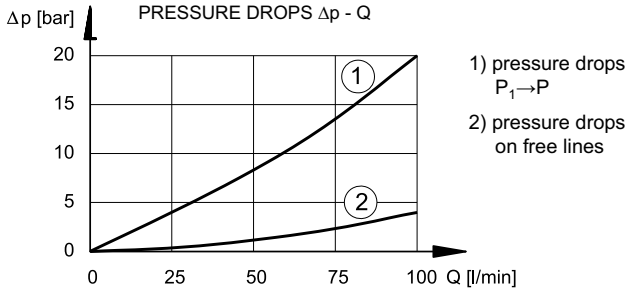
M1 = adjustment knob (omit for adjustment with hexagonal head screw)

Series No. (the overall and mounting dimensions remain unchanged from 50 to 59)

Seals:
omit for mineral oils
V = viton for special fluids

2 - CHARACTERISTIC CURVES (values obtained with viscosity of 36 cSt at 50°C)



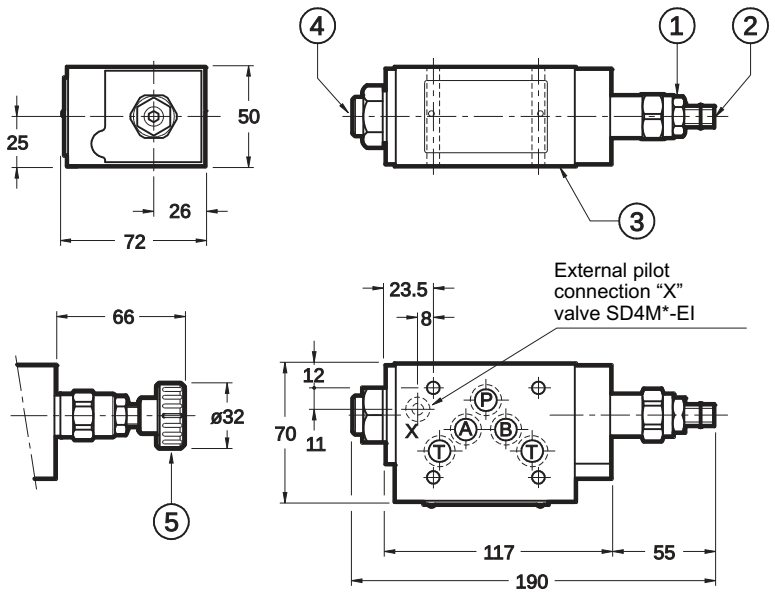


3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

4 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	Locking nut. Spanner 17.
2	Countersunk hex adjustment screw. Spanner 5. Rotate clockwise to increase pressure.
3	Mounting surface with sealing rings: 5 OR type 2050 (12.42x1.78) 90 Shore N.1 OR type 2037 (9.25x1.78) 90 Shore (only for SD4M*-EI)
4	Pressure gauge port 1/4" BSP
5	Adjustment knob: M1

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PCM3

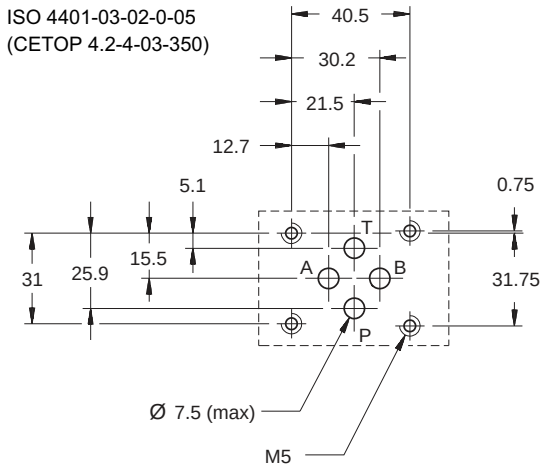
TWO AND THREE-WAY PRESSURE COMPENSATOR WITH FIXED OR VARIABLE ADJUSTMENT

SERIES 10

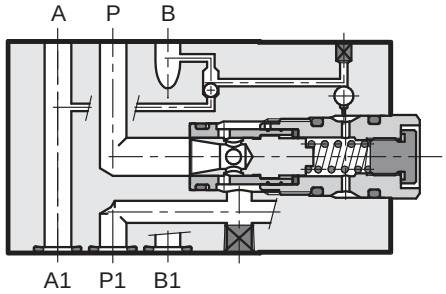
MODULAR VERSION
ISO 4401-03 (CETOP 03)

p max **350** bar
Q max **40** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



— The PCM3 valve is a two or three-way pressure compensator, developed as a modular version with mounting surface according to the ISO 4401 (CETOP RP121H).

— Its aim is to keep the pressure drop setting (characteristic Δp) between the line P and alternatively the lines A and B, at a constant level.

— It is normally used together with proportional directional valves, in order to control the flow rate independently of the pressure variations.

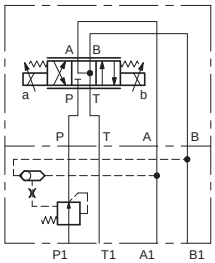
— The selection of the piloting pressure on the lines A and B is carried out automatically via a shuttle check valve built into the compensator.

— The setting of the variable adjustment compensator (characteristic Δp) can be varied from 7 to 33 bar, via a countersunk hex adjustment screw or via an adjustment knob.

— The fixed adjustment compensator is available with setting (characteristic Δp) of 4 and 8 bar.

APPLICATION EXAMPLES

Two-way compensator with fixed adjustment, combined with a proportional valve type DSE3-A*

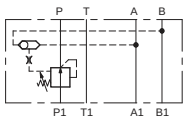


PERFORMANCES (working with mineral oil of viscosity of 36 cSt at 50°C)

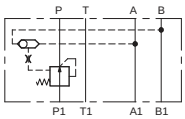
Max operating pressure	bar	350
Characteristic Δp: fixed adjustment variable adjustment	bar	4 - 8 7 ÷ 33
Max flow rate	l/min	40
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass	kg	1,5

HYDRAULIC SYMBOLS

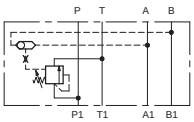
PCM3-PV/10



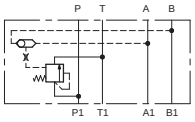
PCM3-P*/10



PCM3-PTV/10

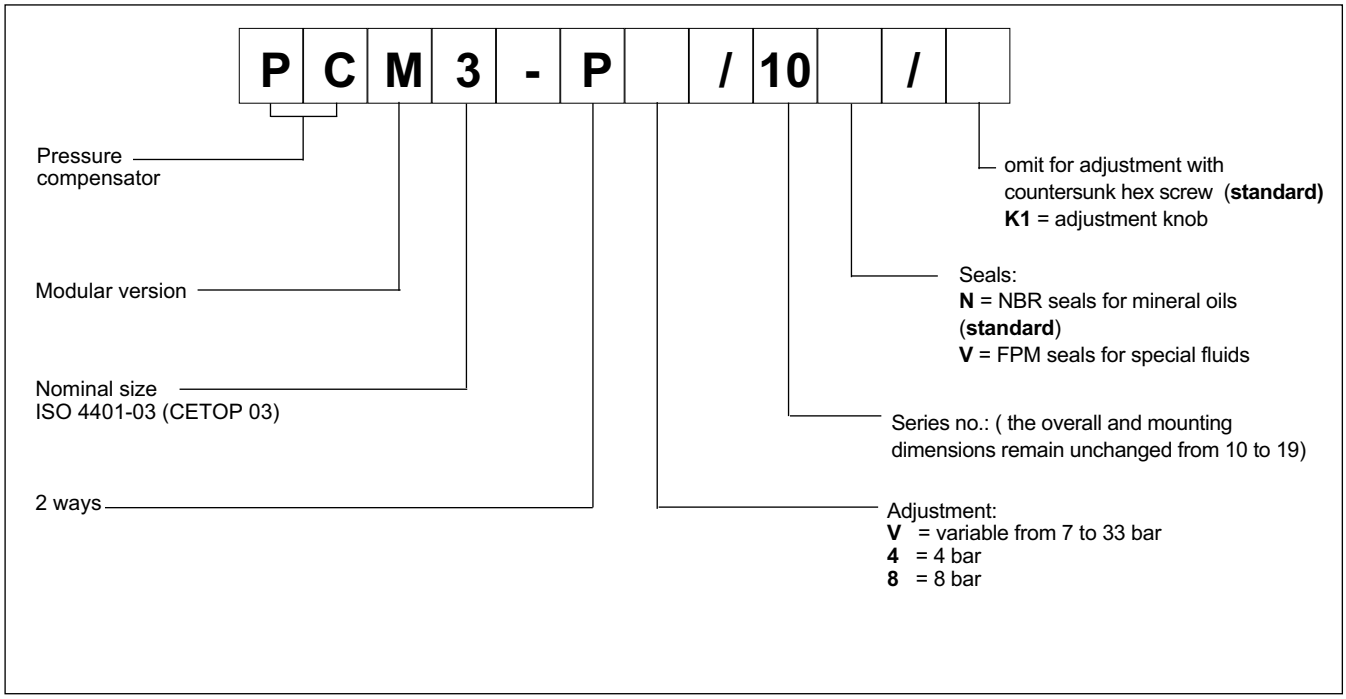


PCM3-PT*/10

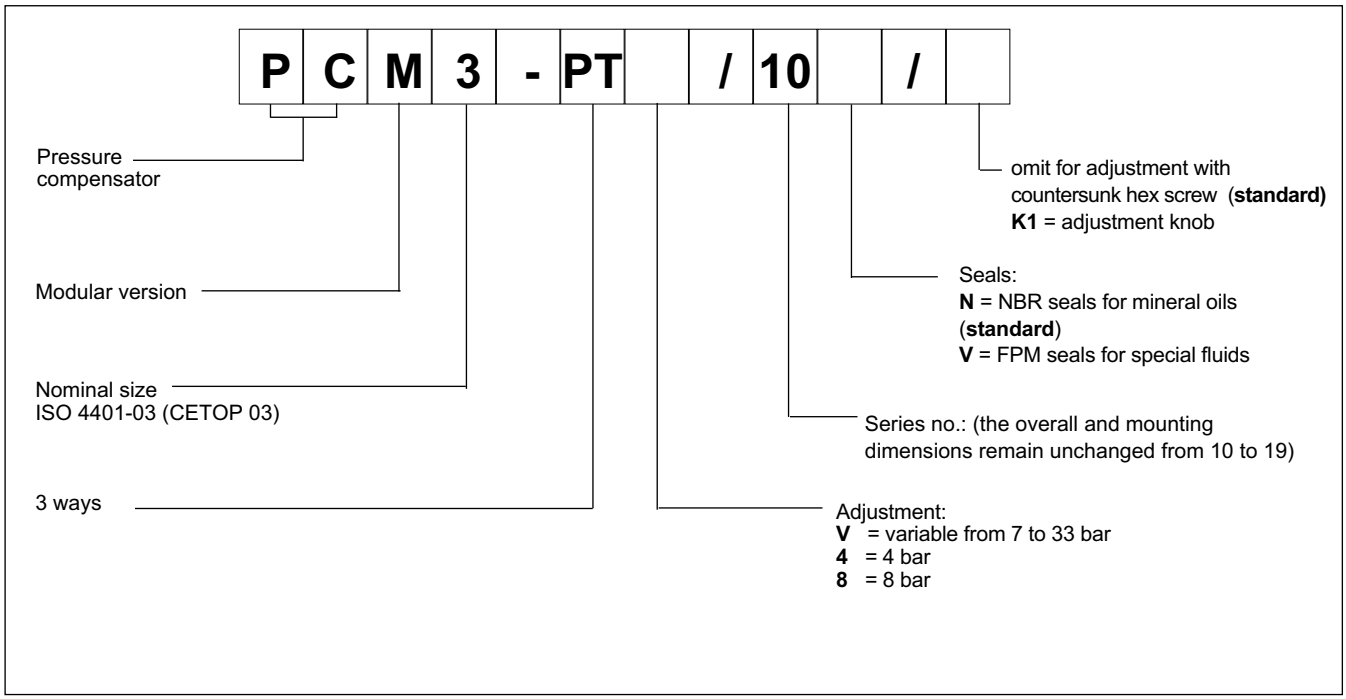


1 - IDENTIFICATION CODE

1.1 - Two-way compensator identification code



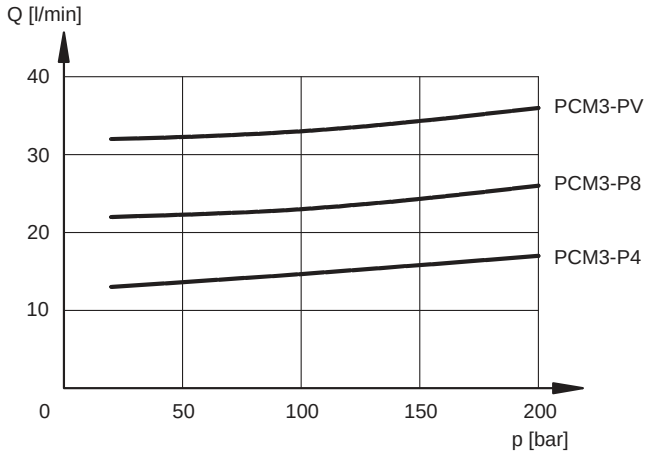
1.2 - Three-way compensator identification code



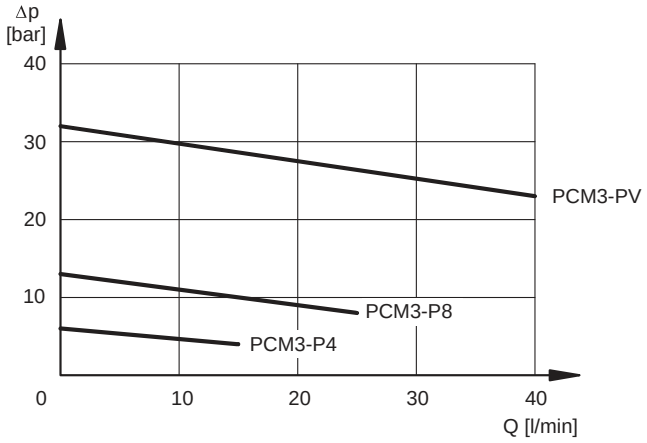
2 - CHARACTERISTIC CURVES (values obtained with viscosity of 36 cSt at 50°C)

2.1 - Two-way compensator characteristic curves

FLOW RATE - PRESSURE Q = f (p)

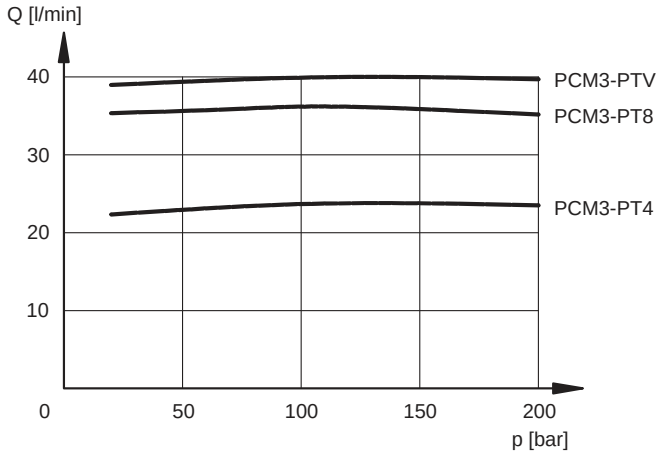


PRESSURE DROPS Δp = f (Q)

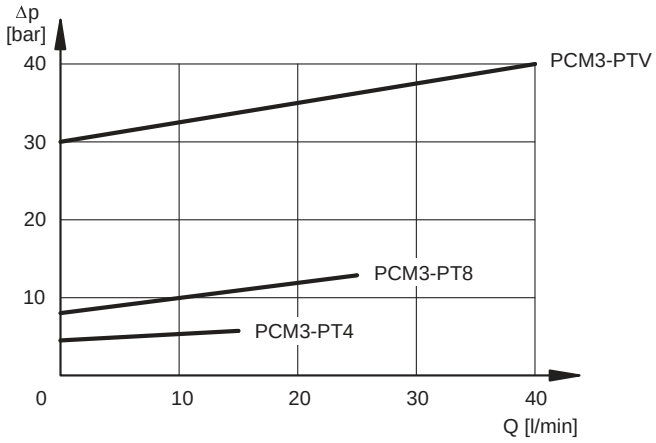


2.2 - Three-way compensator characteristic curves

FLOW RATE - PRESSURE Q = f (p)



PRESSURE DROPS Δp = f (Q)

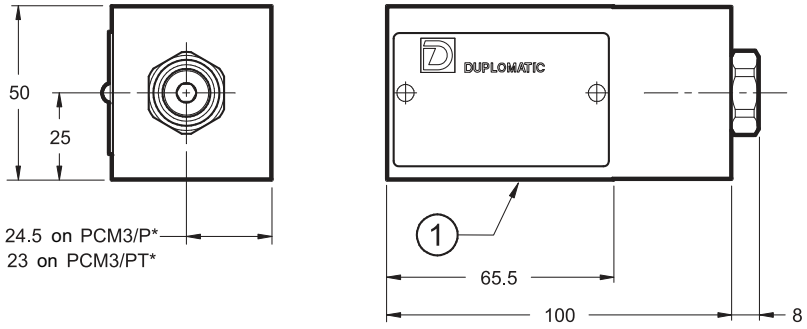


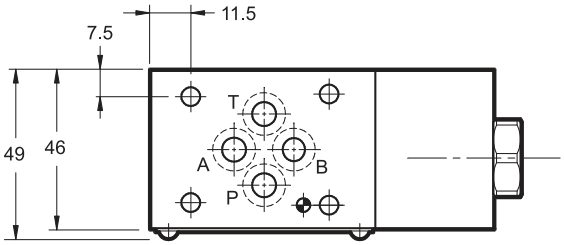
3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. With this kind of fluids, use NBR seals type. With fluids HFDR type (phosphate esters) use FPM seals (code V).
Using other fluid types such as HFA, HFB, HFC, please consult our technical department.
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid itself and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

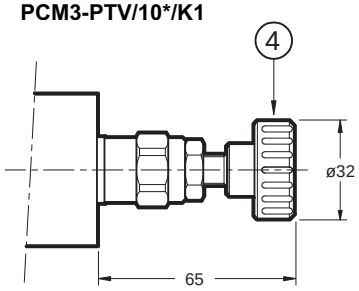
4 - OVERALL AND MOUNTING DIMENSIONS

PCM3-P*/10
PCM3-PT*/10

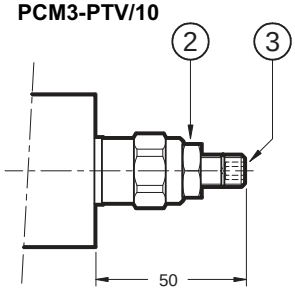




PCM3-PV/10*/K1
PCM3-PTV/10*/K1



PCM3-PV/10
PCM3-PTV/10



dimensions in mm

1	Mounting surface with sealing rings: 4 OR type 2037 - (9.25x1.78) 90 shore
2	Locking nut: spanner 17
3	Countersunk hex adjustment screw: spanner 5 Clockwise rotation to increase pressure
4	Adjustment knob: **K1**

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PCM5

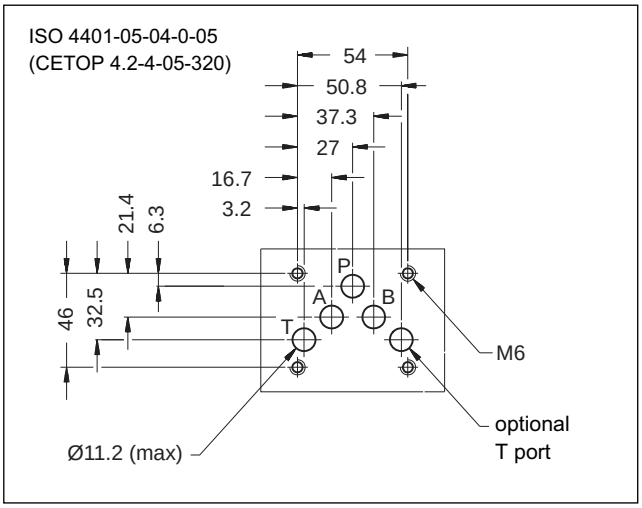
TWO- AND THREE-WAY PRESSURE COMPENSATOR WITH FIXED ADJUSTMENT

SERIES 11

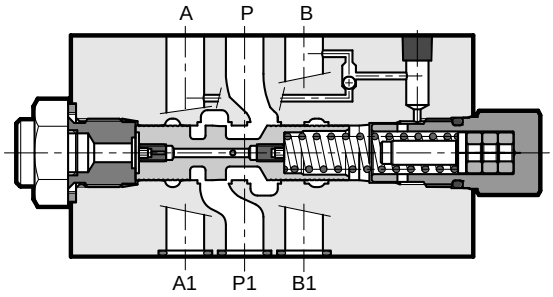
MODULAR VERSION
ISO 4401-05 (CETOP 05)

p max **320** bar
Q max **100** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



— The PCM5 valve is a two- or three- way pressure compensator, designed as a modular version with mounting surface according to ISO 4401-05 (CETOP RP121H).

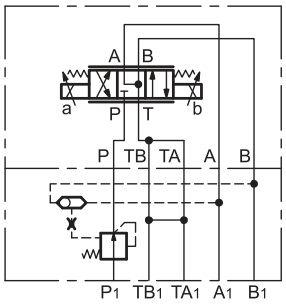
— It keeps the pressure drop setting (characteristic Δp) between the line P and alternatively the lines A and B at a constant level.

— It is used together with proportional directional valves, in order to control the flow rate independently of the pressure variations.

— The selection of the piloting pressure on the lines A and B is carried out automatically via a shuttle check valve built into the compensator.

APPLICATION EXAMPLES

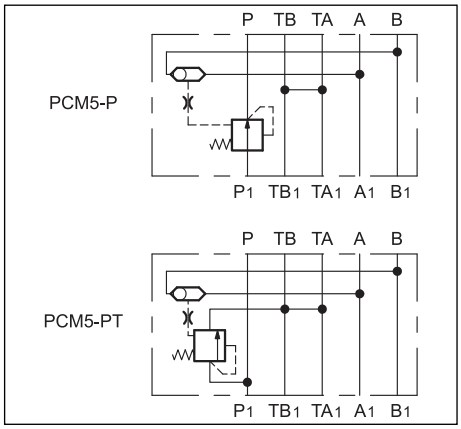
2-way compensator combined with a proportional valve type DSE5-A*



PERFORMANCES (working with mineral oil of viscosity of 36 cSt at 50°C)

Max operating pressure	bar	320
Characteristic Δp	bar	4 - 8
Max flow rate	l/min	100
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass	kg	2,7

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

P	C	M	5	-			/	11	

Pressure compensator

Modular version

Nominal size
ISO 4401-05 (CETOP 05)

P = 2 ways
PT = 3 ways

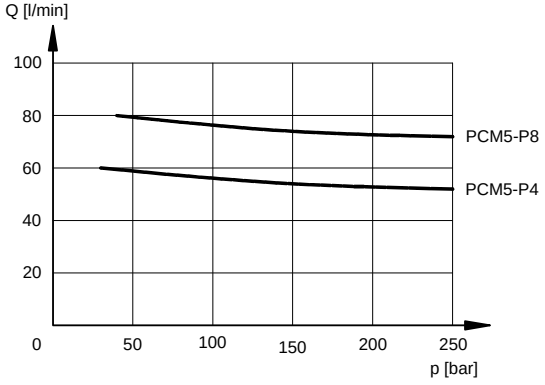
Adjustment: **4** = 4 bar (available on PCM5-P only)
8 = 8 bar

Series No. (the overall and mounting dimensions remain unchanged from 10 to 19)

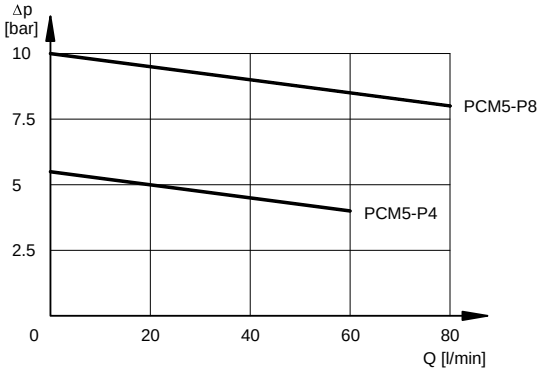
Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

2 - CHARACTERISTIC CURVES PCM5-P* (2-way) (values obtained with viscosity of 36 cSt at 50°C)

FLOW RATE - PRESSURE Q = f (p)

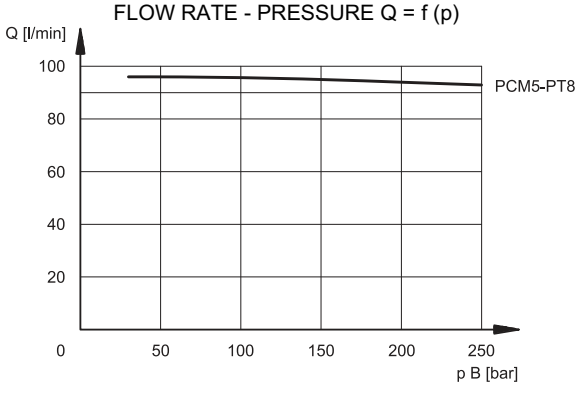


PRESSURE DROPS Δp = f (Q)

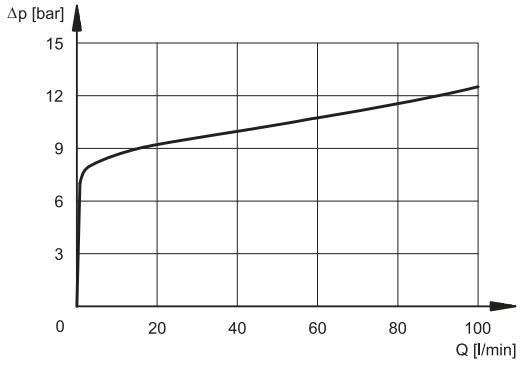


3 - CHARACTERISTIC CURVES PCM5-PT8 (3-way) (values obtained with viscosity of 36 cSt at 50°C)

FLOW RATE - PRESSURE Q = f (p)



PRESSURE DROPS Δp = f (Q)



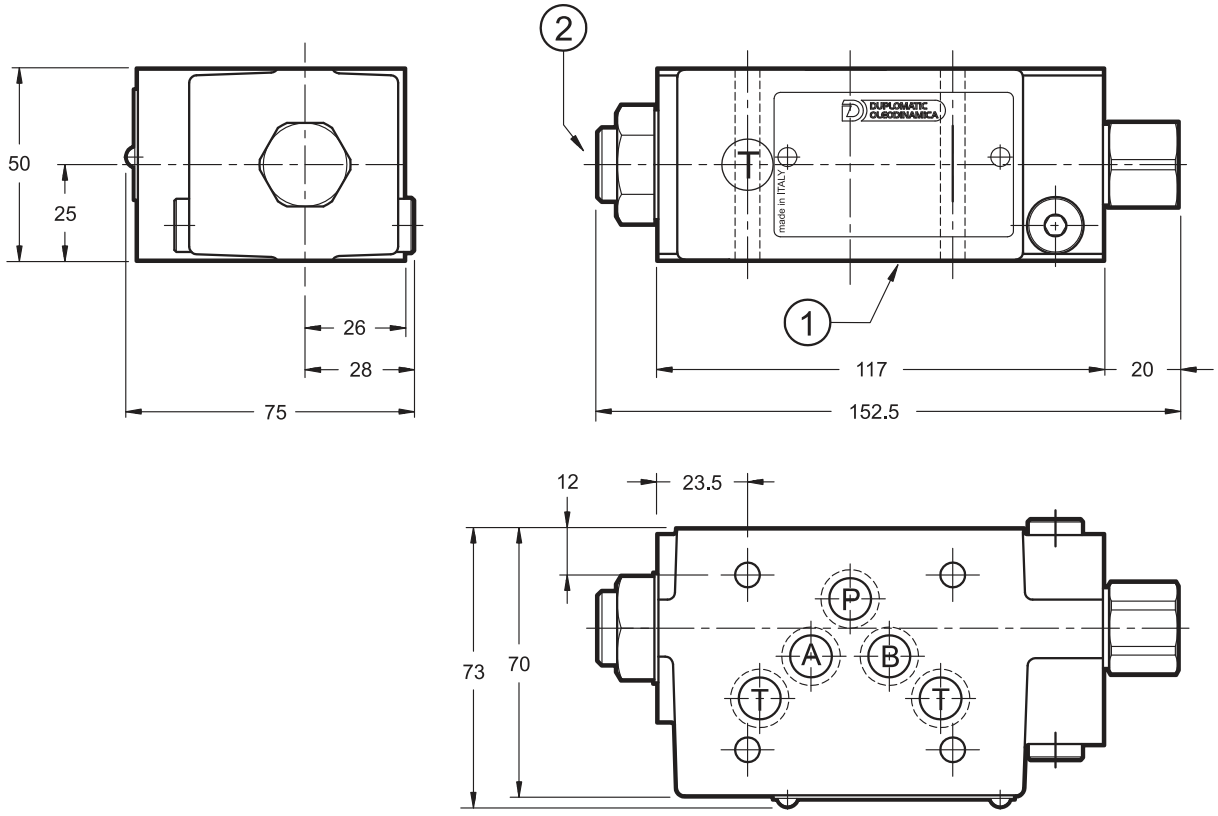
4 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

5 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	Mounting surface with sealing rings: N. 5 OR type 2050 (12.42x1.78) 90 Shore
2	Pressure gauge port 1/4” BSP

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PCM8

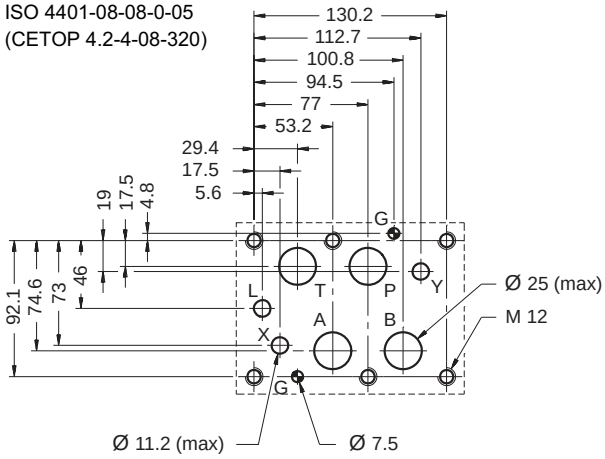
TWO- AND THREE-WAY PRESSURE COMPENSATOR WITH FIXED ADJUSTMENT

SERIES 10

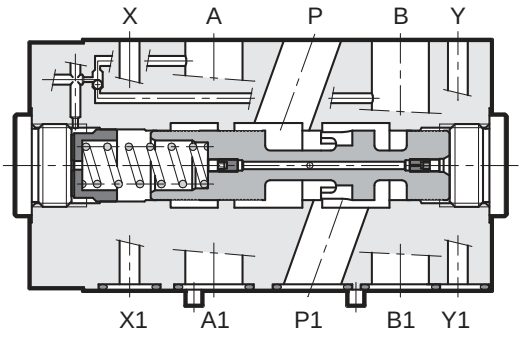
MODULAR VERSION
ISO 4401-08 (CETOP 08)

p max **320** bar
Q max **300** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



— The PCM8 valve is a two or three-way pressure compensator, developed as a modular version with mounting surface according to ISO 4401 (CETOP RP 121H).

— Its function is to keep the pressure drop setting (characteristic Δp) between the line P and alternatively the lines A and B at a constant level.

— It is normally used together with proportional directional valves, in order to control the flow rate independently of the pressure variations.

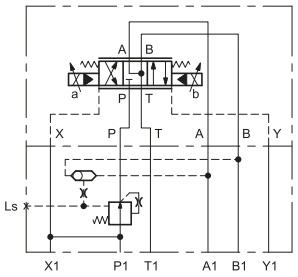
— The selection of the piloting pressure on the lines A and B is carried out automatically via a shuttle check valve built into the compensator.

— They are available with fixed adjustment (characteristic Δp) of 4 and 8 bar.

— The load sensing port can also be used as pressure gauge port or as remote pressure control.

APPLICATION EXAMPLES

Two-way compensator with fixed adjustment and internal piloting, combined with a proportional valve type E5E-S9*/E



PERFORMANCES (with mineral oil of viscosity of 36 cSt a 50°C)

Max operating pressure	bar	320
Characteristic Δp:	bar	4 - 8
Max flow rate	l/min	300
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass	kg	13,5

1 - IDENTIFICATION CODE

1.1 - Two-way compensator identification code

P	C	M	8	-	P		/		E	/	10	

Pressure compensator

Modular version

Nominal size
ISO 4401-08 (CETOP 08)

2 ways

Adjustment: **4** = 4 bar
8 = 8 bar

Piloting: (relevant to the combined directional valve, that must always have external piloting)
I = internal (withdrawn inside the compensator, upstream the narrowing)
E = external (passing line X)

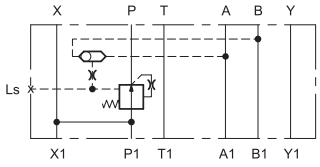
External drain (passing line Y)

Series no.:
(the overall and mounting dimensions remain unchanged from 10 to 19)

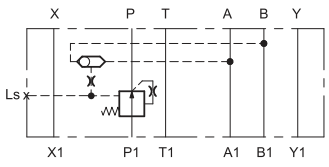
Seals:
N = NBRseals for mineral oils (**standard**)
V = FPM seals for special fluids

Hydraulic symbols

PCM8-P*/IE/10



PCM8-P*/EE/10



1.2 - Three-way compensator identification code

P	C	M	8	-	PT		/		E	/	10	

Pressure compensator

Modular version

Nominal size
ISO 4401-08 (CETOP 08)

3 ways

Adjustment: **4** = 4 bar
8 = 8 bar

Piloting: (relevant to the combined directional valve, that must always have external piloting)
I = internal (withdrawn inside the compensator, upstream the narrowing)
E = external (passing line X)

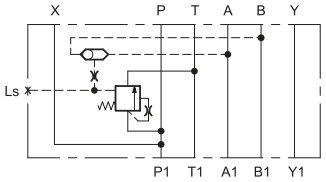
External drain (passing line Y)

Series no.: (the overall and mounting dimensions remain unchanged from 10 to 19)

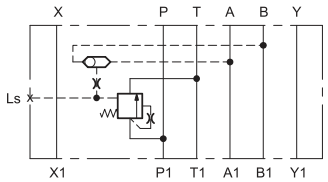
Seals:
N = NBRseals for mineral oils (**standard**)
V = FPM seals for special fluids

Hydraulic symbols

PCM8-PT*/IE/10

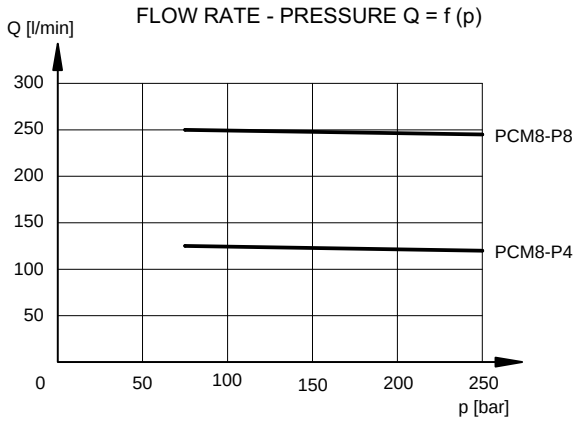


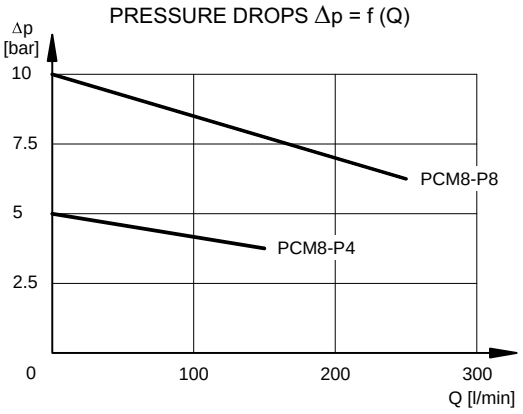
PCM8-PT*/EE/10



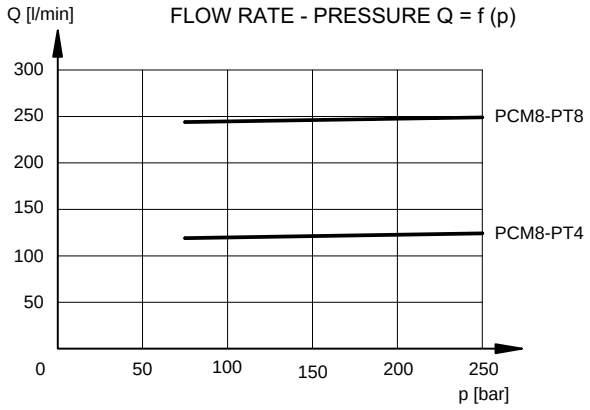
2 - CHARACTERISTIC CURVES (values obtained with viscosity of 36 cSt at 50°C)

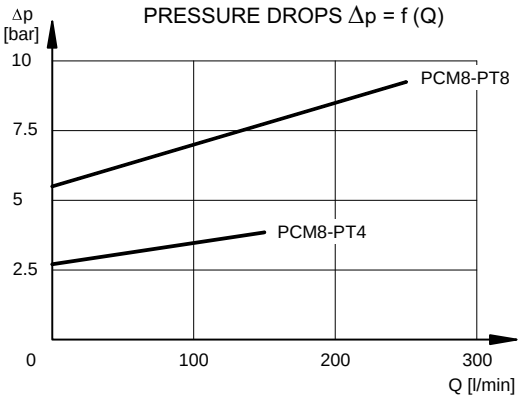
2.1 - Two-way compensator characteristic curves





2.2 - Three-way compensator characteristic curves

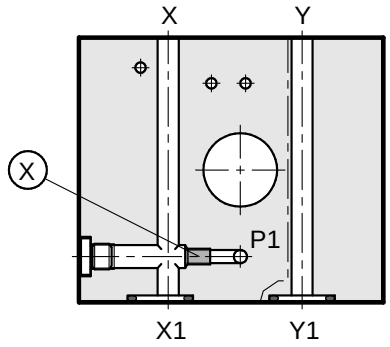




3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

4 - PILOTING AND DRAINAGE



X: plug M6x10 for external piloting
Drainage always external

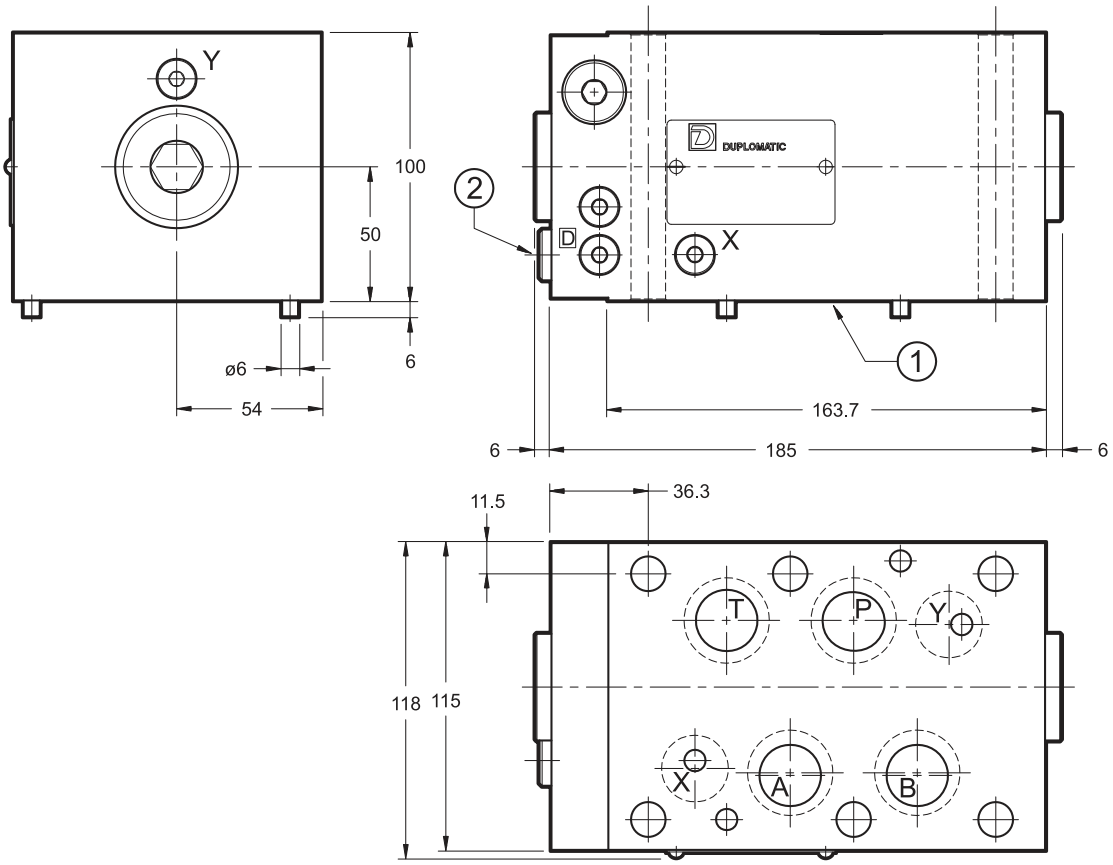
The PCM8 compensators are available with the X piloting line both internal and external. The internal piloting line is withdrawn from the P1 line, upstream the narrowing of the compensator, while the external piloting line comes form a separate piloting circuit. Drainage is always external (passing line Y).
The combined directional valve must always have an external piloting configuration. Drainage can be both internal and external.

VALVE TYPE		X plug
PCM8-P*/IE	INTERNAL PILOTING AND EXTERNAL DRAINAGE	NO
PCM8-P*/EE	INTERNAL PILOTING AND EXTERNAL DRAINAGE	YES

5 - OVERALL AND MOUNTING DIMENSIONS

PCM8-P*/*E/10
PCM8-PT*/*E/10

dimensions in mm



1	Mounting surface with sealing rings: 4 OR type 3106 (25.65 x 2.62) - 90 Shore 2 OR type 3081 (20.24 x 2.62) - 90 Shore
2	Load Sensing Port 1/4" BSP closed

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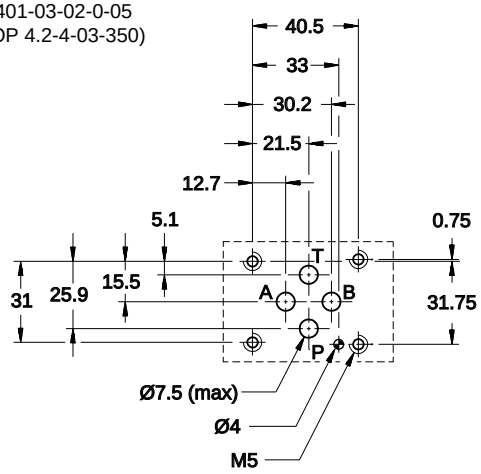
QTM3
FLOW RESTRICTOR VALVE
SERIES 10

MODULAR VERSION
ISO 4401-03

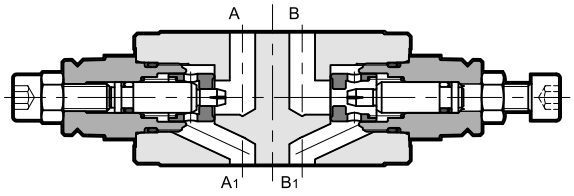
p max **350** bar
Q max (see table of performances)

MOUNTING INTERFACE

ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)



OPERATING PRINCIPLE



— This is a non-compensated flow control valve with a check valve for reverse free flow. It is made in modular version and with mounting surface according to the ISO 4401 standards; it can be assembled quickly without the use of pipes, but using only suitable tie-rods or bolts, thus forming compact modular groups.

— It is also available as a reversible valve (G* versions). The control takes place as meter-in or meter-out, depending on the way in which the valve is facing the OR subplate.

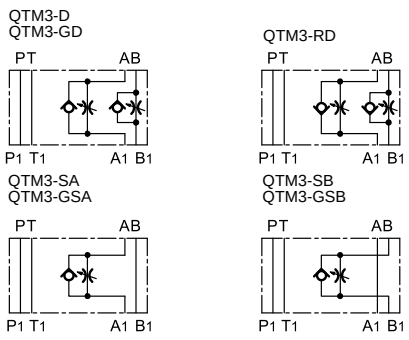
— The built-in check valve allows the reverse free flow (cracking pressure of 0.5 bar).

— It can be supplied with adjustment by hexagonal socket screw or by knob.

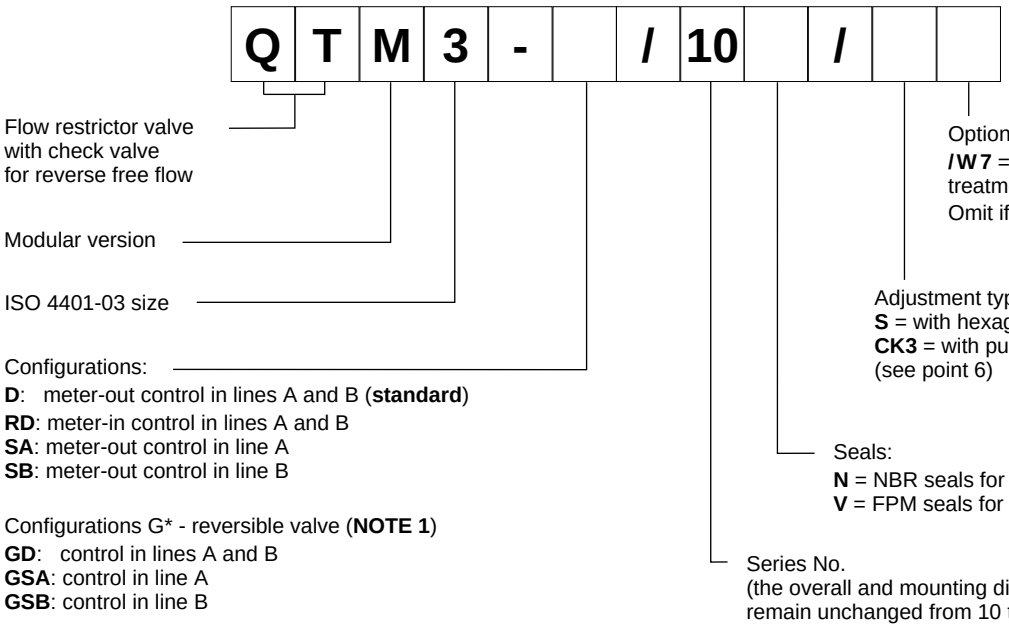
PERFORMANCES (measured with mineral oil of viscosity 36 cSt at 50°C)

Maximum operating pressure Check valve cracking pressure	bar	350 0.5
Maximum flow rate in the controlled lines Maximum flow rate in the free lines Min. controlled flowrate with Δp 10 bar	l/min	50 75 ≤0.060
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass	kg	1.3

HYDRAULIC SYMBOLS



1 - IDENTIFICATION CODE



NOTE 1: The valve body does not provide the OR seats. The mounting interface is achieved by interposition of an OR subplate (included in the delivery). The control of flow (meter-in or meter-out) is depending on the way of assembly the valve on the subplate.

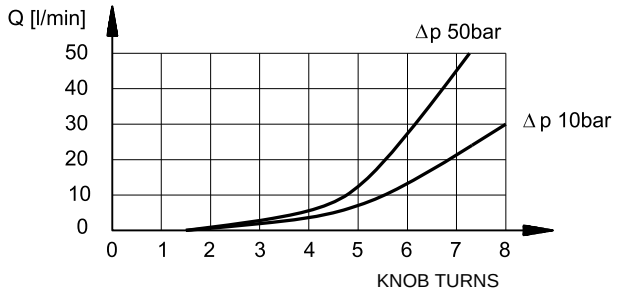
NOTE 2: The standard valve is supplied with surface treatment of phosphating black.

The zinc-nickel finishing on the valve body makes the valve suitable to ensure a salt spray resistance up to **240** hours.
(test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

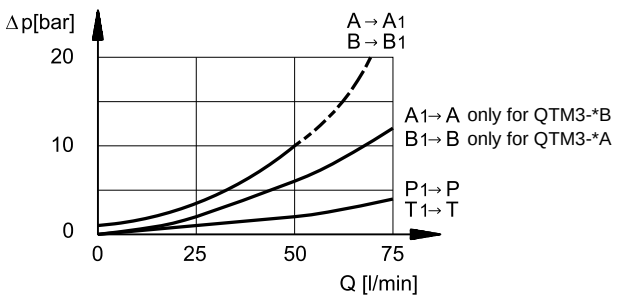
2 - CHARACTERISTIC CURVES

(values obtained with viscosity of 36 cSt at 50°C)

ADJUSTMENT



PRESSURE DROPS Δp - Q



3 - HYDRAULIC FLUIDS

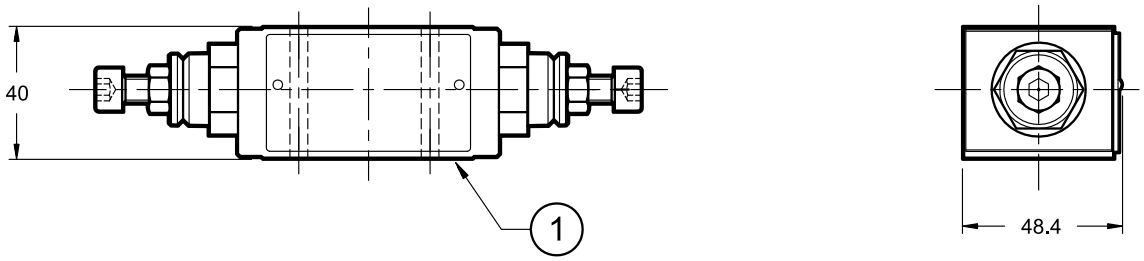
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

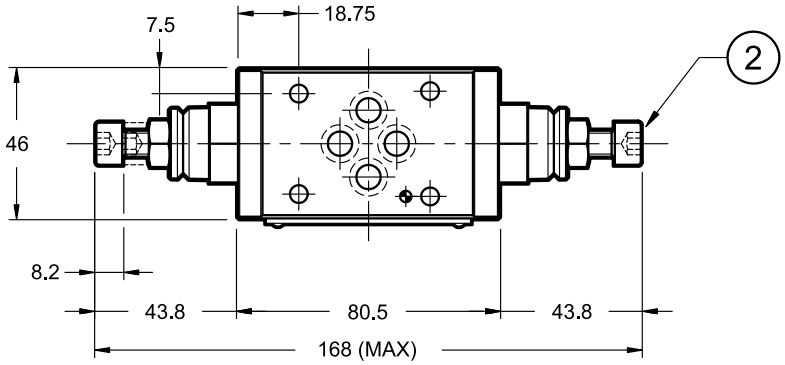
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.The fluid must be preserved in its physical and chemical characteristics.

4 - QTM3 -D, -RD AND -S* - OVERALL AND MOUNTING DIMENSIONS

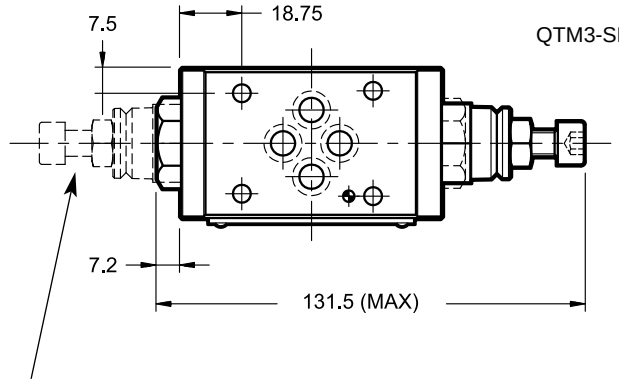
dimensions in mm

QTM3-D
QTM3-RD





QTM3-SB

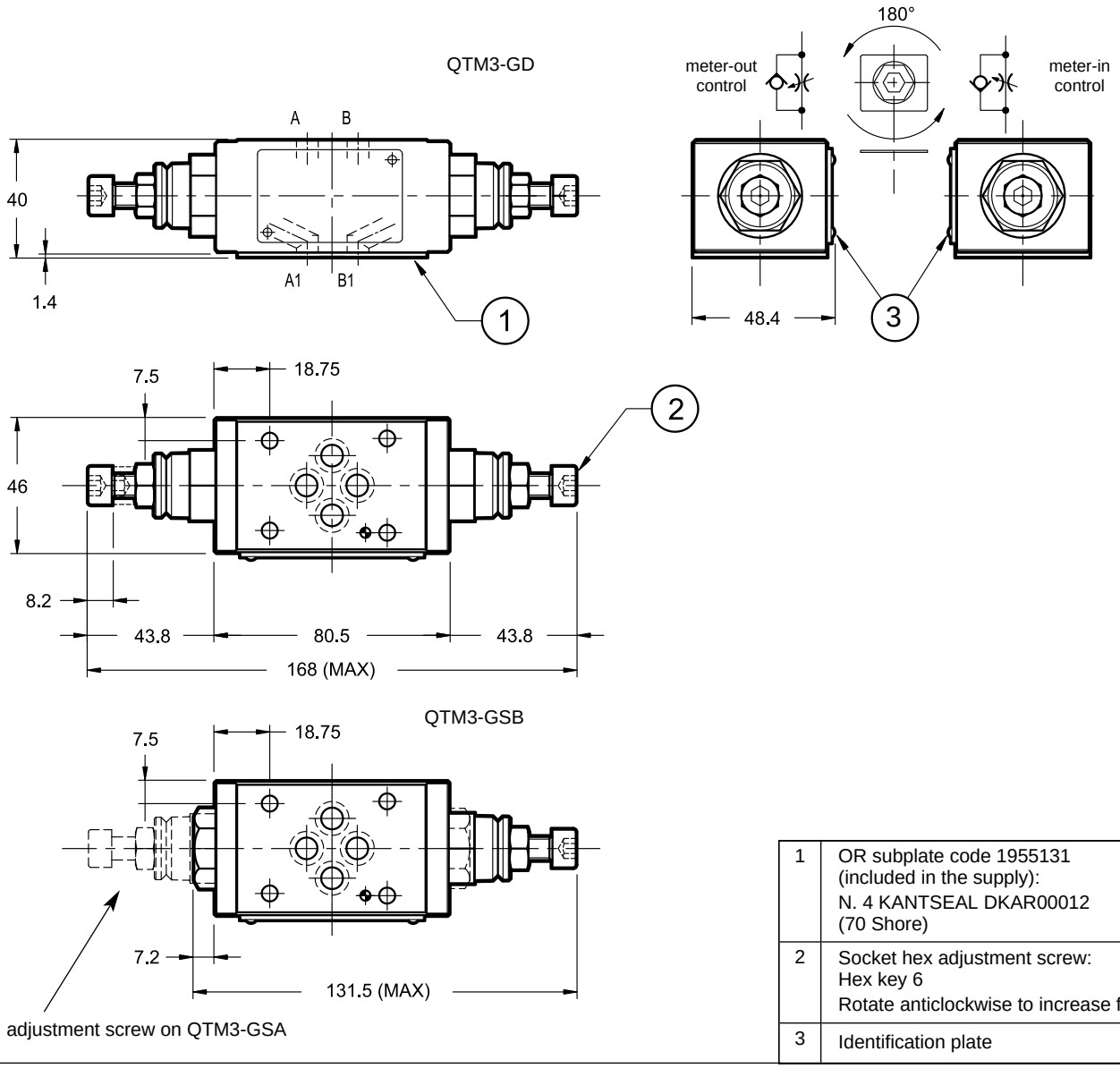


adjustment screw on QTM3-SA

1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Socket hex adjustment screw: Hex key 6 Rotate anticlockwise to increase flow

5 - QTM3-G* - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

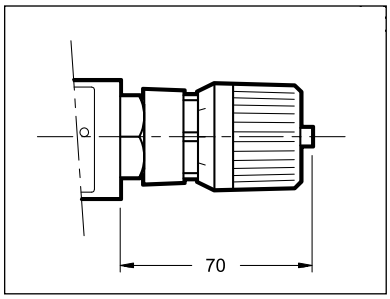


1	OR subplate code 1955131 (included in the supply): N. 4 KANTSEAL DKAR00012 (70 Shore)
2	Socket hex adjustment screw: Hex key 6 Rotate anticlockwise to increase flow
3	Identification plate

6 - ADJUSTMENT KNOB

Valves can be supplied with adjustment knob, which is engaged by pushing and twisting at the same time. When released, the knob disengages to secure the adjustment from involuntary tampering.

Add **CK3** in the identification code to order this version (see point 1).



DUPLOMATIC
MOTION SOLUTIONS
a member of DAIKIN group

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via Mario Re Depaolini, 24 | 20015 Parabiago (MI) | Italy
T +39 0331 895111 | E vendite.ita@duplomatic.com | sales.exp@duplomatic.com
duplomaticmotionsolutions.com

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QTM5

FLOW RESTRICTOR VALVE

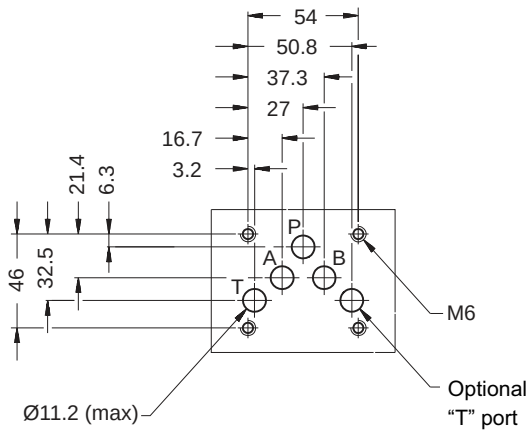
SERIES 10

MODULAR VERSION
ISO 4401-05 (CETOP 05)

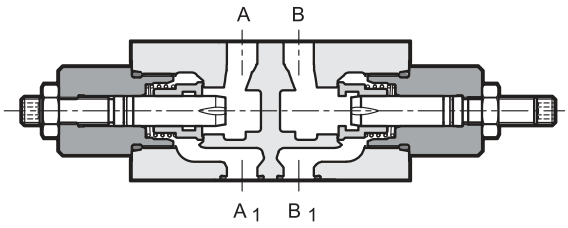
p max **350** bar
Q max **120** l/min

MOUNTING INTERFACE

ISO 4401-05-04-0-05
(CETOP 4.2-4-05)



OPERATING PRINCIPLE

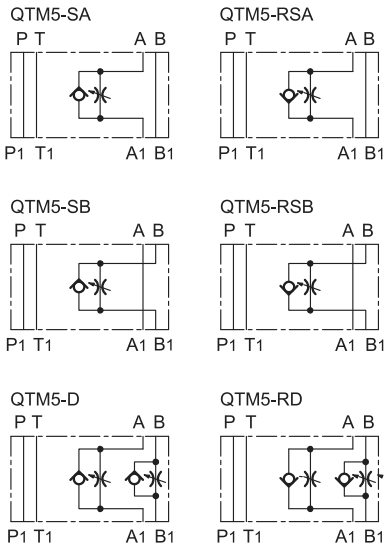


— This is a flow restrictor valve with built in check valve for reverse free flow, made as a modular version with mounting surface according to the ISO 4401 (CETOP RP 12H) standards.

— It can be assembled quickly under all ISO 4401-05 (CETOP 05) modular valves without use of pipes, using suitable tie-rods or bolts, thus forming compact modular groups.

— It is supplied with countersunk hex adjustment screw and locking nut. Rotate anticlockwise to increase the flow rate.

HYDRAULIC SYMBOLS



PERFORMANCES (measured with mineral oil of viscosity 36cSt at 50°C)

Maximum operating pressure	bar	350
Maximum flow rate	l/min	120
Cracking pressure	bar	0,5
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Recommended viscosity	cSt	25
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Mass: QTM5-SA, -SB, -RSA, -RSB QTM5-D, -RD	kg	2,3 2,5

1 - IDENTIFICATION CODE

Q	T	M	5	-		/	10		/	

Flow restrictor valve

Modular version

ISO 4401-05 (CETOP 05) size

Versions for meter-out:
D = control on lines A and B
SA = control on line A
SB = control on line B

Versions for meter-in:
RD = control on lines A and B
RSA = control on line A
RSB = control on line B

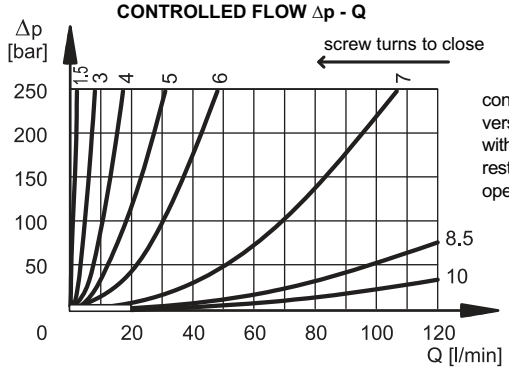
Series No.
(the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
N = Seals in NBR for mineral oils **(standard)**
V = Seals in FPM for special fluids

S = adjustment screw **(standard)**
K1 = adjustment knob

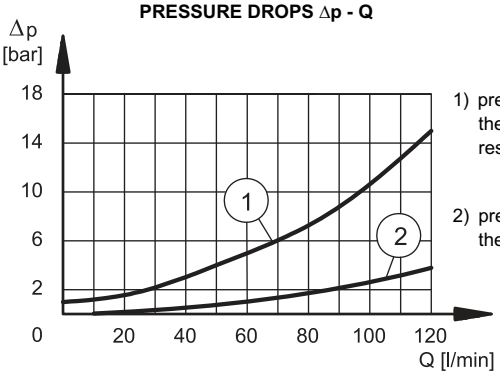
2 - CHARACTERISTIC CURVES (values obtained with viscosity of 36 cSt at 50°C)

CONTROLLED FLOW Δp - Q



controlled flow versus Δp with different restrictor opening values

PRESSURE DROPS Δp - Q



1) pressure drops through the check valve with restrictor all closed

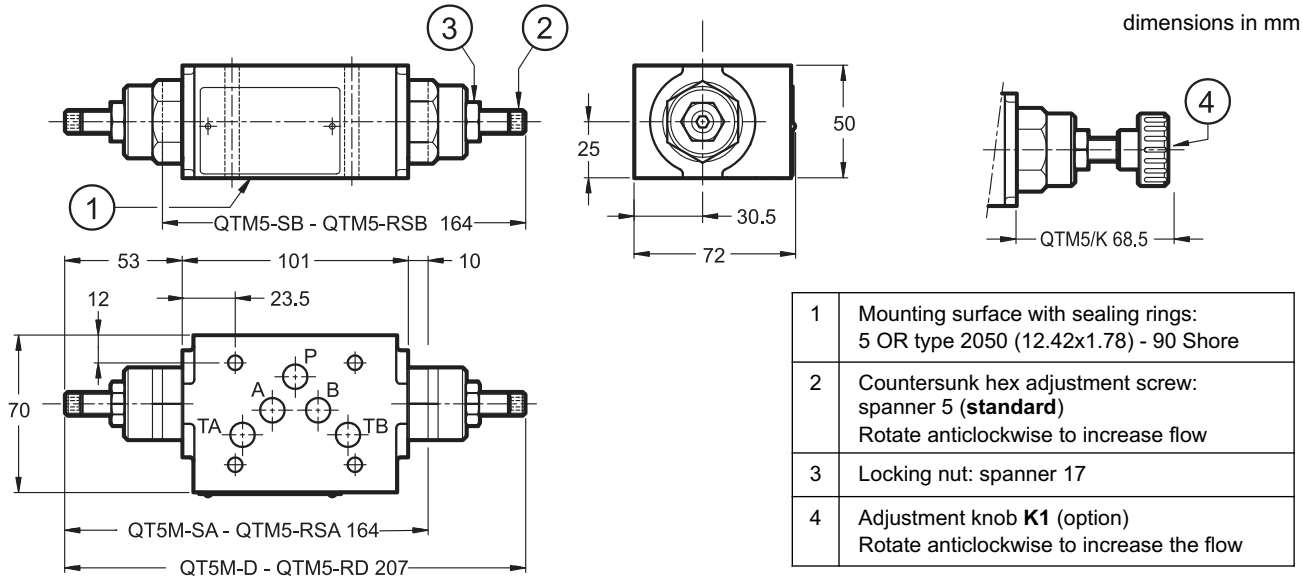
2) pressure drops through the free ports

3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

4 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	Mounting surface with sealing rings: 5 OR type 2050 (12.42x1.78) - 90 Shore
2	Countersunk hex adjustment screw: spanner 5 (**standard**) Rotate anticlockwise to increase flow
3	Locking nut: spanner 17
4	Adjustment knob **K1** (option) Rotate anticlockwise to increase the flow

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www.duplomatic.com • e-mail: sales.exp@duplomatic.com

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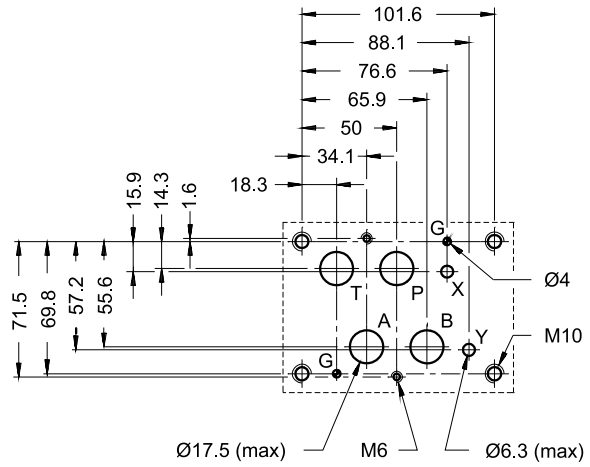
QTM7
FLOW RESTRICTOR VALVE
SERIES 20

MODULAR VERSION
ISO 4401-07

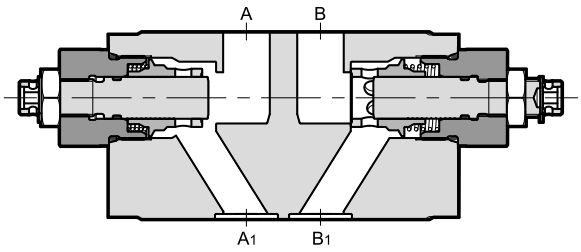
p max **350** bar
Q max **300** l/min

MOUNTING INTERFACE

ISO 4401-07-07-0-05
(CETOP 4.2-4-07)



OPERATING PRINCIPLE



— This is a throttle check valve, in modular version. Mounting surface is according to ISO 4401-07 standards.

— It can be assembled quickly under all ISO 4401-07 modular valves without use of pipes, using suitable tie-rods or bolts, thus forming compact modular groups.

— It is available in two versions: for meter-out flow control in one (A port) or both actuator ports, independent.

— It is supplied with socket hex adjustment screw and locking nut. Rotate anticlockwise to increase the flow rate.

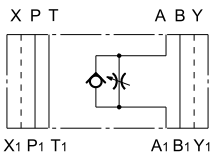
PERFORMANCES

(measured with mineral oil of viscosity 36cSt at 50°C)

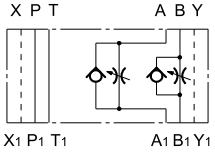
Maximum operating pressure	bar	350
Maximum flow rate	l/min	300
Check valve opening pressure	bar	0,7
Ambient temperature range	°C	-25 / +80
Fluid temperature range	°C	-25 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass: QTM7-SA QTM7-D	kg	6.9 7

HYDRAULIC SYMBOLS

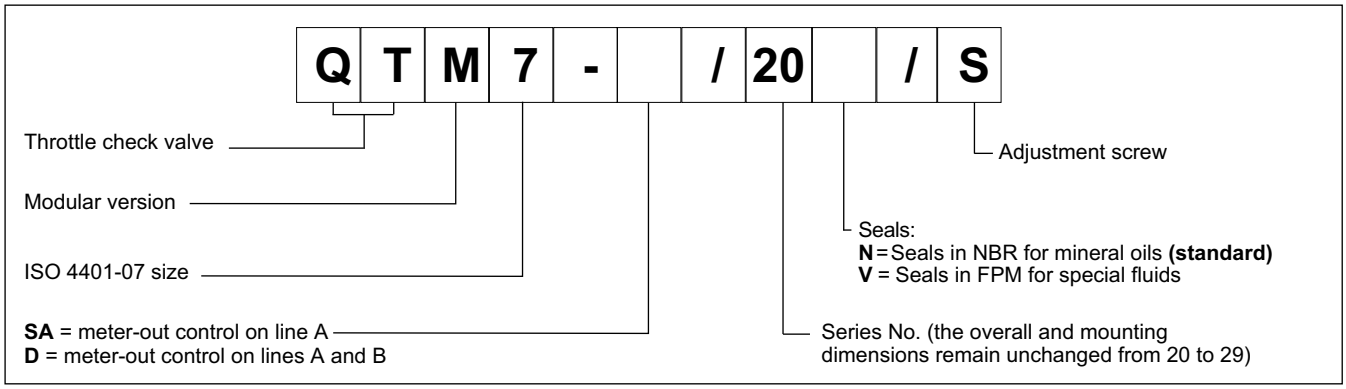
QTM7-SA



QTM7-D

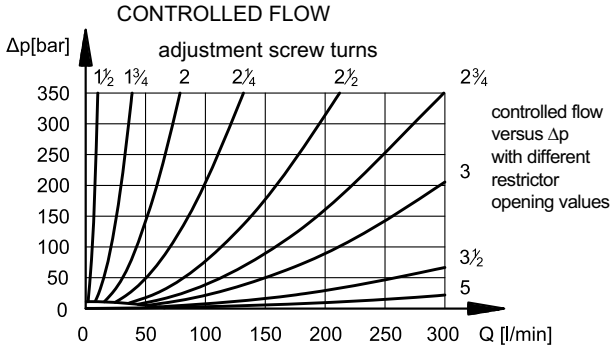


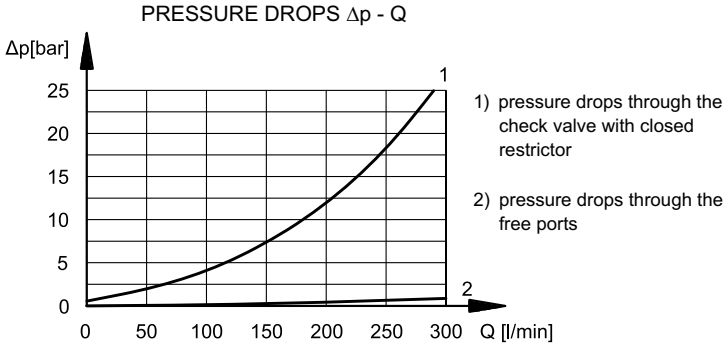
1 - IDENTIFICATION CODE



2 - CHARACTERISTIC CURVES

(values obtained with viscosity of 36 cSt at 50°C)



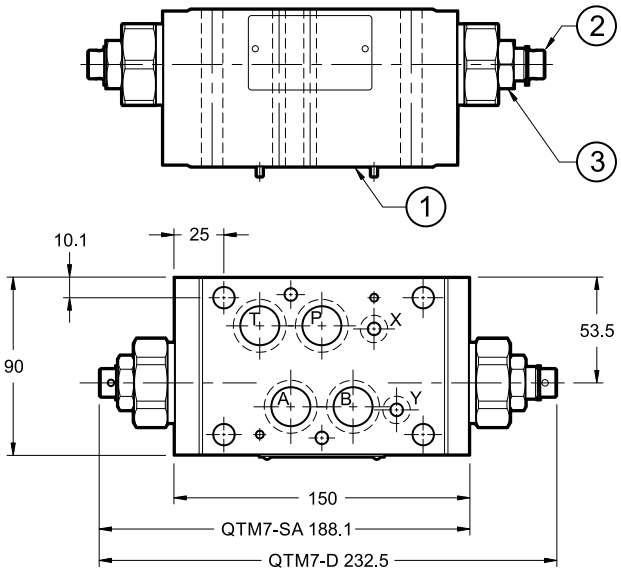


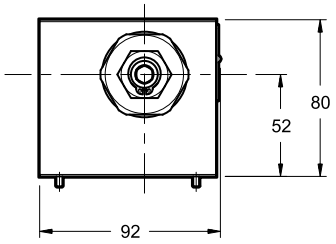
3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

4 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm





1	Mounting surface with sealing rings: 4 OR type 130 (22.22x2.62) 2 OR type 2043 (10.82x1.78)
2	Socket hex adjustment screw: Allen key 8 Rotate anticlockwise to increase the flow
3	Locking nut: spanner 24

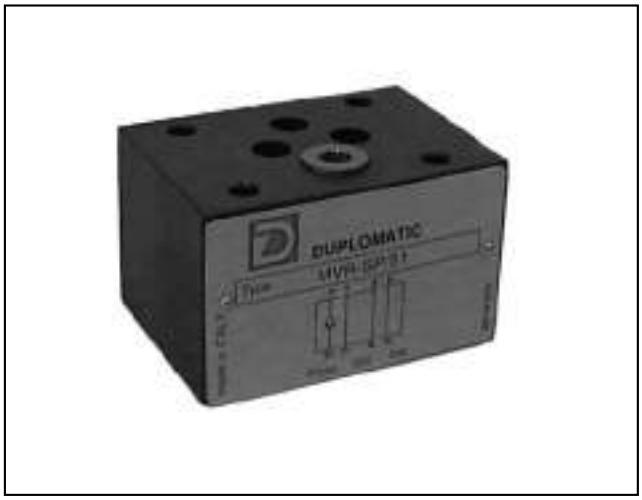
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tel. +39 0331.895.111 • www.duplomatic.com • e-mail: sales.exp@duplomatic.com

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WWW.SUMY.IR

DUPLOMATIC HYDRAULICS



MVR

DIRECT CHECK VALVE

SERIES 51

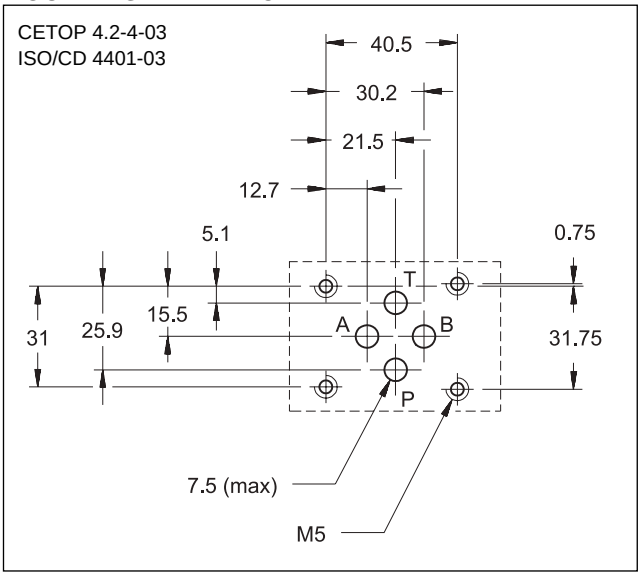
MODULAR VERSION

CETOP 03

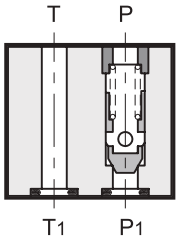
p max **350** bar

Q max (see performance ratings table)

MOUNTING INTERFACE



OPERATING PRINCIPLE



— The MVR valve is a direct check valve made as a modular version with mounting surface according to the CETOP and ISO standards.

— It is used to avoid oil return flows, spontaneous emptying of lines or when the generation of back pressure is desired.

— It can be assembled quickly under the MD1D directional valves (see catalogue 41 200) without use of pipes,using suitable tie-rods or bolts.

— It is available in versions with the check valve only on line P, or line T, or on both lines.

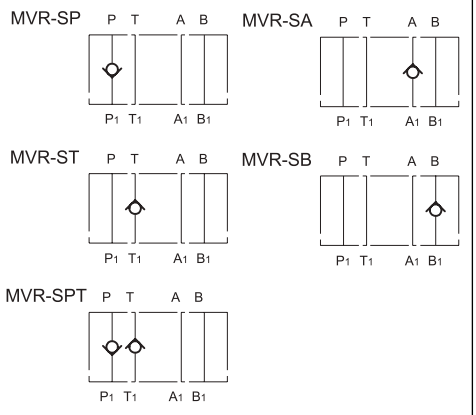
CONFIGURATIONS (see Hydraulic symbols table)

— MVR-SP: check valve on line P.
— MVR-ST: check valve on line T.
— MVR-SPT: check valve on lines P and T.
— MVR-SA: check valve on line A.
— MVR-SB: check valve on line B.

PERFORMANCE RATINGS (measured with mineral oil of viscosity 36cSt at 50°C)

Maximum operating pressure Check valve cracking pressure	bar bar	350 3,5 - 0,5 - 5,2
Maximum flow rate in the controlled lines Maximum flow rate in the free lines	l/min l/min	50 75
Ambient temperature range	°C	–20 ÷ +50
Fluid temperature range	°C	–20 ÷ +70
Fluid viscosity range	cSt	2,8 ÷ 380
Recommended filtration	µm absolute	≤ 25
Recommended viscosity	cSt	25
Mass	kg	1

HYDRAULIC SYMBOLS



WWW.SKMY.IR

MVR
SERIES 51

1 - IDENTIFICATION CODE

M	V	R		-		/	51	/	

CETOP 03 size
Modular version

Check valve

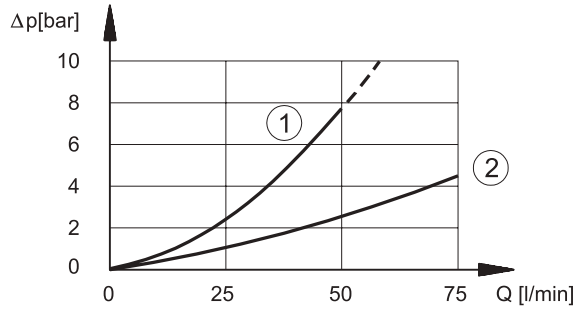
Cracking pressure:
omit for standard cracking pressure = 3,5 bar
1 = 0,5 bar
3 = 5,2 bar

SP: check valve on line P
SA: check valve on line A
SB: check valve on line B
ST: check valve on line T
SPT: check valve on lines P and T

Series No. (the overall and mounting dimensions remain unchanged from 50 to 59)

Seals: omit for mineral oils
V = viton for special fluids

2 - CHARACTERISTIC CURVES (values obtained with viscosity of 36 cSt at 50°C)



① pressure drops on controlled lines

② pressure drops on free lines

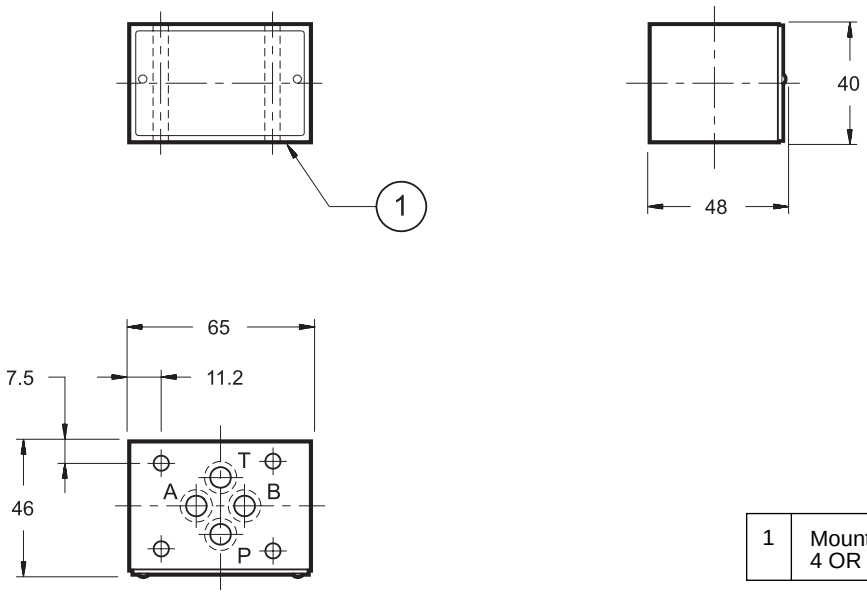
NOTE: check valve cracking pressure must be added to the values indicated with the curve ① of the diagram

3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids, with the addition of suitable anti-frothing and anti-oxidizing agents.
For the use of other types (water glycol, phosphate esters and others), please consult our technical department.

4 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	Mounting surface with sealing rings: 4 OR type 2037

DUPLOMATIC HYDRAULICS

DUPLOMATIC OLEODINAMICA SpA
20025 LEGNANO (MI) - P.le Bozzi, 1 / Via Edison
Tel. 0331/472111-472236 - Fax 0331/548328

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MVR-RS/P

DIRECT CHECK VALVE WITH FLOW RESTRICTOR

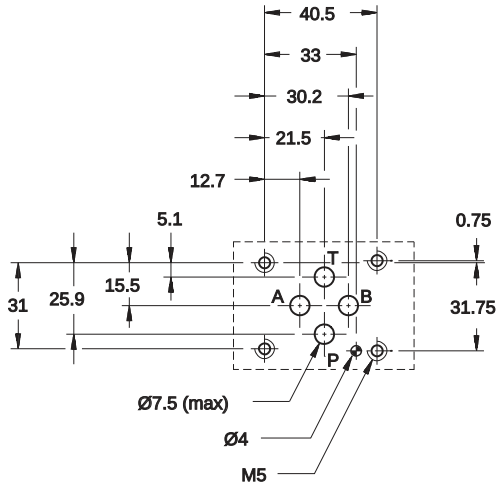
SERIES 50

MODULAR VERSION
ISO 4401-03 (CETOP 03)

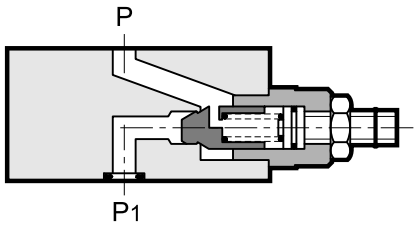
p max **350** bar
Q max (see table of performances)

MOUNTING INTERFACE

ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)



OPERATING PRINCIPLE



— The MVR-RS/P valve is a check valve that incorporates also the function of flow restriction.

— It is made as a modular version with mounting surface according to the ISO 4401 (CETOP RP 121H) standards.

— It can be quickly assembled under the ISO 4401-03 (CETOP 03) directional solenoid valves and modular valves, without use of pipes and using suitable tie-rods or bolts.

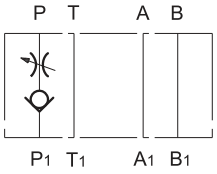
— It is used when it is necessary to control the flow in a direction and to avoid backflows or the self-emptying of the lines in the opposite direction.

— Control of the flow is obtained with a countersunk hex screw with locking nut.

PERFORMANCES (measured with mineral oil of viscosity 36cSt at 50°C)

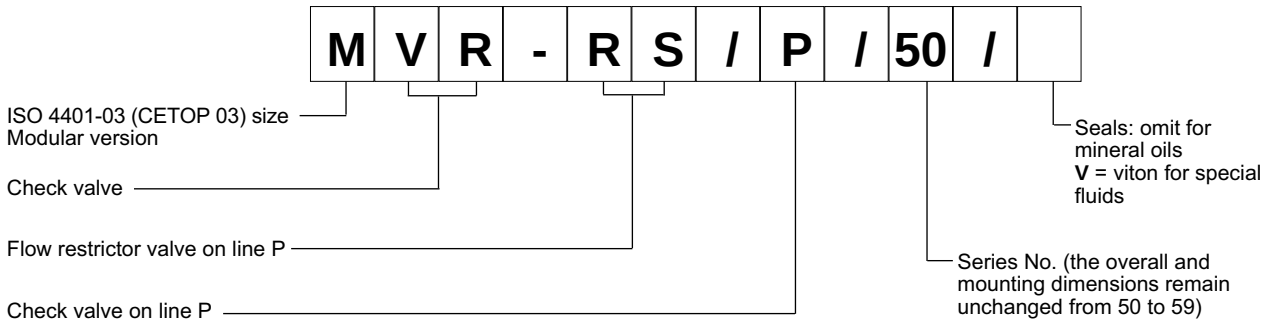
Maximum operating pressure Check valve cracking pressure	bar	350 1
Maximum flow rate in controlled lines Maximum flow rate in the free lines	l/min	50 75
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass:	kg	1,1

HYDRAULIC SYMBOL

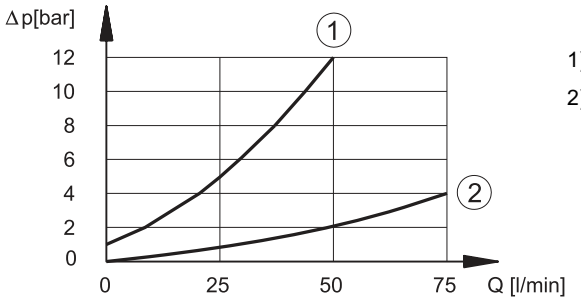


MVR-RS/P
SERIES 50

1 - IDENTIFICATION CODE



2 - CHARACTERISTIC CURVES (values obtained with viscosity of 36 cSt at 50°C)



1) pressure drops $P_1 \rightarrow P$

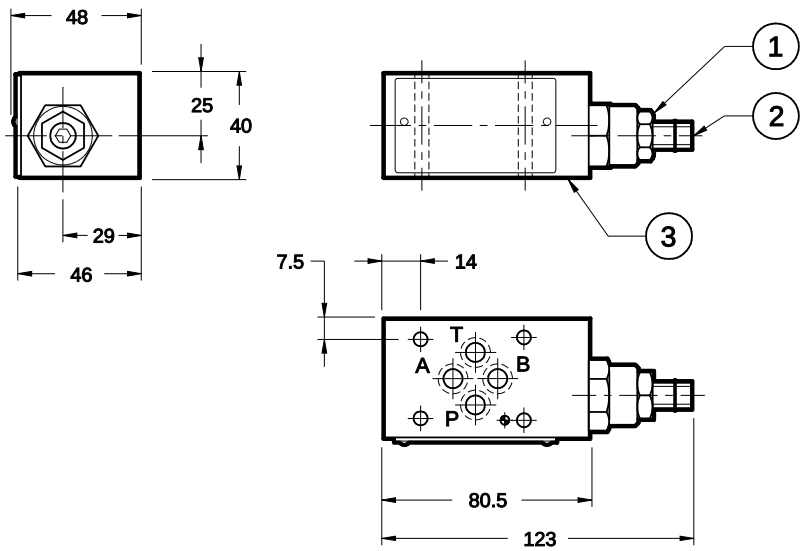
2) pressure drops on free lines (ex. $A \rightarrow A_1$)

3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

4 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	Locking nut: spanner 17
2	Countersunk hex adjustment screw: spanner 5 Rotate anticlockwise to increase flow
3	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) - 90 Shore

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Fax +39 0331.895.339
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CHM3

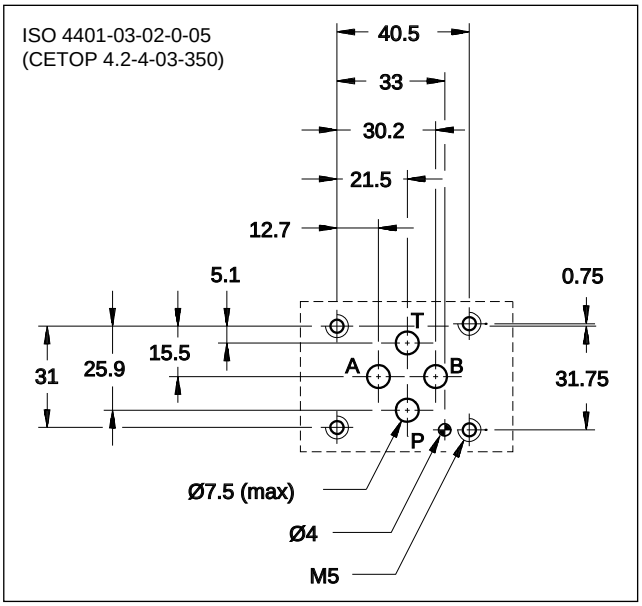
PILOT OPERATED CHECK VALVE

SERIES 10

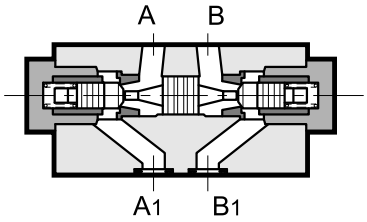
MODULAR VERSION
ISO 4401-03

p max **350** bar
Q max (see table of performances)

MOUNTING SURFACE



OPERATING PRINCIPLE



— This is a check valve (spring closing and cone on edge seals) with a built-in flow control feature. The mounting surface is according to the ISO 4401 standards.

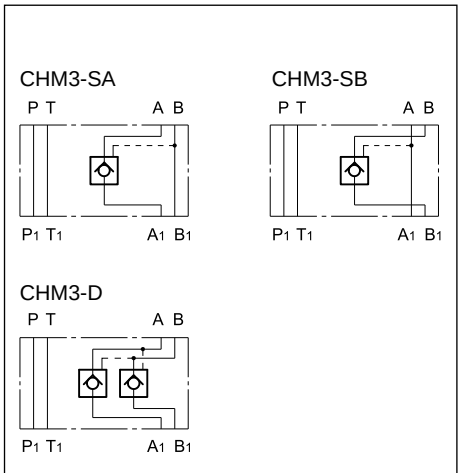
— Its use allows:
- to stop the flow in one direction;
- the flow in one direction, if opened by a pilot pressure;
- the free flow in the other direction.

— The CHM3 are always mounted under the ISO 4401-03 directional solenoid valves and can be assembled with all other ISO 4401-03 valves.

PERFORMANCES (measured with mineral oil of viscosity 36cSt at 50°C)

Maximum operating pressure Check valve cracking pressure	bar	350 3
Maximum flow rate in controlled lines Maximum flow rate in the free lines	l/min	50 75
Ratio between the pressure in the locked chambers and the piloting pressure		3.4:1
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass	kg	1.3

HYDRAULIC SYMBOLS



1 - IDENTIFICATION CODE

C	H	M	3	-		/	10		

Pilot operated check valve

Modular version

ISO 4401-03 size

Configurations:
D = seal on lines A and B of the actuator
SA = seal on line A of the actuator
SB = seal on line B of the actuator

Series No. (the overall and mounting dimensions remain unchanged from 10 to 19)

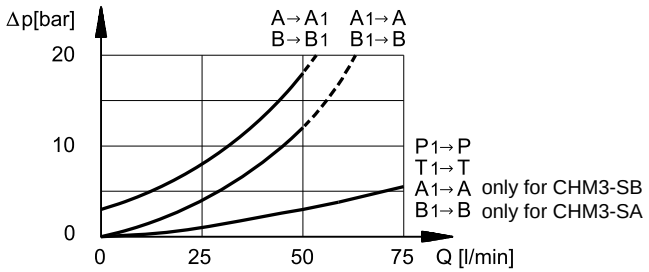
Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Option:
/ W7 = Zinc-nickel surface treatment (see **NOTE**). Omit if not required.

NOTE: The standard valve is supplied with surface treatment of phosphating black. The zinc-nickel finishing on the valve body makes the valve suitable to ensure a salt spray resistance up to **600** hours.
(test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

2 - CHARACTERISTIC CURVES

(values obtained with viscosity of 36 cSt at 50°C)

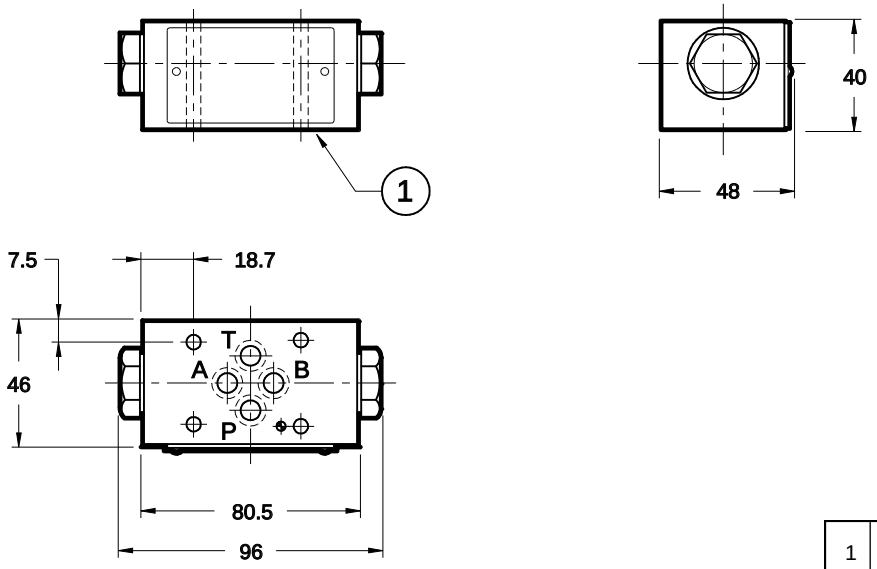


3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.The fluid must be preserved in its physical and chemical characteristics.

4 - OVERALL AND MOUNTING DIMENSIONS



dimensions in mm

1	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) - 90 Shore

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duplomaticmotionsolutions.com

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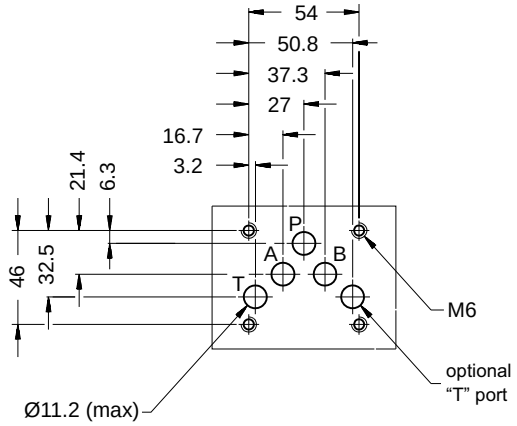
CVM5
DIRECT CHECK VALVE
SERIES 10

MODULAR VERSION
ISO 4401-05

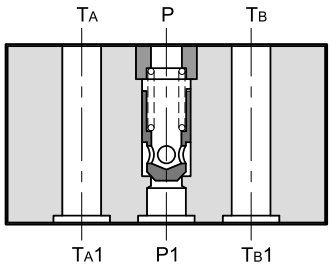
p max **350** bar
Q max **100** l/min

MOUNTING INTERFACE

ISO 4401-05-04-0-05
(CETOP 4.2-4-05-350)



OPERATING PRINCIPLE



— The CVM5 valve is a check valve made as a modular version with mounting surface according to the ISO 4401 standards.

— Its function is to avoid oil backflows and self-emptying of lines, or to generate backpressures.

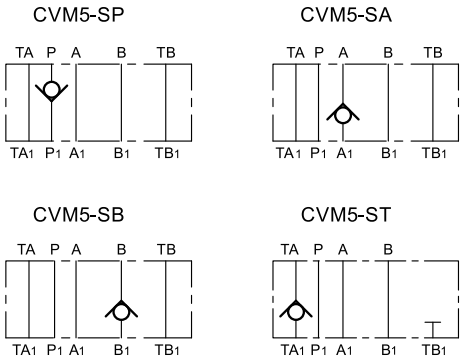
— It can be assembled quickly under the ISO 4401-05 directional solenoid valves without use of pipes, using suitable tie-rods or bolts.

— It is available in four versions: with check valve in line P, in line T, in line A or in line B.

PERFORMANCES
(measured with mineral oil of viscosity 36 cSt at 50°C)

Maximum operating pressure	bar	350
Check valve cracking pressure	bar	0.5 - 8
Maximum flow rate in the controlled lines and in the free lines	l/min	100
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Degree of fluid contamination	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass	kg	2.3

HYDRAULIC SYMBOLS



1 - IDENTIFICATION CODE

C	V	M	5	-			/	10	

Check valve

Modular version

ISO 4401-05 size

SP = check valve on line P
SA = check valve on line A
SB = check valve on line B
ST = check valve on line T

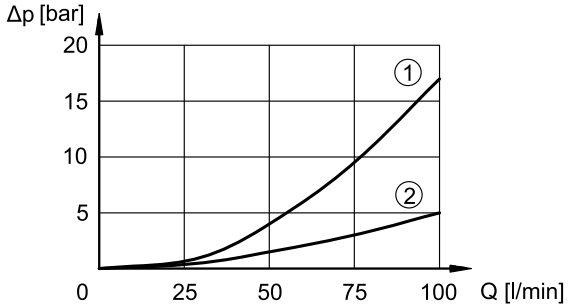
Cracking pressure:
0.5 = 0,5 bar **8** = 8 bar

Series No. (the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

2 - CHARACTERISTIC CURVES

(values obtained with viscosity of 36 cSt at 50°C)



1) pressure drops of controlled lines
2) pressure drops of free lines

NOTE: Add the valve cracking pressure to the values shown by the curve 1 of the diagram

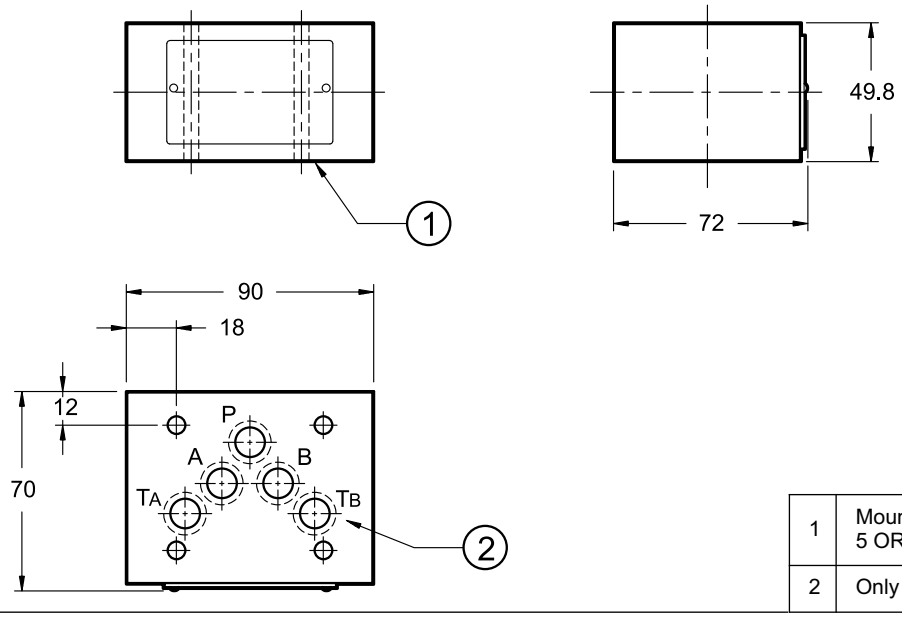
3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.The fluid must be preserved in its physical and chemical characteristics.

4 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	Mounting surface with sealing rings: 5 OR type 2050 (12.42x1.78) - 90 Shore
2	Only for CVM5-ST: TB non-through hole

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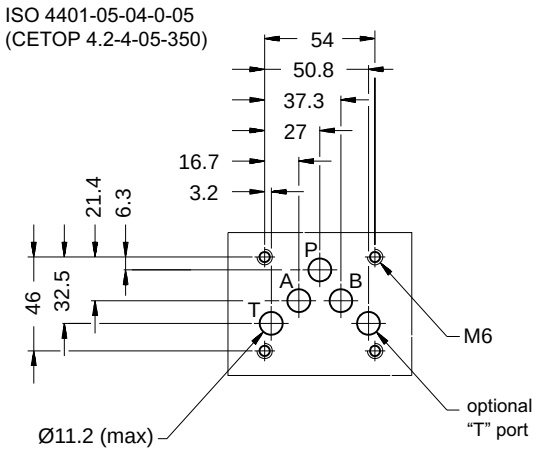


CHM5
PILOT OPERATED CHECK VALVE
SERIES 11

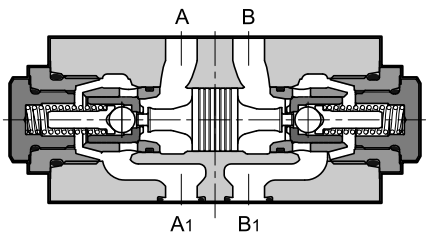
MODULAR VERSION
ISO 4401-05

p max **350** bar
Q max **120** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



— This is a pilot operated check valve (spring closing and cone on edge seals) with a built-in flow control feature. The mounting surface is according to the ISO 4401 standard.

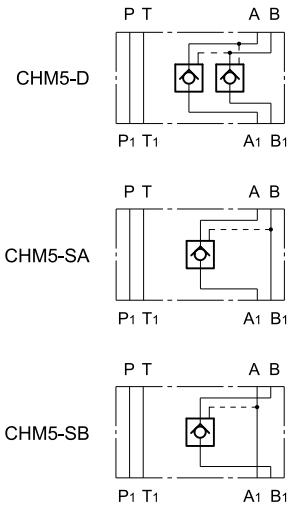
— The CHM5 are always mounted under the ISO 4401-05 directional solenoid valves and can be assembled with all other ISO 4401-05 valves.

— The pre-opening feature of the valve causes the decompression of the cylinder chamber, leading to a smooth motion.

PERFORMANCES
(measured with mineral oil of viscosity 36 cSt at 50°C)

Maximum operating pressure	bar	350
Maximum flow rate	l/min	120
Decompression ratio	14,9:1	
Piloting ratio	2,3:1	
Check valve cracking pressure	bar	2
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Recommended viscosity	cSt	25
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Mass: CHM5-D CHM5-SA and CHM5-SB	kg	2,2 1,9

HYDRAULIC SYMBOLS

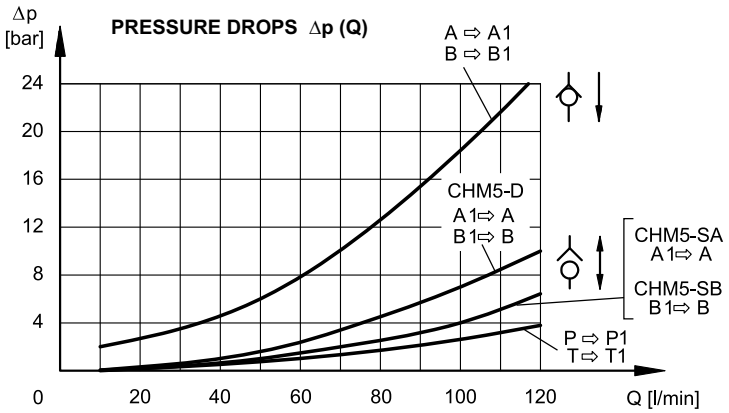


1 - IDENTIFICATION CODE

C	H	M	5	-		/	11	

- Pilot operated check valve
- Modular version
- ISO 4401-05 size
- Configurations: **D** = seal on both A and B lines; **SA** = seal on line B of the actuator; **SB** = seal on line B of the actuator
- Series No. (the overall and mounting dimensions remain unchanged from 10 to 19)
- Seals: **N** = NBR seals for mineral oil **(standard)**; **V** = FPM seals for special fluids

2 - CHARACTERISTIC CURVES (obtained with viscosity of 36 cSt at 50°C)



3 - HYDRAULIC FLUIDS

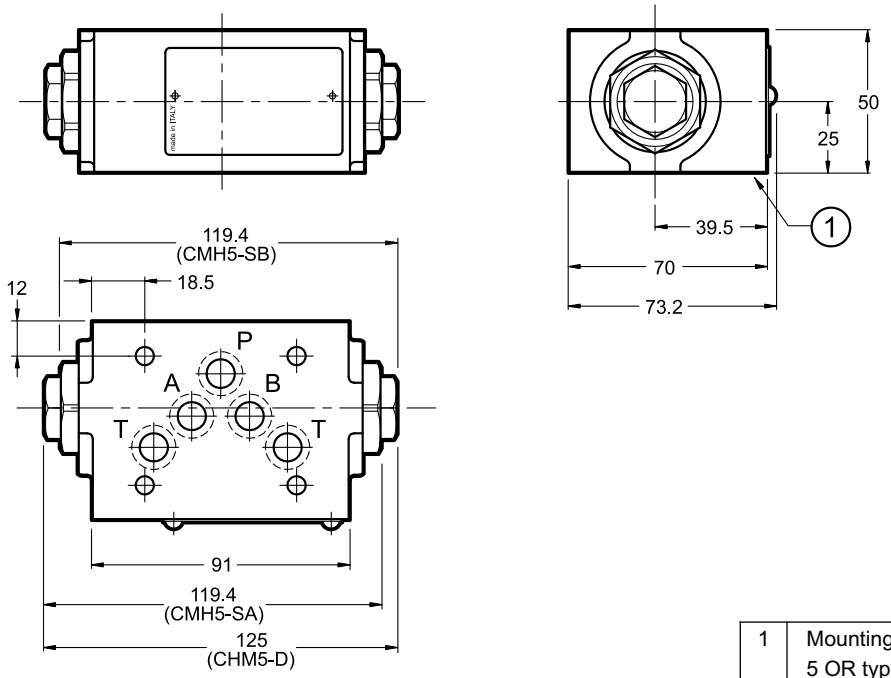
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V).

For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

4 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	Mounting surface with sealing rings: 5 OR type 2050 (12.42x1.78) -90 Shore

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RPC1*/M

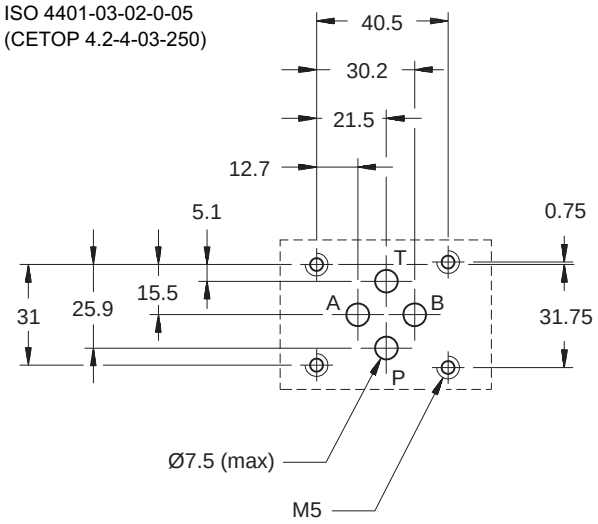
FLOW CONTROL VALVE

SERIES 10

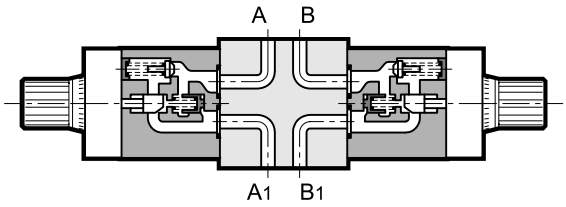
MODULAR VERSION
ISO 4401-03 (CETOP 03)

p max **250** bar
Q max (see table of performances)

MOUNTING INTERFACE



OPERATING PRINCIPLE



— The RPC1*/M valve is a flow control valve with pressure and temperature compensation, made as a modular version with mounting surface according to the ISO 4401 (CETOP RP 121H) standards.

— It can be assembled quickly under theISO 4401-03 (CETOP 03) directional solenoid valves and allows easy execution of hydraulic circuits where control of the speed of the actuators is required.

— It is available in six flow adjustment ranges up to 30 l/min.

— Combined with MDD44 type solenoid operated directional control valves (see cat. 41 250), it's possible to obtain circuits for the fast/slow control of the work actuators.

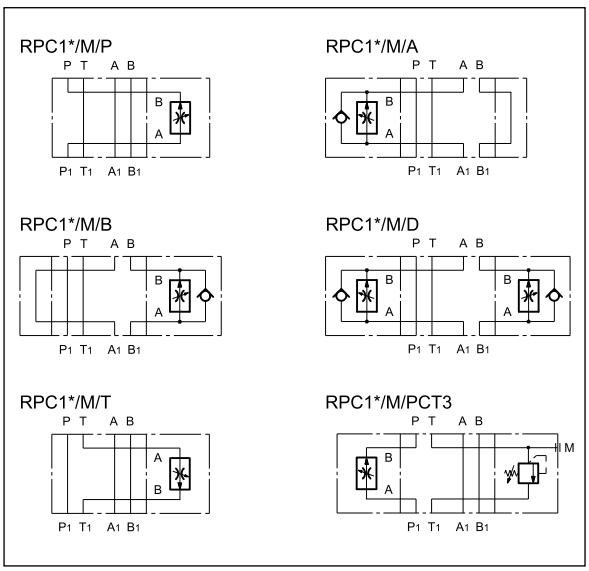
CONFIGURATIONS

(see Hydraulic symbols table and Identification Code - par. 1)

PERFORMANCES (measured with mineral oil of viscosity 36cSt at 50°C)

Maximum operating pressure	bar	250
Maximum flow rate in controlled lines Maximum flow rate in the free lines Reverse free flow maximum flowrate	l/min	1-4-10-16-22-30 65 40
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass: RPC1-*/M/ A-B-T-P RPC1-*/M/ D RPC1-*/M/PCT3 only modular block ISO 4401-03 without flow control valves: RPC1-K/M/* RPC1-K/M/PCT3	kg	3 4,1 3,7 1,5 2,4

HYDRAULIC SYMBOLS



NOTE: for detailed information regarding the RPC1 flow control valve, see catalogue 32 200

1 - IDENTIFICATION CODE

R	P	C	1	-		/	M	/		-		/	10	/	

Pressure and temperature compensated flow control valve

Flow adjustment range:
1 = 1 l/min **16** = 16 l/min
4 = 4 l/min **22** = 22 l/min
10 = 10 l/min **30** = 30 l/min
K = only ISO 4401-03 (CETOP 03) modular block supplied without flow control valve

Modular version size ISO 4401-03 (CETOP 03)

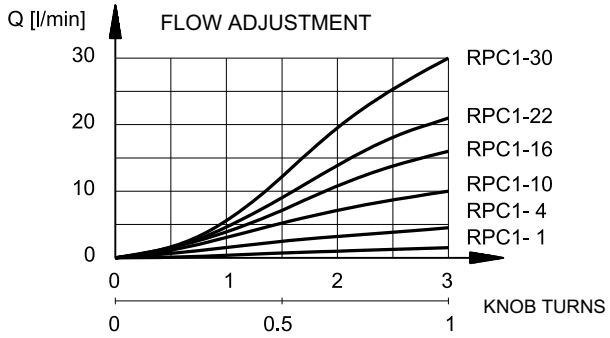
Configurations:
P = meter in control on line P
A = control from chamber A of the actuator
B = control from chamber B of the actuator
D = control from chambers A and B of the actuator
T = meter out control on line T
PCT3 = meter in control on line P with backpressure adjustable on line T up to 70 bar
(A and B configurations are not available in **K** version)

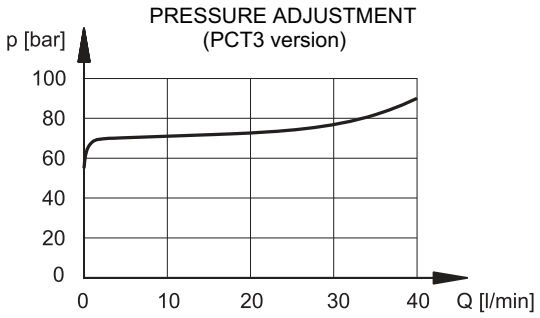
M1 = adjustment knob only for PCT3 version (omit for adjustment with countersunk hex screw)

Series No. (the overall and mounting dimensions remain unchanged from 10 to 19)

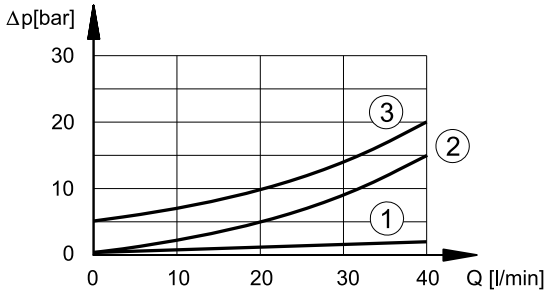
Seals: omit for mineral oils
V = viton for special fluids

2 - CHARACTERISTIC CURVES (values obtained with viscosity of 36 cSt at 50°C)





PRESSURE DROPS Δp - Q



1) pressure drops on free lines
2) pressure drops through check valve
3) pressure drops through the backpressure valve (PCT3 version)

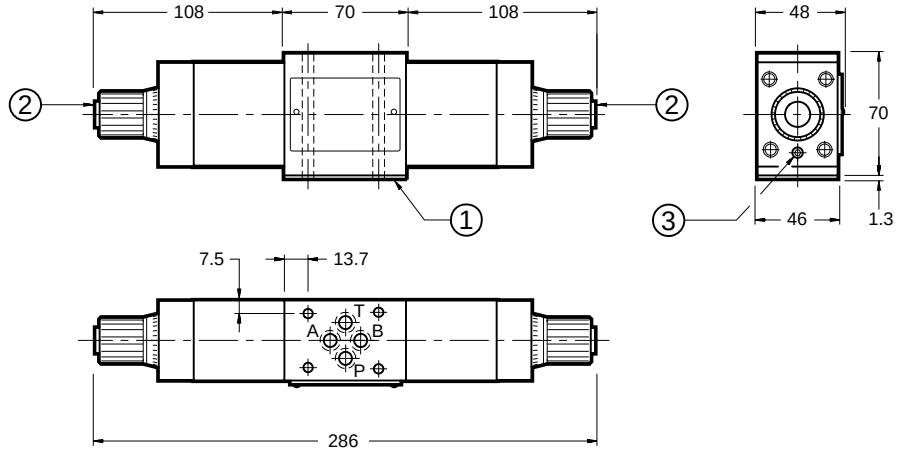
3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

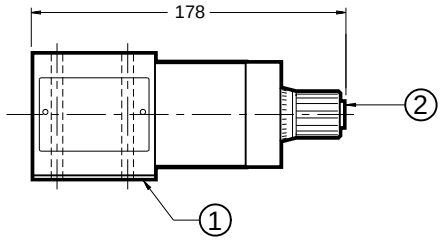
4 - OVERALL AND MOUNTING DIMENSIONS RPC1-*/M VALVES

dimensions in mm

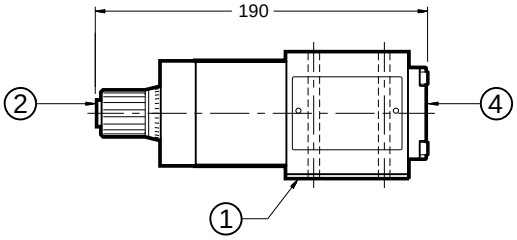
RPC1-*/M/D



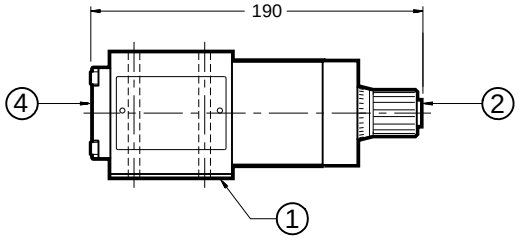
RPC1-*/M/P
RPC1-*/M/T



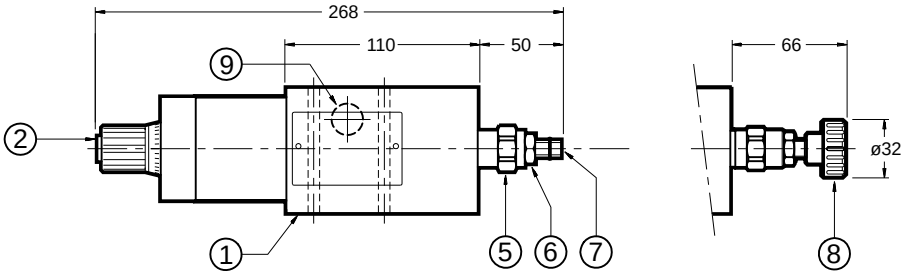
RPC1-*/M/A



RPC1-*/M/B



RPC1-*/M/PCT3

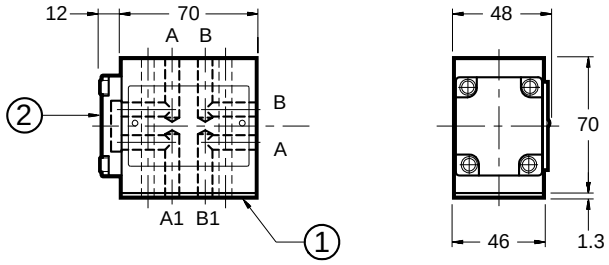


1	Mounting plate with sealing rings: P-OR1L/20N (NBR seals) P-OR1L/20V (Viton seals) For RPC1-*/M/PCT3 without mounting plate: 4 OR 2037 (9.25x1.78) - 90 Shore
2	Flow adjustment knob (3 turns total) Rotate anticlockwise to increase flow.
3	Knob locking screw
4	Cross-connection cover
5	Backpressure valve on line T. Pressure adjustment range up to 70 bar
6	Locking nut: spanner 17
7	Countersunk hex screw: spanner 5 Rotate clockwise to increase pressure
8	Adjustment knob: **M1**
9	Pressure gauge port 1/4” BSP

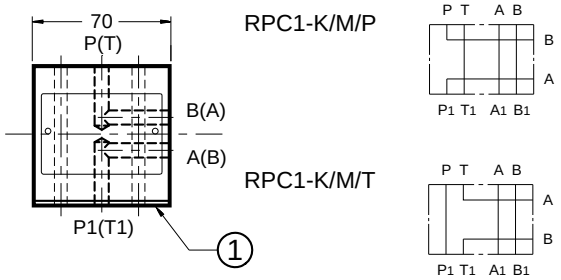
5 - OVERALL AND MOUNTING DIMENSIONS OF BLOCKS WITHOUT FLOW CONTROL VALVE

dimensions in mm

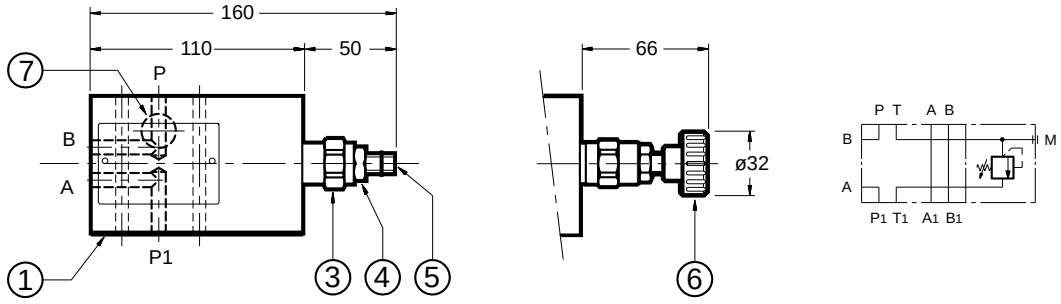
RPC1-K/M/D



1	Mounting plate with sealing rings: P-OR1L/20N (NBR seals) P-OR1L/20V (Viton seals) For RPC1-*/M/PCT3 without mounting plate: 4 OR 2037 (9.25x1.78) - 90 Shore
2	Cross-connection cover
3	Backpressure valve on line T. Pressure adjustment range up to 70 bar
4	Locking nut: spanner 17
5	Countersunk hex screw: spanner 5 Rotate clockwise to increase pressure
6	Adjustment knob: **M1**
7	Pressure gauge port 1/4" BSP



RPC1-K/M/PCT3



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RLM3

ELECTRIC FAST / SLOW SPEED SELECTION VALVE

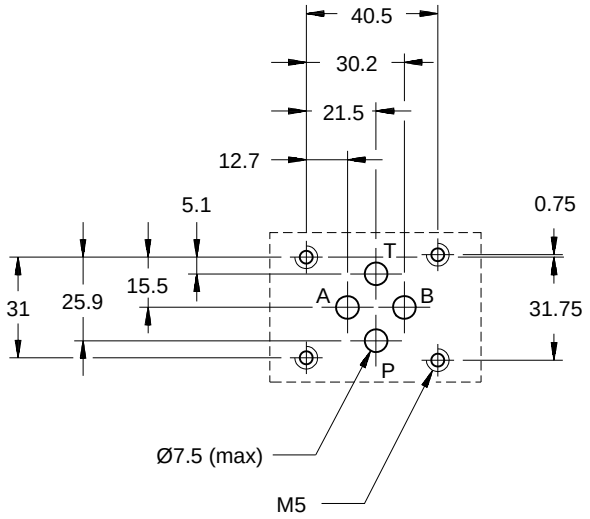
SERIES 21

MODULAR VERSION
ISO 4401-03

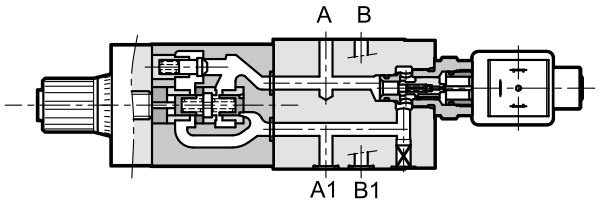
p max **250** bar
Q max (see table of performances)

MOUNTING SURFACE

ISO 4401-03 -02-0-05
(CETOP 4.2-4-03-250)



OPERATING PRINCIPLE



— RLM3* valves are modular valves for fast / slow speed control of hydraulic atuators. The mounting surface is according to ISO 4401-03 standards.

— The slow speed regulation is done by a compensated flow control valve (RPC1, catalogue 32 200). Six adjustment ranges are available.

— The fast/slow speed selection is done by a solenoid poppet valve KT08 (see catalogue 43 105).

— RLM3* valves can be easily stacked under ISO 4401-03 directional solenoid valves with no need of pipes, allowing the construction of directional and speed controls for actuators in a single station.

PERFORMANCES

(measured with mineral oil of viscosity 36 cSt at 50 °C)

Maximum operating pressure	bar	250
Maximum flow rate in controlled lines Maximum flow rate in the free lines	l/min	1 - 4 - 10 - 16 - 22 - 30 65
Minimum controlled flow rate	l/min	0,025
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass	kg	3,1

CONFIGURATIONS

(see hydraulic symbols)

— Type “A”: meter-out control on port A (control on outgoing flow from the A chamber of the actuator) .

— Type “T”: control on the T path of the directional solenoid valve which will be stacked above the RLM3, to regulate the speed in both the directions.

1 - IDENTIFICATION CODE

R	L	M	3		-			/	21	N	-			

Electric fast / slow speed selection valve

Modular version

Size ISO 4401-03

Adjustments:
A = adjustment on chamber A of the actuator
T = adjustment on discharge T of the directional solenoid valve

C = normally closed solenoid valve
A = normally open solenoid valve

Flow adjustment range:
01 = 1 l/min **16** = 16 l/min
04 = 4 l/min **22** = 22 l/min
10 = 10 l/min **30** = 30 l/min

Series No. (the overall and mounting dimensions remain unchanged from 20 to 29)

NBR seals for mineral oils

Manual override
(see point 11):
Omit for valves with no manual override
/CK2 = push and twist

Coil electric connection
(see point 8):
K1 = plug for connector type EN 175301-803 (ex DIN 43650) (**standard**)

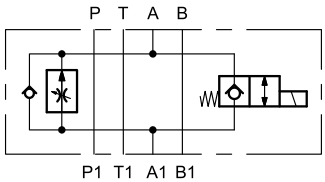
For **D12** and **D24** coils only:
K2 = plug for connector type AMP JUNIOR
K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S

DC power supply :
D00 = valve without coil (the coil locking ring and the related OR are supplied)
D12 = 12 V
D24 = 24 V
D110 = 110 V
D220 = 220 V

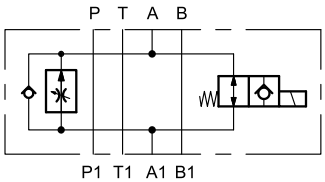
NOTE: For further information about the compensated flow control valve see catalogue 32 200; for further information about the solenoid switching valve see catalogue 43 105.

2 - HYDRAULIC SYMBOLS

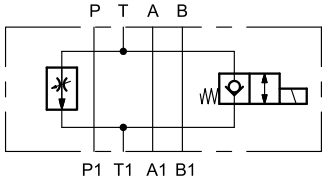
RLM3A-C*



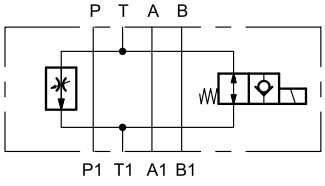
RLM3A-A*



RLM3T-C*



RLM3T-A*



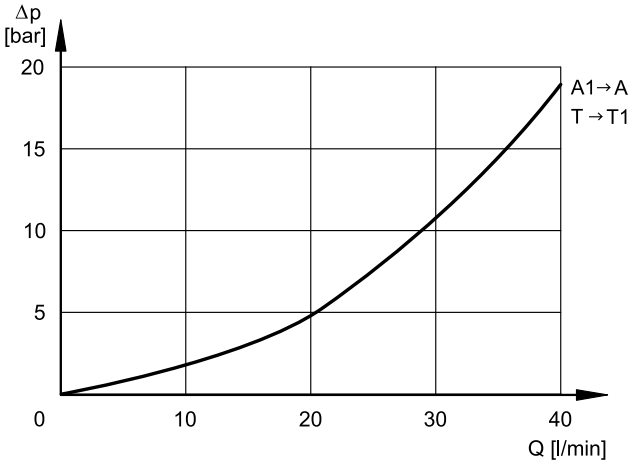
3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

4 - PRESSURE DROPS ΔP-Q

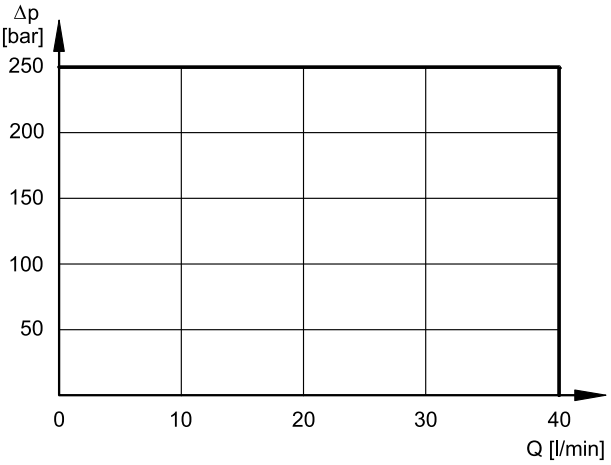
(obtained with viscosity of 36 cSt at 50 °C)



The value in the diagram refer to the fast flow, through the solenoid valve and is the same for both versions A (normally open) and C (normally closed).

5 - OPERATING LIMITS

(obtained with viscosity of 36 cSt at 50 °C and filtration according to ISO 4406:1999 class 18/16/13.)



This curve defines the flow rate operating field according to ISO 6403 standard, with solenoid at rated temperature and voltage equal to 90% of the nominal voltage.

6 - SWITCHING TIME

(obtained with viscosity of 36 cSt at 50 °C)

Values obtained according to the ISO 6403 standard.

TIMES [ms]	ENERGIZING	DE-ENERGIZING
RLM3*-C*	60	85
RLM3*-A*	85	60

7 - ELECTRICAL FEATURES

7.1 - Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation.

The coil is fastened to the tube by a threaded ring, and can be easily replaced. Coils of different voltages can be fitted without having to replace the tube.

Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree, correctly connected and installed.

electric connection	electric connection protection	whole valve protection
K1	IP65	IP65
K2	IP65/67	
K7	IP65/67	

SUPPLY VOLTAGE FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY	10.000 ins/hour
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	In compliance with 2014/30/UE
LOW VOLTAGE	In compliance with 2014/35/UE
CLASS OF PROTECTION Coil insulation (VDE 0580) Impregnation	 class H class F

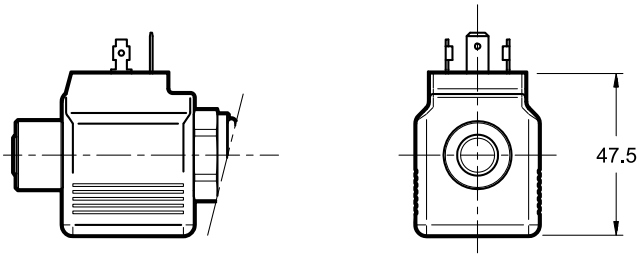
7.2 - Current and absorbed power

The table shows the absorption values relating to the various types of coil for direct current power supply.

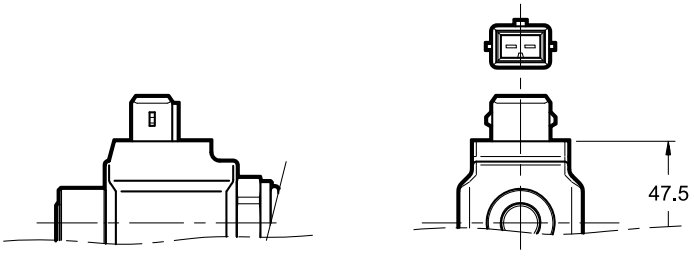
	Nominal voltage [V] (±10%)	Resistance at 20°C [Ω] (±7%)	Absorbed current [A]	Absorbed power [W]	Coil code K1	K2	K7
D12	12	6.5	1.84	22	1904140	1904180	1904150
D24	24	26.2	0.92	22	1904141	1904181	1904151
D110	110	550	0.2	22	1904142	-	-
D220	220	2200	0.1	22	1904143	-	-

8 - ELECTRIC CONNECTIONS

connection for EN 175301-803
(ex DIN 43650) connector
code **K1** (**standard**)



connection for AMP JUNIOR
connector type
code **K2**



connection for
DEUTSCH DT06-2S male
connector type
code **K7**



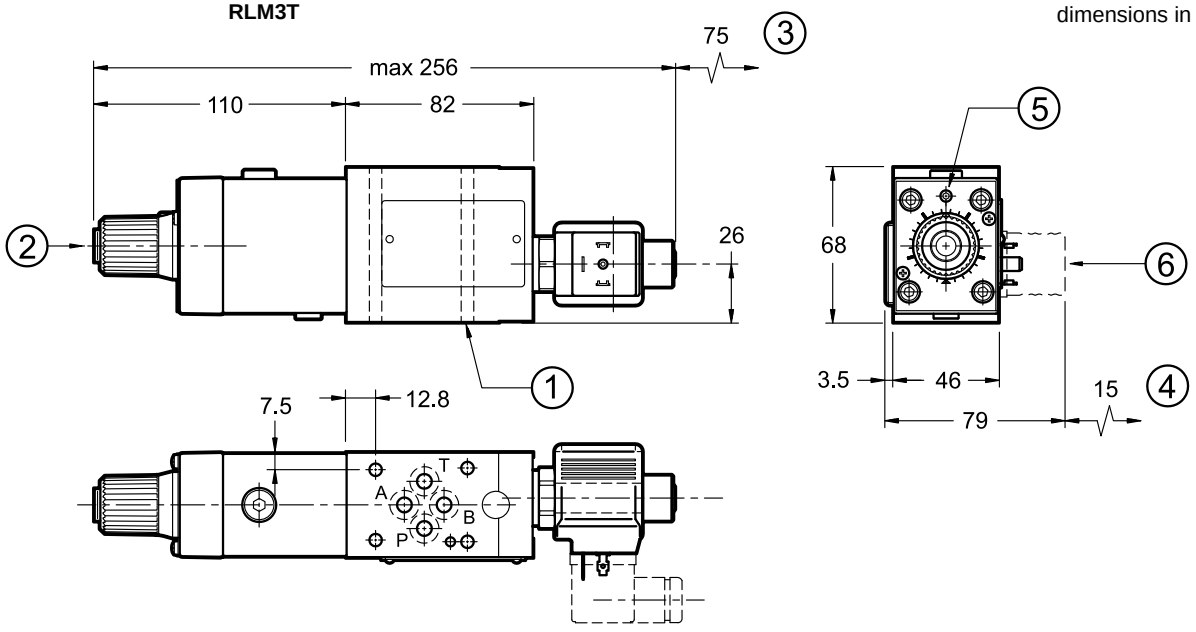
9 - ELECTRIC CONNECTORS

Solenoid valves are delivered without connectors. Connectors type EN 175301-803 (ex DIN 43650) for K1 connection can be ordered separately. See catalogue 49 000.

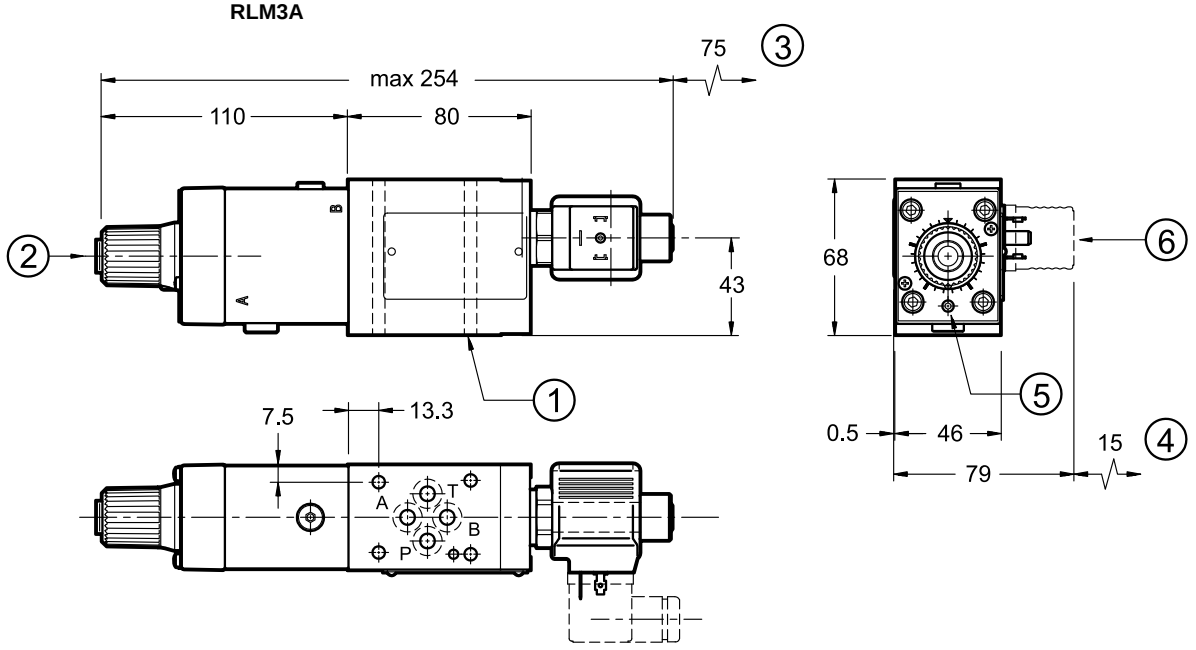
10 - OVERALL AND MOUNTING DIMENSIONS

RLM3T

dimensions in mm



RLM3A



1	Mounting surface with sealing rings: 4 OR 2037 (9.25x1.78) 90 Shore
2	Flow adjustment knob. Rotate counterclockwise to increase the flow.
3	Coil removal space

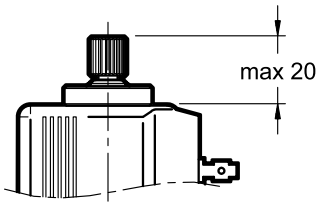
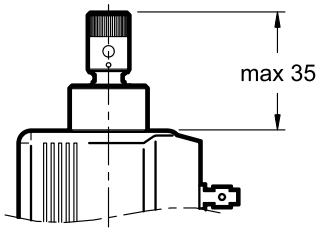
4	Connector removal space
5	Knob locking screw
6	Electric connector EN 175301-803 (ex DIN 43650) (for K1 connection - for other types of connection see point 8)

11 - MANUAL OVERRIDE

The switching solenoid valve can be delivered with push and twist manual override (CK2 code) or without any override.

The override is activated by pressing and turning the knob (clockwise for NO versions, anticlockwise for NC versions); it is deactivated by pressing and turning the knob again in the opposite direction. A small spring allows the knob to return to its initial position.

The shape is different depending on NC or NO version.

CK2 for NC version	CK2 for NO version
	

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duplomaticmotionsolutions.com

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RPC1-*/4M

FLOW CONTROL VALVE

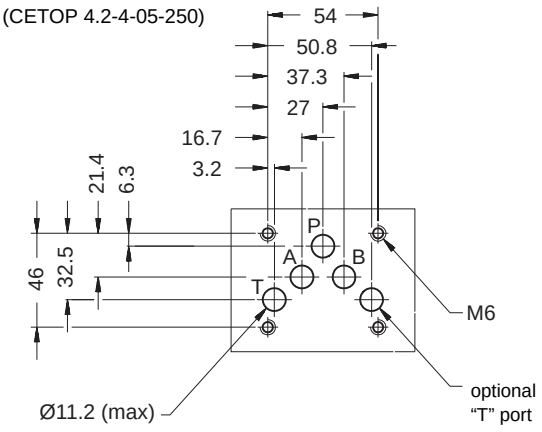
SERIES 10

MODULAR VERSION
ISO 4401-05 (CETOP 05)

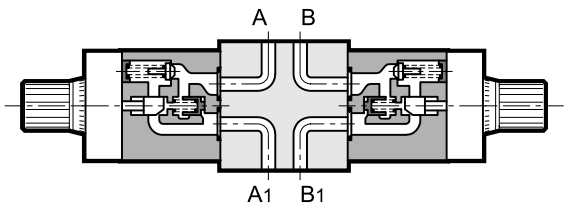
p max **250** bar
Q max (see table of performances)

MOUNTING INTERFACE

ISO 4401-05-04-0-05
(CETOP 4.2-4-05-250)



OPERATING PRINCIPLE



— The RPC1-*/4M valve is a flow control valve with pressure and temperature compensation, made as a modular version with mounting surface according to the ISO 4401 (CETOP RP121H) standards.

— It can be assembled quickly under the ISO 4401-05 (CETOP 05) directional solenoid valves and allows easy execution of hydraulic circuits where speed control of the actuators is required.

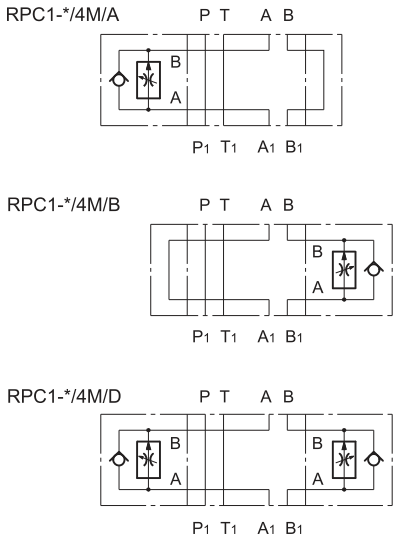
— It is available in six flow adjustment ranges up to 30 l/min.

CONFIGURATIONS (see Hydraulic symbols table and Identification Code - par. 1)

PERFORMANCES (measured with mineral oil of viscosity 36cSt at 50°C)

Maximum operating pressure	bar	250
Maximum flow rate in controlled lines Maximum flow rate in the free lines Reverse free flow maximum flowrate	l/min	1-4-10-16-22-30 100 40
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass: RPC1*/4M/ A-B RPC1*/4M/ D only modular block ISO 4401-05 without flow control valves: RPC1-K/4M/D	kg	4,3 5,6 3

HYDRAULIC SYMBOLS



NOTE: for detailed information regarding the RPC1 flow control valve, see catalogue 32 200.

1 - IDENTIFICATION CODE

R	P	C	1	-		/	4	M	/		/	10	/	

Pressure and temperature compensated flow control valve

Flow adjustment range:
1 = 1 l/min **16** = 16 l/min
4 = 4 l/min **22** = 22 l/min
10 = 10 l/min **30** = 30 l/min
K = only for ISO 4401-05 (CETOP 05) modular block supplied without flow control valves

Modular version
ISO 4401-05 (CETOP 05) size

A = control from chamber A of the actuator
B = control from chamber B of the actuator
D = control from chambers A and B of the actuator
(A and B configurations are not available in K version)

Series No. (the overall and mounting dimensions remain unchanged from 10 to 19)

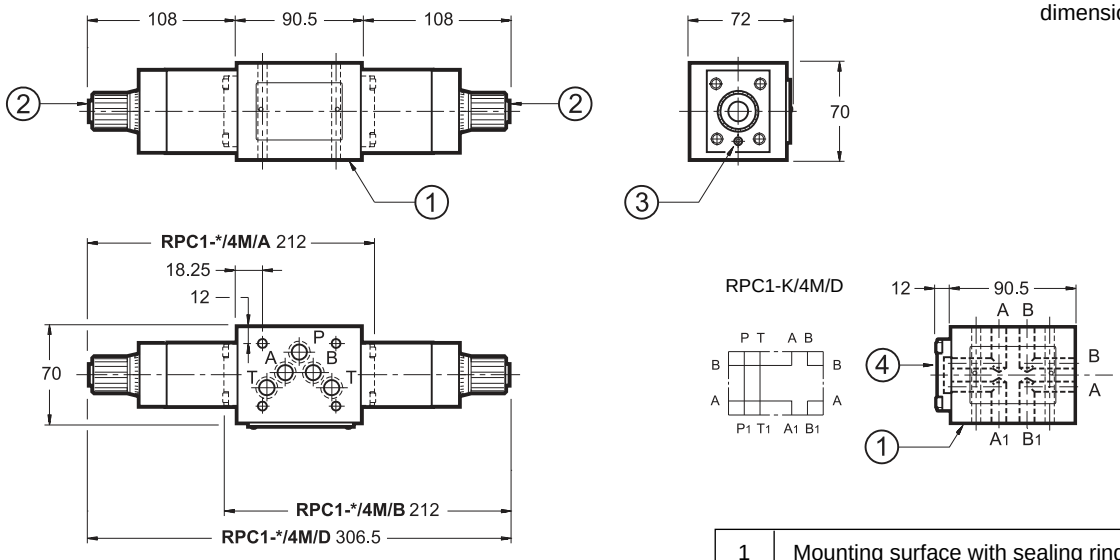
Seals: omit for mineral oils
V = viton for special fluids

2 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

3 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	Mounting surface with sealing rings: 5 OR type 2050 (12.42x1.78) - 90 Shore
2	Adjustment knob. Adjustment in 3 turns of the knob. Rotate anticlockwise to increase flow.
3	Knob locking screw
4	Side locking plate

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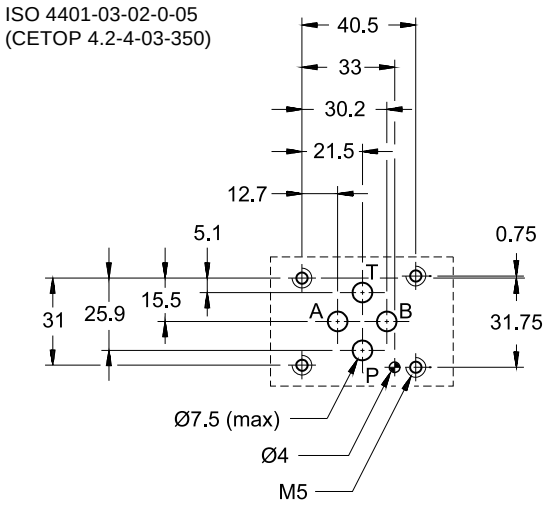


VSM3
SHUTTLE VALVE
SERIES 10

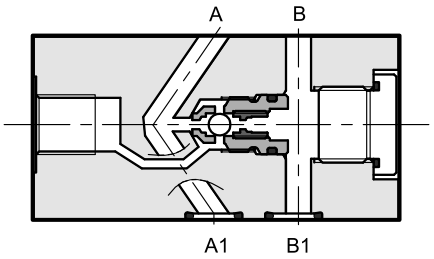
MODULAR VERSION
ISO 4401-03

p max **350** bar
Q max **40** l/min

MOUNTING SURFACE



OPERATING PRINCIPLE



— The VSM3 ia a shuttle valve for pilot signals made as a modular version with mounting surface according to the ISO 4401-03 standards.

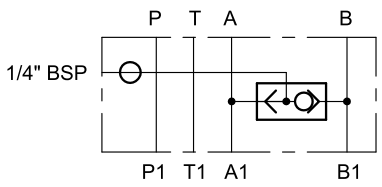
— The valve regulates the passage of the signal with higher pressure between A and B towards the outlet side port 1/4" BSP.

— The shuttle valve VSM3 has been designed with purpose of pilot signal with flowrate up to 3 l/min

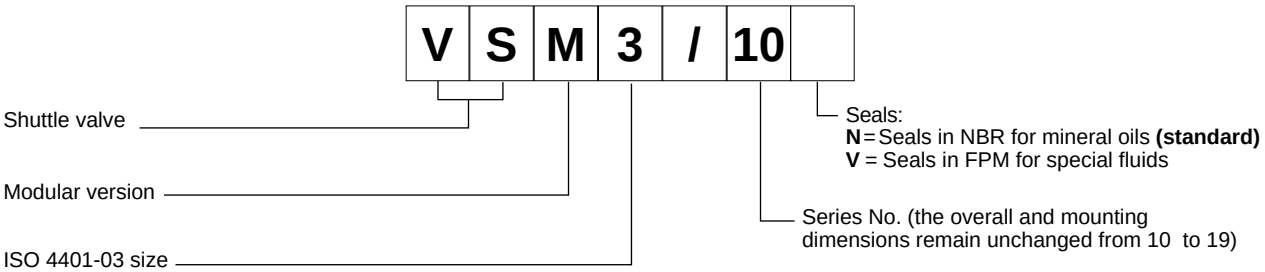
PERFORMANCES
(measured with mineral oil of viscosity 36 cSt at 50°C)

Maximum operating pressure	bar	350
Maximum flow rate thtough the cartridge	l/min	3
Maximum flow rate to A, B, P and T port	l/min	40
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass	kg	0,95

HYDRAULIC SYMBOL



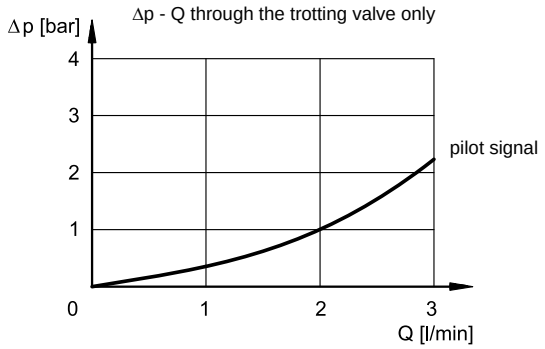
1 - IDENTIFICATION CODE

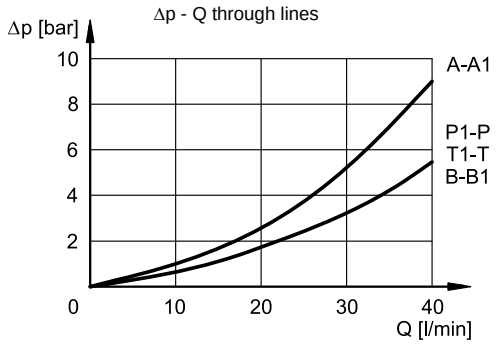


2 - CHARACTERISTIC CURVES

(values obtained with viscosity of 36 cSt at 50°C)

PRESSURE DROPS Δp - Q





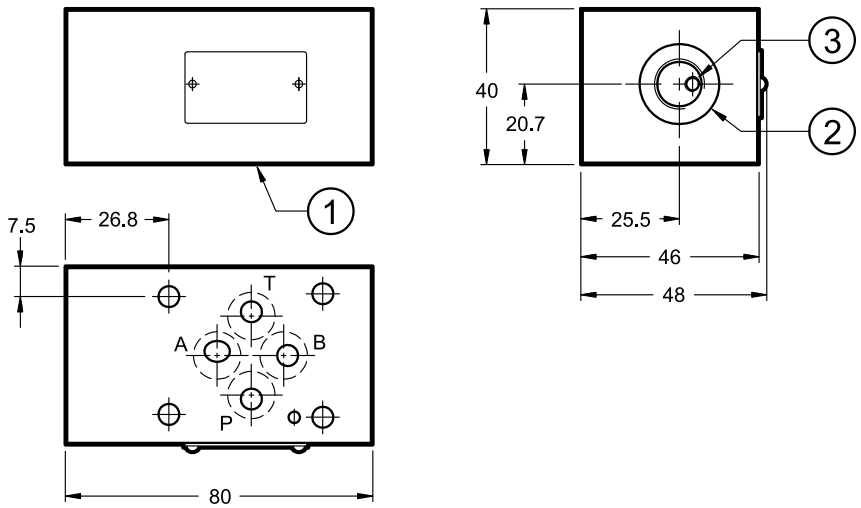
3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

4 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) 90 Shore
2	Outlet signal port 1/4” BSP
3	Cavity for restrictor M4x6

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07

2 catalogue documents | 48 original technical pages

DUPLOMATIC
MOTION SOLUTIONS

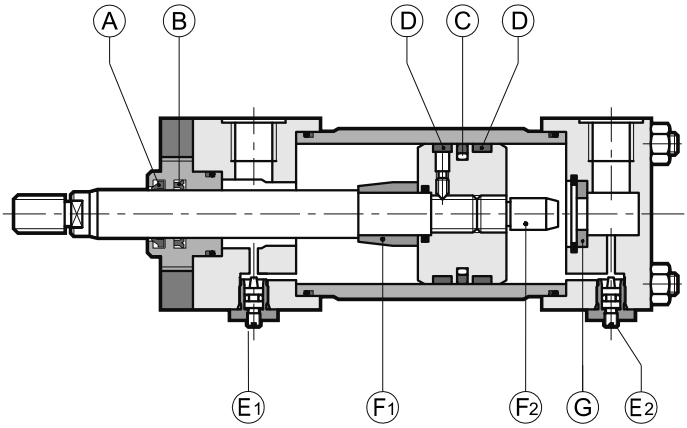
WWW.SUMY.IR



HC2
HYDRAULIC CYLINDERS
HCK2
HYDRAULIC CYLINDERS
ATEX 2014/34/EU
SERIES 20

ISO 6020-2
DIN 24554

DESCRIPTION



— Double acting cylinders constructed in compliance with ISO 6020-2 and DIN 24554.

— The compact design of the square ends with tie rods plus the high quality material and seals render these cylinders highly reliable and therefore strongly recommended for all types of industrial applications.

— The cylinder is available with 14 different mounting styles as well as a vast range of accessories to meet all application requirements.

A - scraper ring
B - Piston rod seal
C - Piston seal
D - Guide rings
E_1 - Front cushioning adjustment screw
E_2 - Rear cushioning adjustment screw
F_1 - Front cushion
F_2 - Rear cushion
G - Bushing

ATEX 2014/34/EU rated version for installation in potentially explosive atmospheres is now available. The standard version of cylinders is ATEX II 2GD classified, whereas cylinders with proximity sensors are ATEX II 3GD classified. The declaration of conformity to the up mentioned standards is always supplied with the cylinder. See point 3 for details.

PERFORMANCES

Nominal operating pressure (continuous service)	bar	160
Maximum operating pressure	bar	210
Peak pressure	bar	250
Maximum speed (standard)	m/s	0.5
Maximum stroke (standard)	mm	5000
Fluid temperature range (standard)	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree		According to ISO 4406:1999 class 20/18/15
Recommended viscosity	cSt	25
Security factor in relation with nominal pressure		≥ 4

1 - CHARACTERISTICS

1.1 Bores and piston rods

Ø 25 to Ø 200 mm bores are available to enable a vast choice according to required force.

Three piston rod diameters are available for each bore (with the exception of the Ø 25 mm bore, for which the intermediate piston rod is not available):

- standard piston rod with 1:1.25 area ratio
- intermediate piston rod with 1:1.45 area ratio
- oversized piston rod with 1:2 area ratio

1.2 - Cushioning

On request, gradual and adjustable cushioning devices can be fitted in the front and/or rear ends of the cylinder without affecting overall dimensions.

The special design of the cushions ensures optimal repeatability also in the event of variations in fluid viscosity.

Cushioning devices are always recommended as they ensure impact-free stopping even at high speed thus reducing pressure surges and impact transferred to the mounting supports.

For all the available bores, cushioning is adjustable by means of a needle.

Rapid piston start-up is guaranteed by the bypass system located inside the front cushioning cone and rear cushioning ring.

The table below shows cushioning cone lengths:

Bore (mm)	25	32	40	50	63	80	100	125	160	200
Front cone length (mm)	17	17	28	28	28	28	30	30	38	45
Rear cone length (mm)	17	17	26	26	26	28	31	30	38	55

1.3 - Connections

The cylinders are supplied as standard with cylindrical BSP threads and spot facing for seal rings in compliance with ISO 1179. Connections which are oversized compared to those shown in the dimensional tables are available upon request. For further information and for the order identification code, please consult our technical office.

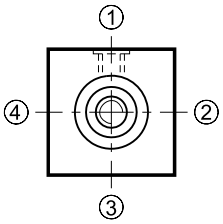
For correct cylinder operation, fluid velocity must not exceed 5 m/s.

1.4 - Connection position

Standard positions of the oil ports, cushioning adjustment screws, breathers and end-stroke proximity sensors are shown in the relevant diagram according to the mounting style.

Connection positions different from the standard can be provided upon request.

Other options positions will be rotated accordingly.



Front view - piston rod side

For special requests please consult our technical office.

1.5 - Seals

The table below illustrates seal characteristics in relation to hydraulic fluid and operating temperatures.

Type	Seal type	Seal material	Hydraulic fluid	Minimum pressure [bar]	Operating pressure [°C]	Max speed [m/s]
K	standard	nitrile polyurethane	mineral oil	10	-20 / +80	0,5
M	low friction	nitrile PTFE	mineral oil water glycol	20 (note)	-20 / +80	15
V	high temperature and/or aggressive fluid	Viton PTFE	special fluids	10	-20 / +150	1

NOTE: for lower pressure use consult our technical office

1.6 - Strokes

Standard cylinders are available with strokes up to 6000 mm. Longer cylinder strokes can be supplied on request.

Stroke tolerances are: 0 + 1 mm for strokes up to 1000 mm
0 + 4 mm for strokes up to 6000 mm

1.7 - Spacers

If the cylinder stroke exceeds 1000 mm we recommend the use of spacers which can be inserted to reduce loads on the piston rod bushing and prevent the piston from sticking.

Spacers are constructed in hardened and tempered steel with PTFE facing. Every spacer is 50 mm long.

We recommend to insert n°1 spacer for strokes from 1001 to 1500 mm, with an increment of n°1 spacer for every 500 mm stroke. Remember that the overall length of the cylinder increases according to the number of inserted spacers (50 mm for each spacer).

1.8 - Tie rod tightening torque

If cylinder has been disassembled, re-assemble it and tighten the tie rod lock nuts cross-wise applying a gradual torque up to the value indicated in the table below. The values below refer to dry threads.

Bore [mm]	25	32	40	50	63	80	100	125	160	200
Tie rod	**M5** x0.8	**M6** x1	**M8** x1	**M12** x12.5	**M12** x12.5	**M16** x1.5	**M16** x1.5	**M22** x1.5	**M27** x2	**M30** x2
Torque [Nm]	5	9	20	70	70	160	160	450	820	1150

1.9 - Breathers

On request cylinder ends can be supplied with breathers for the elimination of air. This is necessary when the entire stroke is not used or when connections are not facing upwards.

1.10 - Surface finish

Standard cylinders are supplied painted with Duplomatic black opaque colour with a paint thickness of 40µm. The rod is chromed.

MOUNTING STYLES

F = front-end T = rear end	A		B		C		D		F		G		H		L		N		P		Q		R		T		U	
	T	F	T	F	T	F	T	F	T	F	T	F	T	F	T	F	T	F	T	F	T	F	T	F	T	F	T	F
Connections	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	3	2 3 4	2 3 4	3	2 3 4	2 3 4	2 3 4	2 3 4	2 3 4	2 3 4	3	3	3	2 3 4	2 3 4	2 3 4	2 3 4	3	2 3 4	2 3 4	2 3 4	2 3 4	2 3 4	2 3 4	2 3 4	2 3 4	2 3 4	2 3 4
Cushioning	1	1	1	1	1	1	1	1	1	1			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		2	2		2	2	2	2	2	2	2	2		2	2	2	2		2	2	2	2	2	2	2	2	2	2
	3	3	3	3	3	3	3	3	3	3			*3	3	3	3	3	*3	3	3	3	3	3	3	3	3	3	3
		4	4		4	4	4	4	4	4	4	4		4	4	4	4		4	4	4	4	4	4	4	4	4	4
Breathers	1	1	1	1	1	1	1	1	1	1			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	2	2	2	2	2	2	2	2	2	2	2	2		2	2	2	2		2	2	2	2	2	2	2	2	2	2
	3	3	3	3	3	3	3	3	3	3			*3	3	3	3	3	*3	3	3	3	3	3	3	3	3	3	3
	4	4	4	4	4	4	4	4	4	4	4	4		4	4	4	4		4	4	4	4	4	4	4	4	4	4
End-stroke proximity sensors		1	1		1	1	1	1	1	1				1	1	1	1		1	1	1	1	1	1	1	1	1	1
	2	2	2	2	2	2	2	2	2	2	2	2		2	2	2	2		2	2	2	2	2	2	2	2	2	2
		3	3		3	3	3	3	3	3			3	3	3	3	3		3	3	3	3	3	3	3	3	3	3
	4	4	4	4	4	4	4	4	4	4	4	4		4	4	4	4		4	4	4	4	4	4	4	4	4	4

NOTES: Positions highlighted with a grey background are relevant to the standard, the others refer to the available options.
For Ø25, Ø32, and Ø40 bores with Ø18 and Ø22 rods, in the positions marked with an asterisk, it is necessary to choose between cushioning and breathers. For end-stroke proximity sensors, refer to the limitations indicated in point 22.

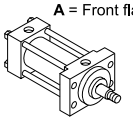
2 - IDENTIFICATION CODE

K = Explosion-proof version according to ATEX 2014/34/EU (point 3). Omit if not required.

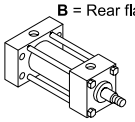
HC		2		-		/			/			-		-			-		-			/			/	20

MOUNTING STYLE

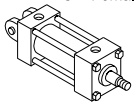
A = Front flange(ME5)



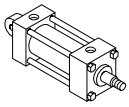
B = Rear flange (ME6)



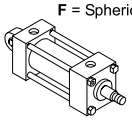
C = Female clevis (MP1)



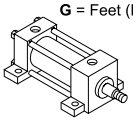
D = Male clevis (MP3)



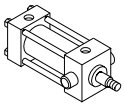
F = Spheric swivel (MP5)



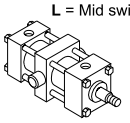
G = Feet (MS2)



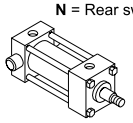
H = Front swinging (MT1)



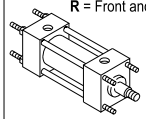
L = Mid swinging (MT4)



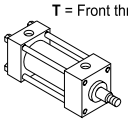
N = Rear swinging (MT2)



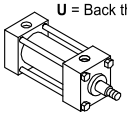
P = Front tie rods (MX3)
Q = Back tie rods (MX2)
R = Front and back tie rods (MX1)



T = Front threaded holes (MX5)



U = Back threaded holes (MX6)



Series (put for spare parts requests)

Dimension XV for "L" mounting (omit for other mounting styles)

N° of spacers multiple of 50 mm (omit if not required) see p. 1.7

Rear end connection position (**1**-**4**) (see point 1.4)

Front end connection position (**1**-**4**) (see point 1.4)

Breathers (see point 1.9)
0 = without breathers
S = front and back breathers

Cushioning (see point 1.2):
0 = without cushioning
1 = front
2 = back
3 = front and back

Seals (see p. 1.5):
K = standard (nitrile + polyurethane)
M = low friction (nitrile + PTFE)
V = high temperature (viton + PTFE)

Stroke (mm) - (For cylinders with spacers indicate the working stroke)

Double rod threading (omit if not required)
See single rod for type and dimensions

Double rod (omit if not required)
See single rod for dimensions.
Not available with mounting style B - C - D - F - N - Q - U

Rod threading: Male thread (**standard**)
W = Female thread
X = Light male thread
Y = Light female thread (see point 4)

Ø Rod (mm)	Rods available for each bore									
12	●									
14		●								
18	●	●	●							
22		●	●	●						
28			●	●	●					
36				●	●	●				
45					●	●	●			
56						●	●	●		
70							●	●	●	
90								●	●	●
110									●	●
140										●
Bore (mm)	**25**	**32**	**40**	**50**	**63**	**80**	**100**	**125**	**160**	**200**

3 - ATEX 2014/34/EU RATED VERSION

ATEX 2014/34/EU rated version cylinders for installation in potentially explosive atmospheres are now available. The standard version of cylinders is ATEX II 2GD classified, whereas cylinders with proximity sensors are ATEX II 3GD classified.

The supply is always delivered accompanied by:

- the ATEX declaration of conformity
- the operating and maintenance user manual, where are described all the information for the proper use of cylinders in potentially explosive environments.

TYPE EXAMINATION CERTIFICATE N°: **CEC 10 ATEX 138**

3.1 - Identification code

To order the ATEX-rated version, simply insert the letter K in the initial part of the identification code. The description becomes HCK2-*.

For cylinders without end-stroke proximity sensors please order with the identification code shown at point 2.

Example: HC**K**2C-200/90-500-K3-S-11/20

For cylinders equipped with end-stroke proximity sensors please refer to the identification code shown at point 22.1.

Example: HC**K**2F-FP22-80/56-200-K3-S-11/20

The ATEX-rated cylinders equipped with end-stroke proximity sensors are compliant with the specifications listed point 22; Also the same limitations described in that point are effective. (NB: for bores Ø160 and Ø200 contact our technical department).

The proximity sensors are compliant with the description and the wiring diagram shown at the point 22.2.

3.2 - Classification

Cylinders without end-stroke proximity sensors have this ATEX mark:

 II 2GD ck IIC T4 (-20°C Ta +80°C)

EX: Specific marking of explosion protection as ATEX 2014/34/EU directive and related technical specification requests.
II: Group II for surface plants
2: Category 2 high protection, eligible for zone 1 for gases and zone 21 for dust (automatically be eligible for zone 2 category 3 for gases and zone 22 for dust)
GD: for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures.
ck: protection by constructional safety and by liquid immersion
IIC: Gas group
(automatically eligible for group IIA and IIB)
T4: Temperature class for gas (max surface temperature)
-20°C Ta +80°C: Ambient temperature range

Cylinders with end-stroke proximity sensors have this ATEX mark:

 II 3GD ck IIC T4 (-20°C Ta +80°C)

EX: Specific marking of explosion protection as ATEX 2014/34/EU directive and related technical specification requests
II: Group II for surface plants
3: Category 3 standard protection, eligible for zone 2 for gases (zone 22 for dust)
GD: for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures.
ck: protection by constructional safety and by liquid immersion
IIC: Gas group
(automatically eligible for group IIA and IIB)
T4: Temperature class for gas (max surface temperature)
-20°C Ta +80°C: Ambient temperature range

3.3 - Operating temperatures

The operating ambient temperature must be between -20°C and +80 °C.

The fluid temperature for the standard version seals (K) and for low friction seals (M) must be between -20°C and +80°C, as for viton (V) seals must be between -20°C and +120 °C.

The actuators are T4 (T135° C) class temperature classified, so they are eligible for operation also at higher class temperature (T3, T2, T1 (T200° C).

3.4 - Admitted velocities

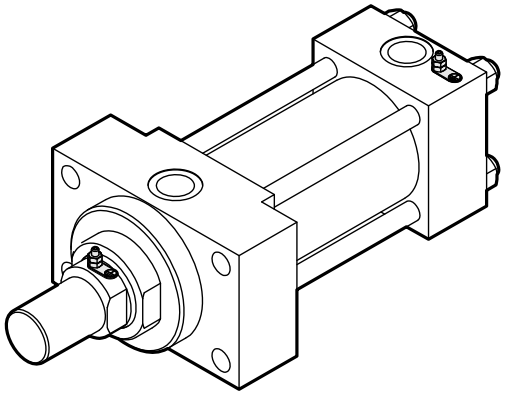
The maximum permissible speed is 0.5 m/s for standard cylinder seals (K) and 1 m/s for actuators with low friction seals (M) or Viton (V).

3.5 - Connectors

The connectors for the end-stroke proximity are available upon request. They are metal, to be wired. The ordering code is **0680961.** One connector per sensor is needed.

3.6 - Grounding points

The ATEX certified actuators are supplied with two grounding points, one on the rear head and one on the rod, for the wire of the cylinder with the ground (M4 screws).

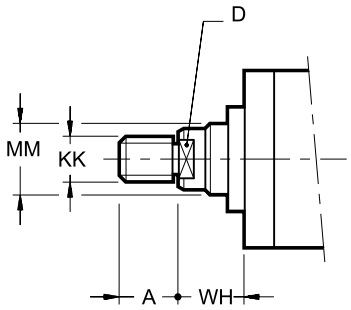


The bottom grounding point must always be connected whereas the connection of the rod grounding point can be avoided in case the whole mechanical stroke is covered during the cylinder operating phase (from the mechanical stop on the cylinder head to the mechanical stop on the bottom), or in case the rod has already been grounded through the mechanical connection between the rod itself and the machine/plan it is installed on.

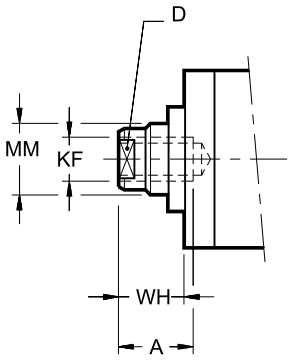
In order to verify such a condition it is necessary to test the equipotentiality of the parts and a maximum resistance equal to 100 Ω as per the EN13463-1 norm.

4 - OVERALL AND MOUNTING DIMENSIONS

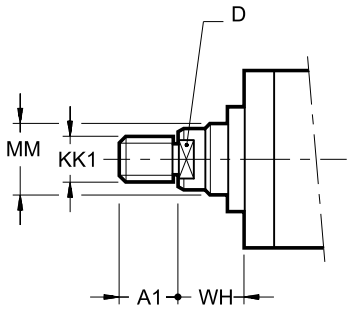
Standard = male thread



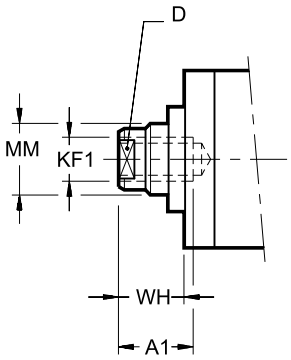
W = female thread



X = light male thread



Y = light female thread

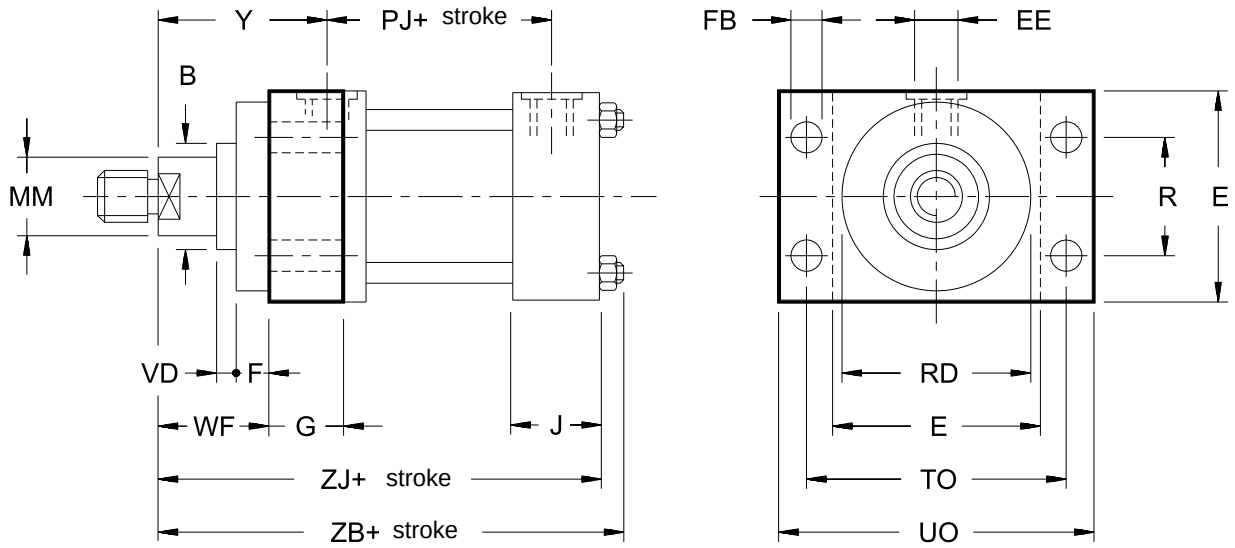


Dimensions in mm

Bore	MM Ø rod	KK	KK1	KF	KF1	A	A1	D	WH
25	12 18	M10x1.25 M14x1.5	- M10x1.25	M8x1 M12x1.25	- M8x1	14 18	- 14	9 14	15
32	14 18 22	M12x1.25 M14x1.5 M16x1.5	- M10x1.25 M12x1.25	M10x1.25 M12x1.25 M16x1.5	- M8x1 M10x1.25	16 18 22	- 14 16	11 14 17	25
40	18 22 28	M14x1.5 M16x1.5 M20x1.5	M10x1.25 M12x1.25 M14x1.5	M12x1.25 M16x1.5 M20x1.5	M8x1 M10x1.25 M12x1.25	18 22 28	14 16 18	14 17 22	25
50	22 28 36	M16x1.5 M20x1.5 M27x2	M12x1.25 M14x1.25 M16x1.5	M16x1.5 M20x1.5 M27x2	M10x1.25 M12x1.25 M16x1.5	22 28 36	16 18 22	17 22 30	26
63	28 36 45	M20x1.5 M27x2 M33x2	M14x1.5 M16x1.5 M20x1.5	M20x1.5 M27x2 M33x2	M12x1.25 M16x1.5 M20x1.5	28 36 45	18 22 28	22 30 36	33
80	36 45 56	M27x2 M33x2 M42x2	M16x1.5 M20x1.5 M27x2	M27x2 M33x2 M42x2	M16x1.5 M20x1.5 M27x2	36 45 56	22 28 36	30 36 50	31
100	45 56 70	M33x2 M42x2 M48x2	M20x1.5 M27x2 M33x2	M33x2 M42x2 M48x2	M20x1.5 M27x2 M33x2	45 56 63	28 36 45	36 50 60	35
125	56 70 90	M42x2 M48x2 M64x3	M27x2 M33x2 M42x2	M42x2 M48x2 M64x3	M27x2 M33x2 M42x2	56 63 85	36 45 56	50 60 80	35
160	70 90 110	M48x2 M64x3 M80x3	M33x2 M42x2 M48x2	M48x2 M64x3 M80x3	M33x2 M42x2 M48x2	63 85 95	45 56 63	60 80 100	32
200	90 110 140	M64x3 M80x3 M100x3	M42x2 M48x2 M64x3	M64x3 M80x3 M100x3	M42x2 M48x2 M64x3	85 95 112	56 63 85	80 100 130	32

5 - OVERALL AND MOUNTING DIMENSIONS ISO/DIN ME5

A FRONT FLANGE



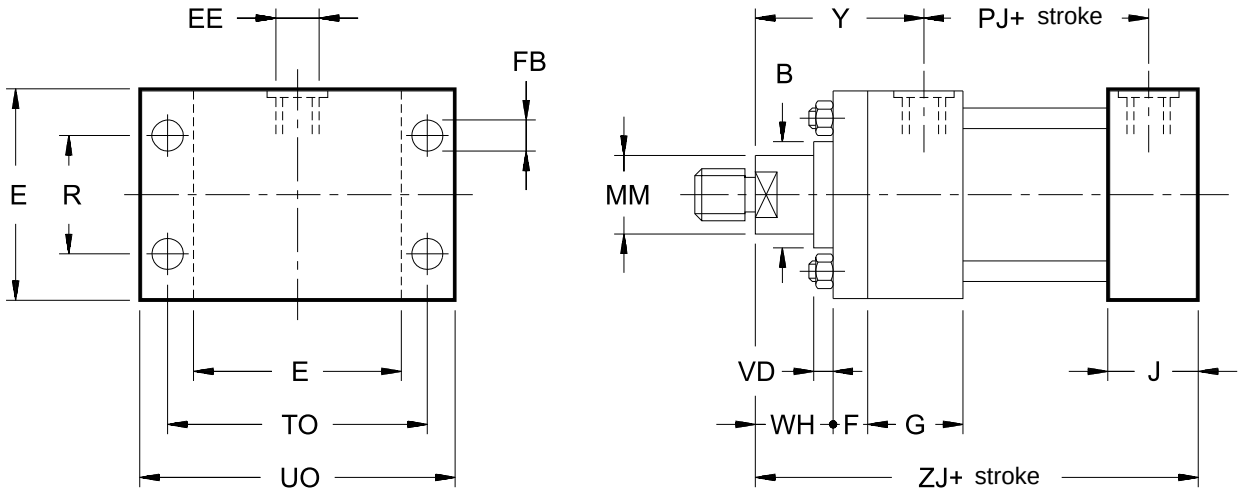
NOTE: The "E" dimension indicated in the table (bores 25 and 32) must be increased of 5 mm, only for the front end, on the oil port side (dimensions not in compliance with ISO standards).

Dimensions in mm

Bore	MM Ø rod	ØB f8	E max	EE BSP	F	ØFB	G	J	PJ	R	ØRD f8	TO	UO max	VD	WF	Y	ZB	ZJ
25	12 18	24 30	40 **NOTE**	1/4"	10	5.5	35	35	54	27	38	51	65	6	25	50	121	114
32	14 18 22	26 30 34	45 **NOTE**	1/4"	10	6.6	36	36	57	33	42	58	70	12 6 12	35	60	137	128
40	18 22 28	30 34 42	63	3/8"	10	11	45	45	74	41	62	87	110	6 12 10	35	62	166	153
50	22 28 36	34 42 50	75	1/2"	16	14	45	45	76	52	74	105	130	7 7 10	41	68	176	159
63	28 36 45	42 50 60	90	1/2"	16	14	45	45	80	65	75 88 88	117	145	7 10 14	48	71	185	168
80	36 45 56	50 60 72	115	3/4"	20	18	50	52	93	83	82 105 105	149	180	5 9 9	51	77	212	190
100	45 56 70	60 72 88	130	3/4"	22	18	50	55	101	97	92 125 125	162	200	7 7 10	57	82	225	203
125	56 70 90	72 88 108	165	1"	22	22	55	71	117	126	105 150 150	208	250	7 10 10	57	86	260	232
160	70 90 110	88 108 133	205	1"	25	26	63	63	130	155	125 170 170	253	300	7	57	86	279	245
200	90 110 140	108 133 163	245	1.1/4"	25	33	80	80	165	190	150 210 210	300	360	7	57	98	336	299

6 - OVERALL AND MOUNTING DIMENSIONS ISO/DIN **ME6**

B REAR FLANGE



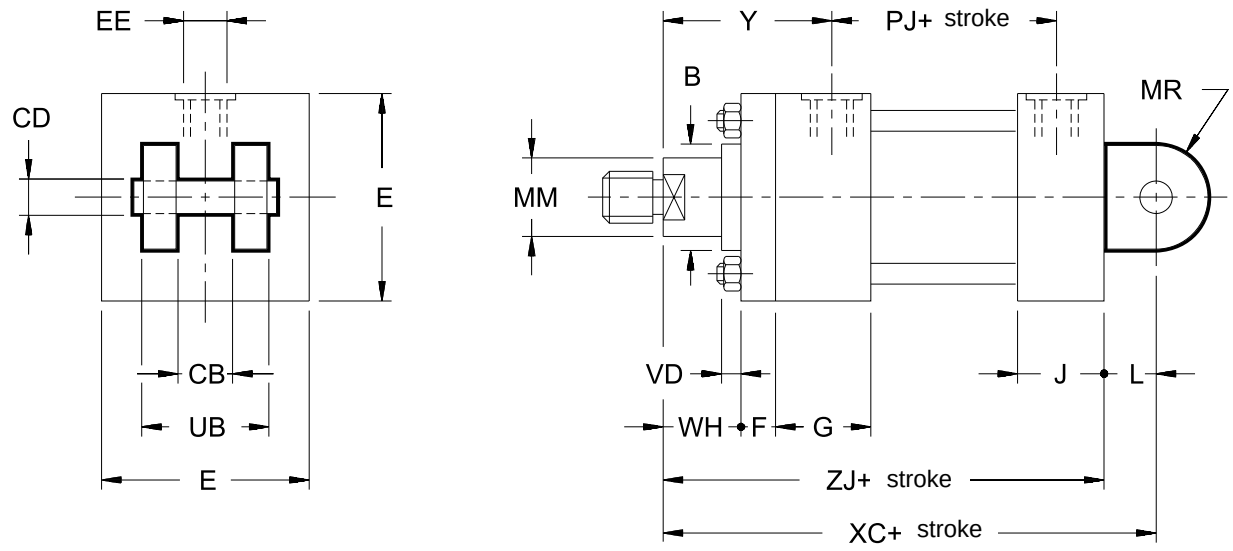
NOTE: The "E" dimension indicated in the table (bores 25 and 32) must be increased of 5 mm, only for the front end, on the oil port side (dimensions not in compliance with ISO standards).

Dimensions in mm

Bore	MM Ø rod	ØB f8	E max	EE BSP	F	ØFB	G	J	PJ	R	TO	UO max	VD	WH	Y	ZJ
25	12 18	24 30	40 **NOTE**	1/4"	10	5.5	45	35	54	27	51	65	6	15	50	114
32	14 18 22	26 30 34	45 **NOTE**	1/4"	10	6.6	45	36	57	33	58	70	12 6 12	25	60	128
40	18 22 28	30 34 42	63	3/8"	10	11	55	45	74	41	87	110	6 12 10	25	62	153
50	22 28 36	34 42 50	75	1/2"	15	14	55	45	76	52	105	130	7 7 10	26	68	159
63	28 36 45	42 50 60	90	1/2"	15	14	55	45	80	65	117	145	7 10 14	33	71	168
80	36 45 56	50 60 72	115	3/4"	20	18	65	52	93	83	149	180	5 9 9	31	77	190
100	45 56 70	60 72 88	130	3/4"	22	18	69	55	101	97	162	200	7 7 10	35	82	203
125	56 70 90	72 88 108	165	1"	22	22	78	71	117	126	208	250	7 10 10	35	86	232
160	70 90 110	88 108 133	205	1"	25	26	86	63	130	155	253	300	7	32	86	245
200	90 110 140	108 133 163	245	1.1/4"	25	33	103	80	165	190	300	360	7	32	98	299

7 - OVERALL AND MOUNTING DIMENSIONS ISO **MP1**

C FEMALE CLEVIS
(with PIN and spring retainers)



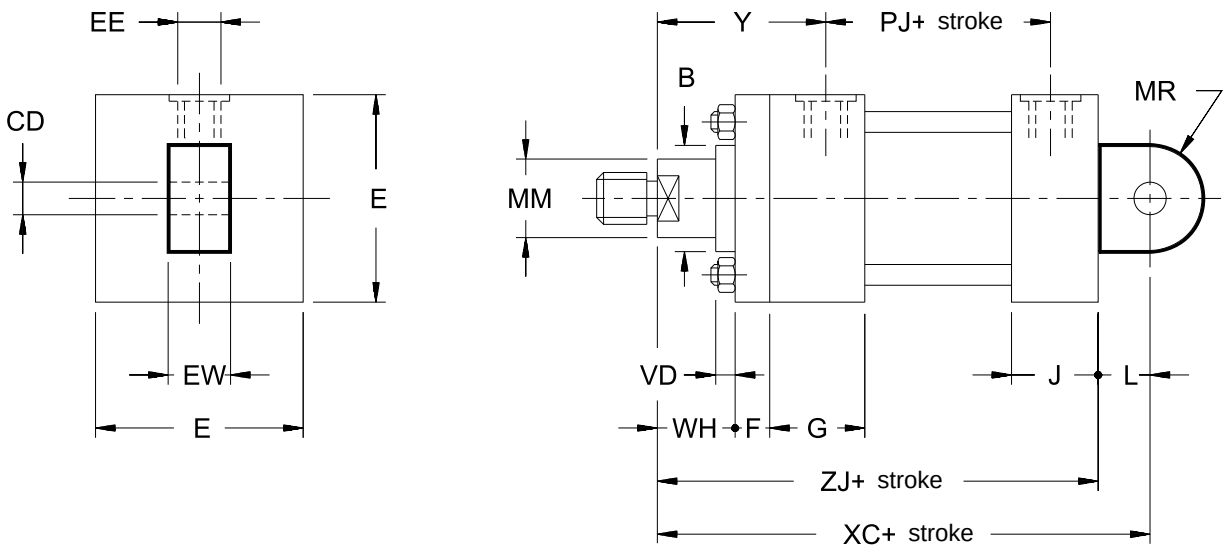
NOTE: The "E" dimension indicated in the table (bores 25 and 32) must be increased of 5 mm, only for the front end, on the oil port side (dimensions not in compliance with ISO standards).

Dimensions in mm

Bore	MM Ø rod	ØB f8	CB A16	ØCD f8	E max	EE BSP	F	G	J	L	MR	PJ	UB	VD	WH	XC	Y	ZJ
25	12 18	24 30	12	10	40 **NOTE**	1/4"	10	45	35	13	12	54	24	6	15	127	50	114
32	14 18 22	26 30 34	16	12	45 **NOTE**	1/4"	10	45	36	19	17	57	32	12 6 12	25	147	60	128
40	18 22 28	30 34 42	20	14	63	3/8"	10	55	45	19	17	74	40	6 12 10	25	172	62	153
50	22 28 36	34 42 50	30	20	75	1/2"	15	55	45	32	29	76	60	7 7 10	26	191	68	159
63	28 36 45	42 50 60	30	20	90	1/2"	15	55	45	32	29	80	60	7 10 14	33	200	71	168
80	36 45 56	50 60 72	40	28	115	3/4"	20	65	52	39	34	93	80	5 9 9	31	229	77	190
100	45 56 70	60 72 88	50	36	130	3/4"	22	69	55	54	50	101	100	7 7 10	35	257	82	203
125	56 70 90	72 88 108	60	45	165	1"	22	78	71	57	53	117	120	7 10 10	35	289	86	232
160	70 90 110	88 108 133	70	56	205	1"	25	86	63	63	59	130	140	7	32	308	86	245
200	90 110 140	108 133 163	80	70	245	1.1/4"	25	103	80	82	78	165	160	7	32	381	98	299

8 - OVERALL AND MOUNTING DIMENSIONS ISO **MP3**

D MALE CLEVIS



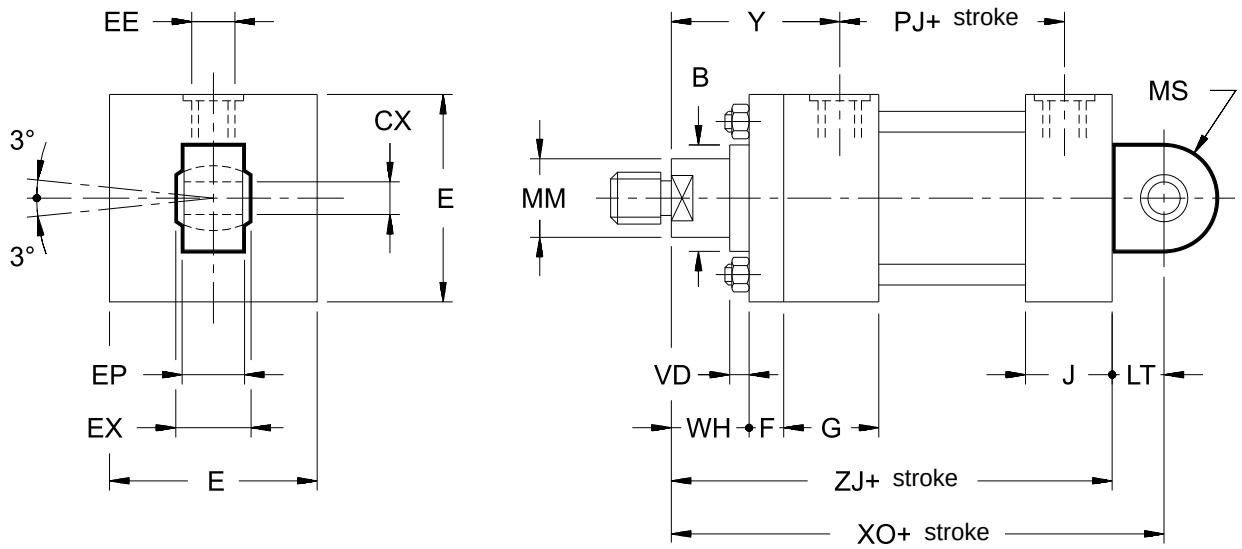
NOTE: The "E" dimension indicated in the table (bores 25 and 32) must be increased of 5 mm, only for the front end, on the oil port side (dimensions not in compliance with ISO standards).

Dimensions in mm

Bore	MM Ø rod	ØB f8	ØCD H9	E max	EE BSP	EW h9	F	G	J	L	MR	PJ	VD	WH	XC	Y	ZJ
25	12 18	24 30	10	40 **NOTE**	1/4"	12	10	45	35	13	12	54	6	15	127	50	114
32	14 18 22	26 30 34	12	45 **NOTE**	1/4"	16	10	45	36	19	17	57	12 6 12	25	147	60	128
40	18 22 28	30 34 42	14	63	3/8"	20	10	55	45	19	17	74	6 12 10	25	172	62	153
50	22 28 36	34 42 50	20	75	1/2"	30	15	55	45	32	29	76	7 7 10	26	191	68	159
63	28 36 45	42 50 60	20	90	1/2"	30	15	55	45	32	29	80	7 10 14	33	200	71	168
80	36 45 56	50 60 72	28	115	3/4"	40	20	65	52	39	34	93	5 9 9	31	229	77	190
100	45 56 70	60 72 88	36	130	3/4"	50	22	69	55	54	50	101	7 7 10	35	257	82	203
125	56 70 90	72 88 108	45	165	1"	60	22	78	71	57	53	117	7 10 10	35	289	86	232
160	70 90 110	88 108 133	56	205	1"	70	25	86	63	63	59	130	7	32	308	86	245
200	90 110 140	108 133 163	70	245	1.1/4"	80	25	103	80	82	78	165	7	32	381	98	299

9 - OVERALL AND MOUNTING DIMENSIONS ISO/DIN **MP5**

F SPHERIC SWIVEL



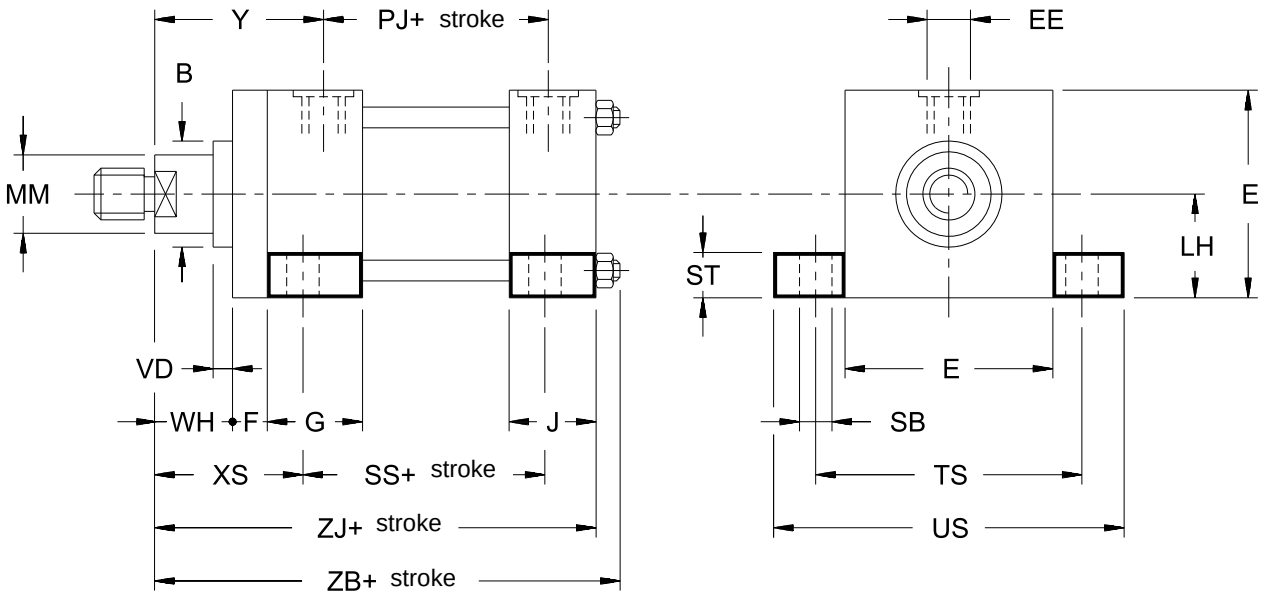
NOTE: The "E" dimension indicated in the table (bores 25 and 32) must be increased of 5 mm, only for the front end, on the oil port side (dimensions not in compliance with ISO standards).

Dimensions in mm

Bore	MM Ø rod	ØB f8	ØCX	E max	EE BSP	EP	EX	F	G	J	LT	MS	PJ	VD	WH	XO	Y	ZJ
25	12 18	24 30	$12^{\ 0}_{-0.008}$	40 **NOTE**	1/4"	8	$10^{\ 0}_{-0.12}$	10	45	35	16	20	54	6	15	130	50	114
32	14 18 22	26 30 34	$16^{\ 0}_{-0.008}$	45 **NOTE**	1/4"	11	$14^{\ 0}_{-0.12}$	10	45	36	20	22	57	12 6 12	25	148	60	128
40	18 22 28	30 34 42	$20^{\ 0}_{-0.012}$	63	3/8"	13	$16^{\ 0}_{-0.12}$	10	55	45	25	29	74	6 12 10	25	178	62	153
50	22 28 36	34 42 50	$25^{\ 0}_{-0.012}$	75	1/2"	17	$20^{\ 0}_{-0.12}$	15	55	45	31	33	76	7 7 10	26	190	68	159
63	28 36 45	42 50 60	$30^{\ 0}_{-0.012}$	90	1/2"	19	$22^{\ 0}_{-0.12}$	15	55	45	38	40	80	7 10 14	33	206	71	168
80	36 45 56	50 60 72	$40^{\ 0}_{-0.012}$	115	3/4"	23	$28^{\ 0}_{-0.12}$	20	65	52	48	50	93	5 9 9	31	238	77	190
100	45 56 70	60 72 88	$50^{\ 0}_{-0.012}$	130	3/4"	30	$35^{\ 0}_{-0.12}$	22	69	55	58	62	101	7 7 10	35	261	82	203
125	56 70 90	72 88 108	$60^{\ 0}_{-0.015}$	165	1"	38	$44^{\ 0}_{-0.15}$	22	78	71	72	80	117	7 10 10	35	304	86	232
160	70 90 110	88 108 133	$80^{\ 0}_{-0.015}$	205	1"	47	$55^{\ 0}_{-0.15}$	25	86	63	92	100	130	7	32	337	86	245
200	90 110 140	108 133 163	$100^{\ 0}_{-0.020}$	245	1.1/4"	57	$70^{\ 0}_{-0.20}$	25	103	80	116	120	165	7	32	415	98	299

10 - OVERALL AND MOUNTING DIMENSIONS ISO/DIN MS2

G FEET



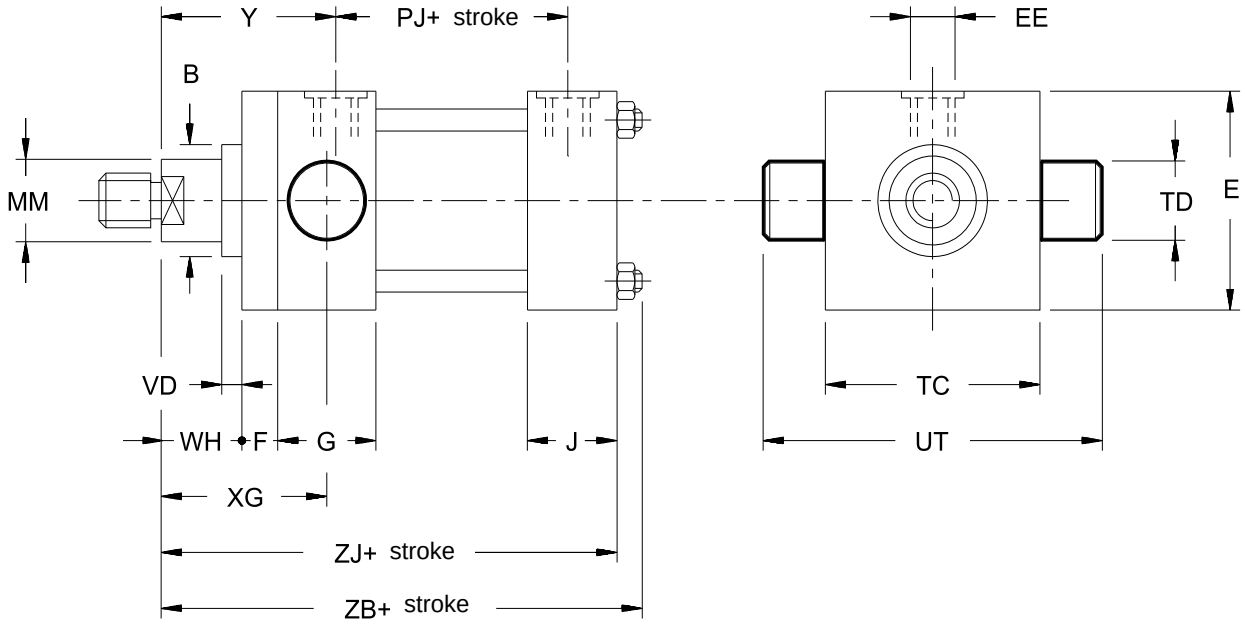
NOTE: The "E" dimension indicated in the table (bores 25 and 32) must be increased of 5 mm, only for the front end, on the oil port side (dimensions not in compliance with ISO standards).

Dimensions in mm

Bore	MM Ø rod	ØB f8	E max	EE BSP	F	G	J	LH h10	PJ	ØSB	SS	ST	TS	US max	VD	WH	XS	Y	ZB	ZJ
25	12 18	24 30	40 **NOTE**	1/4"	10	45	35	19	54	6.6	73	8.5	54	72	6	15	33	50	121	114
32	14 18 22	26 30 34	45 **NOTE**	1/4"	10	45	36	22	57	9	73	12.5	63	84	12 6 12	25	45	60	137	128
40	18 22 28	30 34 42	63	3/8"	10	55	45	31	74	11	98	12.5	83	103	6 12 10	25	45	62	166	153
50	22 28 36	34 42 50	75	1/2"	15	55	45	37	76	14	92	19	102	127	7 7 10	26	54	68	176	159
63	28 36 45	42 50 60	90	1/2"	15	55	45	44	80	18	86	26	124	161	7 10 14	33	65	71	185	168
80	36 45 56	50 60 72	115	3/4"	20	65	52	57	93	18	105	26	149	186	5 9 9	31	68	77	212	190
100	45 56 70	60 72 88	130	3/4"	22	69	55	63	101	26	102	32	172	216	7 7 10	35	79	82	225	203
125	56 70 90	72 88 108	165	1"	22	78	71	82	117	26	131	32	210	254	7 10 10	35	79	86	260	232
160	70 90 110	88 108 133	205	1"	25	86	63	101	130	33	130	38	260	318	7	32	86	86	279	245
200	90 110 140	108 133 163	245	1.1/4"	25	103	80	122	165	39	172	44	311	381	7	32	92	98	336	299

11 - OVERALL AND MOUNTING DIMENSIONS ISO MT1

H FRONT SWINGING



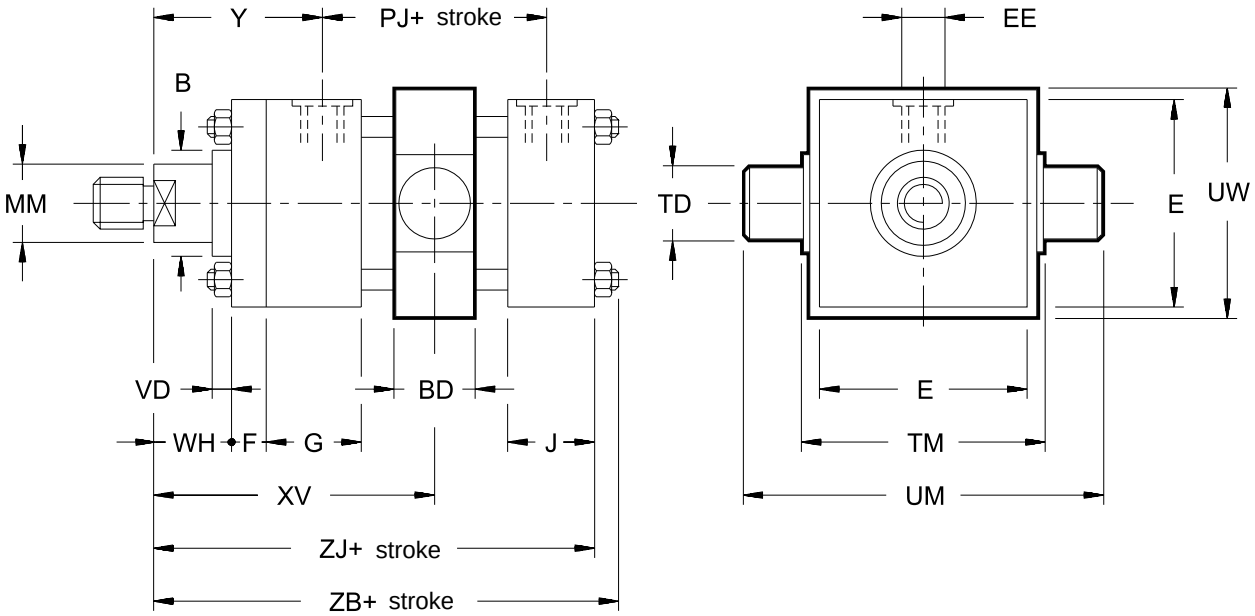
NOTE: The "E" dimension indicated in the table (bores 25 and 32) must be increased of 5 mm, only for the front end, on the oil port side (dimensions not in compliance with ISO standards).

Dimensions in mm

Bore	MM Ø rod	ØB f8	E max	EE BSP	F	G	J	PJ	ØTD f8	TC	UT	VD	WH	XG	Y	ZB	ZJ
25	12 18	24 30	40 **NOTE**	1/4"	10	45	35	54	12	38	58	6	15	44	50	121	114
32	14 18 22	26 30 34	45 **NOTE**	1/4"	10	45	36	57	16	44	68	12 6 12	25	54	60	137	128
40	18 22 28	30 34 42	63	3/8"	10	55	45	74	20	63	95	6 12 10	25	57	62	166	153
50	22 28 36	34 42 50	75	1/2"	15	55	45	76	25	76	116	7 7 10	26	64	68	176	159
63	28 36 45	42 50 60	90	1/2"	15	55	45	80	32	89	139	7 10 14	33	70	71	185	168
80	36 45 56	50 60 72	115	3/4"	20	65	52	93	40	114	178	5 9 9	31	76	77	212	190
100	45 56 70	60 72 88	130	3/4"	-	91	55	101	50	127	207	7 7 10	35	71	82	225	203
125	56 70 90	72 88 108	165	1"	-	100	71	117	63	165	265	7 10 10	35	75	86	260	232
160	70 90 110	88 108 133	205	1"	-	111	63	130	80	203	329	7	32	75	86	279	245
200	90 110 140	108 133 163	245	1.1/4"	-	128	80	165	100	241	401	7	32	85	98	336	299

12 - OVERALL AND MOUNTING DIMENSIONS ISO/DIN MT4

L MID SWINGING



* dimension to be defined in the order (see p. 2)

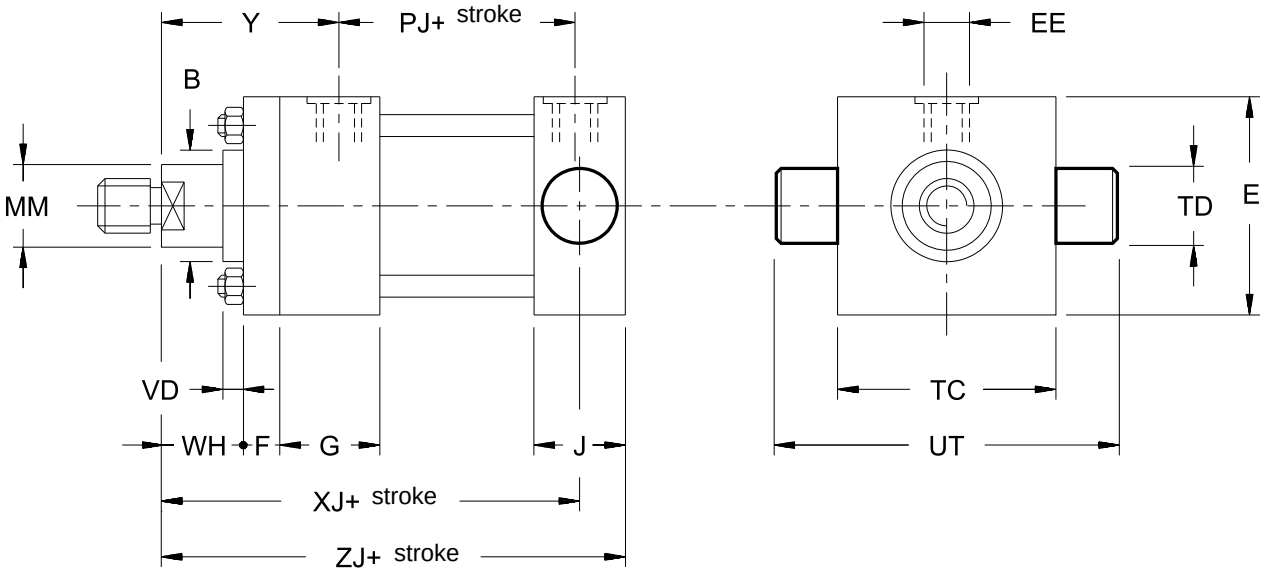
NOTE: The "E" dimension indicated in the table (bores 25 and 32) must be increased of 5 mm, only for the front end, on the oil port side (dimensions not in compliance with ISO standards).

Dimensions in mm

Bore	MM Ø rod	ØB f8	BD	E max	EE BSP	F	G	J	PJ	ØTD f8	TM	UM	UW	VD	WH	XV* min	XV max + stroke	Y	ZB	ZJ	min stroke
25	12 18	24 30	20	40 **NOTE**	1/4"	10	45	35	54	12	48	68	45	6	15	80	69	50	121	114	11
32	14 18 22	26 30 34	25	45 **NOTE**	1/4"	10	45	36	57	16	55	79	50	12 6 12	25	93	79	60	137	128	13
40	18 22 28	30 34 42	30	63	3/8"	10	55	45	74	20	76	108	70	6 12 10	25	105	93	62	166	153	12
50	22 28 36	34 42 50	40	75	1/2"	15	55	45	76	25	89	129	85	7 7 10	26	116	94	68	176	159	22
63	28 36 45	42 50 60	40	90	1/2"	15	55	45	80	32	100	150	95	7 10 14	33	123	103	71	185	168	20
80	36 45 56	50 60 72	45	115	3/4"	20	65	52	93	40	127	191	120	5 9 9	31	139	115	77	212	190	23
100	45 56 70	60 72 88	60	130	3/4"	22	69	55	101	50	140	220	130	7 7 10	35	156	118	82	225	203	38
125	56 70 90	72 88 108	70	165	1"	22	78	71	117	63	178	278	170	7 10 10	35	170	126	86	260	232	44
160	70 90 110	88 108 133	90	205	1"	25	86	63	130	80	215	341	205	7	32	188	137	86	279	245	51
200	90 110 140	108 133 163	110	245	1¼"	25	103	80	165	100	279	439	275	7	32	215	164	98	336	299	51

13 - OVERALL AND MOUNTING DIMENSIONS ISO MT2

N REAR SWINGING



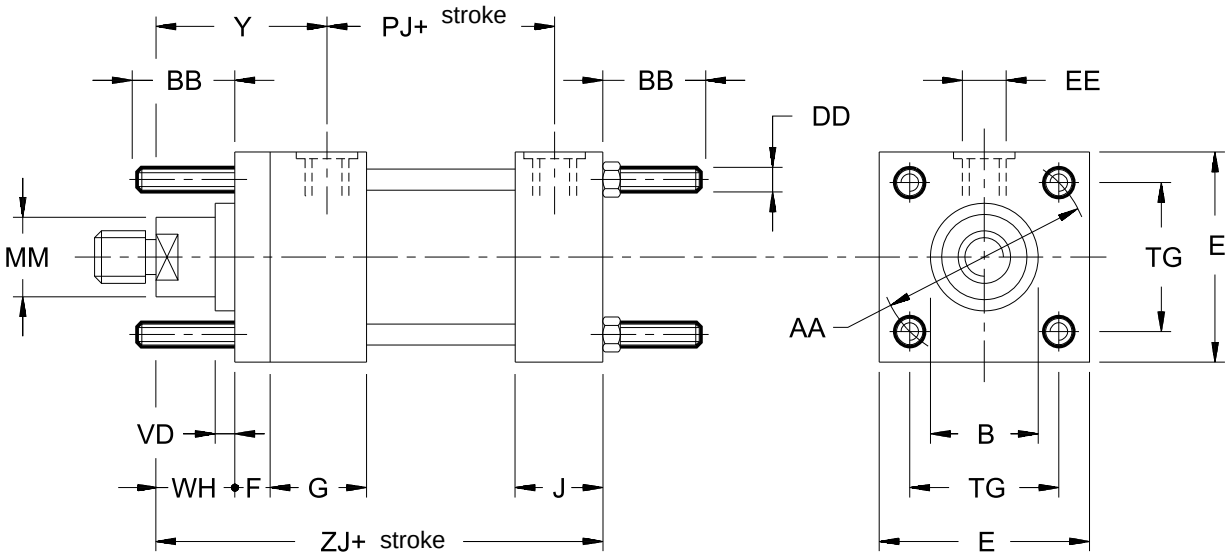
NOTE: The "E" dimension indicated in the table (bores 25 and 32) must be increased of 5 mm, only for the front end, on the oil port side (dimensions not in compliance with ISO standards).

Dimensions in mm

Bore	MM Ø rod	ØB f8	E max	EE BSP	F	G	J	PJ	ØTD f8	TC	UT	VD	WH	XJ	Y	ZJ
25	12 18	24 30	40 **NOTE**	1/4"	10	45	35	54	12	38	58	6	15	101	50	114
32	14 18 22	26 30 34	45 **NOTE**	1/4"	10	45	36	57	16	44	68	12 6 12	25	115	60	128
40	18 22 28	30 34 42	63	3/8"	10	55	45	74	20	63	95	6 12 10	25	134	62	153
50	22 28 36	34 42 50	75	1/2"	15	55	45	76	25	76	116	7 7 10	26	140	68	159
63	28 36 45	42 50 60	90	1/2"	15	55	45	80	32	89	139	7 10 14	33	149	71	168
80	36 45 56	50 60 72	115	3/4"	20	65	52	93	40	114	178	5 9 9	31	168	77	190
100	45 56 70	60 72 88	130	3/4"	22	69	68	101	50	127	207	7 7 10	35	187	82	216
125	56 70 90	72 88 108	165	1"	22	78	85	117	63	165	265	7 10 10	35	209	86	246
160	70 90 110	88 108 133	205	1"	25	86	95	130	80	203	329	7	32	230	86	277
200	90 110 140	108 133 163	245	1.1/4"	25	103	115	165	100	241	401	7	32	276	98	334

14 - OVERALL AND MOUNTING DIMENSIONS ISO MX1-MX2-MX3

P FRONT TIE RODS MX3
Q REAR TIE RODS MX2
R FRONT AND REAR TIE RODS MX1



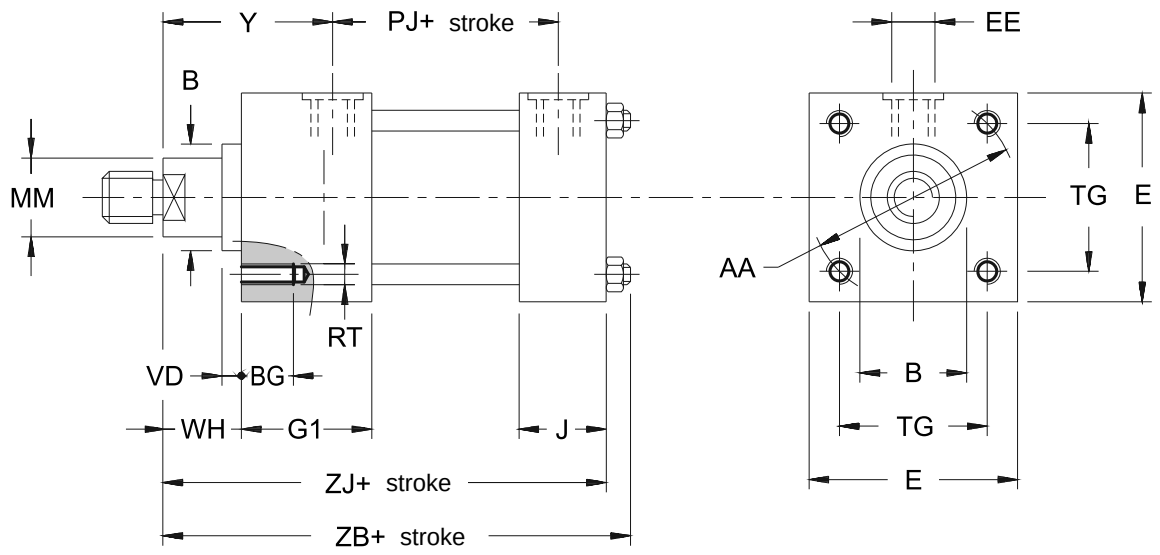
NOTE: The "E" dimension indicated in the table (bores 25 and 32) must be increased of 5 mm, only for the front end, on the oil port side (dimensions not in compliance with ISO standards).

Dimensions in mm

Bore	MM Ø rod	AA	ØB f8	BB	DD	E max	EE BSP	F	G	J	PJ	TG	VD	WH	Y	ZJ
25	12 18	40	24 30	19	M5x0.8	40 **NOTE**	1/4"	10	45	35	54	28.3	6	15	50	114
32	14 18 22	47	26 30 34	24	M6x1	45 **NOTE**	1/4"	10	45	36	57	33.2	12 6 12	25	60	128
40	18 22 28	59	30 34 42	35	M8x1	63	3/8"	10	55	45	74	41.7	6 12 10	25	62	153
50	22 28 36	74	34 42 50	46	M12x1.25	75	1/2"	15	55	45	76	52.3	7 7 10	26	68	159
63	28 36 45	91	42 50 60	46	M12x1.25	90	1/2"	15	55	45	80	64.3	7 10 14	33	71	168
80	36 45 56	117	50 60 72	59	M16x1.5	115	3/4"	20	65	52	93	82.7	5 9 9	31	77	190
100	45 56 70	137	60 72 88	59	M16x1.5	130	3/4"	22	69	55	101	96.9	7 7 10	35	82	203
125	56 70 90	178	72 88 108	81	M22x1.5	165	1"	22	78	71	117	125.9	7 10 10	35	86	232
160	70 90 110	219	88 108 133	92	M27x2	205	1"	25	86	63	130	154.9	7	32	86	245
200	90 110 140	269	108 133 163	115	M30x2	245	1.1/4"	25	103	80	165	190.2	7	32	98	299

15 - OVERALL AND MOUNTING DIMENSIONS ISO MX5

T FRONT THREADED HOLES



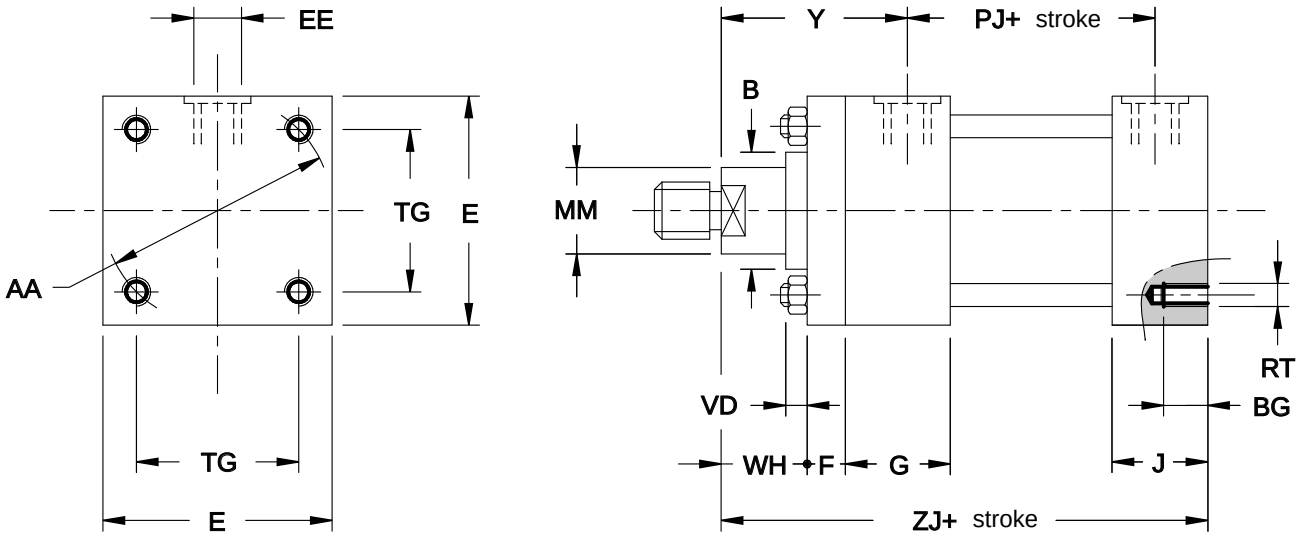
NOTE: The "E" dimension indicated in the table (bores 25 and 32) must be increased of 5 mm, only for the front end, on the oil port side (dimensions not in compliance with ISO standards).

Dimensions in mm

Bore	MM Ø rod	AA	ØB f8	BG	E max	EE BSP	G1	J	PJ	RT	TG	VD	WH	Y	ZB	ZJ
25	12 18	40	24 30	8	40 **NOTE**	1/4"	55	35	54	M5x0.8	28.3	6	15	50	121	114
32	14 18 22	47	26 30 34	9	45 **NOTE**	1/4"	55	36	57	M6x1	33.2	12 6 12	25	60	137	128
40	18 22 28	59	30 34 42	12	63	3/8"	65	45	74	M8x1.25	41.7	6 12 10	25	62	166	153
50	22 28 36	74	34 42 50	18	75	1/2"	70	45	76	M12x1.75	52.3	7 7 10	26	68	176	159
63	28 36 45	91	42 50 60	18	90	1/2"	70	45	80	M12x1.75	64.3	7 10 14	33	71	185	168
80	36 45 56	117	50 60 72	24	115	3/4"	85	52	93	M16x2	82.7	5 9 9	31	77	212	190
100	45 56 70	137	60 72 88	24	130	3/4"	91	55	101	M16x2	96.9	7 7 10	35	82	225	203
125	56 70 90	178	72 88 108	27	165	1"	100	71	117	M22x2.5	125.9	7 10 10	35	86	260	232
160	70 90 110	219	88 108 133	32	205	1"	111	63	130	M27x3	154.9	7	32	86	279	245
200	90 110 140	269	108 133 163	40	245	1¼"	128	80	165	M30x3.5	190.2	7	32	98	336	299

16 - OVERALL AND MOUNTING DIMENSIONS ISO MX6

U REAR THREADED HOLES



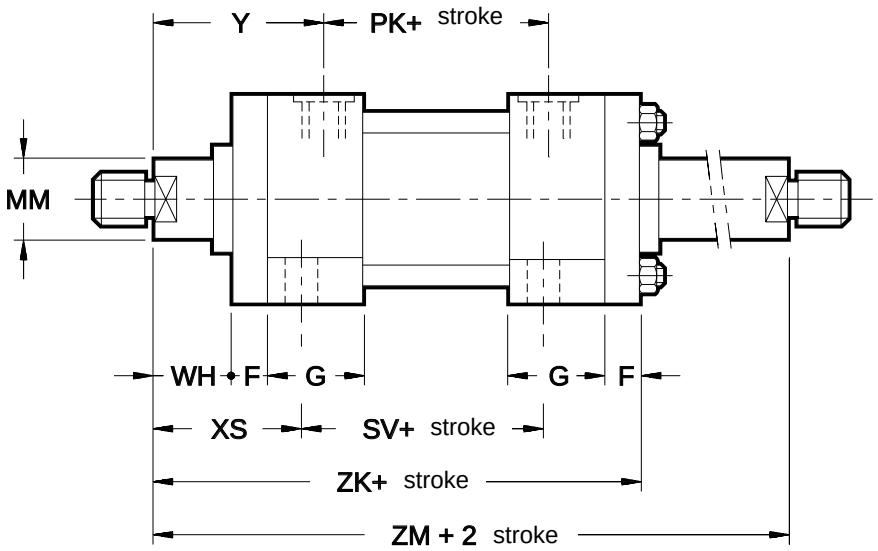
NOTE: The "E" dimension indicated in the table (bores 25 and 32) must be increased of 5 mm, only for the front end, on the oil port side (dimensions not in compliance with ISO standards).

Dimensions in mm

Bore	MM Ø rod	AA	ØB f8	BG	E max	EE BSP	F	G	J	PJ	RT	TG	VD	WH	Y	ZJ
25	12 18	40	24 30	8	40 **NOTE**	1/4"	10	45	35	54	M5x0.8	28.3	6	15	50	114
32	14 18 22	47	26 30 34	9	45 **NOTE**	1/4"	10	45	36	57	M6x1	33.2	12 6 12	25	60	128
40	18 22 28	59	30 34 42	12	63	3/8"	10	55	45	74	M8x1.25	41.7	6 12 10	25	62	153
50	22 28 36	74	34 42 50	18	75	1/2"	15	55	45	76	M12x1.75	52.3	7 7 10	26	68	159
63	28 36 45	91	42 50 60	18	90	1/2"	15	55	45	80	M12x1.75	64.3	7 10 14	33	71	168
80	36 45 56	117	50 60 72	24	115	3/4"	20	65	52	93	M16x2	82.7	5 9 9	31	77	190
100	45 56 70	137	60 72 88	24	130	3/4"	22	69	55	101	M16x2	96.9	7 7 10	35	82	203
125	56 70 90	178	72 88 108	27	165	1"	22	78	71	117	M22x2.5	125.9	7 10 10	35	86	232
160	70 90 110	219	88 108 133	32	205	1"	25	86	63	130	M27x3	154.9	7	32	86	245
200	90 110 140	269	108 133 163	40	245	1.1/4"	25	103	80	165	M30x3.5	190.2	7	32	98	299

17 - OVERALL AND MOUNTING DIMENSIONS

DOUBLE ROD



Dimensions in mm

For other dimensions and mounting styles please see single rod cylinder tables.
Not available for mounting styles B-C-D-F-N-Q-U

Bore	MM Ø rod	F	G	PK	SV	WH	XS	Y	ZM	ZK
25	12 18	10	45	49	88	15	33	50	154	134
32	14 18 22	10	45	52	88	25	45	60	178	147
40	18 22 28	10	55	74	105	25	45	62	195	173
50	22 28 36	15	55	76	99	26	54	67	207	184
63	28 36 45	15	55	84	93	33	65	71	223	193
80	36 45 56	20	65	100	110	31	68	77	246	223
100	45 56 70	22	69	110	107	35	79	82	265	239
125	56 70 90	22	78	124	131	35	79	86	288	261
160	70 90 110	25	86	130	130	32	86	86	302	270
200	90 110 140	25	103	160	172	32	92	98	356	324

NOTE: Double rod cylinders are developed with two separate rods, fixed together by means of threading. Because of this mounting style, the rod with female threading is less resistant than the other.

To simplify the identification of the more resistant rod, the "**M"** marking is stamped on its end.

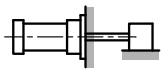
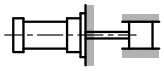
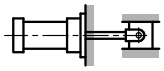
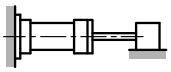
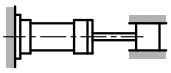
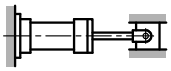
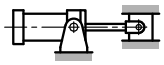
We recommend the use of the weaker rod for the less demanding applications.

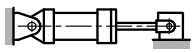
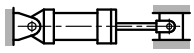
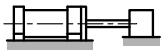
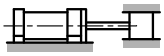
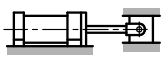
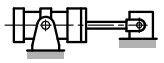
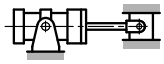
18 - ROD DIAMETER SELECTION

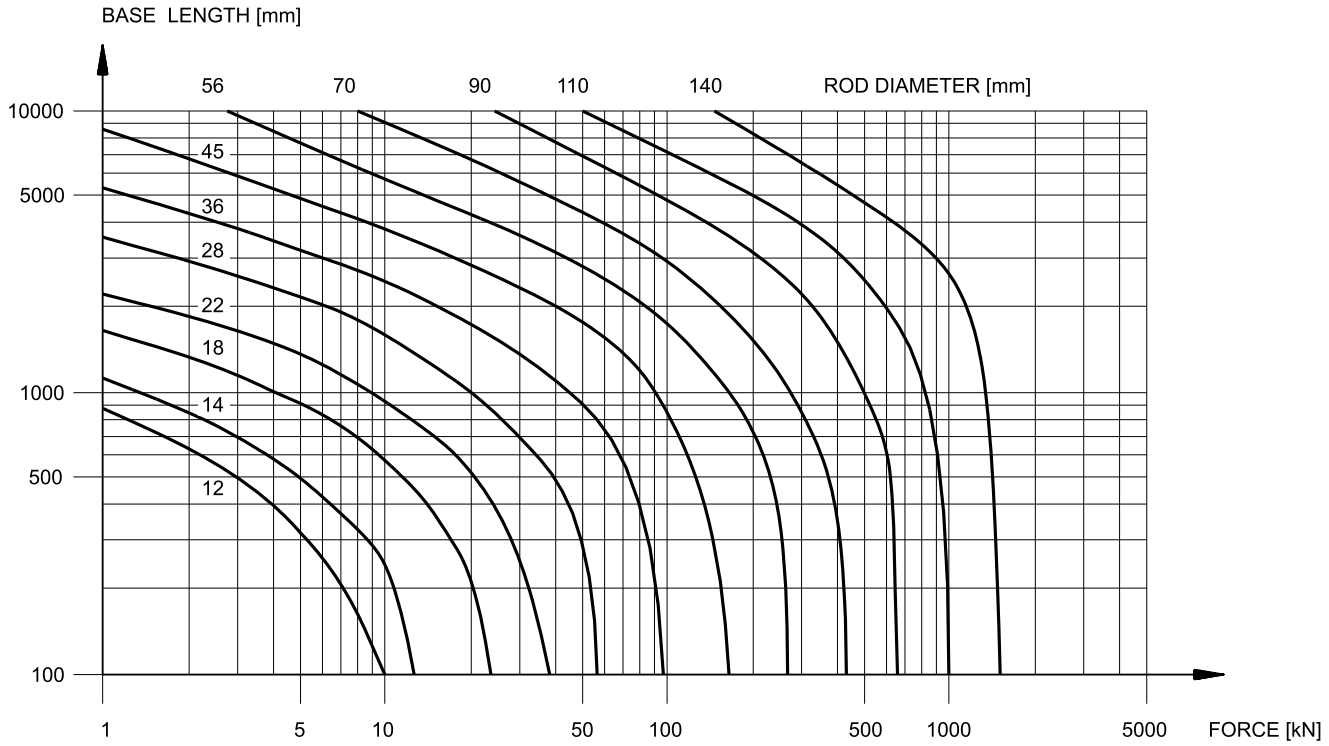
To ensure adequate stability, cylinders must be calculated for maximum compressive load according to the following simplified procedure:

- Refer to the table to identify the stroke factor according to the mounting style.
- To calculate the reference length, multiply the working stroke by the stroke factor.
- To calculate the thrust force, multiply the total cylinder area by the operating pressure.
- On the diagram, find the point of intersection between the thrust force and reference length.
- Identify the minimum rod diameter on the curve above the previous point of intersection.

Cylinders with rod diameters smaller than the value plotted in the diagram will not guarantee sufficient rigidity.

Mounting style	Rod connection	Mounting	Stroke factor
A-P-R-T	Fixed and supported		2
	Fixed and rigidly guided		0.5
	Jointed and rigidly guided		0.7
B-Q-U	Fixed and supported		4
	Fixed and rigidly guided		1
	Jointed and rigidly guided		1.5
H	Jointed and rigidly guided		1

Mounting style	Rod connection	Mounting	Stroke factor
C-D-F-N	Jointed and supported		4
	Jointed and rigidly guided		2
G	Fixed and supported		2
	Fixed and rigidly guided		0.5
	Jointed and rigidly guided		0.7
L	Jointed and supported		3
	Jointed and rigidly guided		1.5



19 - THEORETICAL FORCES

Push force

$$Fs = P \cdot At$$

Pull force

$$Ft = P \cdot Aa$$

Fs = Force (extension) in N
Ft = Force (retraction) in N
At = Total area in mm²
Aa = Annular area in mm²
P = Pressure in MPa

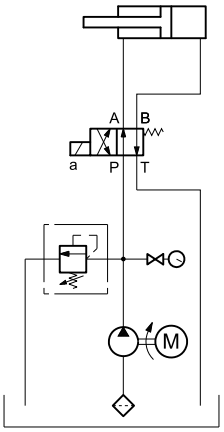
1 bar = 0.1 MPa
1 kgf = 9.81 N

Bore mm	Ø rod mm	Total area mm²	Annular area mm²
25	12	491	378
	18		236
32	14	804	650
	18		550
	22		424
40	18	1 257	1 002
	22		876
	28		641
50	22	1 964	1 583
	28		1 348
	36		946
63	28	3 117	2 502
	36		2 099
	45		1 527
80	36	5 027	4 009
	45		3 437
	56		2 564
100	45	7 854	6 264
	56		5 391
	70		4 006
125	56	12 272	9 809
	70		8 424
	90		5 910
160	70	20 106	16 258
	90		13 744
	110		10 603
200	90	31 416	25 054
	110		21 913
	140		16 022

20 - THEORETICAL VELOCITY

Configuration 1

The diagram illustrates a conventional cylinder application: the fluid is delivered by means of a directional control valve in alternation to the front chamber while the rear chamber is connected to tank and vice versa.
To calculate velocity and force, proceed as follows:



Velocity (extension) $V = \frac{Q \cdot 1000}{At \cdot 60}$

Velocity (retraction) $V = \frac{Q \cdot 1000}{Aa \cdot 60}$

Force (extension) $F = P \cdot At$

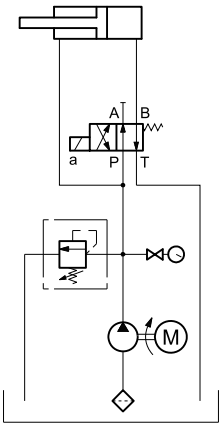
Force (retraction) $F = P \cdot Aa$

V = Velocity in m/s
Q = Flow rate in l/min
At = Total area (piston bore) in mm²
Aa = Annular area (At - As) in mm²
F = Force in N
P = Pressure in MPa
As = Rod area (At - Aa) in mm²
Qd = Flow rate through directional control valve (Q+return flow rate from small chamber) in l/min

1 bar = 0.1 MPa
1 kgf = 9.81 N

Configuration 2

When the system requires high velocity with relatively low forces, we recommend using a regenerative circuit. The diagram 2 illustrates the simplest version of this type of set-up.
The annular chamber is permanently connected to the pump while the full bore end is connected alternately to the pump, in which case the piston rod extends as a result of the differential areas (both chambers are supplied at the same pressure), and to tank, in which case the piston rod retracts.



Velocity (extension) $V = \frac{Q \cdot 1000}{As \cdot 60}$

Velocity (retraction) $V = \frac{Q \cdot 1000}{Aa \cdot 60}$

Force (extension) $F = P \cdot As$

Force (retraction) $F = P \cdot Aa$

NOTE: In regenerative circuits, the sizing of the directional control valve is fundamental. Flow rate through the directional control valve is calculated according to the following formula:

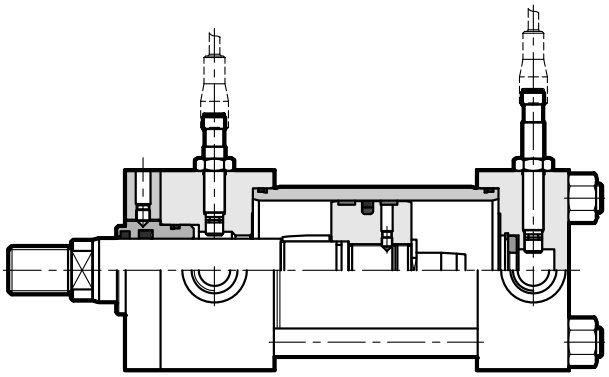
$$Qd = \frac{V \cdot At \cdot 60}{1000}$$

21 - MASSES

Bore	Ø rod	Mass for null stroke						Mass for 10 mm stroke
		Mounting style						
		P-Q-R-T-U	G	A-B	C-D-F	H-N	L	
mm	mm	kg	kg	kg	kg	kg	kg	kg
25	12 18	1.2 1.2	1.3 1.3	1.4 1.4	1.4 1.4	1.4 1.4	1.5 1.5	0.04 0.06
32	14 18 22	1.6 1.6 1.7	1.8 1.8 1.8	1.9 1.9 1.9	1.9 1.9 1.9	1.7 1.7 1.7	1.9 1.9 1.9	0.06 0.07 0.08
40	18 22 28	3.7 3.7 3.8	3.9 3.9 4	4.6 4.6 4.7	4.2 4.2 4.3	3.9 3.9 4	4.6 4.6 4.7	0.1 0.11 0.12
50	22 28 36	5.9 6 6.1	6.4 6.5 6.6	7.1 7.2 7.3	7.1 7.2 7.3	6.3 6.4 6.5	7.9 8 8.1	0.14 0.17 0.18
63	28 36 45	8.5 8.6 8.7	9.7 9.8 9.9	10 10.1 10.2	10.1 10.3 10.4	8.8 8.9 9.1	10.5 10.6 10.7	0.19 0.22 0.26
80	36 45 56	16 16.2 16.3	17.2 17.4 17.6	18.8 19 19.1	19.5 19.6 19.8	16.6 16.7 16.9	19 20 22	0.27 0.32 0.39
100	45 56 70	22 22.5 23	23 24 25	25 25.5 26	28.1 28.5 29	22.8 23.1 23.4	26 27 28	0.4 0.48 0.58
125	56 70 90	41.5 42.5 44	44 44.5 45	47.5 48 49	53 54 55	42.5 43 44	48 49 50	0.65 0.76 0.96
160	70 90 110	69 70 71	72 73 74	79 80 81	89.5 91 92	71 72 72.5	84 85 86	1 1.2 1.4
200	90 110 140	122 123 124	128.5 129.5 131	137 139 140	157 158 159	127 128.5 129.5	152 153 155	1.6 1.8 2.2

22 - END-STROKE PROXIMITY SENSORS

On request, cylinders can be supplied with end-stroke proximity sensors type PNP, with normally open output. They are mounted on the front and rear end of the cylinder and they supply an electric signal when the piston rod reaches the stroke end.



They are available for all cylinder mounting styles, from Ø40, with the following limits:

bore Ø40:

mounting	A-H	available on rear end only
mounting	B-N	available on front end only

bore Ø50:

mounting	H	available on rear end only
mounting	N	available on front end only

bores Ø80 and Ø100:

mounting	N	available on front end only

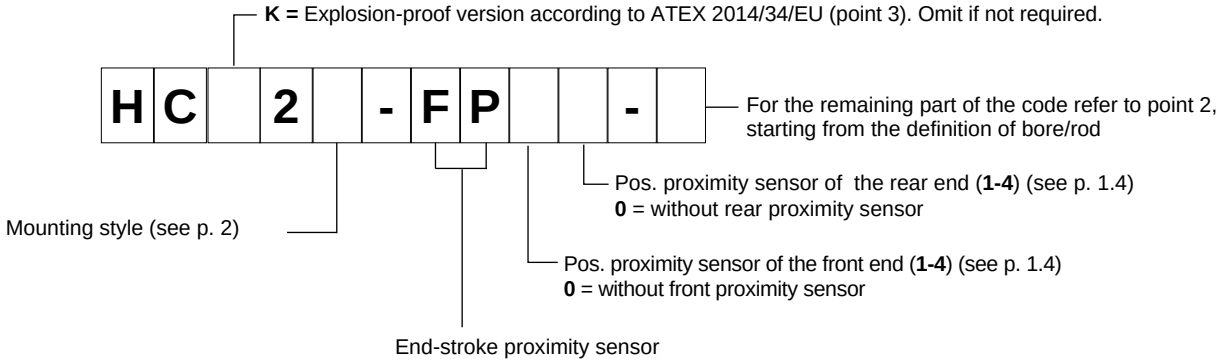
bores Ø125/56, Ø160 and Ø200:

mounting	A	available on rear end only
mounting	B	available on front end only

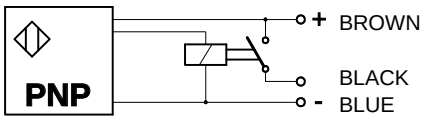
In order to ensure the correct functioning of the system, cylinders must be equipped with cushionings.

These sensors can be only used to provide the switching signal and not to control voltage loads.

22.1 - Identification code



22.2 - Technical characteristics and electrical connection



Rated voltage	VDC	24
Power supply voltage range	VDC	10 ÷ 30
Absorbed current	mA	200
Output	normally open contact	
Electric protection	polarity inversion short circuit overvoltage	
Electric connection	with connector	
Maximum operating pressure	bar	500
Operating temperature range	°C	-25 / +80
Class of protection according IEC EN 60529 (atmospheric ag.)		IP68
Piston position LED (**NOTE**)		NO (it's on the connector)

22.3 - Connectors (to be ordered separately)

NOTE: These connectors are not suitable for ATEX-rated cylinders. The connectors for the ATEX-rated cylinders are described at point 3.5.

Code: **ECM3S/M12L/10/L5**

Connector: pre-wired connector M12 - IP68
Cable: with 3 conductors 0.34 mm² - length 5 mt.
Cable material: polyurethane resin (oil resistant)

LED indication:

The connector has two LEDs, one green and one yellow.

GREEN: Connector power supply.
The LED lights up when the connector is powered.

YELLOW: position signal.
ON - piston at stroke end
OFF - piston not at stroke end

23 - MAGNETIC END-STROKE SENSORS

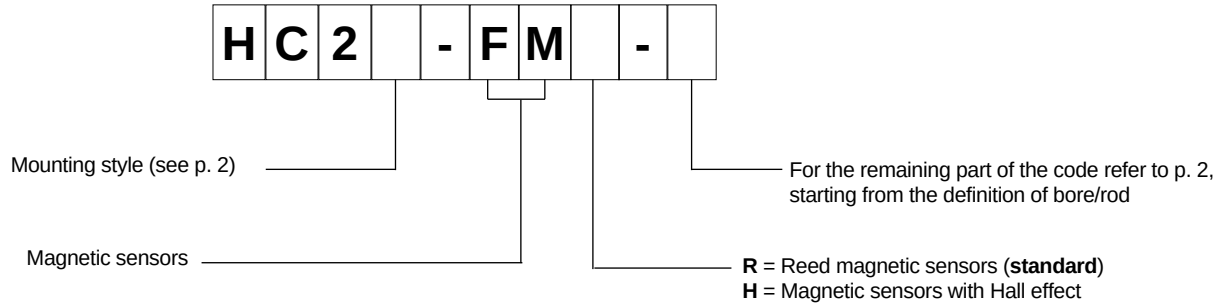
Upon request, cylinders can be supplied with adjustable magnetic sensors, mounted on tie rods, which allow the reading in every position of the piston, both intermediate and end stroke. The “switching zone” of these sensors can reach about 30÷40 mm, depending on piston speed and cylinder bore. Therefore, if the Client needs to read with precision only the signal of the stroke end, and not of other positions, we recommend the use of end-stroke proximity sensors (see p. 22), rather than magnetic sensors.

Magnetic sensors are available for bores Ø25 to Ø125 included. For cylinders with strokes under 80 mm and for cylinders with mid swinging mounting type, we recommend to consult our technical office, because, in some applications, magnetization problems of cylinder parts could happen, affecting the correct functioning of the system.

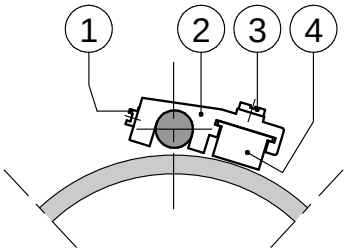
Cylinders are supplied with 2 magnetic sensors, already mounted on tie rods, which can be of two types:

- Reed magnetic sensors (**standard**): they are sensors with normally open contact, which commute exploiting the magnetic field generated by the plastoferrite ring inserted in the piston. They have a long electric life and a switching power which allows to control voltage loads directly.
- Magnetic sensors with Hall effect: they are sensors which read the voltage variation generated by the piston movement, by means of a normally open electronic semiconductor type PNP. Because of the absence of moving parts inside the sensors, they guarantee a much longer electric life than that of Reed sensors, a high sensitivity and switching reliability. As opposed to Reed sensors, these sensors can be used only to provide the switching signal and not to control voltage loads.

23.1 - Identification code



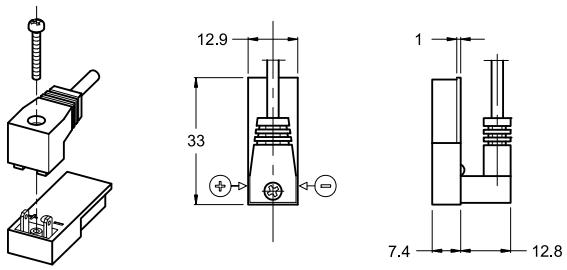
23.2 - Mounting and overall dimensions



1	Bracket fastening screw
2	Socket for fastening to the tie rod
3	Bracket for fastening to the tie rod
4	Sensor fastening screw
5	Magnetic sensor

Reed sensors for Ø 25 and Ø 32 bore and sensors with Hall effect

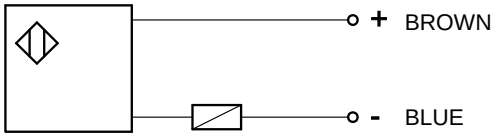
Reed sensors for Ø 40 ÷ Ø 125 bore



23.3 - Technical Characteristics And Electrical Connection

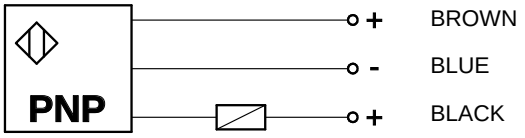
Reed sensors (FMR)

		Reed sensor without connector (for 25 and 32 bores)	Reed sensor with connector (for 40, 50, 63, 80, 100 and 125 bores)
Sensor version		Reed	Reed
Contact		normally open	normally open
Maximum power	W	20	50
Maximum voltage	V AC/DC	130	250
Minimum voltage	V AC/DC	3	3
Voltage drop	V	2,5	2,5
Maximum power	mA	300	1000
Wiring		2 cables	2 cables
Connection		cable (L = 2 m)	connector (with cable L = 2 m)
Cable section	mm^2	0,25	0,25
Varistor	V	-	250
Sheath material		PVC	PVC
Contact indicator		red led	red led
Operating temperature range	°C	-20 / +80	-20 / +80



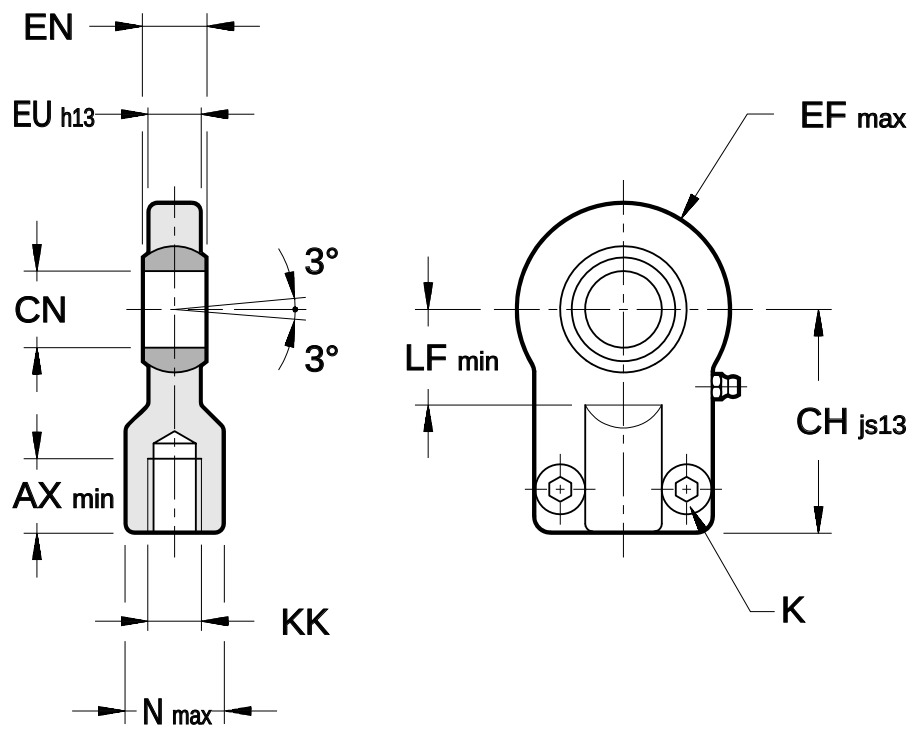
Hall effect sensors (FMH)

Sensor version		Hall effect
Contact		normally open
Sensor type		PNP
Maximum voltage	V AC/DC	30
Minimum voltage	V AC/DC	10
Voltage drop	V	0,5
Maximum power	mA	200
Wiring		3 cables
Connection		cable (L = 2 m)
Cable section	mm^2	0,14
Wire covering material		PVC
Contact indicator		red led
Operating temperature range	°C	-20 / +80



24 - OVERALL AND MOUNTING DIMENSIONS

SPHERICAL SWIVEL ISO 8133 / DIN 24555



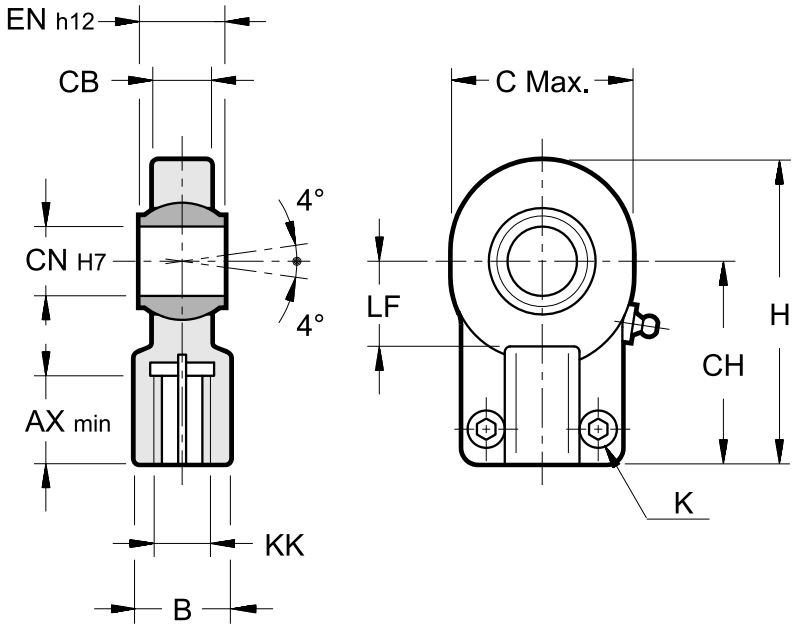
NOTE: no lubricator on SSF-12. On SSF-14 and SSF-18 sizes the injection of the lubricant takes place through a hole.

Dimensions in mm

Type	Ø cylinder rod standard thread	Ø cylinder rod light thread	AX min	CH js13	Ø CN	EF max	EN	EU h13	KK	LF min	N max	K bolt UNI 5931	Torque Nm	Max load kN	Mass kg
SSF-12	12	18	15	42	$12^{\ 0}_{-0.008}$	20	$10^{\ 0}_{-0.12}$	8	M10x1.25	16	17	M6x14	10	8	0.2
SSF-14	14	22	17	48	$16^{\ 0}_{-0.008}$	22.5	$14^{\ 0}_{-0.12}$	11	M12x1.25	20	21	M6x14	10	12.5	0.3
SSF-18	18	28	19	58	$20^{\ 0}_{-0.010}$	27.5	$16^{\ 0}_{-0.12}$	13	M14x1.5	25	25	M8x18	25	20	0.4
SSF-22	22	36	23	68	$25^{\ 0}_{-0.010}$	32.5	$20^{\ 0}_{-0.12}$	17	M16x1.5	30	30	M8x18	25	32	0.7
SSF-28	28	45	29	85	$30^{\ 0}_{-0.010}$	40	$22^{\ 0}_{-0.12}$	19	M20x1.5	35	36	M10x20	49	50	1.2
SSF-36	36	56	37	105	$40^{\ 0}_{-0.012}$	50	$28^{\ 0}_{-0.12}$	23	M27x2	45	45	M10x25	49	80	2.2
SSF-45	45	70	46	130	$50^{\ 0}_{-0.012}$	62.5	$35^{\ 0}_{-0.12}$	30	M33x2	58	55	M12x30	86	125	4.2
SSF-56	56	90	57	150	$60^{\ 0}_{-0.015}$	80	$44^{\ 0}_{-0.15}$	38	M42x2	68	68	M16x40	210	200	8.3
SSF-70	70	110	64	185	$80^{\ 0}_{-0.015}$	102.5	$55^{\ 0}_{-0.15}$	47	M48x2	92	90	M20x50	410	320	19
SSF-90	90	140	86	240	$100^{\ 0}_{-0.020}$	120	$70^{\ 0}_{-0.20}$	57	M64x3	116	110	M24x60	710	500	28

25 - OVERALL AND MOUNTING DIMENSIONS

SPHERICAL SWIVEL ISO 6982 / DIN 24338



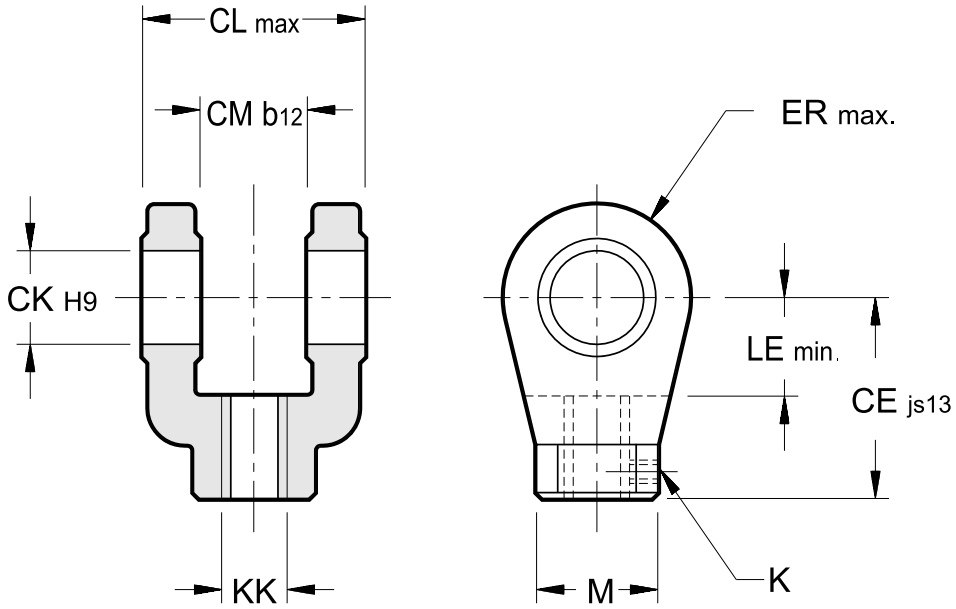
NOTE: no lubricator on LSF-14. On LSF-18 the injection of the lubricant takes place through a hole.

Dimensions in mm

Type	Ø rod standard thread	Ø rod light thread	AX min	B	C max	CB	CH	Ø CN H7	EN h12	H	KK	LF	K bolt UNI 5931	Torque Nm	Max load kN	Mass kg
LSF-14	14	22	17	16	32	11	38	12	12	54	M12x1.25	14	M5x16	6	10.8	0.10
LSF-18	18	28	19	21	40	14	44	16	16	64	M14x1.5	20	M6x14	10	17.6	0.21
LSF-22	22	36	23	25	47	18	52	20	20	75	M16x1.5	22	M8x20	25	30	0.35
LSF-28	28	45	29	30	58	22	65	25	25	96	M20x1.5	27	M8x20	25	48	0.62
LSF-36	36	56	37	38	71	28	80	32	32	119	M27x2	32	M10x25	49	67	1.17
LSF-45	45	70	46	47	90	33	97	40	40	146	M33x2	41	M10x30	49	100	2.15
LSF-56	56	90	57	58	109	41	120	50	50	180	M42x2	50	M12x35	86	156	3.75
LSF-70	70	110	64	70	132	53	140	63	63	212	M48x2	62	M16x40	210	255	7.00
LSF-90	90	140	86	90	170	67	180	80	80	271	M64x3	78	M20x50	410	400	13.8

26 - OVERALL AND MOUNTING DIMENSIONS

FEMALE CLEVIS ISO 8133

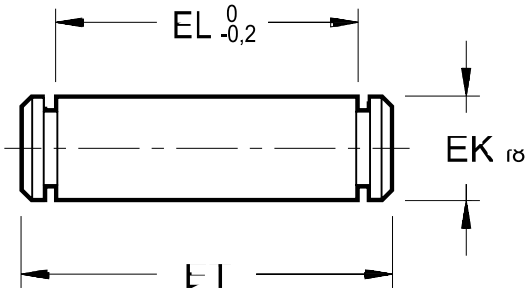


Dimensions in mm

Type	Ø cylinder rod		M	CE	Ø CK	CL	CM	ER	KK	LE	K bolt	Max load	Mass
	standard thread	light thread	CH	js13	H9	max	b12	max		min		kN	kg
FRC-12	12	18	19	32	10	26	12	12	M10x1.25	13	M5x5	8	0.1
FRC-14	14	22	21	36	12	34	16	17	M12x1.25	19	M5x5	12.5	0.2
FRC-18	18	28	21	38	14	42	20	17	M14x1.5	19	M5x5	20	0.2
FRC-22	22	36	32	54	20	62	30	29	M16x1.5	32	M6x6	32	0.5
FRC-28	28	45	32	60	20	62	30	29	M20x1.5	32	M6x6	50	1
FRC-36	36	56	40	75	28	83	40	34	M27x2	39	M6x6	80	1.8
FRC-45	45	70	55	99	36	103	50	50	M33x2	54	M8x8	125	3.7
FRC-56	56	90	56	113	45	123	60	53	M42x2	57	M8x8	200	5.6
FRC-70	70	110	75	126	56	143	70	59	M48x2	63	M12x12	320	9.3
FRC-90	90	140	95	168	70	163	80	78	M64x3	83	M12x12	500	20

27 - OVERALL AND MOUNTING DIMENSIONS

FEMALE CLEVIS PIN ISO 8133
with spring retainers

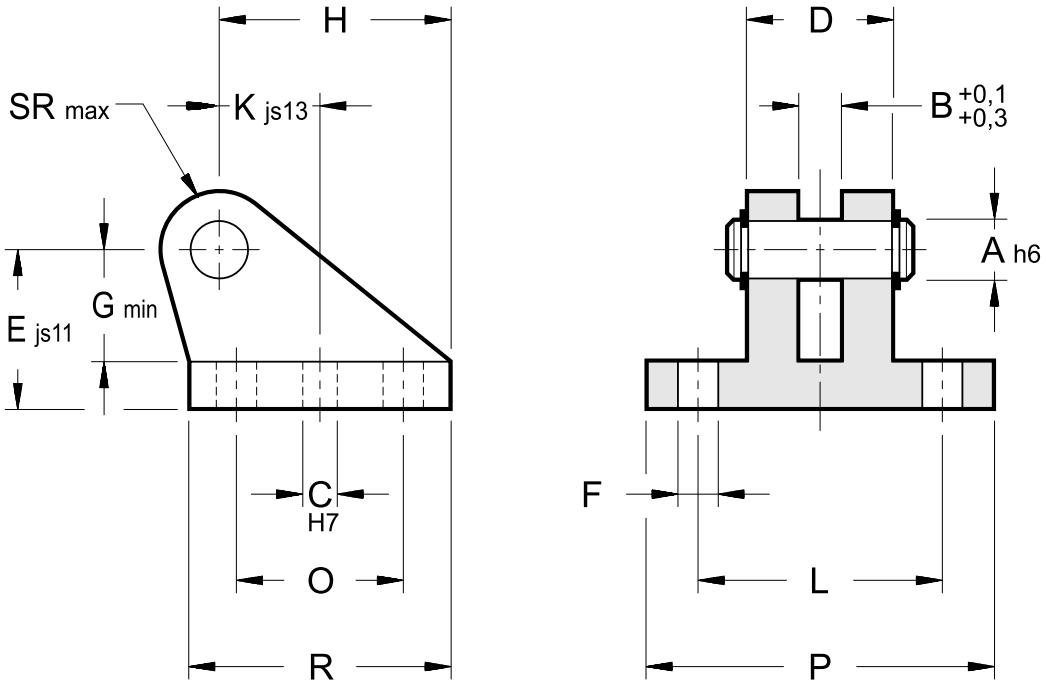


Dimensions in mm

Type	Ø EK f8	EL 0 / - 0.2	ET
PNF-12	10	29	37
PNF-14	12	37	45
PNF-18	14	45	53
PNF-22	20	66	75
PNF-28	20	66	75
PFN-36	28	87	96
PNF-45	36	107	120
PNF-56	45	129	144
PNF-70	56	149	164
PNF-90	70	169	187

28 - OVERALL AND MOUNTING DIMENSIONS

FEMALE CLEVIS FLANGE FOR SPHERIC SWIVEL DIN 24554
(with PIN and spring retainers)

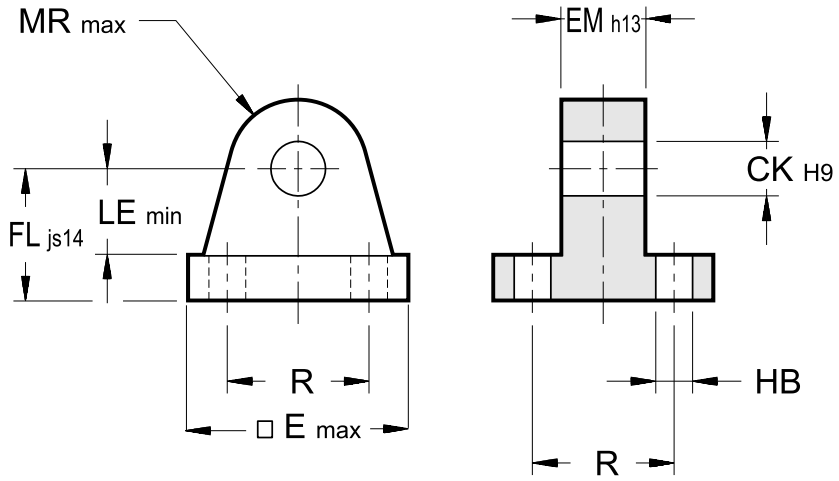


Dimensions in mm

Type	Cylinder bore	ØA h6	B + 0.1 + 0.3	ØC H7	D	E js11	ØF	G min	H	K js13	L	O	P	R	SR max	Max load kN	Mass kg
FLF-25	25	12	10	8	30	40	9	28	56	26	55	40	75	60	12	8	0.5
FLF-32	32	16	14	10	40	50	11	37	74	34	70	55	95	80	16	12.5	1
FLF-40	40	20	16	12	50	55	14	39	80	35	85	58	120	90	20	20	1.7
FLF-50	50	25	20	12	60	65	16	48	98	43	100	70	140	110	25	32	2.7
FLF-63	63	30	22	16	70	85	18	62	120	52	115	90	160	135	30	50	5.2
FLF-80	80	40	28	20	80	100	22	72	148	63	135	120	190	170	40	80	9.3
FLF-100	100	50	35	25	100	125	30	90	190	82	170	145	240	215	50	125	18.5
FLF-125	125	60	44	40	120	150	39	108	225	95	200	185	270	260	60	200	35
FLF-160	160	80	55	40	160	190	45	140	295	125	240	260	320	340	80	320	63
FLF-200	200	100	70	45	200	210	48	150	335	135	300	300	400	400	100	500	110

29 - OVERALL AND MOUNTING DIMENSIONS

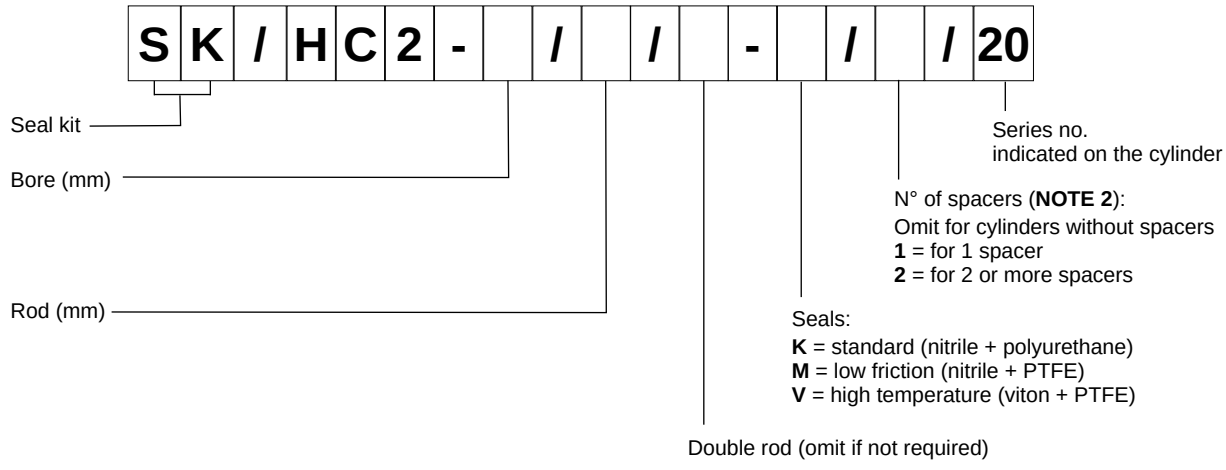
MALE CLEVIS FLANGE ISO 8133



Dimensions in mm

Type	Cylinder bore	ØCK H9	E max	EM h13	FL js14	ØHB	LE min	MR max	R	Load max kN	Mass kg
FLC-25	25	10	40	12	23	5.5	13	12	28.3	8	0.3
FLC-32	32	12	45	16	29	6.6	19	17	33.2	12.5	0.5
FLC-40	40	14	63	20	29	9	19	17	41.7	20	0.9
FLC-50	50	20	75	30	48	13.5	32	29	52.3	32	1.3
FLC-63	63	20	90	30	48	13.5	32	29	64.3	50	1.9
FLC-80	80	28	115	40	59	17.5	39	34	82.7	80	4
FLC-100	100	36	130	50	79	17.5	54	50	96.9	125	6.3
FLC-125	125	45	165	60	87	24	57	53	125.9	200	11.4
FLC-160	160	56	205	70	103	30	63	59	154.9	320	20
FLC-200	200	70	245	80	132	33	82	78	190.2	500	38

30 - SEAL KIT IDENTIFICATION CODE



NOTE 1: the seal kit includes all the seals of a cylinder with cushionings.

NOTE 2: To determine the number of spacers fitted in the cylinder, see the cylinder plate and the identification code on page 3.

DUPLOMATIC
MOTION SOLUTIONS
a member of DAIKIN group

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duplomaticmotionsolutions.com

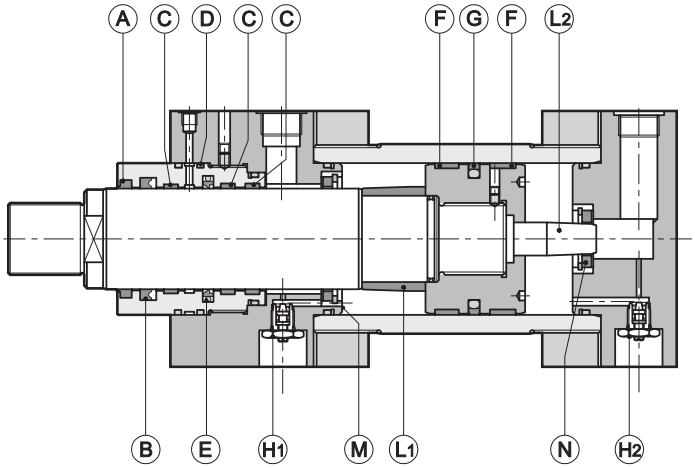
REPRODUCTION IS FORBIDDEN. THE COMPANY RESERVES THE RIGHT TO APPLY ANY MODIFICATIONS.



HC3
HYDRAULIC CYLINDERS
HCK3
HYDRAULIC CYLINDERS
ATEX 2014/34/UE
SERIES 10

ISO 6022
DIN 24333

DESCRIPTION



— Double acting cylinders constructed in compliance with ISO 6022 and DIN 24333.

— The materials used to make these cylinders are particularly resistant and make them suitable for applications in the iron and steel sector.

— The cylinder is available with 5 different mounting styles as well as a range of accessories to meet all application requirements.

A - scraper ring
B - piston rod seal
C - guide ring
D - drain seal (O-Ring)
E - piston rod seal
F - guide ring
G - piston seal
H1 - front cushioning adjustment screw
H2 - rear cushioning adjustment screw
L1 - front cushion
L2 - rear cushion
M - front cushioning bushing
N - rear cushioning bushing

ATEX 2014/34/UE rated version for installation in potentially explosive atmospheres is now available. The standard version of cylinders is ATEX II 2GD classified, whereas cylinders with proximity sensors are ATEX II 3GD classified. The declaration of conformity to the up mentioned standards is always supplied with the cylinder. See paragraph 3 for details.

PERFORMANCES

Nominal operating pressure (continuous service)	bar	250
Maximum operating pressure	bar	320
Maximum speed (standard)	m/s	0,5
Maximum stroke (standard)	mm	5000
Fluid temperature range (standard)	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree		According to ISO 4406:1999 class 20/18/15
Recommended viscosity	cSt	25

1 - CHARACTERISTICS

1.1 - Bores and piston rods
Ø 50 to Ø 400 mm bores are available to enable a vast choice according to required force.

Two piston rod diameters are available for each bore:

- reduced piston rod with area ratio 1:1.65

- standard piston rod with area ratio 1:2

1.2 - Cushionings
On request, gradual and adjustable cushioning devices can be fitted in the front and/or rear ends of the cylinder without affecting overall dimensions.

The special design of the cushions ensures optimal repeatability also in the event of variations in fluid viscosity.

Cushioning devices are always recommended as they ensure impact-free stopping even at high speed thus reducing pressure surges and impact transferred to the mounting supports.

The cylinder ends of bores higher than 160mm with cushioning can have an additional port connected directly with the braking chamber. This connection must be used in case of application, near the cylinder, of a pressure relief valve set at 350 bar, to limit overpressures during braking. For further information and for the order identification code, please consult our technical office.

The table below shows cushioning cone lengths:

Bore (mm)	50	63	80	100	125	140	160	180	200	250	320	400
Front cone length (mm)	38	40	50	50	60	60	75	75	80	100	100	110
Rear cone length (mm)	34	42	58	49	64	64	68	73	69	101	99	108

1.3 - Connections
The cylinders are supplied as standard with cylindrical BSP threads and spot facing for seal rings in compliance with ISO 1179.

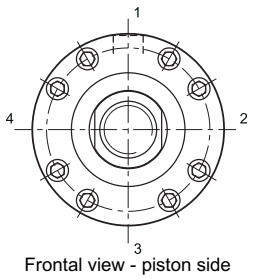
Connections which are oversized compared to those shown in the dimensional tables are available upon request. For further information and for the order identification code, please consult our technical office.

For correct cylinder operation, fluid velocity must not exceed 5 m/s.

1.4 - Connection position
Standard positions of the oil ports, cushioning adjustment screws, breathers, optional external drain and optional end-stroke proximity sensors, are indicated in the table below.

Connection positions different from the standard are available upon request. As a consequence, the other options positions will be rotated.

For special requests, please consult our technical office.



Frontal view - piston side

	POSITION
Connections	1
Cushioning adjustment	3
Breathers	4
Drainage	1
Proximity end stroke	2
Optional port (see par. 1.2)	4

1.5 - Seals
The table below illustrates seal characteristics in relation to hydraulic fluid and operating temperatures.

NOTE: for lower pressure use consult our technical office.

Type	Seal type	Seal material	Hydraulic fluid	Minimum pressure [bar]	Operating pressure [°C]	Max speed [m/s]
K	Standard	nitrile polyurethane	mineral oil	10	-20 / +80	0,5
M	Low friction	nitrile PTFE	Mineral oil Water glycol	20 (note)	-20 / +80	15
V	high temperature and/or aggressive fluid	Viton PTFE	Special fluids	10	-20 / +150	1

1.6 - Strokes
Standard cylinders are available with strokes up to 5000 mm. Longer cylinder strokes can be supplied on request.

Stroke tolerances are:

0 + 1 mm for strokes up to 1000 mm

0 + 4 mm for strokes up to 5000 mm.

1.7 - Spacers
In the case of cylinder strokes above 1000 mm we recommend the use of spacers which can be inserted to reduce loads on the piston rod bushing and prevent the piston from sticking.

Spacers are constructed in hardened and tempered steel with PTFE facing.

Every spacer is 50 mm long. We recommend to insert 1 spacer for strokes from 1001 to 1500 mm, with an increment of 1 spacer for every 500 mm stroke.

You must remember that the overall length of the cylinder increases according to the number of inserted spacers (50 mm for each spacer).

1.8 - Drainage
A connection for external drainage on the front end (even on the back end for double-rod cylinders) can be supplied upon request, for fluid drops recovery of the first seal of the rod, without any modification to the overall dimensions.

Connection: 1/8” BSP for bore up to Ø 100 included - 1/4” BSP for higher bores.

1.9 - Breathers
On request cylinder ends can be supplied with breathers for the elimination of air. This is necessary when the entire stroke is not used or when connections are not facing upwards.

1.10 - Surface finish
The cylinders are supplied painted with Duplomatic black opaque colour with a paint thickness of 40µ. The rod is chromed.

2 - IDENTIFICATION CODE

K = Explosion-proof version according to ATEX 2014/34/UE (paragraph 3). Omit if not required.

HC		3		-		/			/			-			-			-			/		-			/			/	10

Series (indicate for spare parts requests)

Dimension XV for "L" mounting (omit for other mounting styles)

N. of spacers multiple of 50 mm (omit if not required) (see par. 1.7)

Back end connection position (**1**-**4**) (see par. 1.4)

Front end connection position (**1**-**4**) (see par. 1.4)

Drainage for second rod. Omit if not required (see par. 1.8)
0 = without drainage
E = external drainage with connection on the back end

Drainage (see par. 1.8)
0 = without drainage
E = external drainage with connection on the front end

Breathers (see par. 1.9)
0 = without breathers
S = front and back breathers

Cushioning (see par. 1.2):
0 = without cushioning **1** = front
2 = back **3** = front and back

Seals (see par. 1.5):
K = standard (nitrile + polyurethane)
M = low friction (nitrile + PTFE)
V = high temperature (viton + PTFE)

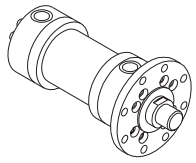
Stroke (mm) - For cylinders with spacers indicate the working stroke.

Double rod threading (omit if not required). See single rod for dimensions

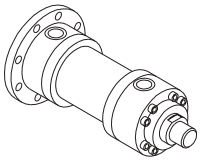
Double rod (omit if not required)
See single rod for dimensions. Not available with mounting style B-D-F.

Rod threading: Male thread (**standard**)
W = Female thread (see par. 4)

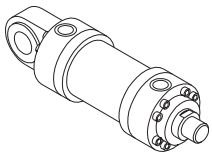
MOUNTING STYLE



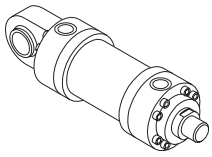
A= Front flange (MF3)



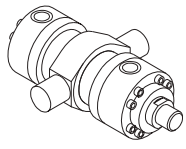
B= Rear flange (MF4)



D= Male clevis (MP3)



F= Spheric swivel (MP5)



L= Mid swinging (MT4)

Ø rod (mm)		Rods available for each bore											
32	**36**	●											
40	**45**		●										
50	**56**			●									
63	**70**				●								
80	**90**					●							
90	**100**						●						
100	**110**							●					
110	**125**								●				
125	**140**									●			
160	**180**										●		
200	**220**											●	
250	**280**												●
Bore (mm)		**50**	**63**	**80**	**100**	**125**	**140***	**160**	**180***	**200**	**250**	**320**	**400**

* Bores not considered by the standard ISO 6022

3 - ATEX 2014/34/UE RATED VERSION

ATEX 2014/34/UE rated version cylinders for installation in potentially explosive atmospheres are now available. The standard version of cylinders is ATEX II 2GD classified, whereas cylinders with proximity sensors are ATEX II 3GD classified.

The supply is always delivered accompanied by:

- the ATEX declaration of conformity
- the operating and maintenance user manual, where are described all the information for the proper use of cylinders in potentially explosive environments.

TYPE EXAMINATION CERTIFICATE N°: **CEC 10 ATEX 138**

3.1 - Identification code

To order the ATEX-rated version, simply insert the letter K in the initial part of the identification code. The description becomes HCK3-*.

For cylinders without end-stroke proximity sensors please order with the identification code shown at paragraph 2.

Example: HC**K**3C-200/125-350-K3-S-0-11/20

For cylinders equipped with end-stroke proximity sensors please refer to the identification code shown at paragraph 16.1.

Example: HC**K**3F-FP22-80/56-225-K3-S-0-11/20

The ATEX-rated cylinders equipped with end-stroke proximity sensors are compliant with the specifications listed paragraph 16; Also the same prescriptions described in that paragraph are effective. (NB: for bores Ø125 and Ø400 feasibility contact our technical department).

The proximity sensors are compliant with the description and the wiring diagram shown at the paragraph 16.2.

3.2 - Classification

Cylinders without end-stroke proximity sensors have this ATEX mark:

 II 2GD ck IIC T4 (-20°C Ta +80°C)

EX: Specific marking of explosion protection as ATEX 2014/34/UE directive and related technical specification requests.
II: Group II for surface plants
2: Category 2 high protection, eligible for zone 1 for gases and zone 21 for dust (automatically be eligible for zone 2 category 3 for gases and zone 22 for dust)
GD: for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures.
ck: protection by constructional safety and by liquid immersion
IIC: Gas group (automatically eligible for group IIA and IIB)
T4: Temperature class for gas (max surface temperature)
-20°C Ta +80°C: Ambient temperature range

Cylinders with end-stroke proximity sensors have this ATEX mark:

 II 3GD ck IIC T4 (-20°C Ta +80°C)

EX: Specific marking of explosion protection as ATEX 2014/34/UE directive and related technical specification requests
II: Group II for surface plants
3: Category 3 standard protection, eligible for zone 2 for gases (zone 22 for dust)
GD: for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures.
ck: protection by constructional safety and by liquid immersion
IIC: Gas group (automatically eligible for group IIA and IIB)
T4: Temperature class for gas (max surface temperature)
-20°C Ta +80°C: Ambient temperature range

3.3 - Operating temperatures

The operating ambient temperature must be between -20°C and +80 °C.

The fluid temperature for the standard version seals (K) and for low friction seals (M) must be between -20°C and +80°C, as for viton (V) seals must be between -20°C and +120 °C.

The actuators are T4 (T135° C) class temperature classified, so they are eligible for operation also at higher class temperature (T3, T2, T1 (T200° C).

3.4 - Admitted velocities

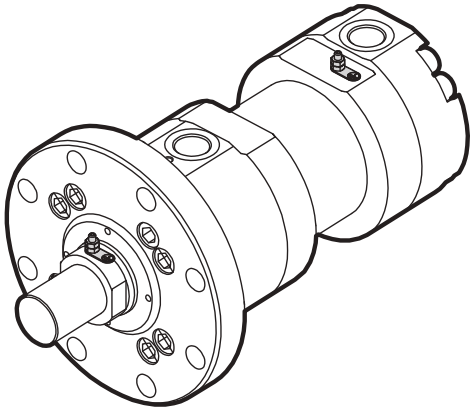
The maximum permissible speed is 0.5 m/s for standard cylinder seals (K) and 1 m/s for actuators with low friction seals (M) or Viton (V).

3.5 - Connectors

The connectors for the end-stroke proximity are available upon request. They are metal, to be wired. The ordering code is **0680961.** One connector per sensor is needed.

3.6 - Grounding points

The ATEX certified actuators are supplied with two grounding points, one on the rear head and one on the rod, for the wire of the cylinder with the ground (M4 screws).



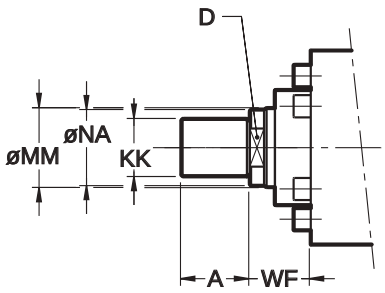
The bottom grounding point must always be connected whereas the connection of the rod grounding point can be avoided in case the whole mechanical stroke is covered during the cylinder operating phase (from the mechanical stop on the cylinder head to the mechanical stop on the bottom), or in case the rod has already been grounded through the mechanical connection between the rod itself and the machine/plan it is installed on.

In order to verify such a condition it is necessary to test the equipotentiality of the parts and a maximum resistance equal to 100 Ω as per the EN13463-1 norm.

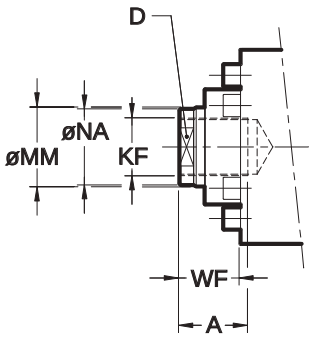
4 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

Standard = male thread



W = female thread



* For bores Ø 180 (piston rod Ø 110) and higher, the rod has 4 holes at 90° realized on Ø NA and of Ø shown in the table.

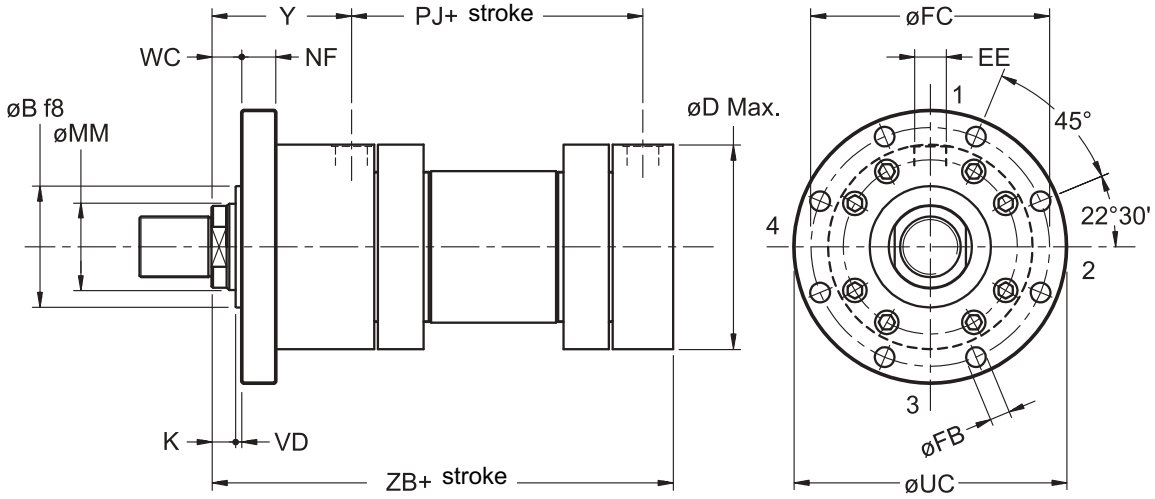
A pin wrench UNI 6752 - DIN 1810 must be used.

Bore	MM Ø rod	KK	Ø NA	KF	A	D	WF
50	32 36	M27x2	31 35	- M27x2	36	28 32	47
63	40 45	M33x2	38 43	- M33x2	45	34 36	53
80	50 56	M42x2	48 54	- M42x2	56	43 46	60
100	63 70	M48x2	60 67	- M48x2	63	53 60	68
125	80 90	M64x3	77 87	- M64x3	85	65 75	76
140	90 100	M72x3	87 96	- M72x3	90	75 85	76
160	100 110	M80x3	96 106	- M80x3	95	85 95	85
180	110 125	M90x3	106 121	- M90x3	105	95 ø 12*	95
200	125 140	M100x3	121 136	- M100x3	112	ø 12*	101
250	160 180	M125x4	155 175	- M125x4	125	ø 15*	113
320	200 220	M160x4	195 214	- M160x4	160	ø 15*	136
400	250 280	M200x4	245 270	- M200x4	200	ø 20*	163

5 - OVERALL AND MOUNTING DIMENSIONS ISO MF3

A FRONT FLANGE

dimensions in mm



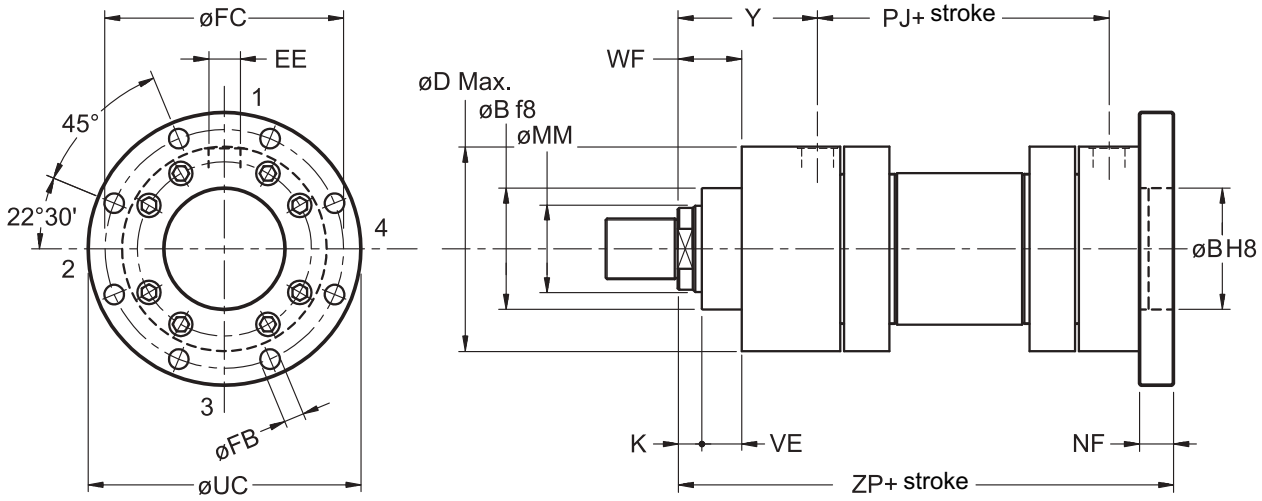
NOTE: Ø 400 bore has 12 equally spaced Ø FB holes in the mounting flange

Bore	MM Ø rod	ØB f8	ØD max	EE BSP	ØFB	ØFC	K	NF	PJ	ØUC	VD	WC	Y	ZB
50	32 36	63	105	1/2”	13,5	132	18	25	120	155	4	22	98	244
63	40 45	75	122	3/4”	13,5	150	21	28	133	175	4	25	112	274
80	50 56	90	145	3/4”	17,5	180	24	32	155	210	4	28	120	305
100	63 70	110	175	1”	22	212	27	36	171	250	5	32	134	340
125	80 90	132	210	1”	22	250	31	40	205	290	5	36	153	396
140	90 100	145	255	1. 1/4”	26	300	31	40	208	340	5	36	181	430
160	100 110	160	270	1. 1/4”	26	315	35	45	235	360	5	40	185	467
180	110 125	185	300	1. 1/4”	33	365	40	50	250	420	5	45	205	505
200	125 140	200	330	1. 1/4”	33	385	40	56	278	440	5	45	220	550
250	160 180	250	410	1. 1/2”	39	475	42	63	325	540	8	50	260	652
320	200 220	320	500	2”	45	600	48	80	350	675	8	56	310	764
400	250 280	400	628	2”	45 **NOTE**	720	53	100	360	800	10	63	333	775

6 - OVERALL AND MOUNTING DIMENSIONS ISO MF4

B BACK FLANGE

dimensions in mm



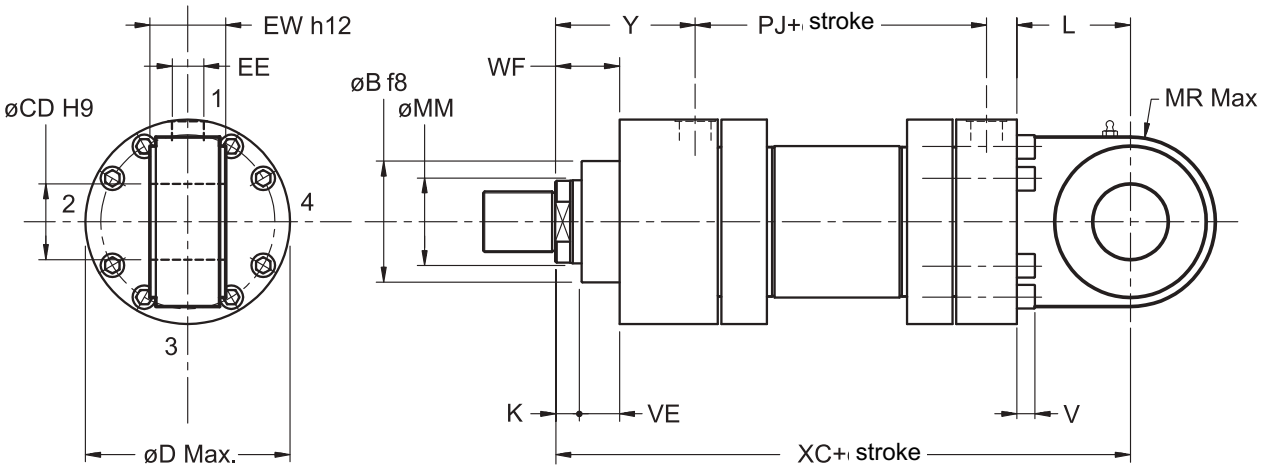
NOTE: Ø 400 bore has 12 equally spaced ØFB holes in the mounting flange

Bore	MM Ø rod	ØB f8	ØD max	EE BSP	ØFB	ØFC	K	NF	PJ	ØUC	VE	WF	Y	ZP
50	32 36	63	105	1/2”	13,5	132	18	25	120	155	29	47	98	265
63	40 45	75	122	3/4”	13,5	150	21	28	133	175	32	53	112	298
80	50 56	90	145	3/4”	17,5	180	24	32	155	210	36	60	120	332
100	63 70	110	175	1”	22	212	27	36	171	250	41	68	134	371
125	80 90	132	210	1”	22	250	31	40	205	290	45	76	153	430
140	90 100	145	255	1. 1/4”	26	300	31	40	208	340	45	76	181	465
160	100 110	160	270	1. 1/4”	26	315	35	45	235	360	50	85	185	505
180	110 125	185	300	1. 1/4”	33	365	40	50	250	420	55	95	205	550
200	125 140	200	330	1. 1/4”	33	385	40	56	278	440	61	101	220	596
250	160 180	250	410	1. 1/2”	39	475	42	63	325	540	71	113	260	703
320	200 220	320	500	2”	45	600	48	80	350	675	88	136	310	830
400	250 280	400	628	2”	45 **NOTE**	720	53	100	360	800	110	163	333	855

7 - OVERALL AND MOUNTING DIMENSIONS ISO MP3

D MALE CLEVIS
(with bushing)

dimensions in mm

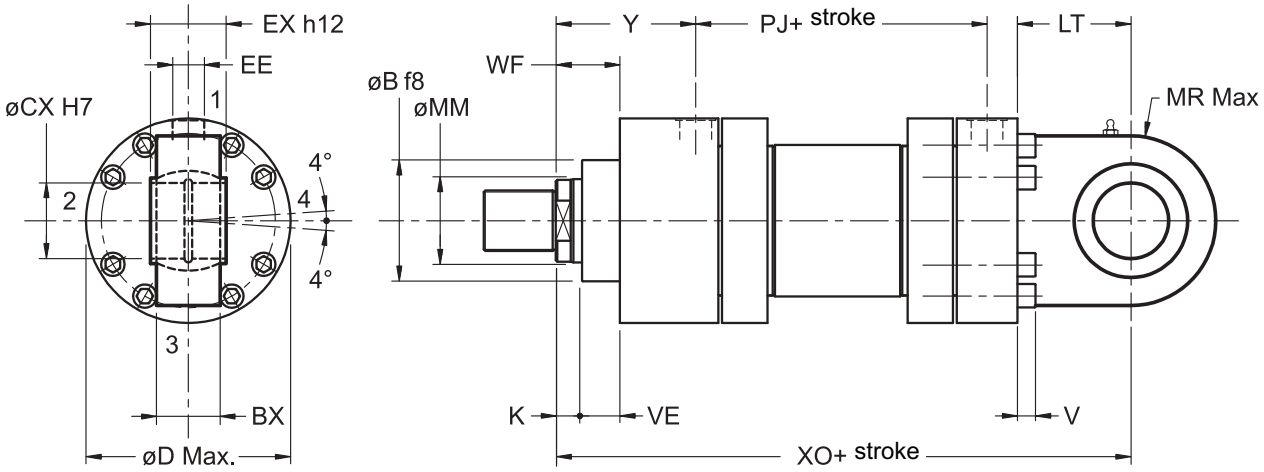


Bore	MM Ø rod	Ø B f8	Ø CD H9	Ø D max	EE BSP	EW h12	K	L	MR max	PJ	V	VE	WF	XC	Y
50	32 36	63	32	105	1/2”	32	18	61	35	120	8	29	47	305	98
63	40 45	75	40	122	3/4”	40	21	74	50	133	10	32	53	348	112
80	50 56	90	50	145	3/4”	50	24	90	61.5	155	12	36	60	395	120
100	63 70	110	63	175	1”	63	27	102	72.5	171	16	41	68	442	134
125	80 90	132	80	210	1”	80	31	124	90	205	16	45	76	520	153
140	90 100	145	90	255	1.1/4”	90	31	150	113	208	24	45	76	580	181
160	100 110	160	100	270	1.1/4”	100	35	150	125	235	24	50	85	617	185
180	110 125	185	110	315	1.1/4”	110	40	185	147.5	250	27	55	95	690	205
200	125 140	200	125	330	1.1/4”	125	40	206	160	278	24	61	101	756	220
250	160 180	250	160	410	1.1/2”	160	42	251	200	325	27	71	113	903	260
320	200 220	320	200	510	2”	200	48	316	250	350	36	88	136	1080	310
400	250 280	400	250	628	2”	250	53	300	320	360	42	110	163	1075	333

8 - OVERALL AND MOUNTING DIMENSIONS ISO MP5

F SPHERIC SWIVEL

dimensions in mm

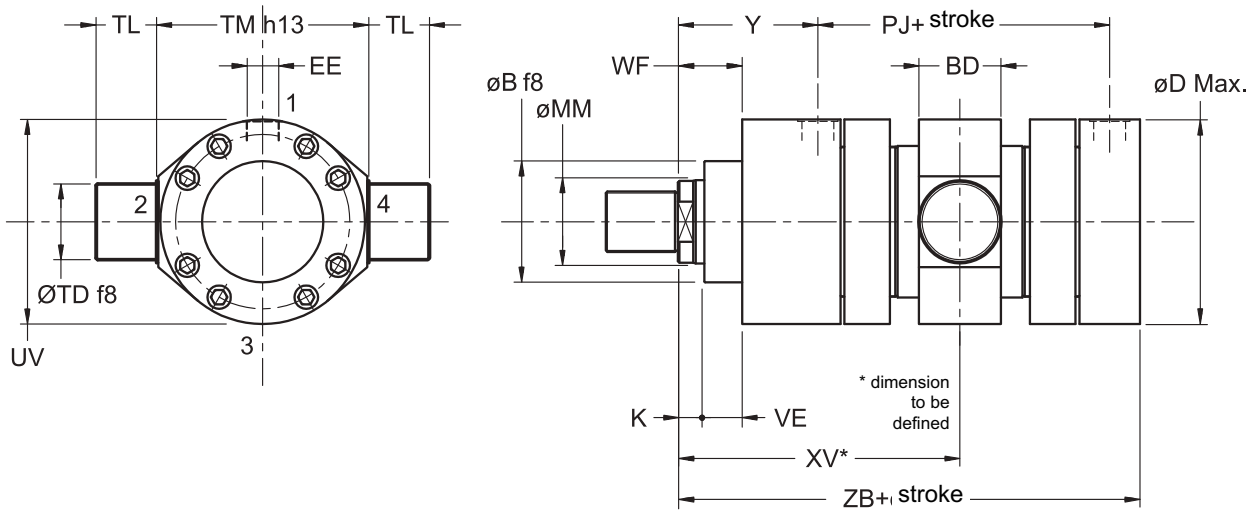


Bore	MM Ø rod	ØB f8	BX	ØCX H7	ØD max	EE BSP	EX h12	K	LT	MS max	PJ	V	VE	WF	XO	Y
50	32 36	63	27	32	105	1/2”	32	18	61	40	120	8	29	47	305	98
63	40 45	75	35	40	122	3/4”	40	21	74	50	133	10	32	53	348	112
80	50 56	90	40	50	145	3/4”	50	24	90	63	155	12	36	60	395	120
100	63 70	110	50	63	175	1”	63	27	102	71	171	16	41	68	442	134
125	80 90	132	60	80	210	1”	80	31	124	90	205	16	45	76	520	153
140	90 100	145	65	90	255	1.1/4”	90	31	150	113	208	24	45	76	580	181
160	100 110	160	70	100	270	1.1/4”	100	35	150	112	235	24	50	85	617	185
180	110 125	185	80	110	300	1.1/4”	110	40	185	147.5	250	27	55	95	690	205
200	125 140	200	102	125	330	1.1/4”	125	40	206	160	278	24	61	101	756	220
250	160 180	250	130	160	410	1.1/2”	160	42	251	200	325	27	71	113	903	260
320	200 220	320	162	200	500	2”	200	48	316	250	350	36	88	136	1080	310
400	250 280	400	192	250	628	2”	250	53	300	320	360	42	110	163	1075	333

9 - OVERALL AND MOUNTING DIMENSIONS ISO MT4

L MID SWINGING

dimensions in mm

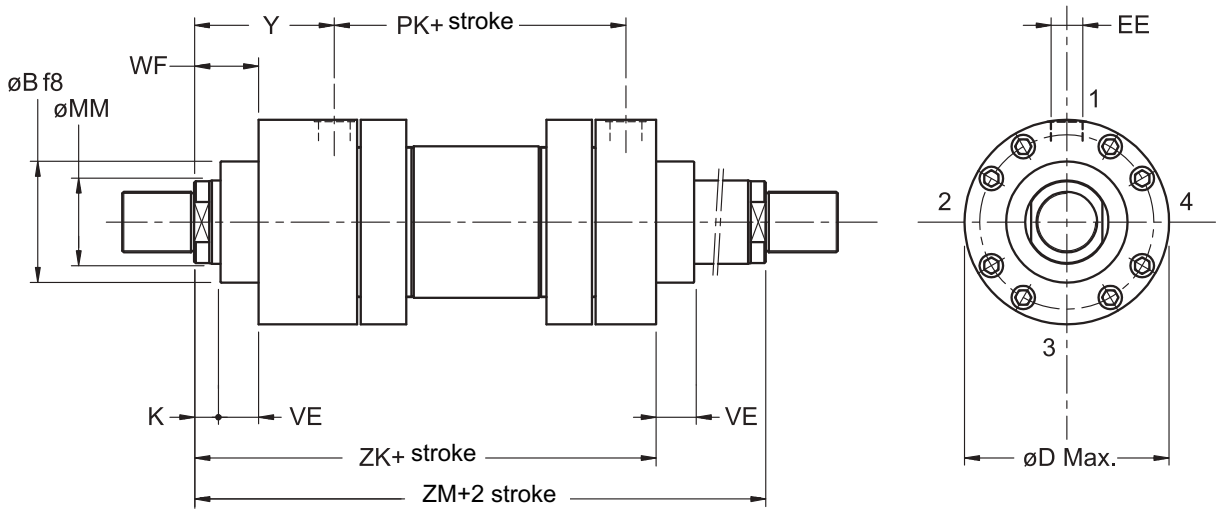


Bore	MM Ø rod	ØB f8	BD	stroke mm	ØD max	EE BSP	K	PJ	ØTD f8	TL	TM h13	ØUV	VE	WF	XV min	XV max + stroke	Y	ZB
50	32 36	63	38	45	105	1/2”	18	120	32	25	112	105	29	47	180	144	98	244
63	40 45	75	48	45	122	3/4”	21	133	40	32	125	122	32	53	195	160	112	274
80	50 56	90	58	60	145	3/4”	24	155	50	40	150	145	36	60	220	175	120	305
100	63 70	110	73	80	175	1”	27	171	63	50	180	175	41	68	245	185	134	340
125	80 90	132	88	95	210	1”	31	205	80	63	224	210	45	76	290	220	153	396
140	90 100	145	98	115	255	1. 1/4”	31	208	90	70	265	255	45	76	330	240	181	430
160	100 110	160	108	115	270	1. 1/4”	35	235	100	80	280	270	50	85	340	255	185	467
180	110 125	185	118	150	300	1. 1/4”	40	250	110	90	320	315	55	95	390	270	205	505
200	125 140	200	133	180	330	1. 1/4”	40	278	125	100	335	330	61	101	430	280	220	550
250	160 180	250	180	220	410	1. 1/2”	42	325	160	125	425	410	71	113	505	320	260	652
320	200 220	320	220	280	500	2”	48	350	200	160	530	510	88	136	590	380	310	764
400	250 280	400	270	420	628	2”	53	360	250	200	630	628	110	163	675	340	333	775

10 - OVERALL AND MOUNTING DIMENSIONS

DOUBLE ROD

dimensions in mm



For other dimensions and mounting styles please see single rod cylinder tables.
Not available for mounting styles B - D - F.

Bore	MM Ø rod	K	ØD max	EE BSP	PK	VE	WF	Y	ZM	ZK
50	32 36	18	105	1/2”	126	29	47	98	322	275
63	40 45	21	122	3/4”	134	32	53	112	358	305
80	50 56	24	145	3/4”	153	36	60	120	393	333
100	63 70	27	175	1”	165	41	68	134	433	365
125	80 90	31	210	1”	204	45	76	153	510	434
140	90 100	31	255	1. 1/4”	208	45	76	181	570	494
160	100 110	35	270	1. 1/4”	225	50	85	185	595	510
180	110 125	40	300	1. 1/4”	250	55	95	205	660	565
200	125 140	40	330	1. 1/4”	271	61	101	220	711	610
250	160 180	42	410	1. 1/2”	308	71	113	260	828	715
320	200 220	48	500	2”	350	88	136	310	970	834
400	250 280	53	628	2”	360	110	163	333	975	812

NOTE: Double rod cylinders are developed with two separate rods, fixed together by means of threading.

Because of this mounting style, the rod with female threading is less resistant than the other. To simplify the identification of the more resistant rod, the “**M**” marking is stamped on its end.

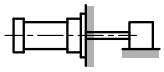
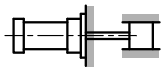
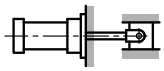
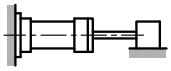
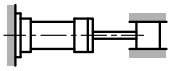
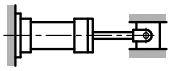
We recommend the use of the weaker rod for the less demanding applications.

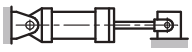
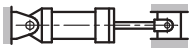
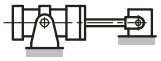
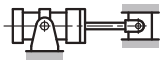
11 - ROD DIAMETER SELECTION

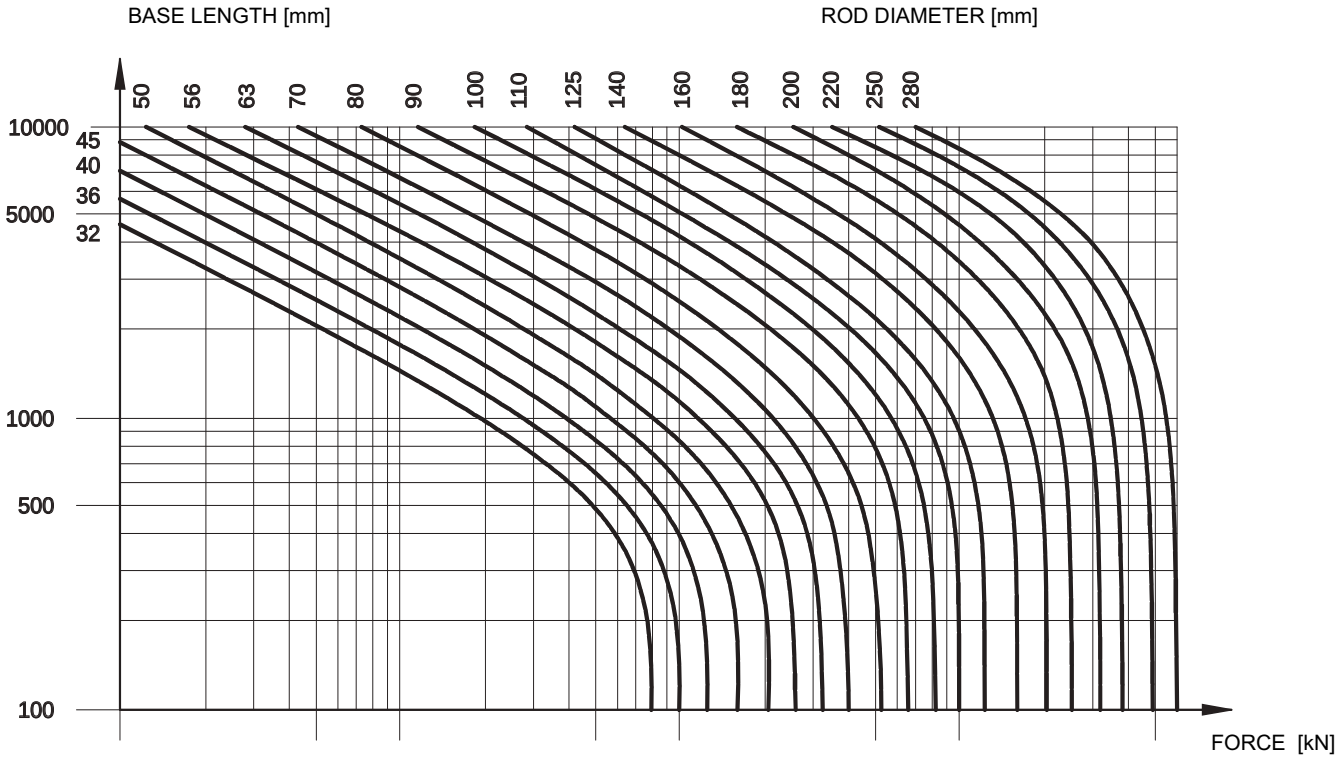
To ensure adequate stability, cylinders must be calculated for maximum compressive load according to the following simplified procedure:

- Refer to the table to identify the stroke factor according to the mounting style.
- To calculate the reference length, multiply the working stroke by the stroke factor.
- To calculate the thrust force, multiply the total cylinder area by the operating pressure.
- On the diagram, find the point of intersection between the thrust force and reference length.
- Identify the minimum rod diameter on the curve above the previous point of intersection.

Cylinders with rod diameters smaller than the value plotted in the diagram will not guarantee sufficient rigidity.

Mounting style	Rod connection	Mounting	Stroke factor
A	Fixed and supported		2
	Fixed and rigidly guided		0.5
	Jointed and rigidly guided		0.7
B	Fixed and supported		4
	Fixed and rigidly guided		1
	Jointed and rigidly guided		1.5

Mounting style	Rod connection	Mounting	Stroke factor
D - F	Jointed and supported		4
	Jointed and rigidly guided		2
L	Jointed and supported		3
	Jointed and rigidly guided		1.5



12 - THEORETICAL FORCES

Push force

$$Fs = P \cdot At$$

Pull force

$$Ft = P \cdot Aa$$

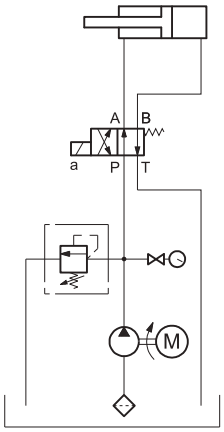
Fs = Force (extension) in N
Ft = Force (retraction) in N
At = Total area in mm²
Aa = Annular area in mm²
P = Pressure in MPa

1 bar = 0.1 MPa
1 kgf = 9.81 N

Bore mm	Ø rod mm	Total area mm²	Anular area mm²
50	32 36	1964	1159 946
63	40 45	3117	1861 1527
80	50 56	5027	3063 2564
100	63 70	7854	4737 4006
125	80 90	12272	7245 5910
140	90 100	15394	9032 7540
160	100 110	20106	12252 10603
180	110 125	25447	15943 13175
200	125 140	31416	19144 16022
250	160 180	49087	28981 23640
320	200 220	80425	49009 42412
400	250 280	125664	76576 64089

13 - THEORETICAL VELOCITIES

Configuration 1
The diagram illustrates a conventional cylinder application: the fluid is delivered by means of a directional control valve in alternation to the front chamber while the rear chamber is connected to tank and vice versa.



To calculate velocity and force, proceed as follows:

Velocity (extension)

$$V = \frac{Q \cdot 1000}{At \cdot 60}$$

Velocity (retraction)

$$V = \frac{Q \cdot 1000}{Aa \cdot 60}$$

Force (extension)

Force (retraction)

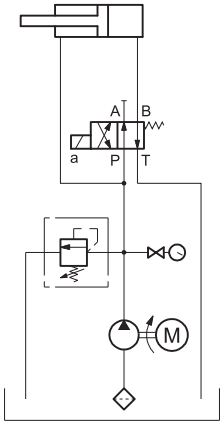
$$F = P \cdot At$$

$$F = P \cdot Aa$$

V = Velocity in m/s
Q = Flow rate in l/min
At = Total area (piston bore) in mm²
Aa = Annular area (At - As) in mm²
F = Force in N
P = Pressure in MPa
As = Rod area (At - Aa) in mm²
Qd = Flow rate through directional control valve (Q+return flow rate from small chamber) in l/min

1 bar = 0.1 MPa
1 kgf = 9.81 N

Configuration 2
When the system requires high velocity with relatively low forces, we recommend using a regenerative circuit. Diagram 2 illustrates the simplest version of this type of set-up.



The annular chamber is permanently connected to the pump while the full bore end is connected alternately to the pump, in which case the piston rod extends as a result of the differential areas (both chambers are supplied at the same pressure), and to tank, in which case the piston rod retracts.

Velocity (extension)

$$V = \frac{Q \cdot 1000}{As \cdot 60}$$

Velocity (retraction)

$$V = \frac{Q \cdot 1000}{Aa \cdot 60}$$

Force (extension)

Force (retraction)

$$F = P \cdot As$$

$$F = P \cdot Aa$$

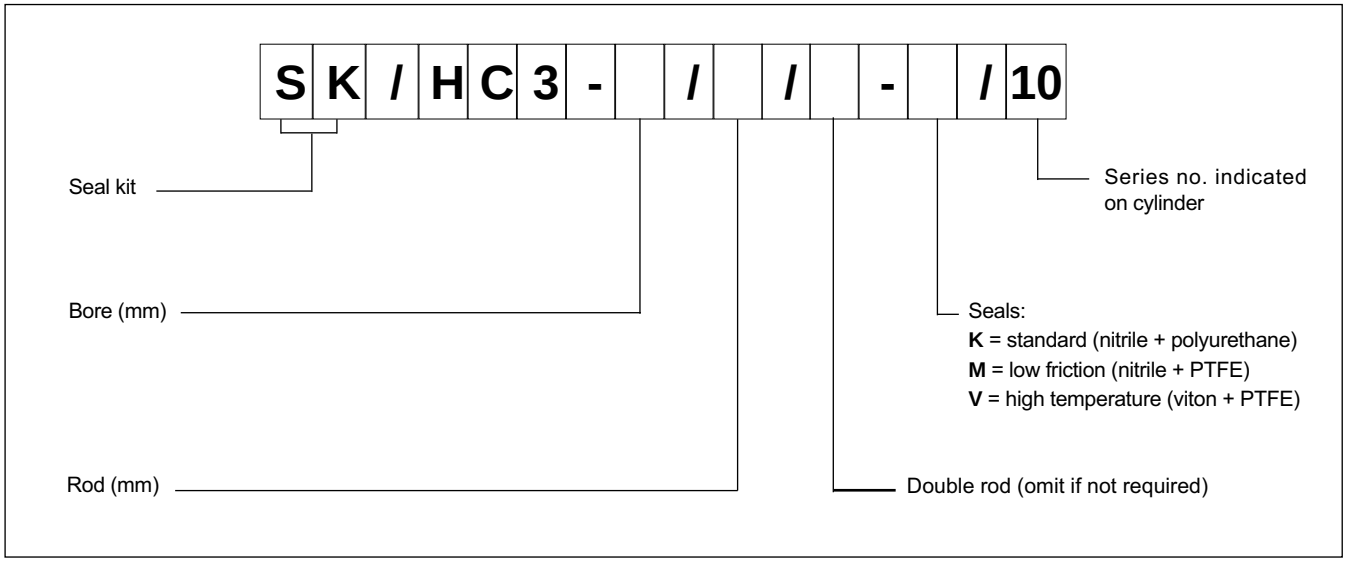
NOTE: In the case of regenerative circuits, the sizing of the directional control valve is fundamental. Flow rate through the directional control valve is calculated according to the following formula:

$$Qd = \frac{V \cdot At \cdot 60}{1000}$$

14 - MASSES

Bore	Ø rod	Mass for null stroke			Mass for 10 mm stroke
		Mounting style			
		A -B	D - F	L	
mm	mm	kg	kg	kg	kg
50	32 36	14	16	17	0,2
63	40 45	28	27	27	0,3
80	50 56	39	38	39	0,5
100	63 70	61	62	63	0,6 0,7
125	80 90	103 104	107 108	110	0,9 1
140	90 100	164	173	175	1,1 1,2
160	100 110	198 199	210	208 209	1,6 1,7
180	110 125	289	296 297	298 299	2 2,2
200	125 140	356 357	365 366	364 365	2,2 2,4
250	160 180	666 667	698 700	685 687	3,2 3,6
320	200 220	1200 1250	1314 1365	1259 1310	5,1 5,6
400	250 280	2180 2250	2259 2330	2249 2320	7 7,5

15 - SEAL KIT IDENTIFICATION CODE



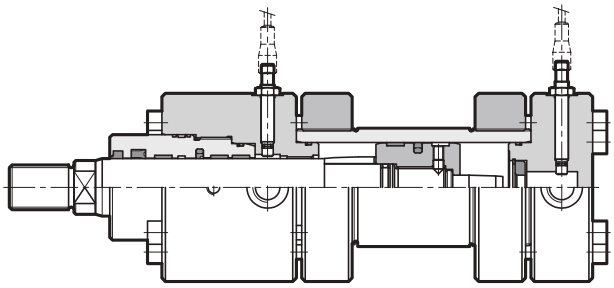
NOTE: the seal kit includes all the seals of a full-options cylinder (cushionings and external drain).

16 - END-STROKE PROXIMITY SENSORS

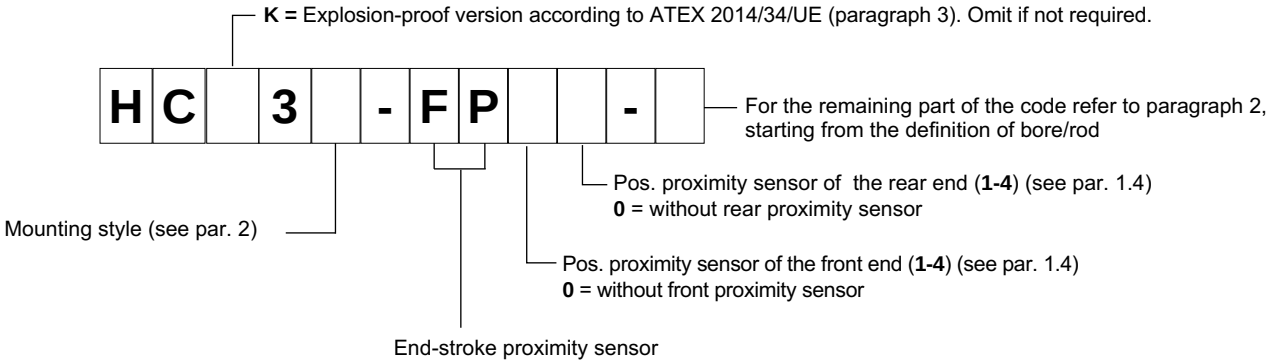
Upon request, cylinders can be supplied with end-stroke proximity sensors type PNP, with normally open output. They are mounted on the front and rear end of the cylinder and they supply an electric signal when the piston rod reaches the stroke end. They are available for all cylinder mounting styles, on both ends and for every available bore.

In order to ensure the correct functioning of the system, cylinders must be equipped with cushionings.

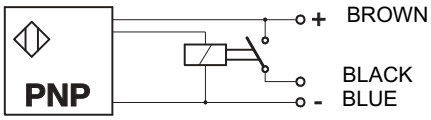
These sensors can be only used to provide the switching signal and not to control voltage loads.



16.1 - Identification code



16.2 - Technical characteristics and electrical connection



Rated voltage	VDC	24
Power supply voltage range	VDC	10 ÷ 30
Absorbed current	mA	200
Output	normally open contact	
Electric protection	polarity inversion short circuit overvoltage	
Electric connection	with connector	
Maximum operating pressure	bar	500
Operating temperature range	°C	-25 / +80
Class of protection according IEC EN 60529 (atmospheric ag.)		IP 68
Piston position LED (**NOTE**)		NO (it's on the connector)

16.3 - Connectors

Connectors for proximity sensors must be ordered separately, by specifying the code: **ECM3S/M12L/10**

NOTE: These connectors are not suitable for ATEX-rated cylinders. The connectors for the ATEX-rated cylinders are described at paragraph 3.5.

Connector: pre-wired connector M12 - IP68
Cable: with 3 conductors 0.34 mm^2 - length 5 mt.
Cable material: polyurethane resin (oil resistant)

The connector has two LEDs, one green and one yellow.

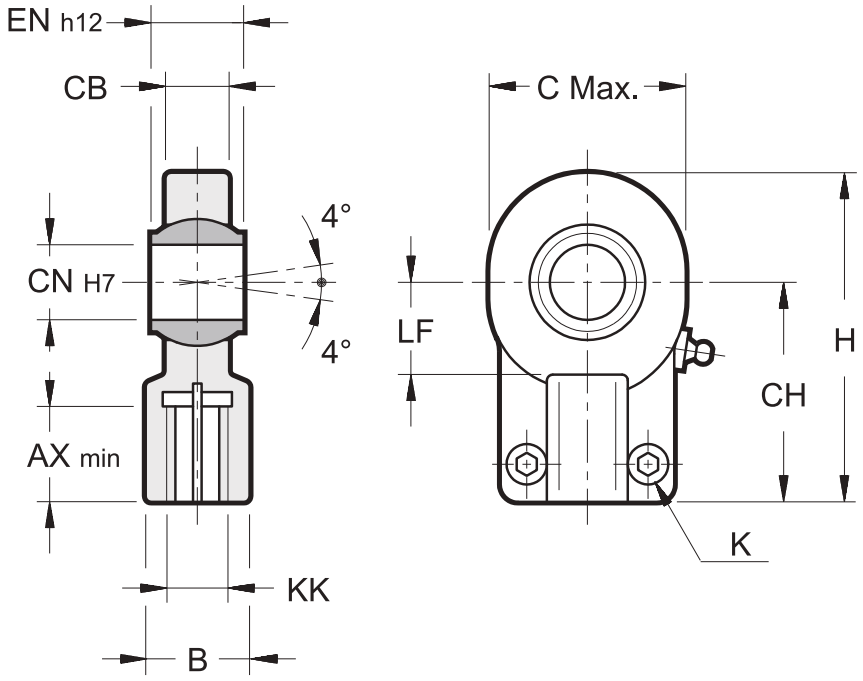
GREEN: Connector power supply.
The LED burn when the connector is supplied.

YELLOW: position signal.
ON - piston at stroke end
OFF - piston not at stroke end

17 - OVERALL AND MOUNTING DIMENSIONS

SPHERIC SWIVEL ISO 6982 / DIN 24338

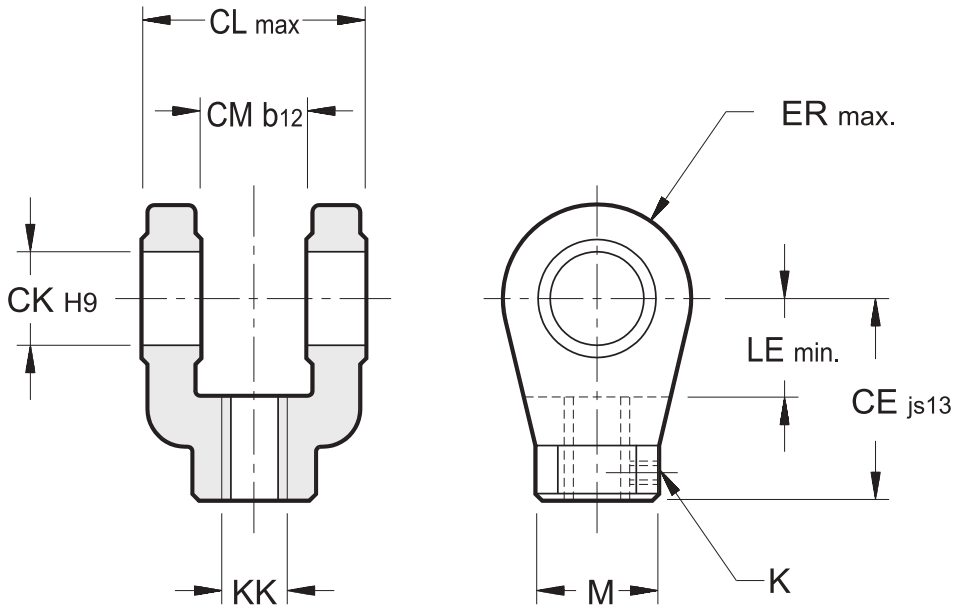
Dimensions in mm



Type	Ø cylinder bore	AX min	B	C max	CB	CH	Ø CN H7	EN h12	H	KK	LF	BOLT K UNI 5931	Torque Nm	Max load kN	Mass Kg
LSF-36	50	37	38	71	28	80	32	32	119	M27x2	32	M10x25	49	67	1.17
LSF-45	63	46	47	90	33	97	40	40	146	M33x2	41	M10x30	49	100	2.15
LSF-56	80	57	58	109	41	120	50	50	180	M42x2	50	M12x35	86	156	3.75
LSF-70	100	64	70	132	53	140	63	63	212	M48x2	62	M16x40	210	255	7
LSF-90	125	86	90	170	67	180	80	80	271	M64x3	78	M20x50	410	400	13.8
LSF-100	140	91	100	185	72	195	90	90	296	M72x3	85	M20x60	410	490	19.1
LSF-110	160	96	110	224	84	210	100	100	322	M80x3	98	M24x60	710	610	25
LSF-125	180	106	125	235	88	235	110	110	364	M90x3	105	M24x60	710	655	32
LSF-140	200	113	135	290	102	260	125	125	405	M100x3	120	M24x70	710	950	46
LSF-180	250	126	165	346	130	310	160	160	480	M125x4	150	M24x80	710	1370	82.5
LSF-220	320	161	215	460	162	390	200	200	620	M160x4	195	M30x100	1500	2120	168

18 - OVERALL AND MOUNTING DIMENSIONS

FEMALE CLEVIS ISO 8133



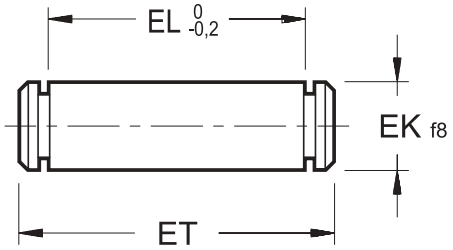
Dimensions in mm

Type	Ø cylinder bore	M CH	CE js13	Ø CK H9	CL max	CM b12	ER max	KK	LE min	K bolt	Max load kN	Mass kg
FRC-36	50	40	75	28	83	40	34	M27x2	39	M6x6	80	1.8
FRC-45	63	56	99	36	103	50	50	M33x2	54	M8x8	125	3.7
FRC-56	80	56	113	45	123	60	53	M42x2	57	M8x8	200	5.6
FRC-70	100	75	126	56	143	70	59	M48x2	63	M12x12	320	9.3
FRC-90	125	95	168	70	163	80	78	M64x3	83	M12x12	500	20
FRC-110	160	95	168	70	163	80	78	M80x3	83	M12x12	500	20

19 - OVERALL AND MOUNTING DIMENSIONS

FEMALE CLEVIS ISO 8133
with spring retainers

Dimensions in mm



Type	Ø EK f8	EL 0 / - 0.2	ET	Mass kg
PNF-36	28	87	96	0.5
PNF-45	36	107	120	1
PNF-56	45	129	144	1.8
PNF-70	56	149	164	3.2
PNF-90	70	169	187	5.6

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08

PROPORTIONAL & SERVO VALVES

48 catalogue documents | 556 original technical pages



PLKE08

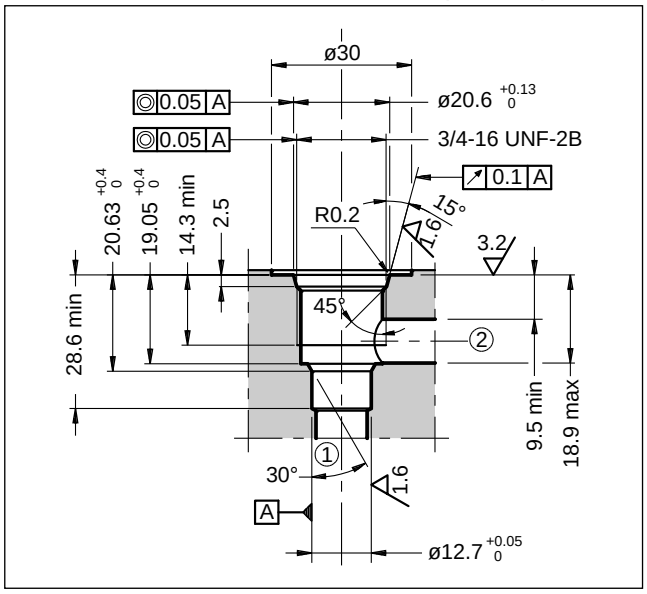
PROPORTIONAL PRESSURE CONTROL VALVE DIRECT OPERATED

SERIES 10

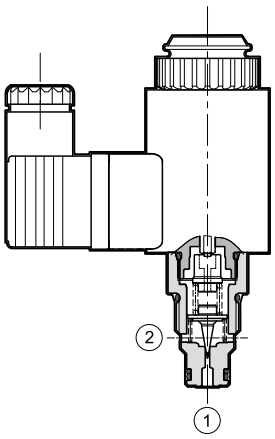
CARTRIDGE TYPE
seat 3/4-16 UNF-2B (SAE-08)

p max **400** bar
Q max **2** l/min

SEAT DIMENSIONS: 3/4-16 UNF-2B (SAE-08)



OPERATING PRINCIPLE



— The PLKE08 valve is a proportional pressure control valve, direct operated, cartridge type. They can be used in blocks and manifolds with SAE-08 seat.

— The valve is suitable as a pilot stage for remote control of two stage pressure control and reducing valves.

— The design of this valve has a mechanical pressure limitation feature for higher safety of the application.

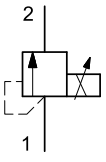
— The valve can be controlled directly by a current control supply unit or combined with an external electronic card to maximize the valve performances (see point 11).

— The valve is available in four pressure control ranges up to 350 bar.

PERFORMANCES
(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Maximum operating pressure (**NOTE**): - port 1 - port 2	bar	 400 210
Minimum controlled pressure	see p min = f(Q)	
Nominal flow Maximum flow	l/min	1 2
Step response	see point 5	
Hysteresis (with PWM 200 Hz)	% of p nom	< 5%
Repeatability	% of p nom	< ±1,5%
Electrical characteristic	see point 4	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass	kg	0.42

HYDRAULIC SYMBOL



NOTE: The maximum operating pressure is the sum of set pressure and return flow pressure.

1 - IDENTIFICATION CODE

PL	K	E	08	-		/	10		-			/	

Pressure control valve

Cartridge type

Electrical proportional control

Size

Pressure control range
080 = up to 80 bar
170 = up to 170 bar
250 = up to 250 bar
350 = up to 390 bar

Series No.
(from 10 to 19 sizes and mounting dimensions remain unchanged)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

D12 = Nominal solenoid voltage 12 V DC
D24 = Nominal solenoid voltage 24 V DC

Coil electrical connection:
K1 = plug for connector type EN 175301-803 (ex DIN 43650) (**standard**)
K2 = plug for connector type AMP JUNIOR
K7 = plug for connector type DEUTSCH DT04-2P male

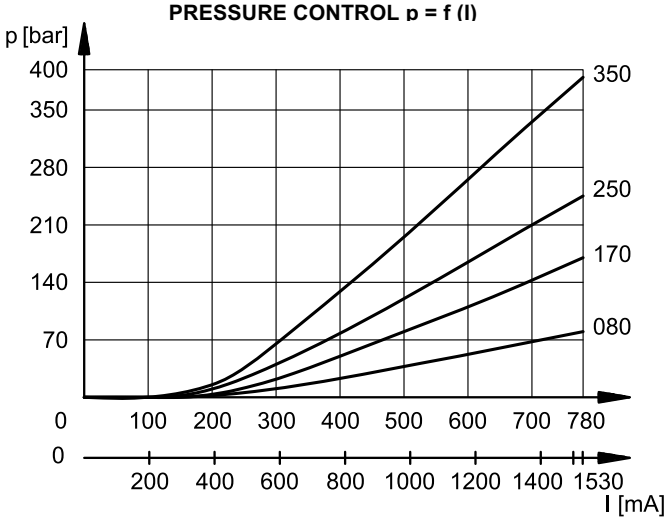
Option: manual override (see at point 11)

2 - CHARACTERISTIC CURVES

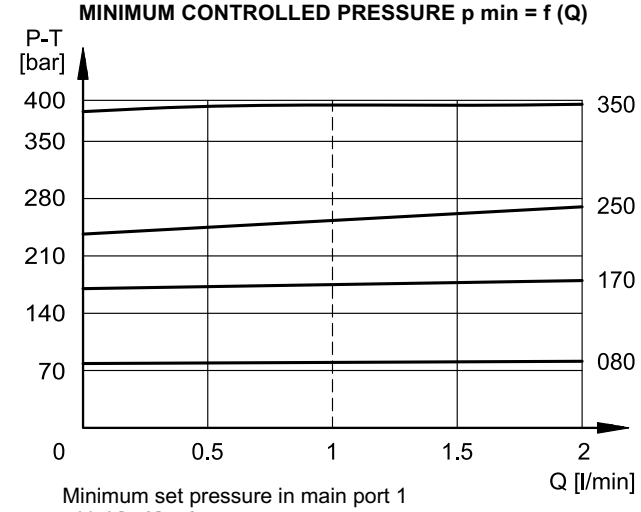
(measured with viscosity of 36 cSt at 50 °C)

Typical control curves according to the current supplied to the solenoid, measured with input flow rate Q = 1 l/min. The curves have been obtained without any hysteresis and linearity compensation and they are measured without any backpressure.

PRESSURE CONTROL p = f (I)

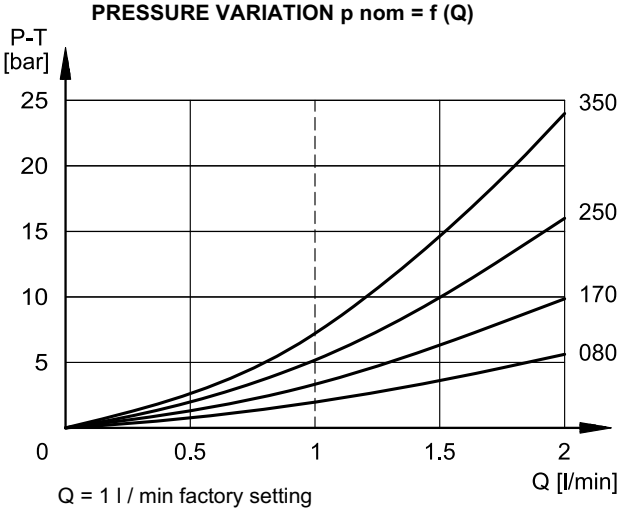


MINIMUM CONTROLLED PRESSURE p min = f (Q)



Minimum set pressure in main port 1
with I [mA] = 0

PRESSURE VARIATION p nom = f (Q)



Q = 1 l / min factory setting

3 - MAX PRESSURE VALUES

This valve incorporates a mechanical limit of the maximum pressure, that operates independently of the applied current. This kind of design ensures that the pressure cannot rise over even if the solenoid current exceeds the maximum current ($I > I_{max}$).

Values obtained with oil viscosity of 36 cSt at 50°C, Q = 1 l/min

		PLKE08-080	PLKE08-170	PLKE08-250	PLKE08-350
pressure value at 780 mA	bar	80	170	250	390
max pressure value when $I > I_{max}$	bar	90	190	290	440

4 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube and secured by means of a lock nut. It can be rotated through 360° depending on installation clearances.

Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree correctly connected and installed.

electric connection	electric connection protection	whole valve protection
K1	IP65	IP65
K2	IP65	
K7	IP65/67	

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20°C)	Ω	4.98	21
NOMINAL CURRENT	A	1.53	0.78
DUTY CYCLE		100%	
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2014/30/EU		
CLASS OF PROTECTION Coil insulation (VDE 0580) Impregnation	class H class F		

5 - STEP RESPONSE

(obtained with mineral oil with viscosity of 36 cSt at 50 °C and electronic control card)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

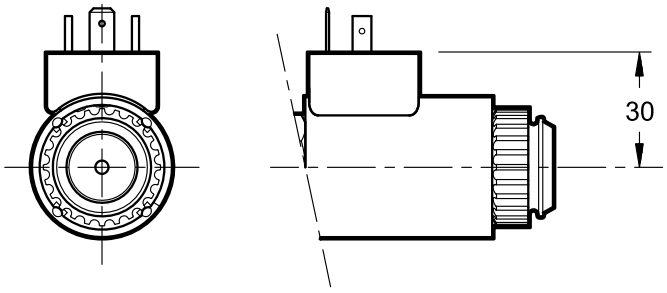
The table illustrates typical step response times measured with a PLKE08-350 bar and with input flow rate Q = 0,5 l/min.

REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms]	80	50

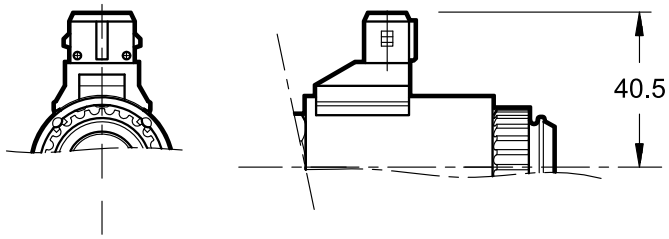
6 - ELECTRIC CONNECTIONS

Connectors for K1 connection are always delivered together with the valve.

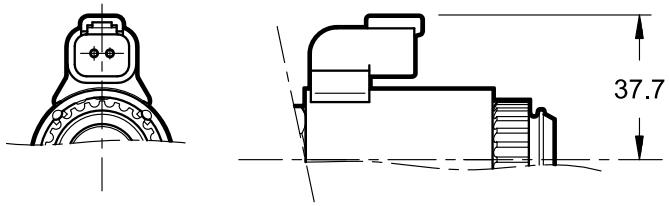
connection for EN 175301-803
connector
code **K1** (**standard**)



connection for AMP JUNIOR
connector type
code **K2**

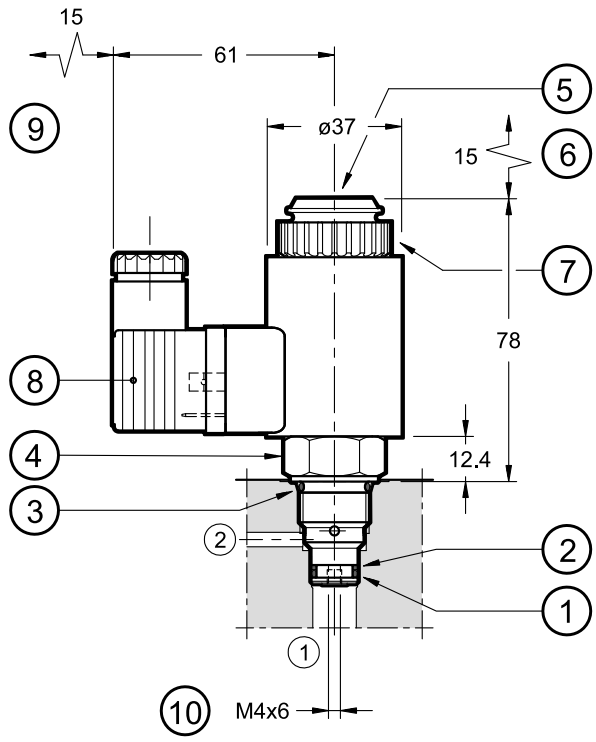


connection for
DEUTSCH DT06-2S male connector
code **K7**



7 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



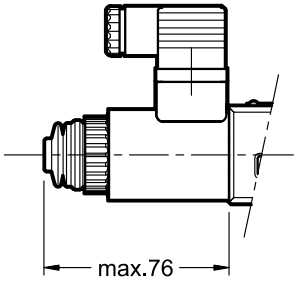
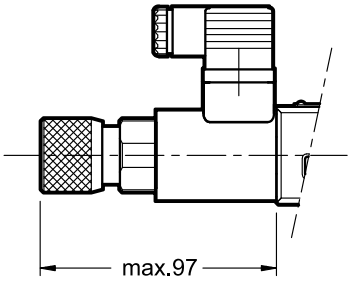
1	OR type 2037 (9.25x1.78) - 90 shore
2	PARBAK type 8-012 (9.96x1.14x1.35)
3	OR type 3-908 (16.36x2.2) - 70 shore
4	Cartridge tightening: spanner 24 Tightening torque 50 Nm
5	Manual override, integrated in the solenoid tube
6	Coil removal space
7	Coil locking ring: tightening torque 5 Nm ± 0,5
8	Electric connector type EN 175301-803 (ex DIN 43650)
9	Connector removal space
10	Seat for optional calibrated flow restrictor

8 - MANUAL OVERRIDES

These valves have solenoids whose pin for manual operation is integrated in the tube. Actuate this override by pushing it with a suitable tool, minding not to damage the sliding surface.

Two different manual override versions are available upon request:

- **CM** version, manual override boot protected.
- **CK1** version, knob to screw

CM Version	CK1 Version
	
Code: 3404100043	Code: 3404100041

9 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

10 - INSTALLATION

These valves can be installed in any position without impairing correct operation if it is ensured that there is no air in the hydraulic circuit.

Otherwise, vertical mounting with solenoid downward is preferable. In this case you must consider possible variations of the minimum controlled pressure values reported in point 2.

Connect the valve main port 2 directly to the reservoir.

NOTE: Occurring return pressures are to be added up to the value of pressure setting at main port 1.

11 - ELECTRONIC CONTROL UNITS

For one valve

EDM-M102	24V DC solenoids	rail mounting DIN EN 50022	see cat. 89 251
EDM-M163	12V DC solenoids		

For two valves

EDM-M30022	24V DC solenoids	rail mounting DIN EN 50022	see cat. 89 251
EDM-M36633	12V DC solenoids		

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PDE3

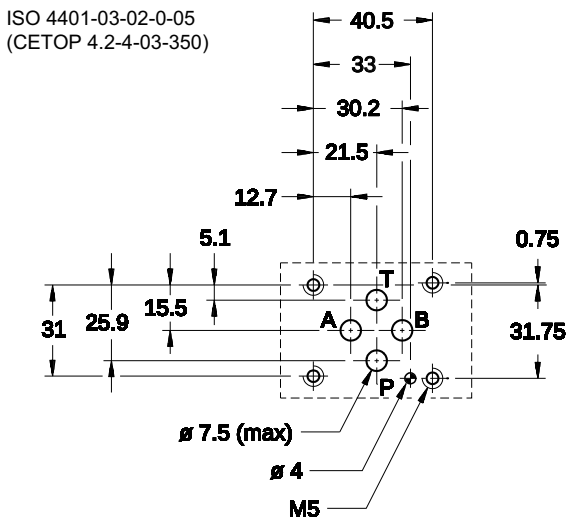
PROPORTIONAL PRESSURE RELIEF VALVE, DIRECT OPERATED

SERIES 10

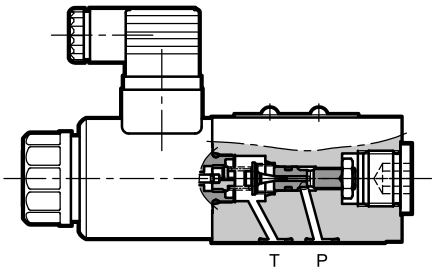
SUBPLATE MOUNTING ISO 4401-03

p max **350** bar
Q max **2** l/min

MOUNTING SURFACE



OPERATING PRINCIPLE



— The PDE3 valve is a direct operated proportional pressure relief valve, with mounting interface in compliance with ISO 4401 standards.

— It is suitable to pilot two-stage valves or for pressure control in hydraulic circuits.

— The design of this valve has a mechanical pressure limitation feature for higher safety of the application.

— The valve can be controlled directly by a current control supply unit or by an electronic control unit, to exploit valve performance to the full (see par. 9).

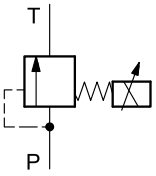
— The valve is available in five pressure control ranges up to 350 bar.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Maximum operating pressure: - P port - T port	bar	 350 2
Minimum controlled pressure	see p min = f(Q) diagram	
Nominal flow Maximum flow (see p min = f(Q) diagram)	l/min	1 2
Step response	see paragraph 6	
Hysteresis (with PWM 200 Hz)	% of p nom	< 5%
Repeatability	% of p nom	< ±1,5%
Electrical characteristic	see paragraph 5	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass	kg	1,6

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

P	D	E	3	-		/	10		-		K1

Pressure control valve

Direct operated

Electrical proportional control

Size ISO 4401-03

Pressure control range
025 = 0,9 - 25 bar
070 = 1,6 - 70 bar
140 = 2,4 - 140 bar
210 = 3,2 - 210 bar
350 = 5 - 350 bar

Series No.
(the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Coil electrical connection:
plug for connector type
EN 175301-803 (ex DIN 43650)
(**standard**)

D12 = Nominal solenoid voltage 12V DC
D24 = Nominal solenoid voltage 24V DC

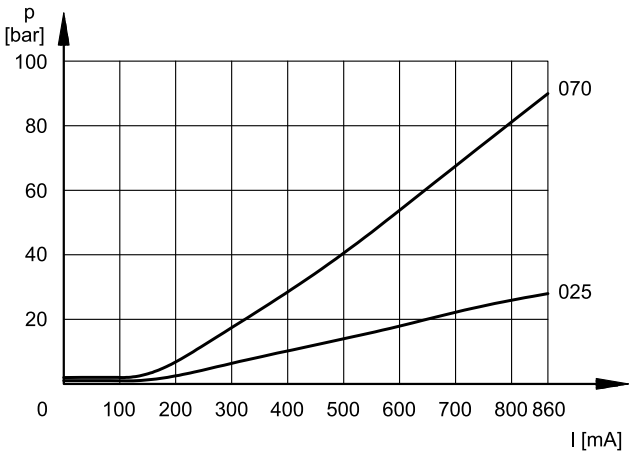
2 - CHARACTERISTIC CURVES

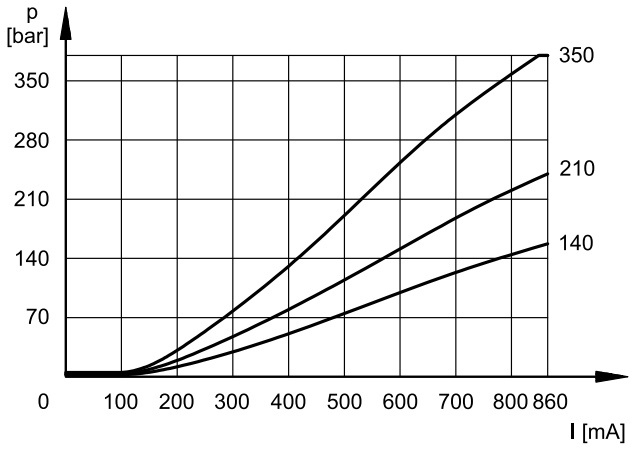
(obtained with viscosity of 36 cSt at 50°C, and valves with D24 coil)

Typical control curves according to the current supplied to the solenoid, measured with input flow rate Q = 1 l/min.

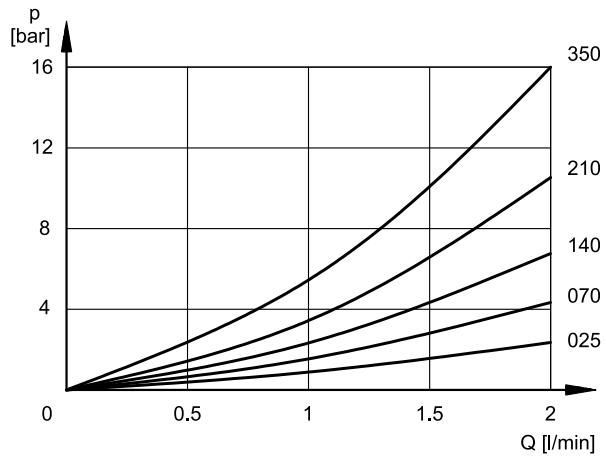
Curves have been obtained without any hysteresis and linearity compensation and they are measured without any backpressure in T. The full scale pressure is set in factory with a flow rate of 1 l/min. In case of higher flow rate, the full scale pressure will increase considerably (see diagram pmax = f (Q)).

PRESSURE CONTROL p = f(I)

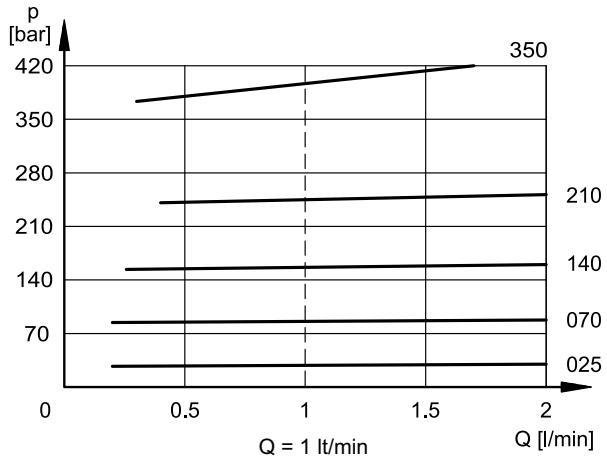




MINIMUM CONTROLLED PRESSURE p min = f (Q)



PRESSURE VARIATION p max = f (Q)



Q = 1 lt/min
factory setting

3 - MAX PRESSURE VALUES

This valve incorporates a mechanical limit of the maximum pressure, that operates independently of the applied current. This kind of design ensures that the pressure cannot rise over even if the solenoid current exceeds the maximum current ($I > I_{max}$).

Values obtained with oil viscosity of 36 cSt at 50°C, Q = 1 l/min

		PDE3-025	PDE3-070	PDE3-140	PDE3-210	PDE3-350
pressure value at 800 mA	bar	25	77	142	217	360
max pressure value when $I > I_{max}$	bar	33,5	90	161	252	390

4 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

5 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut and can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20°C)	Ω	3.66	17.6
NOMINAL CURRENT	A	1.88	0.86
DUTY CYCLE	100%		
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2014/30/EU		
CLASS OF PROTECTION atmospheric agents (EN 60529) coil insulation (VDE 0580) Impregnation	IP65 class H class F		

6 - STEP RESPONSE

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

The table illustrates typical step response times measured with a PDE3-210 and with an input flow rate of Q = 1 l/min and pressure oil volume of 0,1 litre. The response time is affected both by the flow rate and the oil volume in the pipework.

REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms]	60	70

7 - INSTALLATION

We recommend installing these valves with the solenoid downward, either in horizontal or vertical position. If the valve is installed on vertical axis with the solenoid upward, you should consider possible variations of the minimum controlled pressure from those indicated in paragraph 2.

Ensure that there is no air in the hydraulic circuit. In certain applications it might be necessary to vent the air entrapped in the solenoid tube by unfastening the drain screw placed in the solenoid tube.

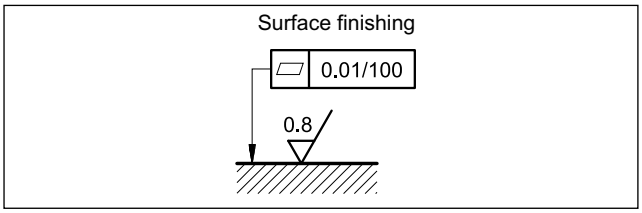
Ensure the solenoid tube is always filled with oil. Make sure the drain screw has been put back correctly at the end of the task.

Connect the valve T port directly to the tank. **Add any backpressure value detected in the T line to the controlled pressure value.**

Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.

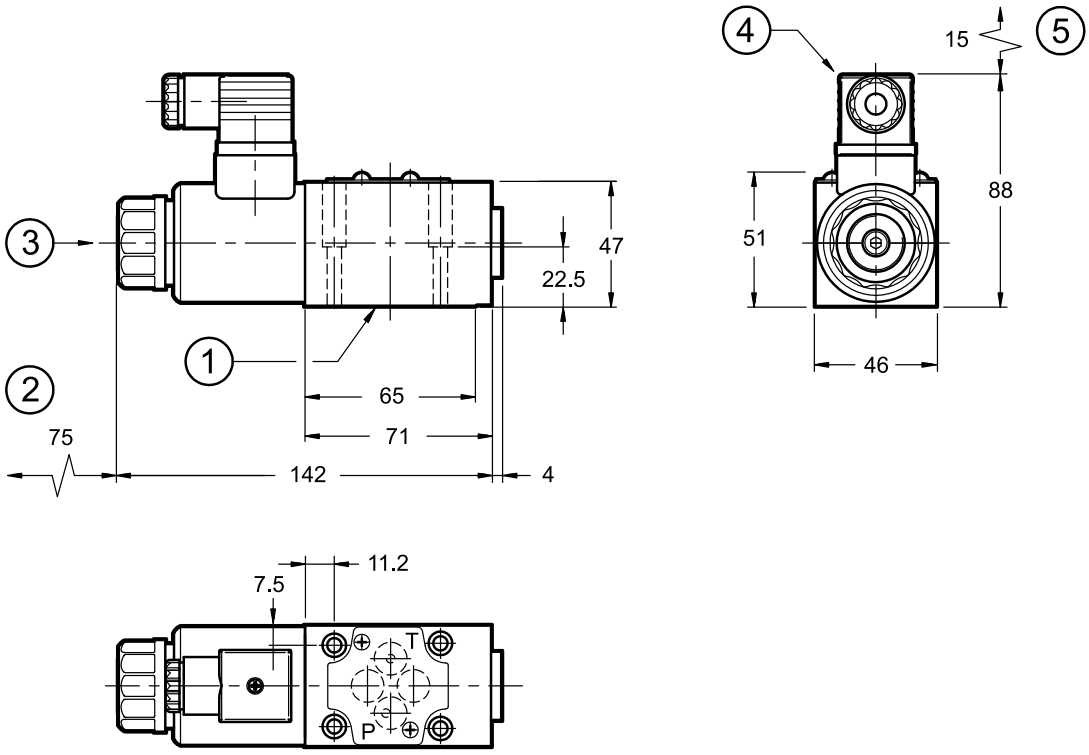
Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols.

If minimum values are not observed, fluid can easily leaks between the valve and support surface.



8 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (3) placed at the end of the solenoid tube.

Valve fastening: 4 SHC screws M5x30 - ISO 4762	
Tightening torque: 5 Nm (A 8.8 screws)	
Threads of mounting holes: M5x10	

1	Mounting surface with sealing rings: 4 OR type 2037 (9.25 x 1.78) - 90 shore
2	Coil removal space
3	Breather (Allen key 4)
4	EN 175301-803 (ex DIN 43650) connector, included in the supply
5	Connector removal space

9 - ELECTRONIC CONTROL UNITS

EDC-112	for solenoid 24V DC	plug version	see cat. 89 120
EDC-142	for solenoid 12V DC		
EDM-M112	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 251
EDM-M142	for solenoid 12V DC		

10 - SUBPLATES

(see catalogue 51 000)

PMMD-AI3G with ports on rear
PMMD-AL3G with side ports
Ports dimensions: P, T, A, B: 3/8” BSP thread

DUPLOMATIC MOTION SOLUTIONS

DUPLOMATIC MS S.p.A.
via M. Re Depaolini 24 • 20015 PARABIAGO (MI) • ITALY
tel. +39 0331.895.111 • www.duplomatic.com • e-mail: sales.exp@duplomatic.com

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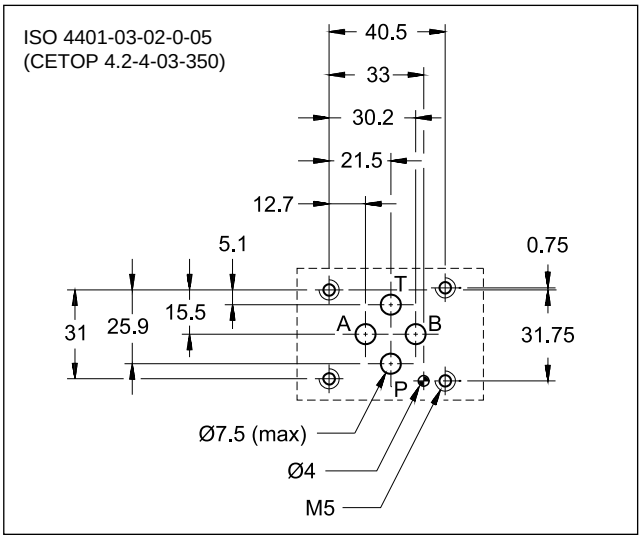
PDE3G*

PROPORTIONAL PRESSURE CONTROL VALVE WITH INTEGRATED ELECTRONICS

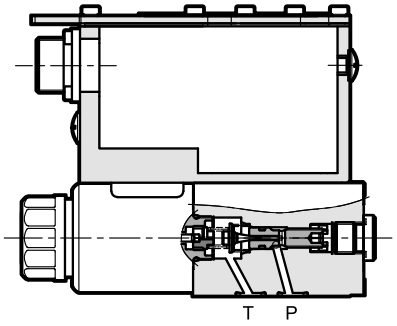
SUBPLATE MOUNTING ISO 4401-03

p max **350** bar
Q max **2** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



— The PDE3G* valve is a proportional pressure control valve, direct operated, with mounting surface in compliance with ISO 4401 standards.

— It is suitable to pilot two-stage valves, for pressure control in hydraulic circuits.

— Valves are available with different types of electronics, with analogue or fieldbus interfaces

— A solenoid current monitoring signal is available.

— Five pressure control ranges are available, up to 350 bar.

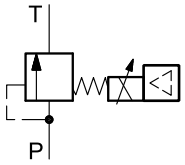
— The valves are easy to install. The driver manages digital settings directly.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50 °C and p = 140 bar)

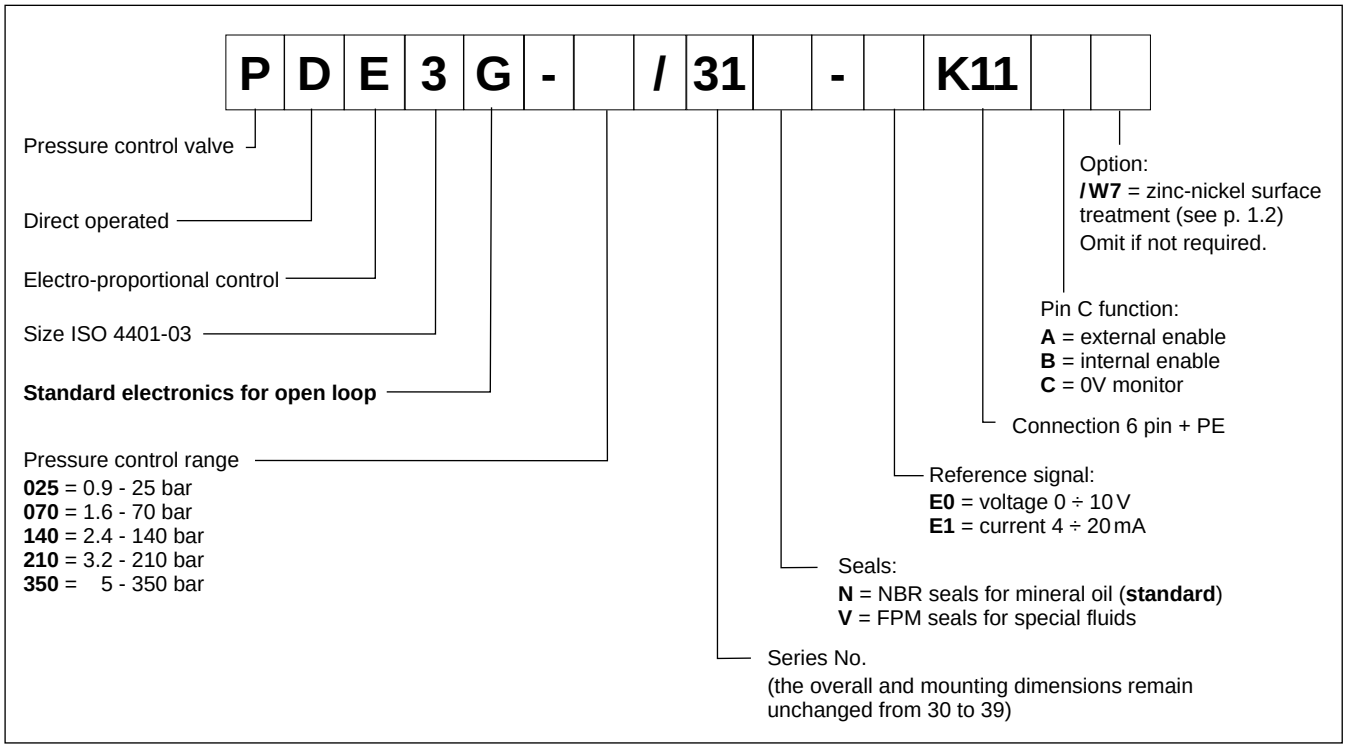
Maximum operating pressure: - P port - T port	bar	 350 2
Nominal flow Maximum flow (see diagram p min = f(Q))	l/min	1 2
Step response	see point 7	
Hysteresis	% of p nom	< 4%
Repeatability	% of p nom	< ±1%
Electrical characteristic	see point 2	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass	kg	2

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODES AND CONFIGURATION

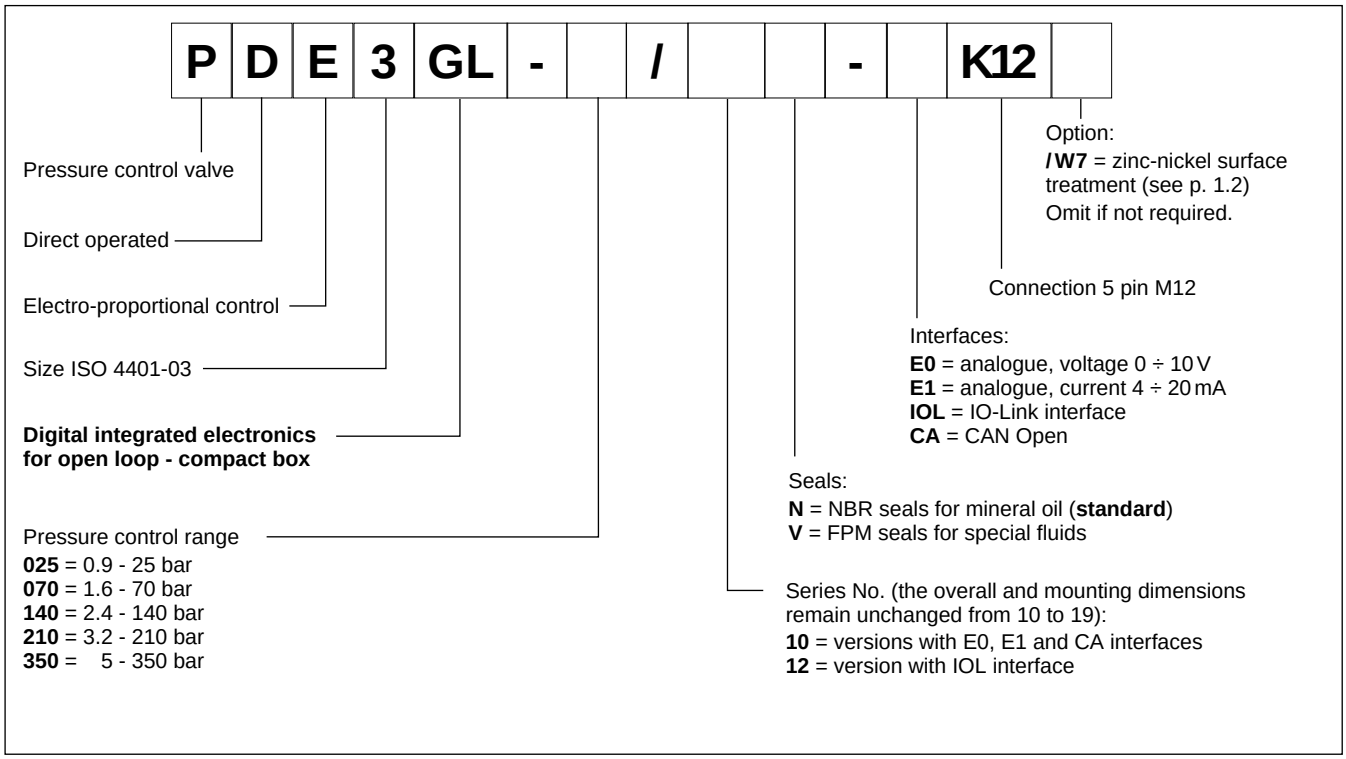
1.1 - Standard electronics



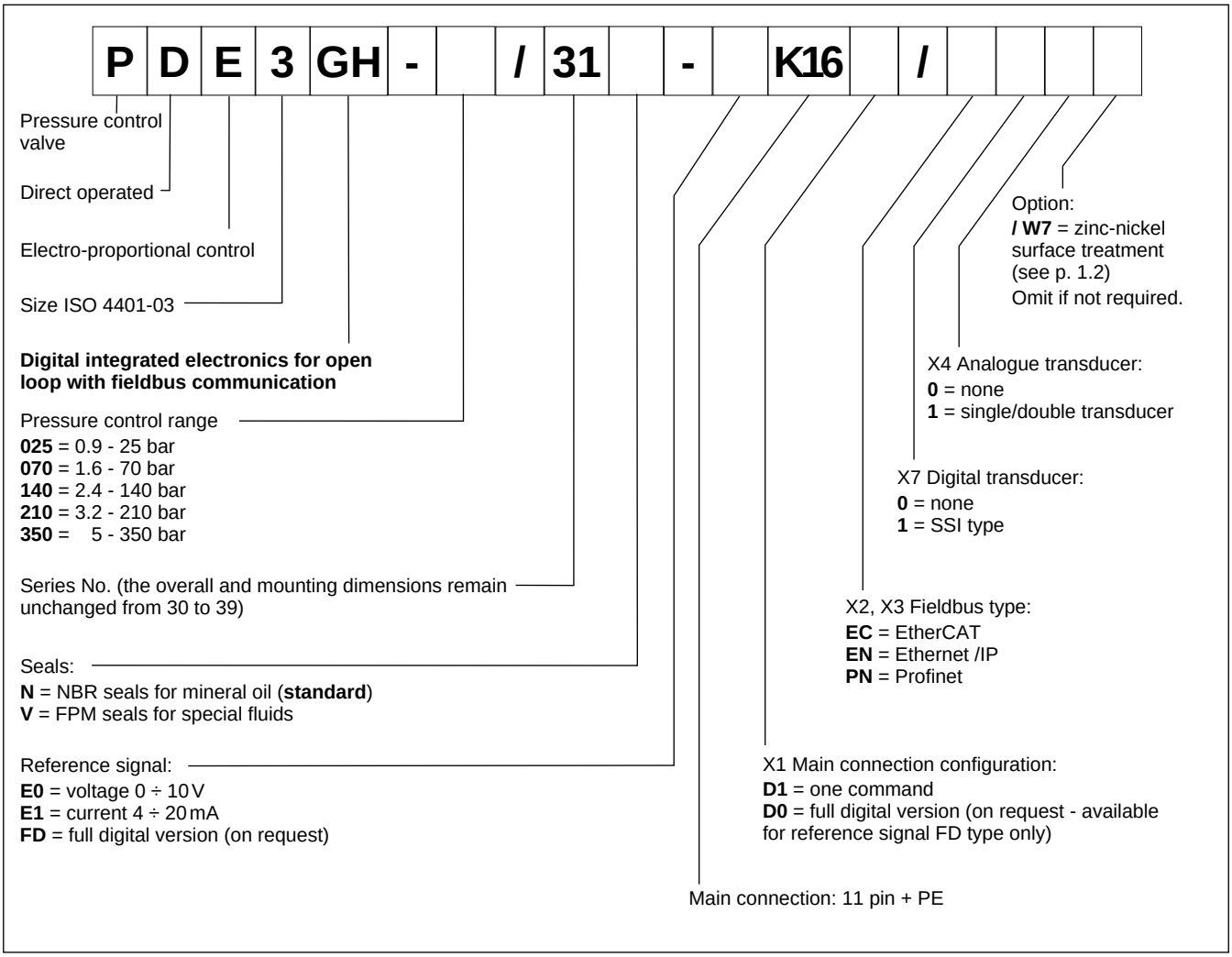
1.2 - Surface treatments

The standard valve is supplied with surface treatment of phosphating black. The zinc-nickel finishing on the valve body makes the valve suitable to ensure a salt spray resistance up to 240 hours. (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

1.3 - Compact electronics



1.4 - Electronics with fieldbus communication



2 - ELECTRONICS COMMON DATA

Duty cycle		100% (continuous operation)
Protection class according to EN 60529		IP65/IP67
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	25
Maximum solenoid current	A	1.88
Fuse protection, external	A	2A time lag
Managed breakdowns		Overload and electronics overheating, cable breakdown, supply voltage failures
Electromagnetic compatibility (EMC) emissions EN 61000-6-4, immunity EN 61000-6-2		According to 2014/30/EU standards

NOTE: The IP degree is guaranteed only with mating connector of equivalent IP degree, installed and tightened correctly. Moreover, on the GH versions it is necessary to protect any unused connections with caps.

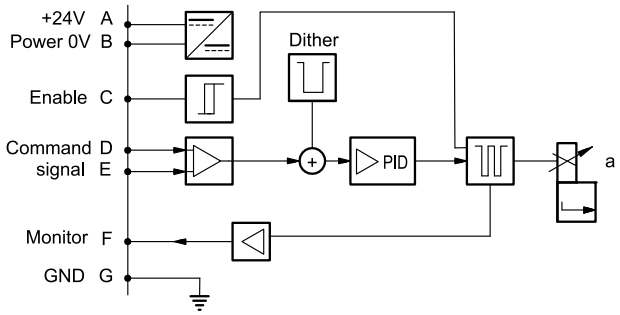
3 - PDE3G - STANDARD ELECTRONICS

3.1 - Electrical characteristics

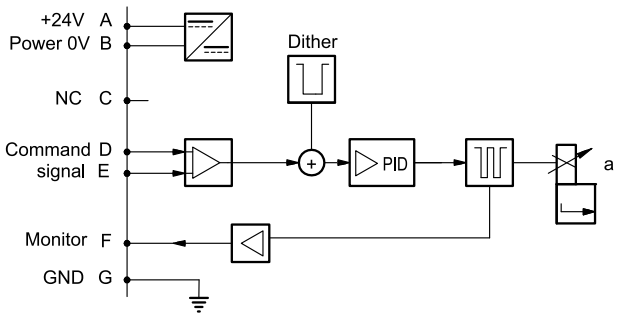
Command signal: voltage (E0) current (E1)	V DC mA	0 ÷ 10 (impedance Ri > 11 kohm) 4 ÷ 20 (impedance Ri = 58 ohm)
Monitor signal (current to solenoid): voltage (E0) current (E1)	V DC mA	0 ÷ 10 (impedance Ro > 1 kohm) 4 ÷ 20 (impedance Ro = 500 ohm)
Communication for diagnostic		LIN-bus Interface (by means of the optional kit)
Connection		6 pin + PE (MIL-C-5015-G - DIN EN 175201-804)

3.2 - On-board electronics diagrams

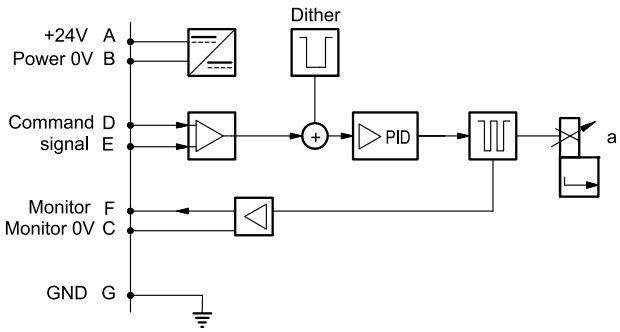
VERSION A - External Enable



VERSION B - Internal Enable

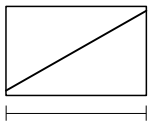


VERSION C - 0V Monitor

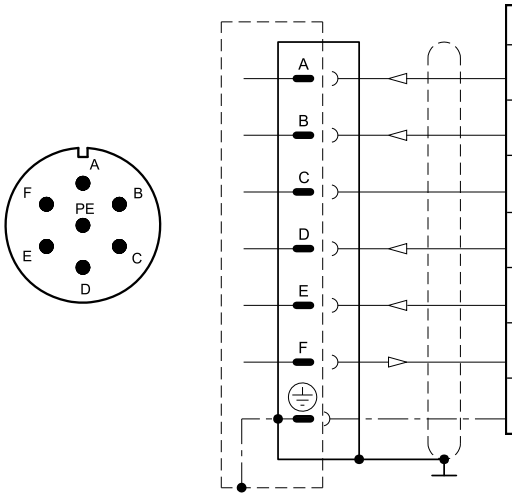


3.3 - Versions with voltage command (E0)

The reference signal is between 0 ÷ 10V. The monitor feature of versions B and C becomes available with a delay of 0.5 sec from the power-on of the card.



COMMAND	**0V**	**+10V**
MONITOR	**0V**	**+10V**

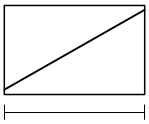


Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	0 ÷ 10 V	Command		
E	0 V	Command reference		
F	0 ÷ 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

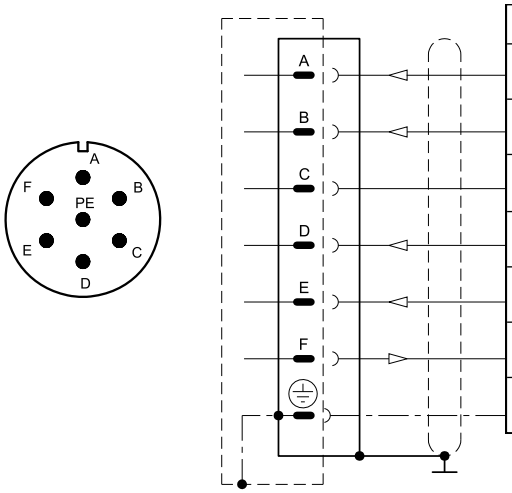
3.4 - Versions with current command (E1)

The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower, the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**4 mA**	**20 mA**
MONITOR	**4 mA**	**20 mA**



Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	Command reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

4 - PDE3GL - COMPACT ELECTRONICS

In IO-Link networks, the length of the connecting cables is limited to 20 metres. In CA versions, pin 3 and pin 5 are galvanic isolated up to 100 V to avoid earth loops.

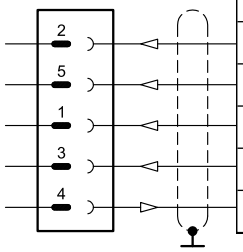
4.1 - Electrical characteristics

Command signal: voltage (E0) current (E1)	V DC mA	0 ÷ 10 (impedance Ri > 11 kohm) 4 ÷ 20 (impedance Ri = 58 ohm)
Monitor signal (current to solenoid): voltage (E0) current (E1)	 V DC mA	 0 ÷ 5 (impedance Ro > 1 kohm) 4 ÷ 20 (impedance Ro = 500 ohm)
IO-Link communication (IOL): Data rate	 kBaud	IO-Link Port Class B 38.4
Can Open communication (CA): Data rate	 kbit	 10 ÷ 1000
Data register (IOL and CA versions only)		card voltage supply, solenoid faults (shortcircuit, bad configuration), box temperature.
Connection		5-pin M12 code A (IEC 61076-2-101)

4.2 - Pin tables

'E0' connection

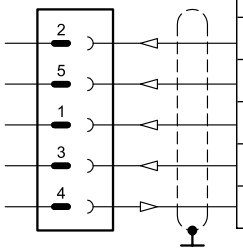




Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	0 ÷ 10 V	Command
3	0 V	Command reference
4	0 ÷ 5 V	Monitor (0V reference: pin 5)

'E1' connection

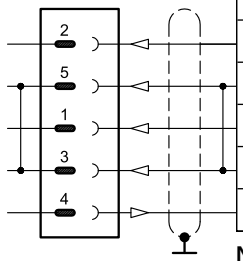




Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	4 ÷ 20 mA	Command
3	0V	Command reference
4	4 ÷ 20 mA	Monitor (0V reference: pin 5)

'IOL' connection



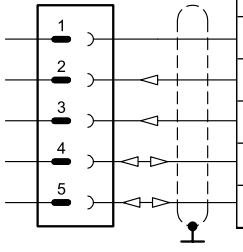


Pin	Values	Function
2	2L+ 24 V DC	Solenoid supply voltage
5	2L- 0 V (GND)	
1	1L+ +24 V DC	Logic and IO-Link supply voltage
3	1L- 0V (GND)	
4	C/Q	IO-Link Communication

NOTE: Pin 3 and pin 5 are linked with each other in the valve electronics. The reference potentials 1L- and 2L- of the two supply voltages must also be linked with each other on the customer side.

'CA' connection





Pin	Values	Function
1	CAN_SH	Shield
2	24 V DC	Supply voltage
3	0 V (GND)	
4	CAN H	Bus line (high)
5	CAN_L	Bus line (low)

5 - PDE3GH - FIELDBUS ELECTRONICS

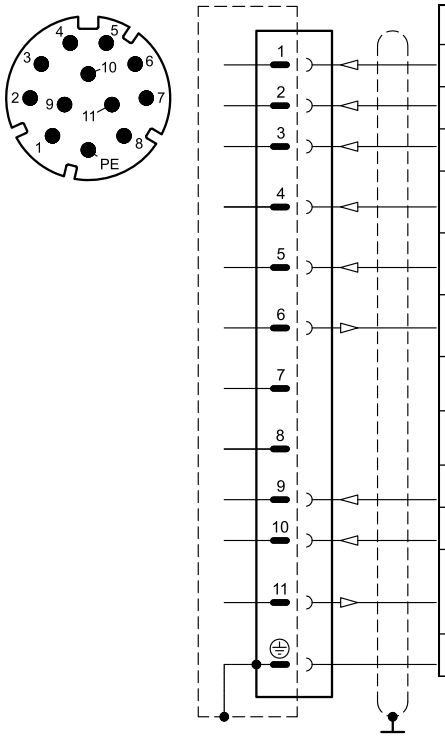
The 11+ PE pin connection allows separate supply voltage for electronics and solenoids.

Command - valve position schemes as for the standard electronics. Please refer to pictures in point 3.3 and 3.4.

5.1 - Electrical characteristics

Command signal: voltage (E0) current (E1) digital (FD)	V DC mA	0 ÷ 10 (impedance Ri > 11 kohm) 4 ÷ 20 (impedance Ri = 58 ohm) via fieldbus
Monitor signal (current to solenoid): voltage (E0) current (E1)	V DC mA	0 ÷ 10 (impedance Ro > 1 kohm) 4 ÷ 20 (impedance Ro = 500 ohm)
Communication / diagnostic		via Bus register
Communication interface standards		IEC 61158
Communication physical layer		fast ethernet, insulated 100 Base TX
Power connection		11 pin + PE (DIN 43651)

5.2 - X1 Main connection pin table



D1: one command

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	0 ÷ 10 V (E0) 4 ÷ 20 (E1)	Command
5	0 V	Command reference signal
6	0 ÷ 10 V (E0) 4 ÷ 20 (E1)	Monitor (0V reference pin 10)
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V reference pin 2)
12	GND	Ground (Earth)

D0: full digital

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	NC	do not connect
5	NC	do not connect
6	NC	do not connect
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V ref. pin 2)
12	GND	Ground (Earth)

5.3 - FIELDBUS connections

Please wire following guidelines provided by the related standards communication protocol. Any connections present and not used must be protected with special caps so as not to nullify the protection against atmospheric agents.

X2 (IN) connection M12 D 4 pin female



Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

X3 (OUT) connection: M12 D 4 pin female

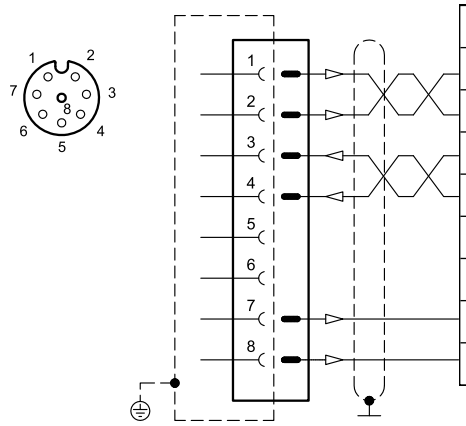


Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

NOTE: Shield connection on connector housing is recommended.

5.4 - Digital transducer connection
X7 connection: M12 A 8 pin female

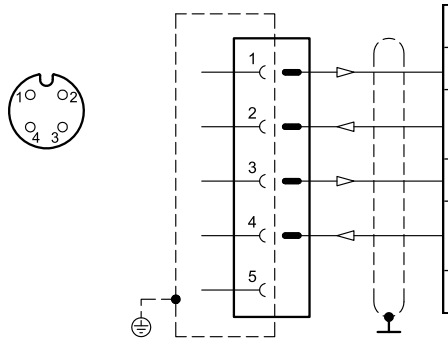
VERSION 1: SSI type



Pin	SSI Values	Function	Notes
1	CLK+	Serial synchronous clock (+)	Input - digital signal
2	CLK-	Serial synchronous clock (-)	
3	MIS0+	Serial position data (+)	
4	MIS0-	Serial position data (-)	
5	NC	-	do not connect
6	NC	-	
7	+24 V	transducer power supply	Output power supply
8	0 V	-	Common GND

5.5 - Analogue transducer connection
X4 connection: M12 A 4 pin female

VERSION 1: single / double transducer
(single or double is a software-selectable option)



Pin	Values	Notes
1	+24 V	Remote transducer power supply (out) 100 mA
2	±10 V 4 ÷20 mA	Input signal of transducer 1 (range software selectable)
3	0 V	Common reference signal for transducer power and signals
4	±10 V 4 ÷20 mA	Input signal of transducer 2 (range software selectable)
5	-	

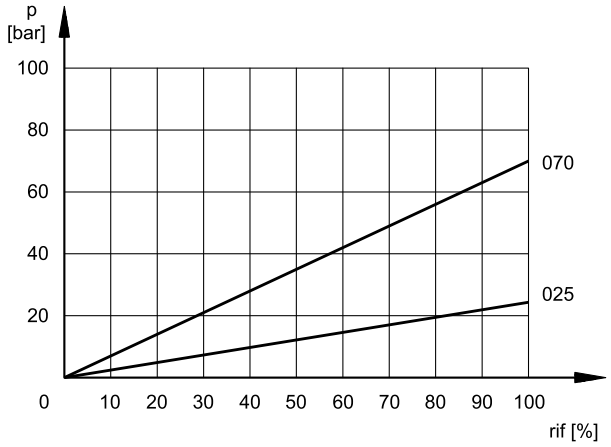
6 - CHARACTERISTIC CURVES

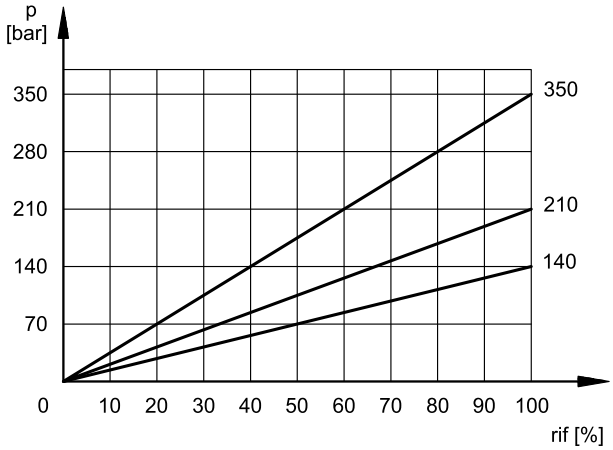
(measured with viscosity of 36 cSt at 50°C)

Typical control curves according to the reference signal for pressure control ranges, measured with input flow rate Q = 1 l/min. Characteristic curves measured without backpressure in T, with linearity compensation set by the onboard electronics.

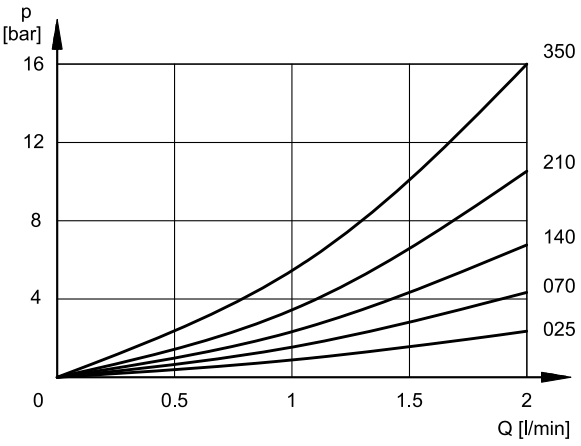
The full scale pressure is set in factory with a flow rate of 1 l/min. In case of higher flow rate, the full scale pressure will increase considerably. See diagram pmax = f (Q).

PRESSURE CONTROL p = f (I)

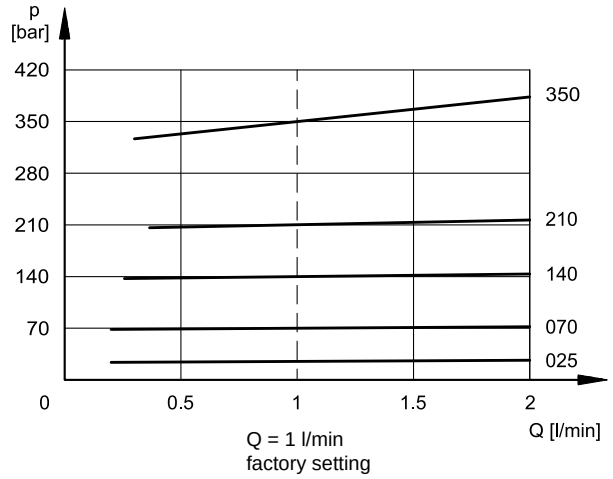




MINIMUM CONTROLLED PRESSURE p min = f (Q)



PRESSURE VARIATION p max = f (Q)



Q = 1 l/min
factory setting

7 - STEP RESPONSE

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

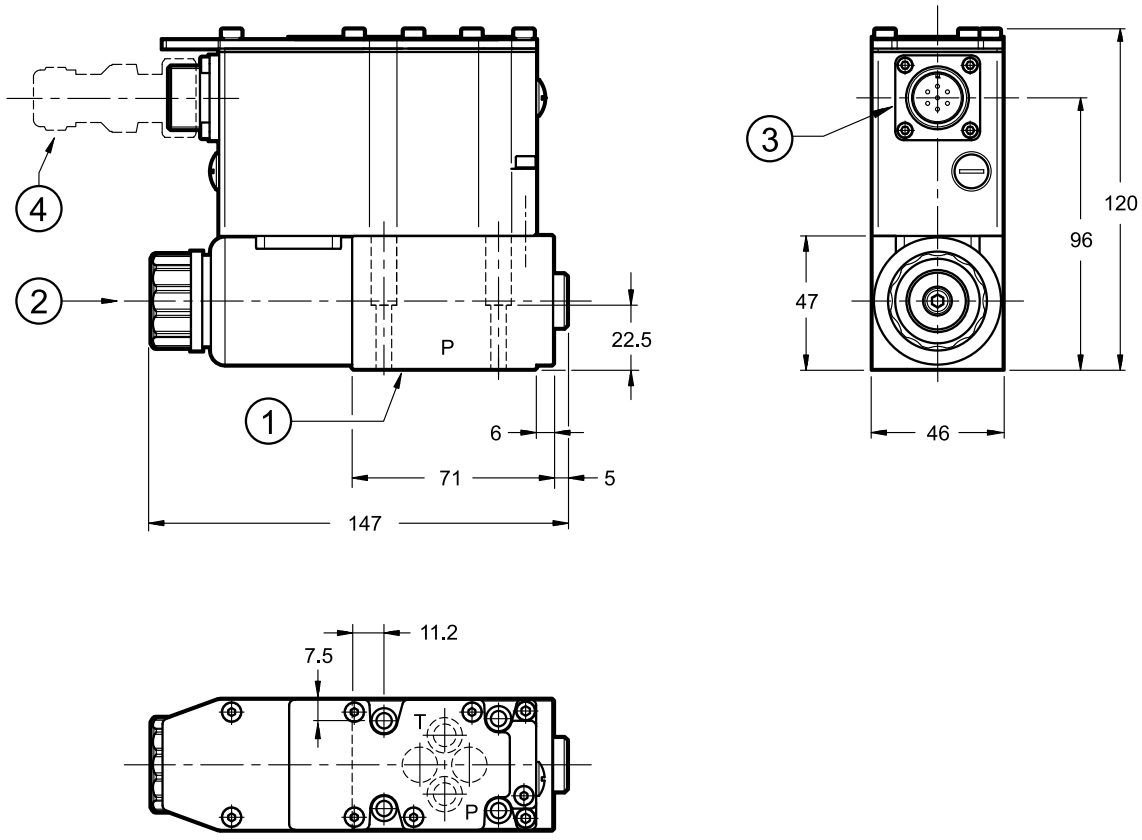
The table illustrates typical step response times measured with a PDE3G-210 and with an input flow rate of Q = 1 l/min and pressure oil volume of 0,1 litre.

The response time is affected both by the flow rate and the oil volume in the pipework.

REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms]	60	20

8 - PDE3G - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

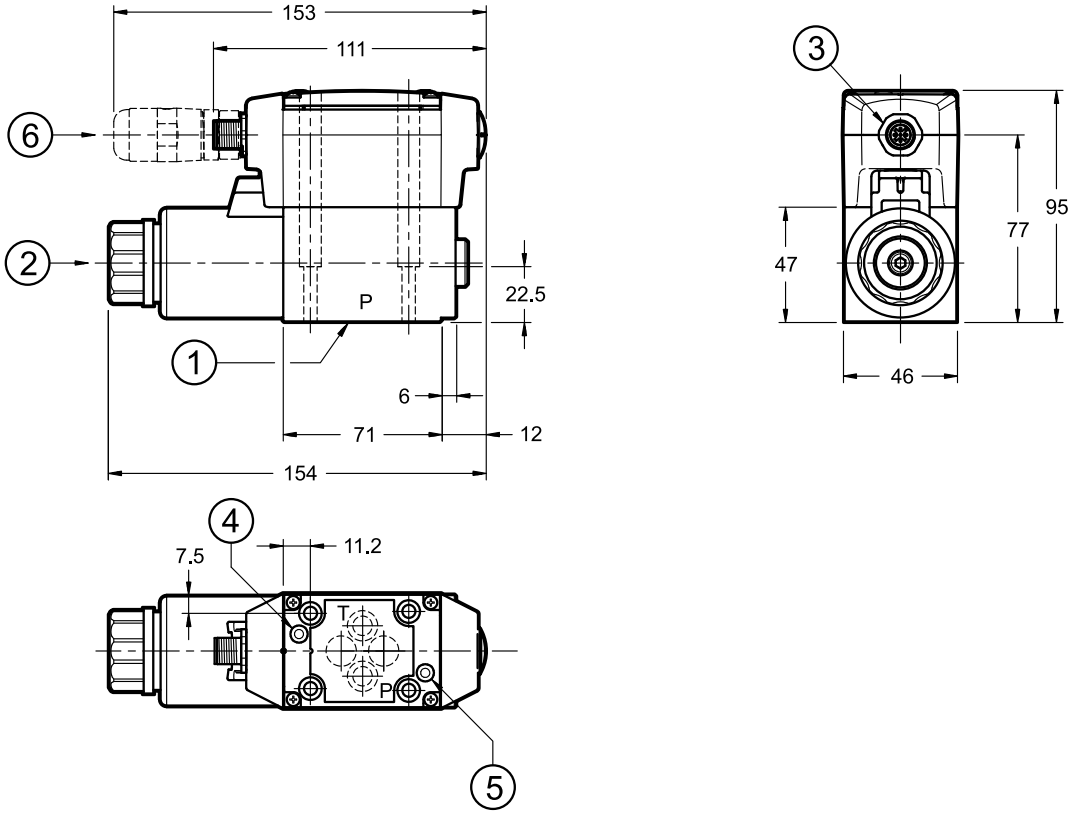


NOTE:
at the first start up or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

Fastening bolts: 4 SHCS M5x30 - ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

1	Mounting surface with sealing rings: 4 OR type 2037 (9.25 x 1.78) - 90 Shore
2	Breather: Allen key 4
3	Main connection 6 pin + PE
4	Mating connector 6 poles + PE, female type MIL-5015-G **To be ordered separately** See catalogue 89 000

9 - PDE3GL - OVERALL AND MOUNTING DIMENSIONS

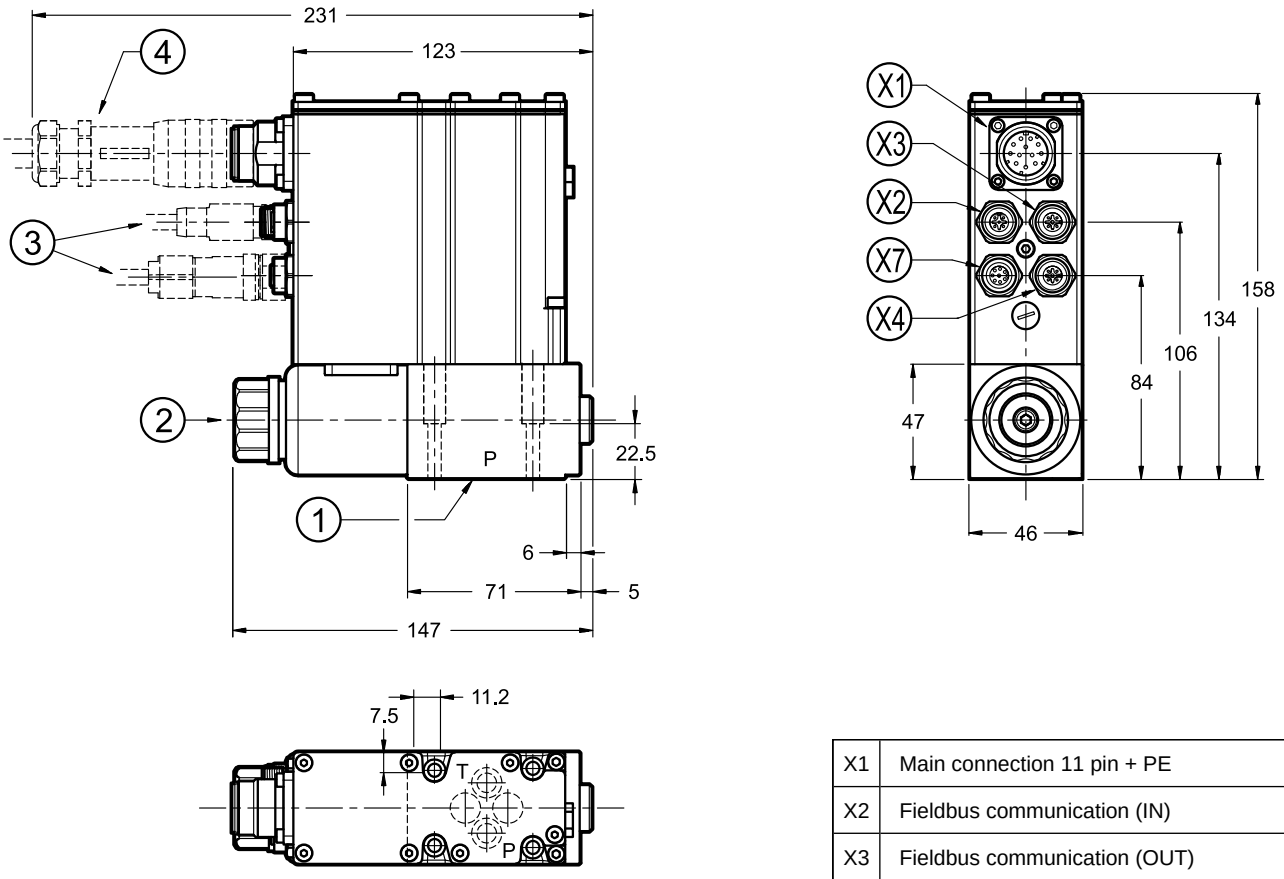


1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Breather: Allen key 4
3	Connection M12 A 5 pin
4	L1 LED
5	L2 LED
6	Mating connector M12 5 poles code A, female **To be ordered separately.** See catalogue 89 000

Fastening bolts: 4 SHCS M5x30- ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

10 - PDE3GH - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



X1	Main connection 11 pin + PE
X2	Fieldbus communication (IN)
X3	Fieldbus communication (OUT)
X4	X4 connection for analogue transducer
X7	X7 connection for digital transducer

1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Breather: Allen key 4
3	Mating connector 11 poles + PE **To be ordered separately.** See catalogue 89 000
4	Mating connectors for fieldbus communication and signals **To be ordered separately.** See catalogue 89 000

Fastening bolts: 4 SHCS M5x30 - ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

NOTE: Depending on the chosen version, X4 and X7 connections may not be present.
Please refer to section 5 for connection descriptions and pinout.

11 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

12 - INSTALLATION

We recommend installing these valves in vertical position with the solenoid downward, either horizontal. If the valve is installed on vertical axis with the solenoid upward, you should consider possible variations of the minimum controlled pressure from those indicated at point 6.

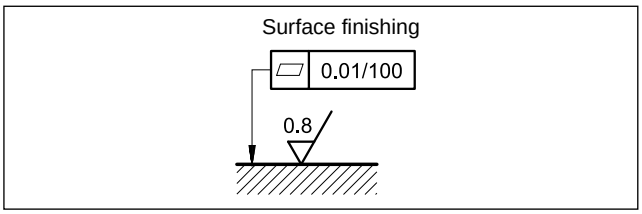
Ensure that there is no air in the hydraulic circuit. In certain applications it might be necessary to vent the air entrapped in the solenoid tube by unfastening the drain screw placed in the solenoid tube.

Ensure the solenoid tube is always filled with oil. Make sure the drain screw has been put back correctly at the end of the task. Connect the valve T port directly to the tank.

Add any backpressure value detected in the T line to the controlled pressure value. Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols.

If minimum values are not observed, fluid can easily leaks between the valve and support surface.



13 - ACCESSORIES

(to be ordered separately)

13.1 - Mating connectors

Mating connectors must be ordered separately. See catalogue 89 000.

For K11 and K16 versions we recommend the choice of a metal connector to avoid electromagnetic disturbances and to comply with EMC regulations on electromagnetic compatibility. If you opt for a plastic connector, make sure that it guarantees and maintains the IP and EMC protection characteristics of the valve.

13.2 - Mating connectors and caps for fieldbus communication and for sensors.

Duplomatic offers spare parts to be wired and also ready-to-use cord sets. Please refer to cat. 89 000.

13.3 - Connection cable

The optimal wiring provides for 7 isolated conductors, with separate screen for the signal wires (command, monitor) and an overall screen.

Cross section for power supply:
- up to 20 m cable length : 1,0 mm^2
- up to 40 m cable length : 1,5 mm^2 (IO-Link excluded)

Cross section for signals (command, monitor):
- 0,50 mm^2

13.4 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic. See catalogue 89 850.

14 - SUBPLATES

(see catalogue 51 000)

PMMD-AI3G rear ports
PMMD-AL3G side ports
Ports dimensions: P, T, A, B: 3/8” BSP

DUPLOMATIC MOTION SOLUTIONS
a member of DAIKIN group

DUPLOMATIC MS Spa
via Mario Re Depaolini, 24 | 20015 Parabiago (MI) | Italy
T +39 0331 895111 | E vendite.ita@duplomatic.com | sales.exp@duplomatic.com
duplomaticmotionsolutions.com

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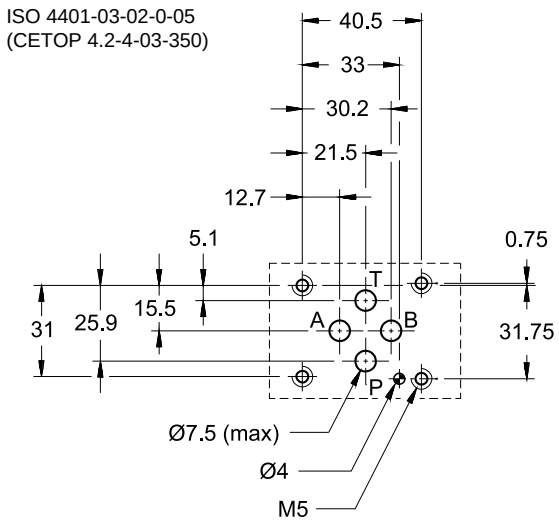
PDE3J*

PROPORTIONAL PRESSURE CONTROL VALVE, WITH PRESSURE FEEDBACK AND INTEGRATED ELECTRONICS

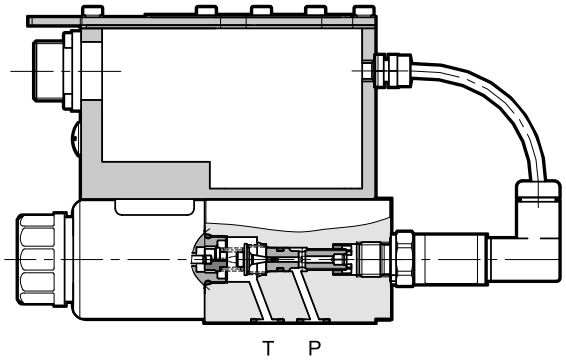
SUBPLATE MOUNTING ISO 4401-03

p max **350** bar
Q max **2** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



— The PDE3J* is a direct operated proportional pressure control valve with pressure feedback and mounting interface in compliance with ISO 4401 standards.

— It is suitable to pilot two-stage valves, for pressure control in hydraulic circuits.

— It is available with different types of electronics, with analogue or fieldbus interfaces.

— The monitoring of the value detected by the pressure transmitter is available on pin F.

— Three pressure adjustment ranges are available up to 350 bar .

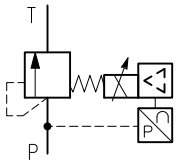
— The valve is easy to install. The driver manages digital settings directly.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

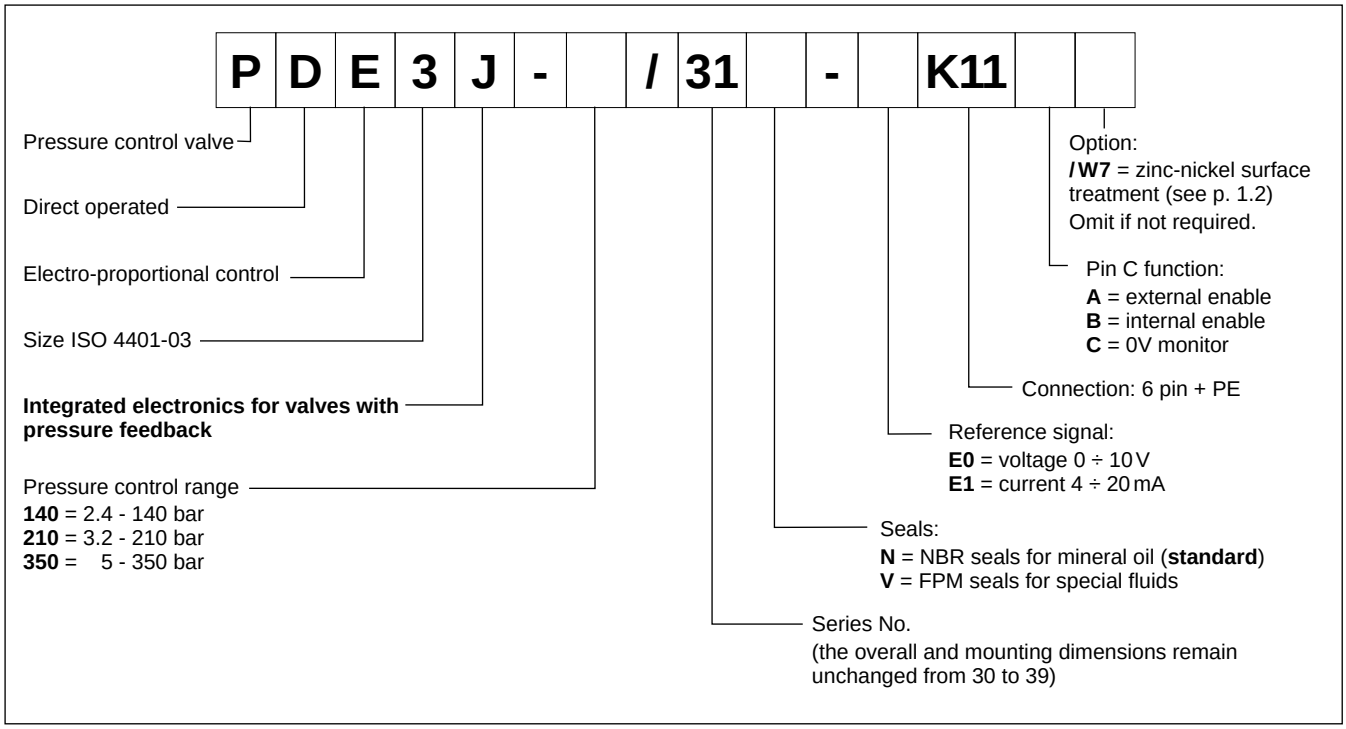
Maximum operating pressure: - P port - T port	bar	 350 2
Nominal flow Maximum flow (see p min= f(Q) diagram)	l/min	1 2
Step response	see point 7	
Hysteresis	% of p nom	< 1%
Repeatability	% of p nom	< ±0,5%
Electrical characteristic	see point 2	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass	kg	2,5

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

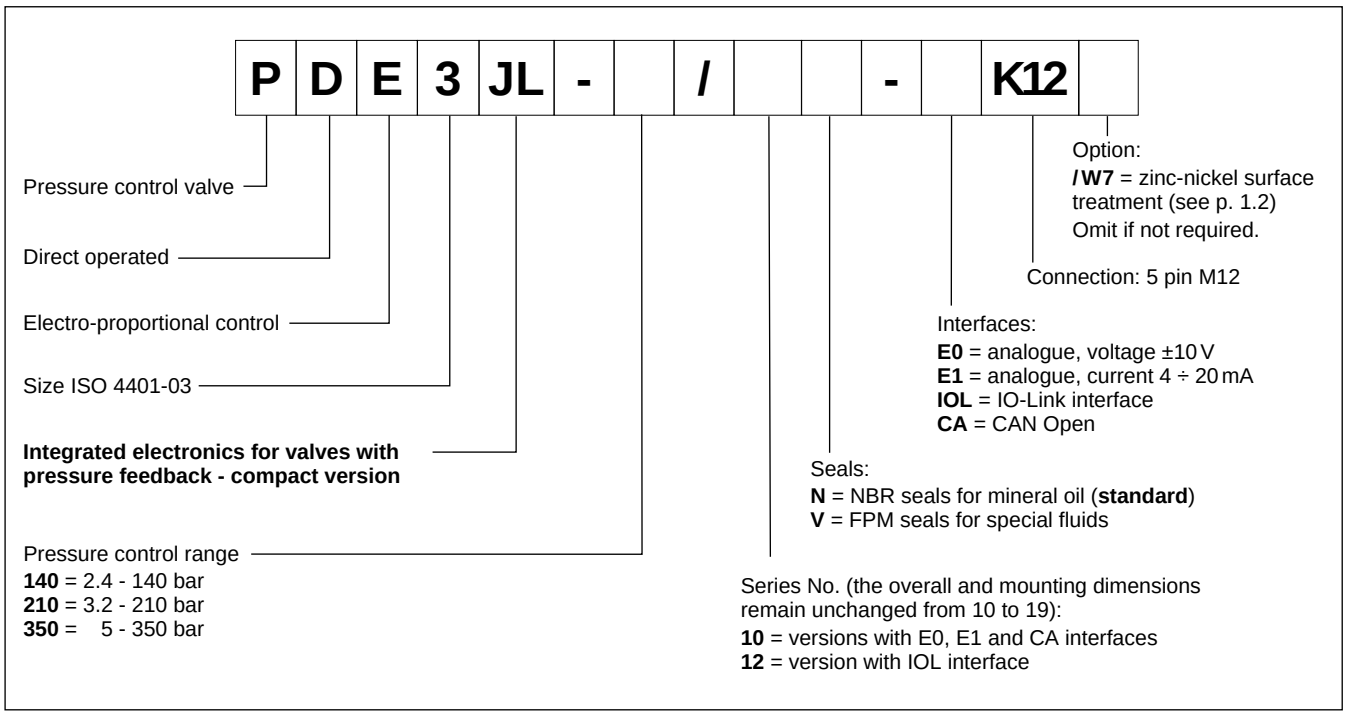
1.1 - Standard electronics



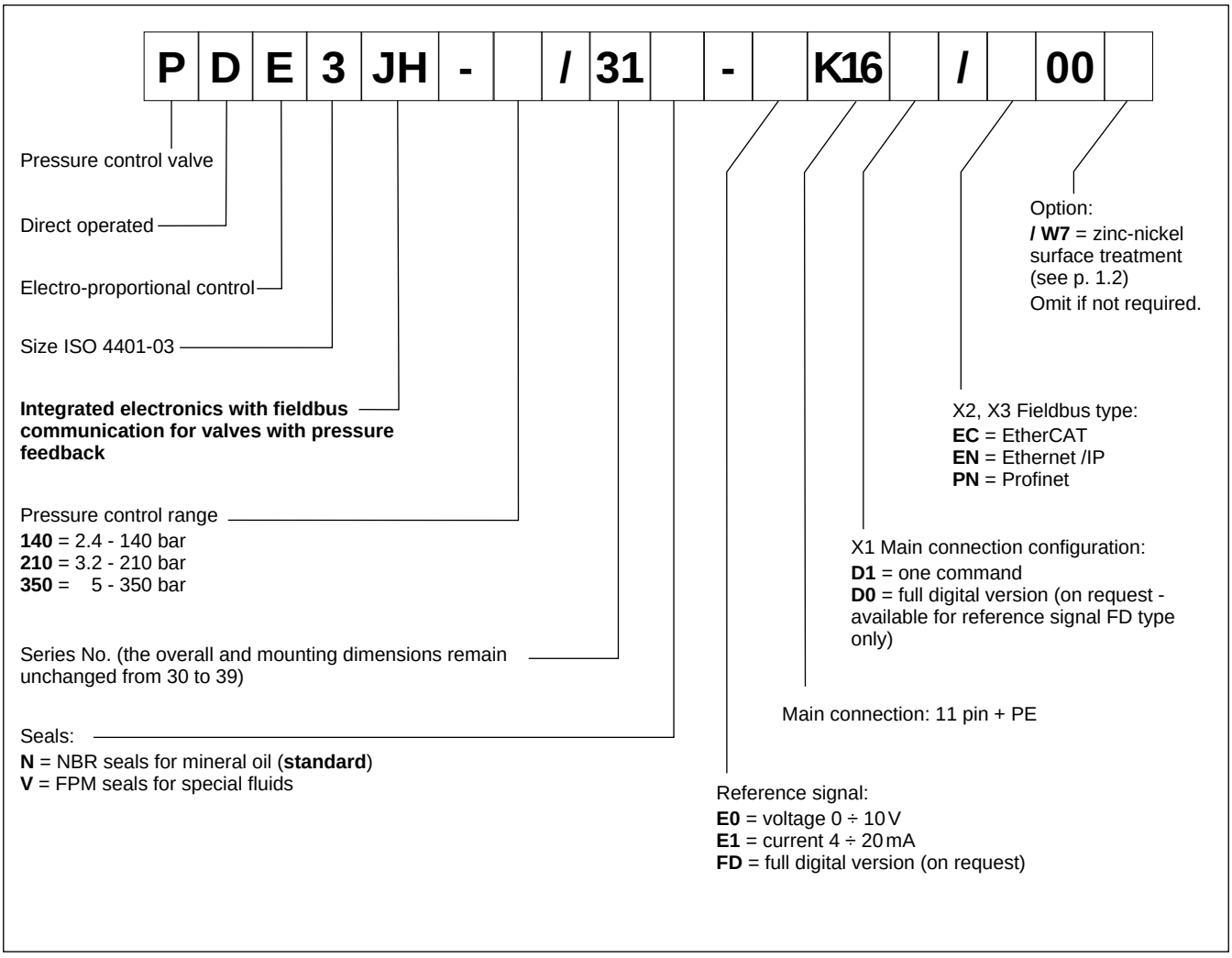
1.2 - Surface treatments

The standard valve is supplied with surface treatment of phosphating black. The zinc-nickel finishing on the valve body makes the valve suitable to ensure a salt spray resistance up to 240 hours. (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

1.3 - Compact electronics



1.4 - Electronics with fieldbus communication



2 - ELECTRONICS COMMON DATA

Duty cycle		100% (continuous operation)
Protection class according to EN 60529		IP65/IP67 (**NOTE**)
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	25
Maximum solenoid current	A	1.88
Fuse protection, external	A	2A time lag
Managed breakdowns		Overload and electronics overheating, cable breakdown, supply voltage failures
Electromagnetic compatibility (EMC) emissions EN 61000-6-4, immunity EN 61000-6-2		According to 2014/30/EU standards

NOTE: The IP degree is guaranteed only with mating connector of equivalent IP degree, installed and tightened correctly. Moreover, on the JH versions it is necessary to protect any unused connections with caps.

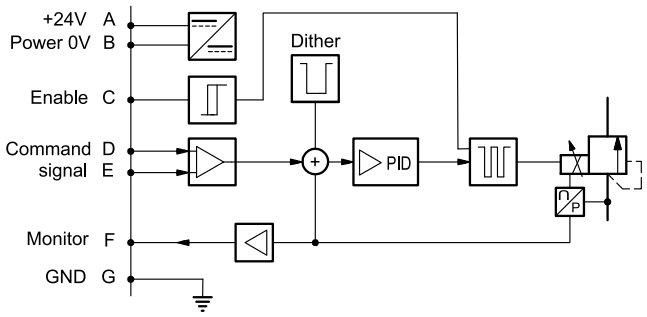
3 - PDE3J - STANDARD ELECTRONICS

3.1 - Electrical characteristics

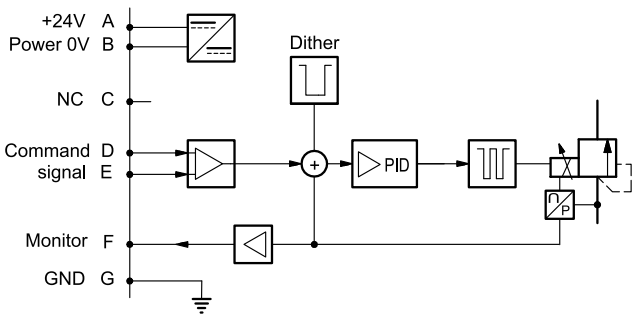
Command signal: voltage (E0) current (E1)	V DC mA	0 ÷ 10 (impedance Ri > 11 kOhm) 4 ÷ 20 (impedance Ri = 58 Ohm)
Monitor signal (pressure at transducer): voltage (E0) current (E1)	V DC mA	0 ÷ 10 (impedance Ro > 1 kOhm) 4 ÷ 20 (impedance Ro = 500 Ohm)
Communication for diagnostic		LIN-bus Interface (by means of the optional kit)
Connection		6 pin + PE (MIL-C-5015-G - DIN EN 175201-804)

3.2 - On-board electronics diagrams

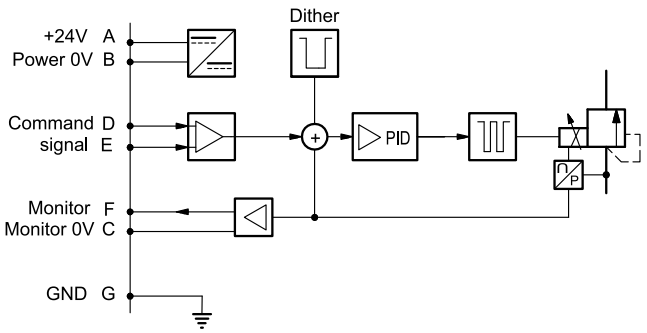
VERSION A - External Enable



VERSION B - Internal Enable

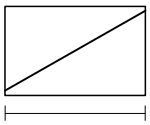


VERSION C - 0V Monitor

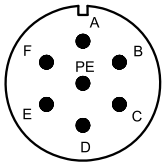


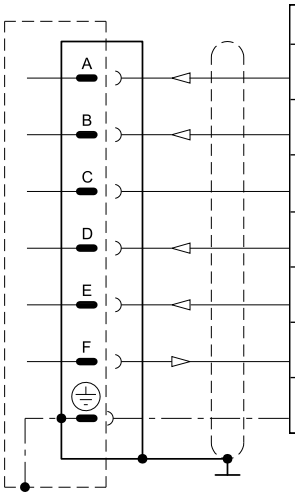
3.3 - Version with voltage command (E0)

The reference signal is between 0 ÷ 10V. The monitor feature of versions B and C becomes available with a delay of 0.5 sec from the power-on of the card.



COMMAND	**0V**	**+10V**
MONITOR	**0V**	**+10V**



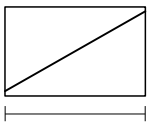


Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	0 ÷ 10 V	Command (differential input)		
E	0 V	Command reference		
F	0 ÷ 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

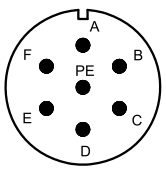
3.4 - Versions with current command (E1)

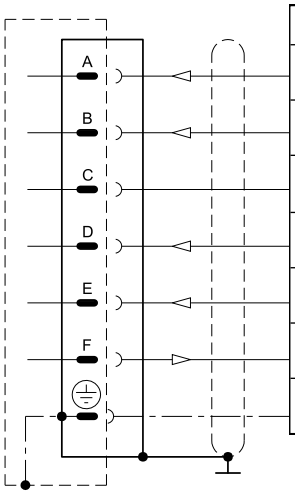
The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower, the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**4 mA**	**20 mA**
MONITOR	**4 mA**	**20 mA**





Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	Command reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

4 - PDE3JL - COMPACT ELECTRONICS

In IO-Link networks, the length of the connecting cables is limited to 20 metres. In CA versions, pin 3 and pin 5 are galvanic isolated up to 100 V to avoid earth loops.

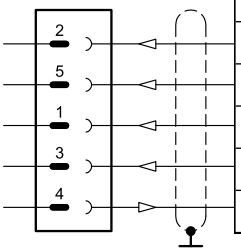
4.1 - Electrical characteristics

Command signal: voltage (E0) current (E1)	V DC mA	0 ÷ 10 (impedance Ri > 11 kOhm) 4 ÷ 20 (impedance Ri = 58 Ohm)
Monitor signal (pressure at transducer): voltage (E0) current (E1)	 V DC mA	 0 ÷ 5 (impedance Ro > 1 kOhm) 4 ÷ 20 (impedance Ro = 500 Ohm)
IO-Link communication (IOL): Data rate	 kBaud	IO-Link Port Class B 38.4
Can Open communication (CA): Data rate	 kbit	 10 ÷ 1000
Data register (IOL and CA versions only)		card voltage supply, solenoid faults (shortcircuit, bad configuration), box temperature.
Connection		5-pin M12 code A (IEC 61076-2-101)

4.2 - Pin tables

'E0' connection

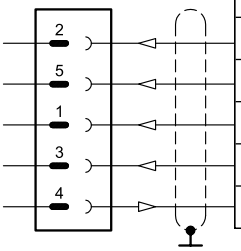




Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	0 ÷ 10 V	Command
3	0 V	Command reference
4	0 ÷ 5 V	Monitor (0V reference: pin 5)

'E1' connection

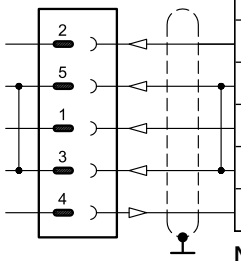




Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	4 ÷ 20 mA	Command
3	0V	Command reference
4	4 ÷ 20 mA	Monitor (0V reference: pin 5)

'IOL' connection



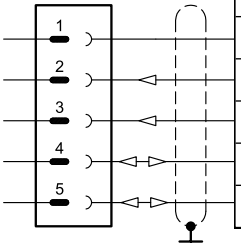


Pin	Values	Function
2	2L+ 24 V DC	Solenoid supply voltage
5	2L- 0 V (GND)	
1	1L+ +24 V DC	Logic and IO-Link supply voltage
3	1L- 0V (GND)	
4	C/Q	IO-Link Communication

NOTE: Pin 3 and pin 5 are linked with each other in the valve electronics. The reference potentials 1L- and 2L- of the two supply voltages must also be linked with each other on the customer side.

'CA' connection





Pin	Values	Function
1	CAN_SH	Shield
2	24 V DC	Supply voltage
3	0 V (GND)	
4	CAN H	Bus line (high)
5	CAN_L	Bus line (low)

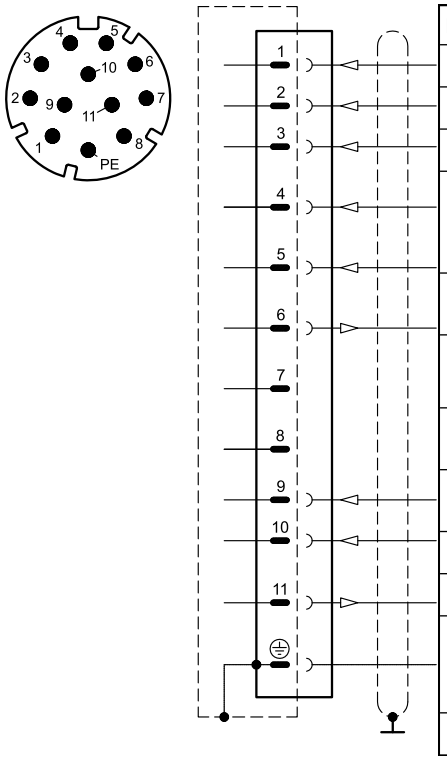
5 - PDE3JH - FIELDBUS ELECTRONICS

The 11+ PE pin connection allows separate supply voltage for electronics and solenoid. Command - valve position schemes as for the standard electronics. Please refer to pictures in point 3.3 and 3.4.

5.1 - Electrical characteristics

Command signal: voltage (E0) current (E1) digital (FD)	V DC mA	0 ÷ 10 (impedance Ri > 11 kOhm) 4 ÷ 20 (impedance Ri = 58 Ohm) via fieldbus
Monitor signal (pressure at transducer): voltage (E0) current (E1)	V DC mA	0 ÷ 10 (impedance Ro > 1 kOhm) 4 ÷ 20 (impedance Ro = 500 Ohm)
Communication / diagnostic		via Bus register
Communication interface standards		IEC 61158
Communication physical layer		fast ethernet, insulated 100 Base TX
Power connection		11 pin + PE (DIN 43651)

5.2 - X1 Main connection pin table



D1: one command

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	0 ÷ 10 V (E0) 4 ÷ 20 (E1)	Command
5	0 V	Command reference signal
6	0 ÷ 10 V (E0) 4 ÷ 20 (E1)	Monitor (0V reference pin 10)
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V reference pin 2)
12	GND	Ground (Earth)

D0: full digital

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	NC	do not connect
5	NC	do not connect
6	NC	do not connect
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V ref. pin 2)
12	GND	Ground (Earth)

5.3 - FIELDBUS connections

Please wire following guidelines provided by the related standards communication protocol. Any connections present and not used must be protected with special caps so as not to nullify the protection against atmospheric agents.

X2 (IN) connection M12 D 4 pin female



Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

X3 (OUT) connection: M12 D 4 pin female



Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

NOTE: Shield connection on connector housing is recommended.

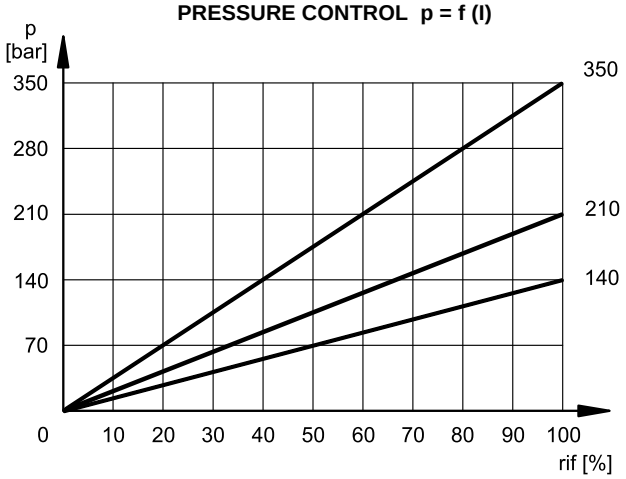
6 - CHARACTERISTIC CURVES

(measured with viscosity of 36 cSt at 50°C)

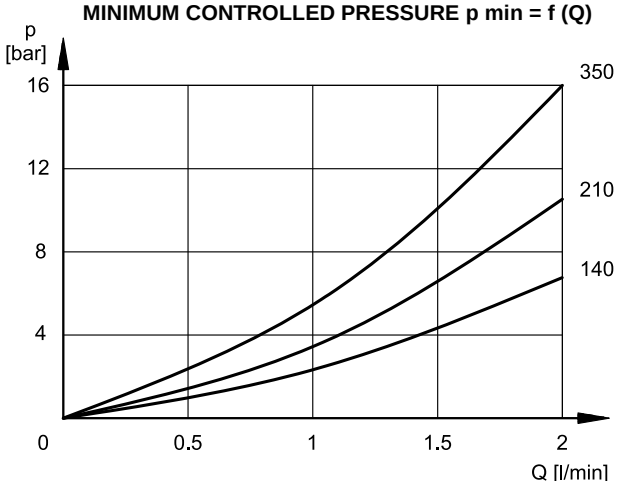
Typical control characteristics, according to the reference signal for available pressure control ranges, measured with input flow rate Q = 1 l/min.

Characteristic curves measured without backpressure in T, with linearity and hysteresis compensation set by the onboard electronics.

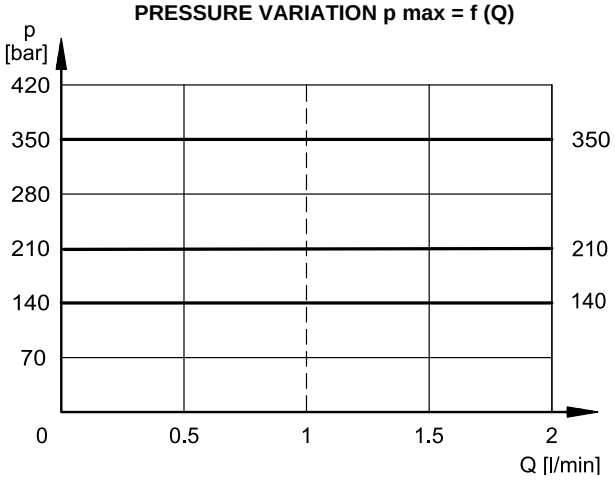
PRESSURE CONTROL p = f (I)



MINIMUM CONTROLLED PRESSURE p min = f (Q)



PRESSURE VARIATION p max = f (Q)



7 - STEP RESPONSE

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

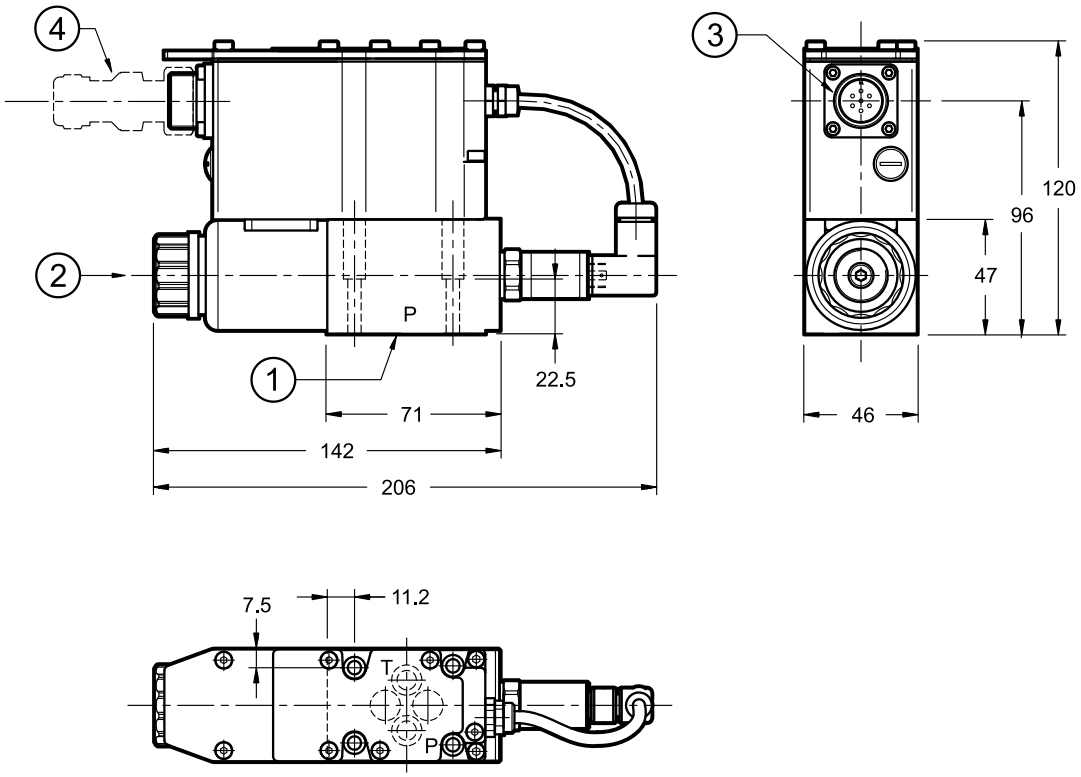
The table illustrates typical step response times measured with a PDE3J-210 and with an input flow rate of Q = 1 l/min and pressure oil volume of 0,1 litre.

The response time is affected both by the flow rate and the oil volume in the pipework.

REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms]	60	20

8 - PDE3J - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



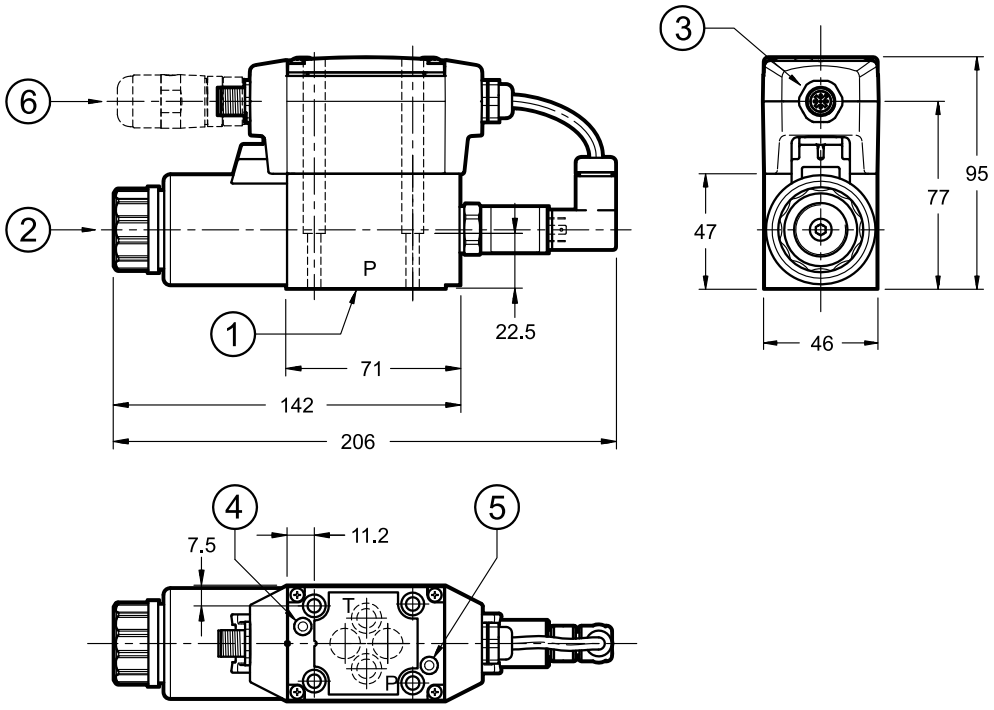
NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

Fastening bolts: 4 SHC screws M5x30- ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

1	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) - 90 shore
2	Breather: Allen key 4
3	Main connection
4	Mating connector 6 poles + PE , female type MIL-5015-G **To be ordered separately.** See catalogue 89 000

9 - PDE3JL - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



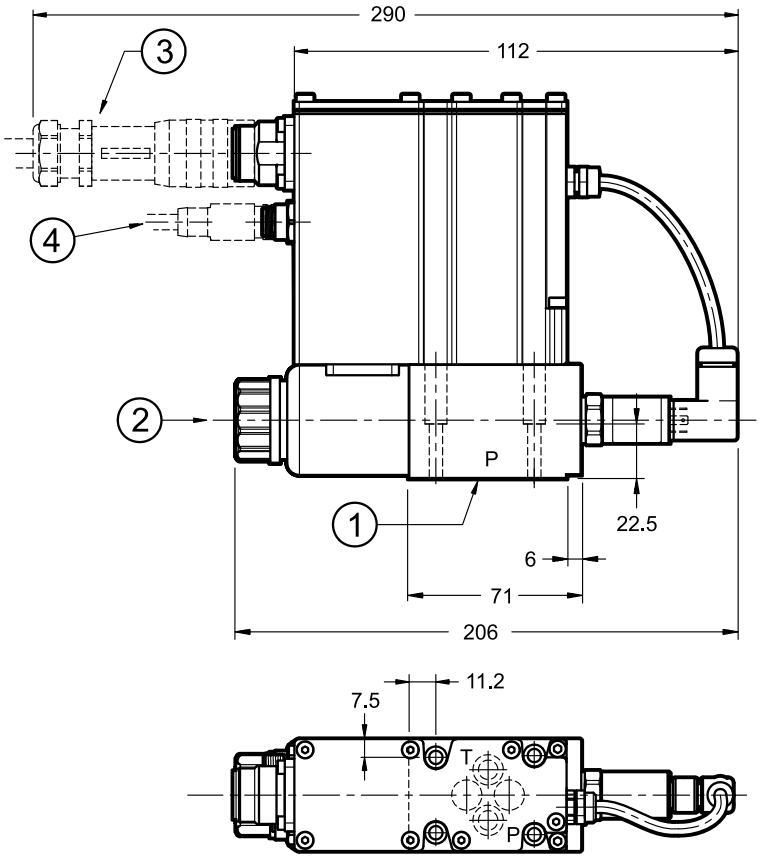
NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

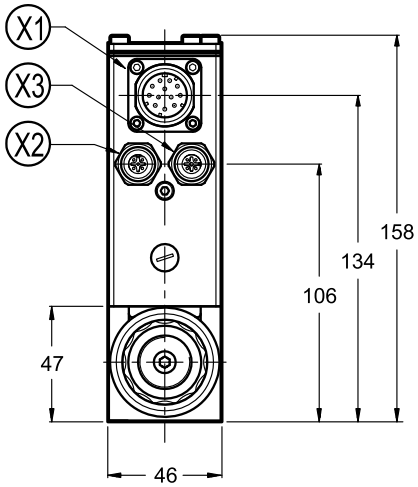
Fastening bolts: 4 SHC screws M5x30- ISO 4762	
Torque: 5 Nm (A8.8)	
Threads of mounting holes: M5x10	

1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Breather: Allen key 4
3	Connection M12 A 5 pin
4	L1 LED
5	L2 LED
6	Mating connector M12 5 poles - code A, female **To be ordered separately.** See catalogue 89 000

10 - PDE3JH - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm





X1	Main connection 11 pin + PE
X2	Fieldbus communication (IN)
X3	Fieldbus communication (OUT)

NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

Fastening bolts: 4 SHC screws M5x30 - ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Breather: Allen key 4
3	Mating connector 11 poles + PE **To be ordered separately.** See catalogue 89 000
4	Mating connectors for fieldbus communication **To be ordered separately.** See catalogue 89 000

11 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

12 - INSTALLATION

We recommend installing these valves with the solenoid downward, either in horizontal or vertical position. If the valve is installed on vertical axis with the solenoid upward, you should consider possible variations of the minimum controlled pressure from those indicated in point 5.

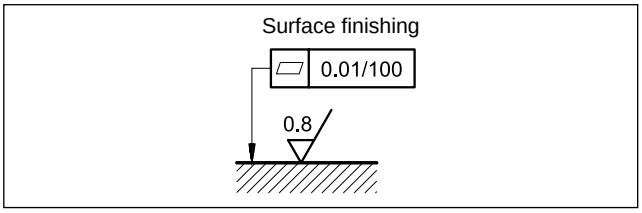
Ensure that there is no air in the hydraulic circuit. In certain applications it might be necessary to vent the air entrapped in the solenoid tube by unfastening the drain screw placed in the solenoid tube.

Ensure the solenoid tube is always filled with oil. Make sure the drain screw has been put back correctly at the end of the task. Connect the valve T port directly to the tank.

Add any backpressure value detected in the T line to the controlled pressure value. Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols.

If minimum values are not observed, fluid can easily leaks between the valve and support surface.



13 - ACCESSORIES

(to be ordered separately)

13.1 - Mating connectors

Mating connectors must be ordered separately. See catalogue 89 000.

For K11 and K16 versions we recommend the choice of a metal connector to avoid electromagnetic disturbances and to comply with EMC regulations on electromagnetic compatibility. If you opt for a plastic connector, make sure that it guarantees and maintains the IP and EMC protection characteristics of the valve.

13.2 - Mating connectors and caps for fieldbus communication

Duplomatic offers spare parts to be wired and also ready-to-use cord sets. Please refer to cat. 89 000.

13.3 - Connection cable

The optimal wiring provides for 7 isolated conductors, with separate screen for the signal wires (command, monitor) and an overall screen.

Cross section for power supply:
- up to 20 m cable length : 1,0 mm^2
- up to 40 m cable length : 1,5 mm^2 (IO-Link excluded)

Cross section for signals (command, monitor):
- 0,50 mm^2

13.4 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic. See catalogue 89 850.

14 - SUBPLATES

(see catalogue 51 000)

PMMD-AI3G rear ports
PMMD-AL3G side ports
Ports dimensions: P, T, A, B: 3/8” BSP

DUPLOMATIC MOTION SOLUTIONS
a member of DAIKIN group

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duplomaticmotionsolutions.com

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PRE3

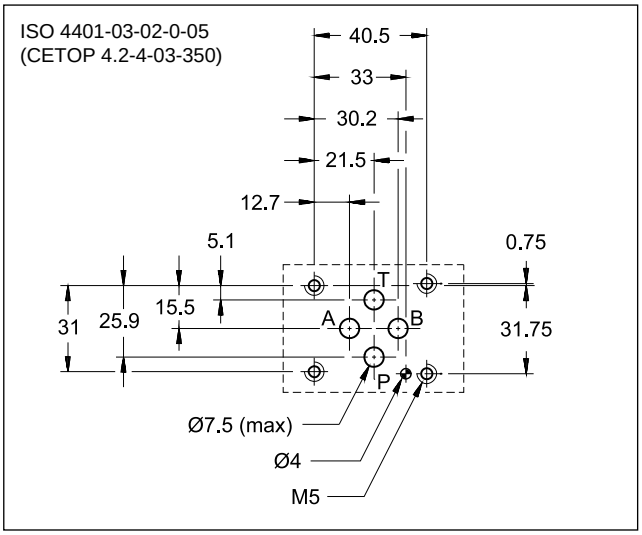
PILOT OPERATED PRESSURE CONTROL VALVE WITH ELECTRIC PROPORTIONAL CONTROL

SERIES 20

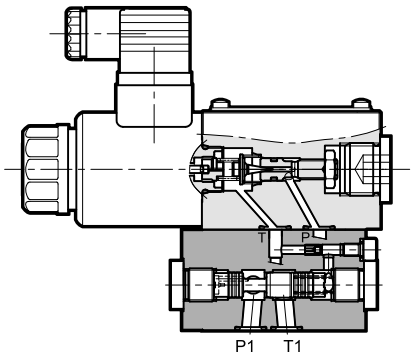
SUBPLATE MOUNTING ISO 4401-03

p max **350** bar
Q max **40** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



— The PRE3 is a pilot operated pressure control valve with electric proportional control and mounting interface in compliance with ISO 4401 standards.

— It is suitable to modulate the pressure in hydraulic circuits.

— The valve can be controlled directly by a current control supply unit or by an electronic control unit to exploit valve performance to the full (see at point 9).

— The design of this valve has a mechanical pressure limitation feature for higher safety of the application.

— Five pressure control ranges up to 350 bar are available.

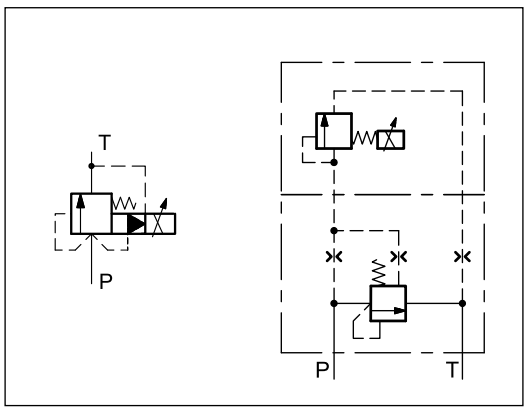
PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Maximum operating pressure: - P port - T port	bar	 350 2
Minimum controlled pressure	see p min = f(Q) diagram	
Minimum flow Maximum flow (see graph p max= f(Q))	l/min	2 40
Step response	see point 6	
Hysteresis (with PWM 200 Hz)	% of p nom	< 5%
Repeatability	% of p nom	< ±1.5%
Electrical characteristic	see point 5	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass	kg	3,5

HYDRAULIC SYMBOL

simplified **detailed**



1 - IDENTIFICATION CODE

P	R	E	3	-		/	20		-		K1

Pressure control valve, pilot operated

Electrical proportional control

Size ISO 4401-03

Pressure control range
025 = 4 - 25 bar
070 = 4 - 70 bar
140 = 4 - 140 bar
210 = 5 - 210 bar
350 = 5 - 350 bar

Series No.
(the overall and mounting dimensions remain unchanged from 20 to 29)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Coil electrical connection:
for connector type EN 175301-803 (ex DIN 43650) (**standard**)

D12 = Nominal solenoid voltage 12V DC
D24 = Nominal solenoid voltage 24V DC

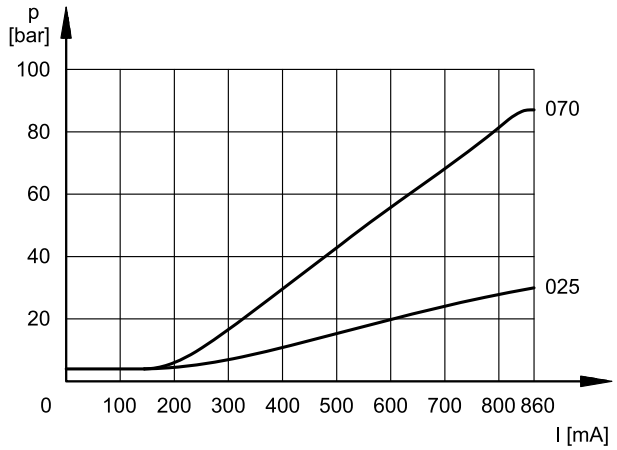
2 - CHARACTERISTIC CURVES

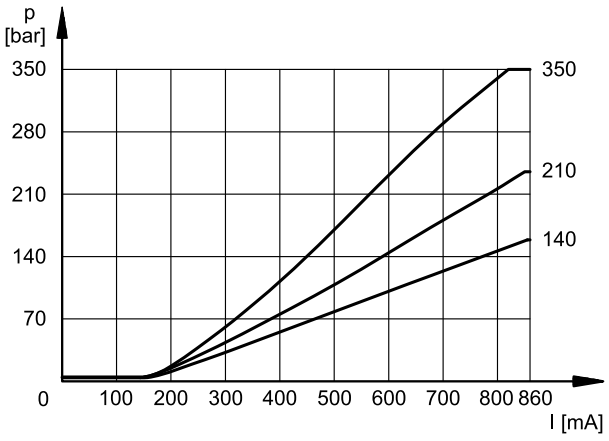
(measured with viscosity of 36 cSt at 50°C)

Typical control curves according to the current supplied to the solenoid (D24 version with maximum current 860 mA) for the available pressure control ranges, measured with input flow rate Q = 10 l/min. Curves have been obtained without any hysteresis and linearity compensation and they have been measured without any backpressure in T.

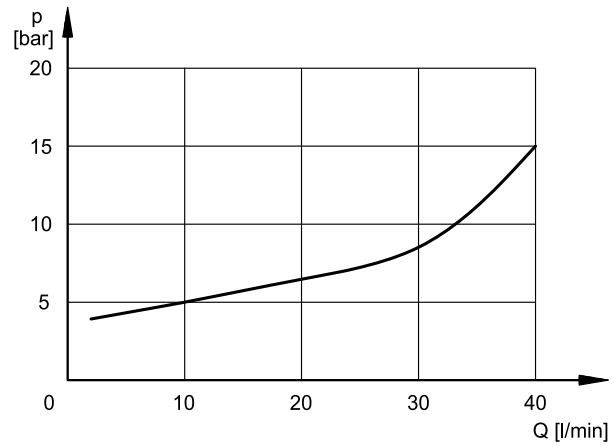
The full scale pressure is set in factory with a flow rate of 10 l/min. In case of higher flow rate, the full scale pressure will increase (see diagram pmax = f (Q)).

PRESSURE CONTROL p = f (I)

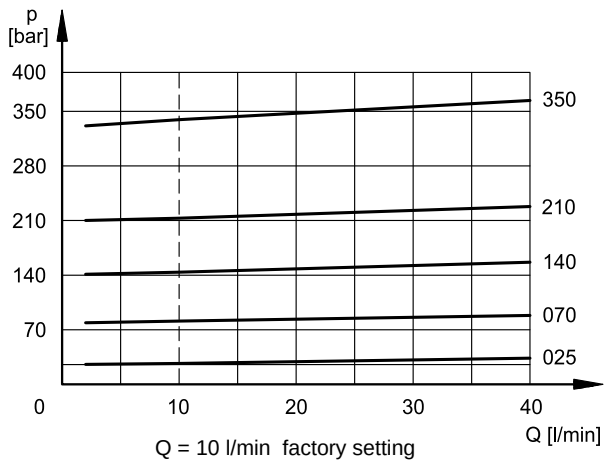




MINIMUM CONTROLLED PRESSURE pmin = f (Q)



PRESSURE VARIATION pmax = f (Q)



Q = 10 l/min factory setting

3 - MAX PRESSURE VALUES

This valve incorporates a mechanical limit of the maximum pressure, that operates independently of the applied current. This kind of design ensures the pressure cannot rise over even if the solenoid current exceeds the maximum current ($I > I_{max}$).

Values obtained with oil viscosity of 36 cSt at 50°C, Q = 10 l/min

		PRE3-025	PRE3-070	PRE3-140	PRE3-210	PRE3-350
pressure value at 800 mA	bar	28	82	145	215	335
max pressure value when $I > I_{max}$	bar	30	86	155	230	350

4 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

5 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut and can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20°C)	Ω	3.66	17.6
MAXIMUM CURRENT	A	1.88	0.86
DUTY CYCLE	100%		
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2014/30/EU		
PROTECTION FROM ATMOSPHERIC AGENTS (IEC 60529)	IP65		
CLASS OF PROTECTION Coil insulation (VDE 0580) Impregnation	 class H class F		

6 - STEP RESPONSE

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

The table illustrates typical step response times measured with a PRE3-210 and with input flow rate Q = 10 l/min, and a pressure oil volume of 0,1 litre. The response time is affected by both the flow rate and the oil volume inside the piping.

REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms]	80	40

7 - INSTALLATION

We recommend to install the PRE3 valve either in horizontal position, or vertical position with the solenoid downward. If the valve is installed in vertical position and with the solenoid upward, you must consider possible variations of the minimum controlled pressure, if compared to what is indicated in point 2.

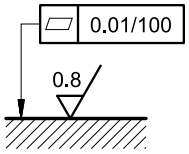
Ensure that there is no air in the hydraulic circuit. In particular applications, it can be necessary to vent the air entrapped in the solenoid tube, by using the apposite drain screw in the solenoid tube. Ensure that the solenoid tube is always filled with oil. At the end of the operation, make sure of having screwed the drain screw correctly.

Connect the valve T port directly to the tank. Add any backpressure value detected in the T line to the controlled pressure value.

Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.

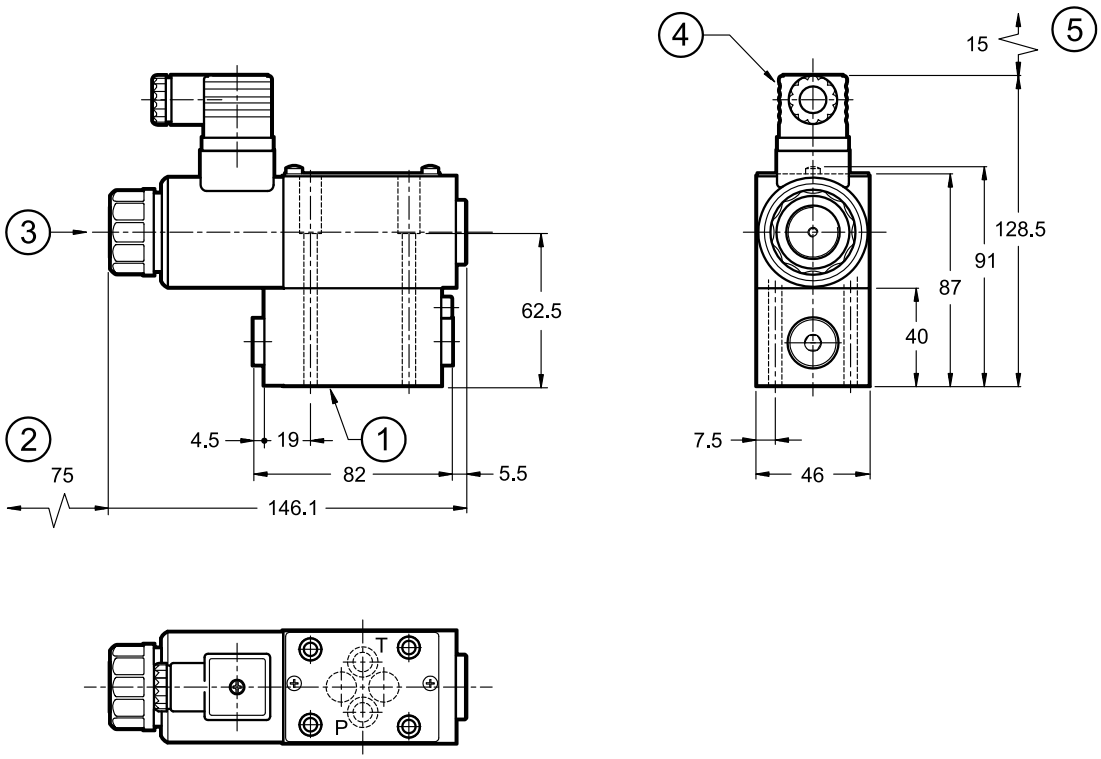
Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.

Surface finishing



8 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (3) placed at the end of the solenoid tube.

Fastening bolts: 4 SHC screws M5x70 - ISO 4762	
Torque: 5 Nm (A8.8)	
Threads of mounting holes: M5x10	

1	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) - 90 shore
2	Coil removal space
3	Breather (male hexagonal spanner 4)
4	EN 175301-803 (ex DIN 43650) connector (included in the delivery)
5	Connector removal space

9 - ELECTRONIC CONTROL UNITS

EDC-112	for solenoid 24V DC	plug version	see catalogue 89 120
EDC-142	for solenoid 12V DC		
EDM-M112	for solenoid 24V DC	DIN EN 50022 rail mounting	see catalogue 89 251
EDM-M142	for solenoid 12V DC		

10 - SUBPLATES

(see catalogue 51 000)

PMMD-AI3G with ports on rear
PMMD-AL3G with side ports
Ports dimensions P, T, A and B: 3/8” BSP thread

DUPLOMATIC MOTION SOLUTIONS
a member of DAIKIN group

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duplomaticmotionsolutions.com

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PRE3G*

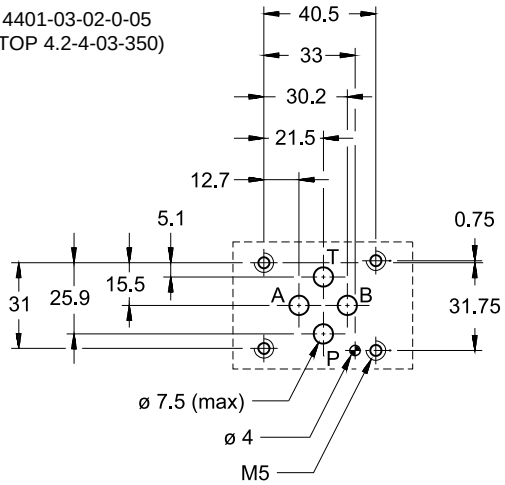
PROPORTIONAL PRESSURE CONTROL VALVE, PILOT OPERATED WITH INTEGRATED ELECTRONICS

SUBPLATE MOUNTING ISO 4401-03

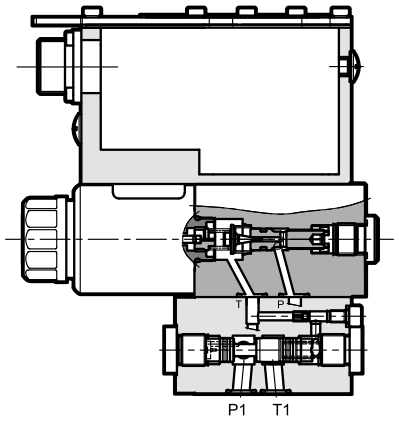
p max **350** bar
Q max **40** l/min

MOUNTING INTERFACE

ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)



OPERATING PRINCIPLE



— The PRE3G* valve is a proportional pressure control valve, pilot operated, with mounting surface in compliance with ISO 4401 standards.

— It is suitable to modulate the pressure in hydraulic circuits.

— It is available with different types of electronics, with analogue or fieldbus interfaces.

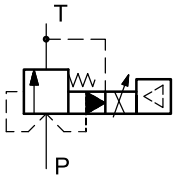
— Valves are easy to install. The driver manages digital settings directly.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50 °C and p = 140 bar)

Maximum operating pressure: - P port - T port	bar	 350 2
Minimum controlled pressure	see p min= f(Q) diagram	
Minimum flow Maximum flow (see p max = f(Q) diagram)	l/min	2 40
Step response	see point 7	
Hysteresis	% of p nom	< 4%
Repeatability	% of p nom	< ±1%
Electrical characteristic	see point 2	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass	kg	3.8

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

1.1 - Standard electronics

P	R	E	3	G	-		/	32		-		K11	

Pressure control valve

Electrical proportional control

Size ISO 4401-03

Standard electronics for open loop

Pressure control range
070 = 4 ÷ 70 bar
140 = 4 ÷ 140 bar
210 = 5 ÷ 210 bar
350 = 5 ÷ 350 bar

Series No.
(the overall and mounting dimensions remain unchanged from 30 to 39)

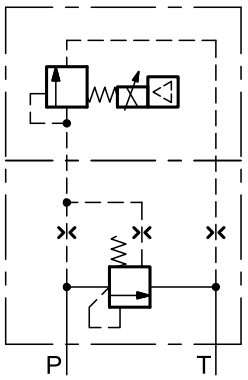
Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Reference signal:
E0 = voltage 0 ÷ 10 V
E1 = current 4 ÷ 20 mA

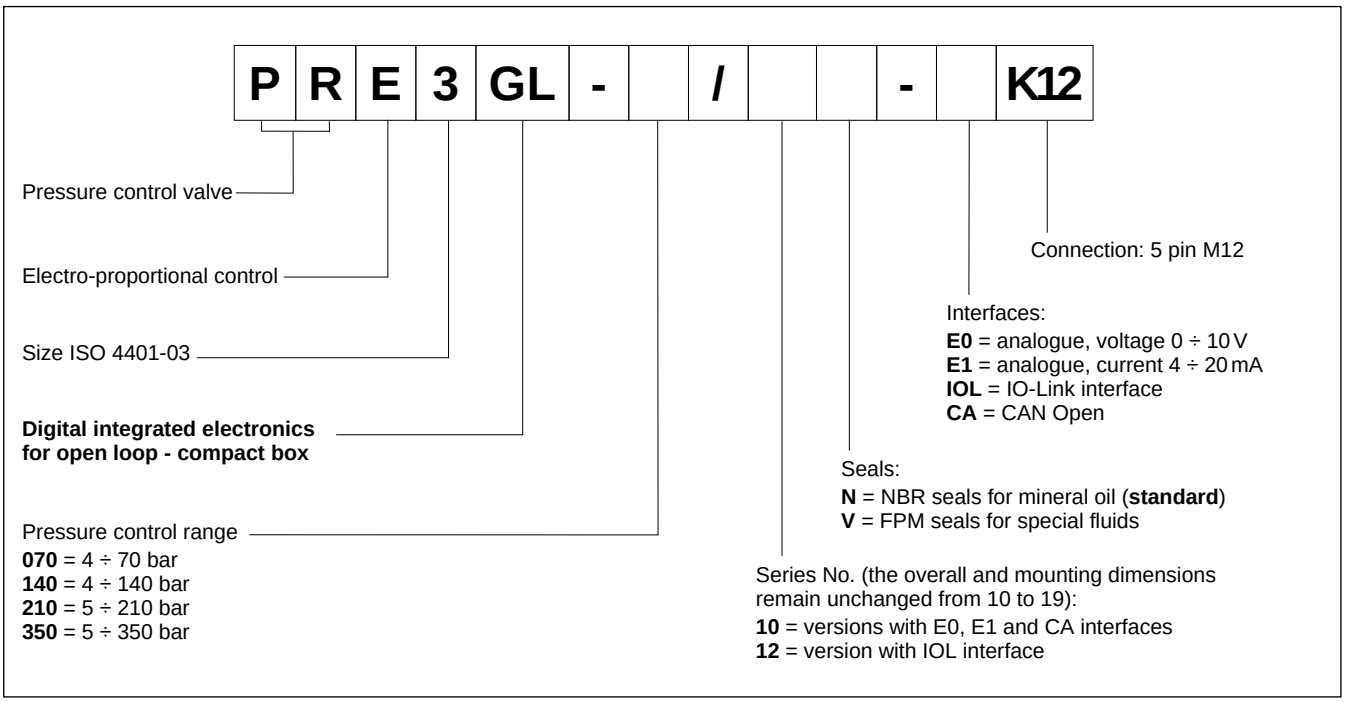
Connection 6 pin + PE

Pin C function:
A = external enable
B = internal enable
C = 0V monitor

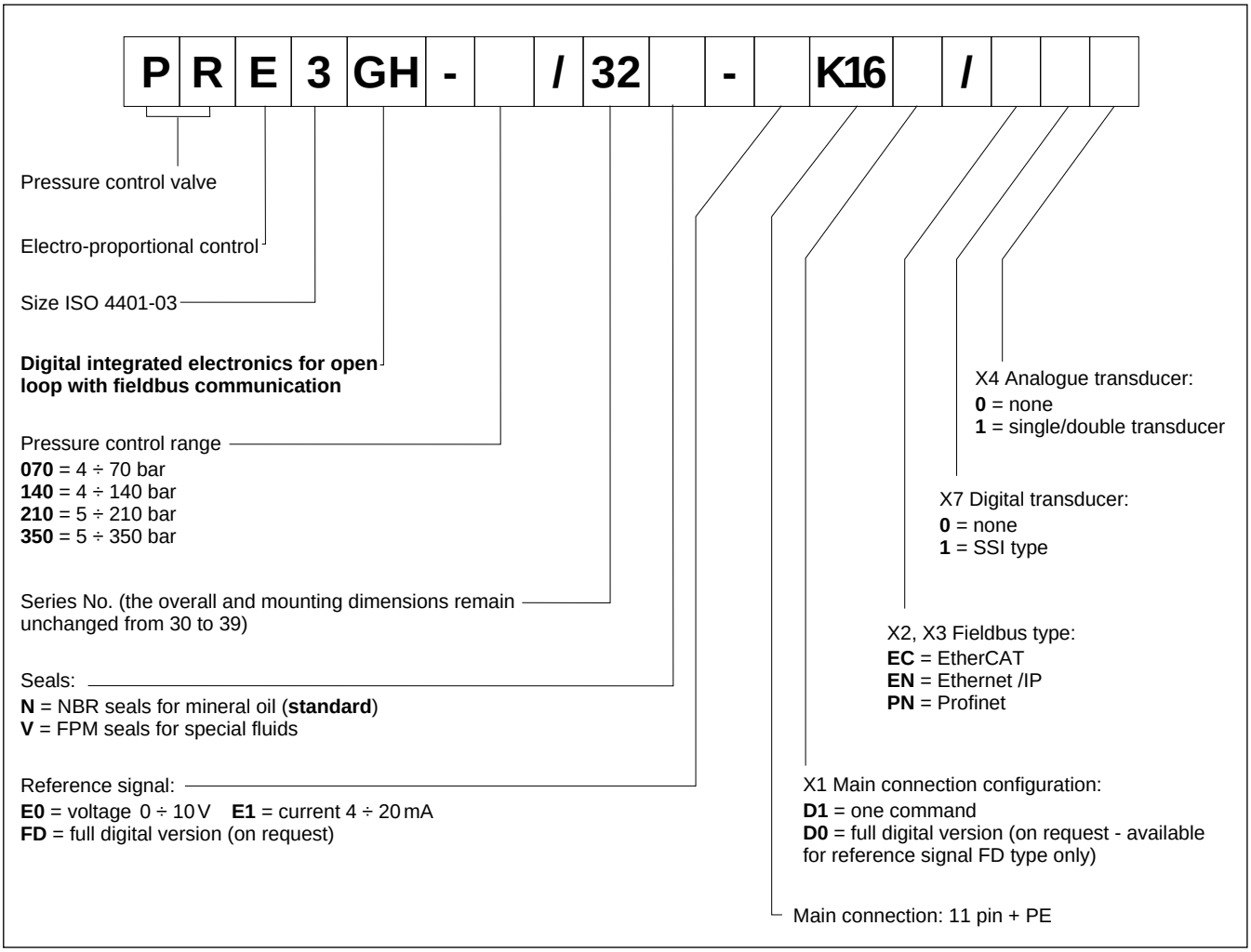
1.2 - Detailed symbol



1.3 - Compact electronics



1.4 - Electronics with fieldbus communication



2 - ELECTRONICS COMMON DATA

Duty cycle		100% (continuous operation)
Protection class according to EN 60529		IP65/IP67 (**NOTE**)
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	25
Maximum solenoid current	A	1.88
Fuse protection, external	A	2A time lag
Managed breakdowns		Overload and electronics overheating, cable breakdown, supply voltage failures
Electromagnetic compatibility (EMC) emissions EN 61000-6-4, immunity EN 61000-6-2		According to 2014/30/EU standards

NOTE: The IP degree is guaranteed only with mating connector of equivalent IP degree, installed and tightened correctly. Moreover, on the GH versions it is necessary to protect any unused connections with caps.

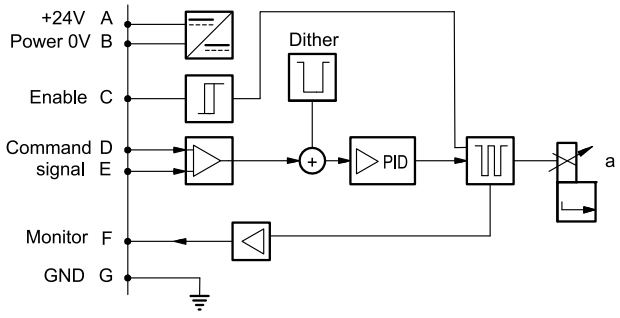
3 - PRE3G - STANDARD ELECTRONICS

3.1 - Electrical characteristics

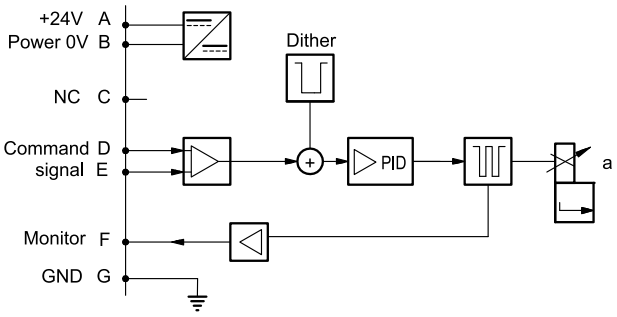
Command signal:	voltage (E0) current (E1)	V DC mA	0 ÷ 10 (impedance Ri > 11 kohm) 4 ÷ 20 (impedance Ri = 58 ohm)
Monitor signal (current to solenoid):	voltage (E0) current (E1)	V DC mA	0 ÷ 10 (impedance Ro > 1 kohm) 4 ÷ 20 (impedance Ro = 500 ohm)
Communication for diagnostic			LIN-bus Interface (by means of the optional kit)
Connection			6 pin + PE (MIL-C-5015-G - DIN EN 175201-804)

3.2 - On-board electronics diagrams

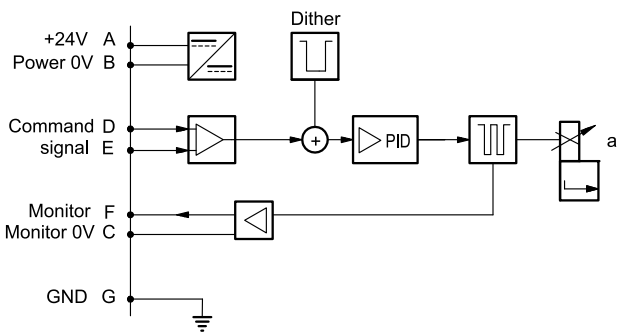
VERSION A - External Enable



VERSION B - Internal Enable

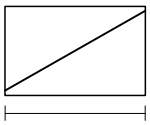


VERSION C - 0V Monitor

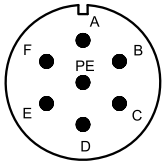


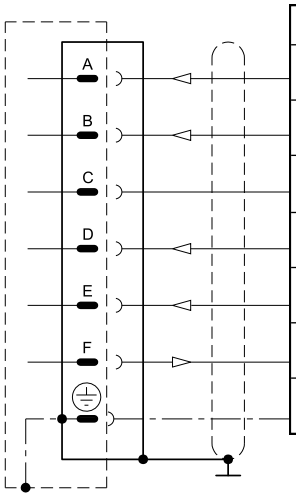
3.3 - Versions with voltage command (E0)

The reference signal is between 0 ÷ 10V. The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**0V**	**+10V**
MONITOR	**0V**	**+10V**



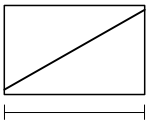


Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	0 ÷ 10 V	Command		
E	0 V	Command reference		
F	0 ÷ 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

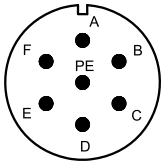
3.4 - Versions with current command (E1)

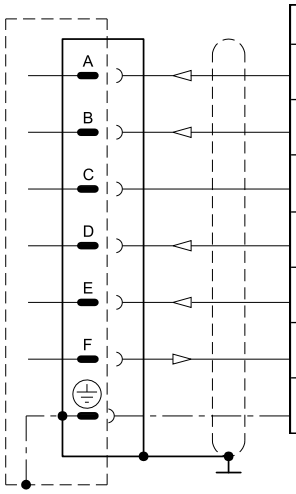
The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower, the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**4 mA**	**20 mA**
MONITOR	**4 mA**	**20 mA**





Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	Command reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

4 - PRE3GL - COMPACT ELECTRONICS

In IO-Link networks, the length of the connecting cables is limited to 20 metres. In CA versions, pin 3 and pin 5 are galvanic isolated up to 100 V to avoid earth loops.

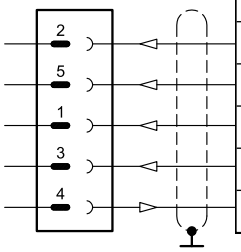
4.1 - Electrical characteristics

Command signal: voltage (E0) current (E1)	V DC mA	0 ÷ 10 (impedance Ri > 11 kohm) 4 ÷ 20 (impedance Ri = 58 ohm)
Monitor signal (current to solenoid): voltage (E0) current (E1)	 V DC mA	 0 ÷ 5 (impedance Ro > 1 kohm) 4 ÷ 20 (impedance Ro = 500 ohm)
IO-Link communication (IOL): Data rate	 kBaud	IO-Link Port Class B 38.4
Can Open communication (CA): Data rate	 kbit	 10 ÷ 1000
Data register (IOL and CA versions only)		card voltage supply, solenoid faults (shortcircuit, bad configuration), box temperature.
Connection		5-pin M12 code A (IEC 61076-2-101)

4.2 - Pin tables

'E0' connection

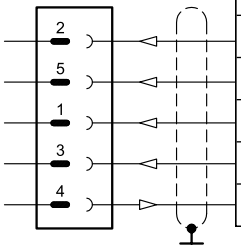




Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	0 ÷ 10 V	Command
3	0 V	Command reference
4	0 ÷ 5 V	Monitor (0V reference: pin 5)

'E1' connection

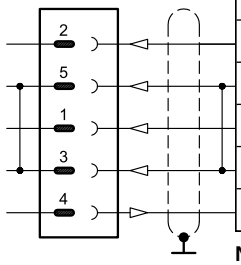




Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	4 ÷ 20 mA	Command
3	0V	Command reference
4	4 ÷ 20 mA	Monitor (0V reference: pin 5)

'IOL' connection



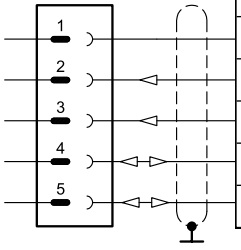


Pin	Values	Function
2	2L+ 24 V DC	Solenoid supply voltage
5	2L- 0 V (GND)	
1	1L+ +24 V DC	Logic and IO-Link supply voltage
3	1L- 0V (GND)	
4	C/Q	IO-Link Communication

NOTE: Pin 3 and pin 5 are linked with each other in the valve electronics. The reference potentials 1L- and 2L- of the two supply voltages must also be linked with each other on the customer side.

'CA' connection





Pin	Values	Function
1	CAN_SH	Shield
2	24 V DC	Supply voltage
3	0 V (GND)	
4	CAN H	Bus line (high)
5	CAN_L	Bus line (low)

5 - PRE3GH - FIELDBUS ELECTRONICS

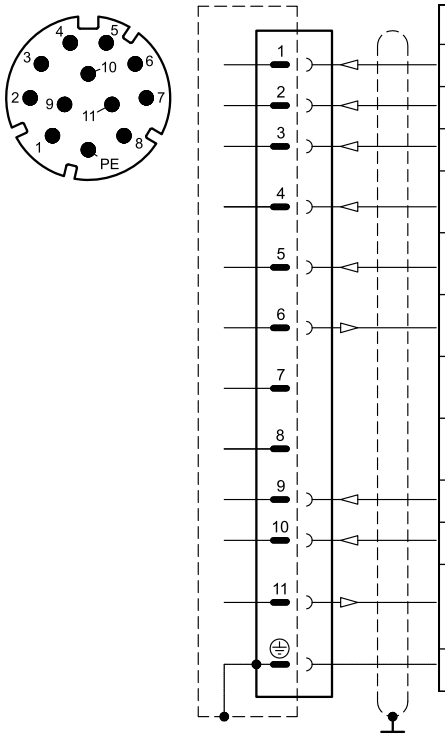
The 11+ PE pin connection allows separate supply voltage for electronics and solenoid.

Command - valve position schemes as for the standard electronics. Please refer to pictures at points. 3.3 and 3.4.

5.1 - Electrical characteristics

Command signal: voltage (E0) current (E1) digital (FD)	 V DC mA	 0 ÷ 10 (impedance Ri > 11 kohm) 4 ÷ 20 (impedance Ri = 58 ohm) via fieldbus
Monitor signal (current to solenoid): voltage (E0) current (E1)	 V DC mA	 0 ÷ 10 (impedance Ro > 1 kohm) 4 ÷ 20 (impedance Ro = 500 ohm)
Communication / diagnostic		via Bus register
Communication interface standards		IEC 61158
Communication physical layer		fast ethernet, insulated 100 Base TX
Power connection		11 pin + PE (DIN 43651)

5.2 - X1 Main connection pin table



D1: one command

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	0 ÷ 10 V (E0) 4 ÷ 20 (E1)	Command
5	0 V	Command reference signal
6	0 ÷ 10 V (E0) 4 ÷ 20 (E1)	Monitor (0V reference pin 10)
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V reference pin 2)
12	GND	Ground (Earth)

D0: full digital

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	NC	do not connect
5	NC	do not connect
6	NC	do not connect
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V ref. pin 2)
12	GND	Ground (Earth)

5.3 - FIELDBUS connections

Please wire following guidelines provided by the related standards communication protocol. Any connections present and not used must be protected with special caps so as not to nullify the protection against atmospheric agents.

X2 (IN) connection: M12 D 4 pin female



Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

X3 (OUT) connection: M12 D 4 pin female



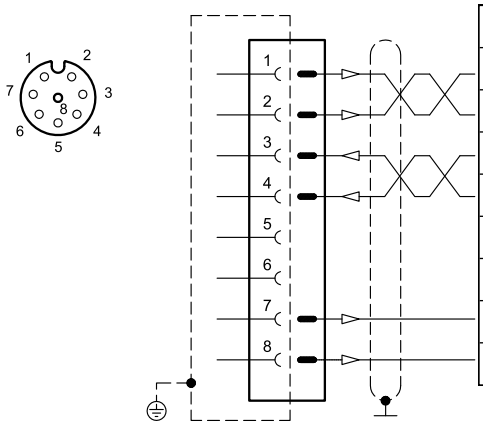
Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

NOTE: Shield connection on connector housing is recommended.

5.4 - Digital transducer connection

X7 connection: M12 A 8 pin female

VERSION 1: SSI type



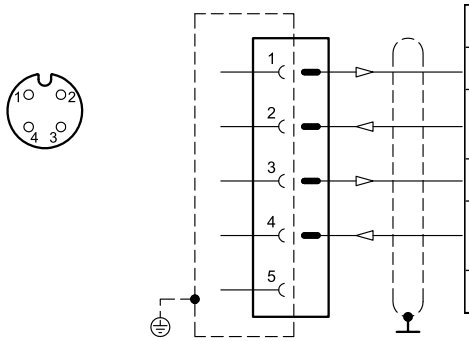
Pin	SSI Values	Function	Notes
1	CLK+	Serial synchronous clock (+)	Input - digital signal
2	CLK-	Serial synchronous clock (-)	
3	MIS0+	Serial position data (+)	
4	MIS0-	Serial position data (-)	
5	NC	-	do not connect
6	NC	-	
7	+24 V	transducer power supply	Output power supply
8	0 V	-	Common GND

5.5 - Analogue transducer connection

X4 connection: M12 A 4 pin female

VERSION 1: single / double transducer

(single or double is a software-selectable option)



Pin	Values	Notes
1	+24 V	Remote transducer power supply (out) 100 mA
2	±10 V 4 ÷20 mA	Input signal of transducer 1 (range software selectable)
3	0 V	Common reference signal for transducer power and signals
4	±10 V 4 ÷20 mA	Input signal of transducer 2 (range software selectable)
5	-	

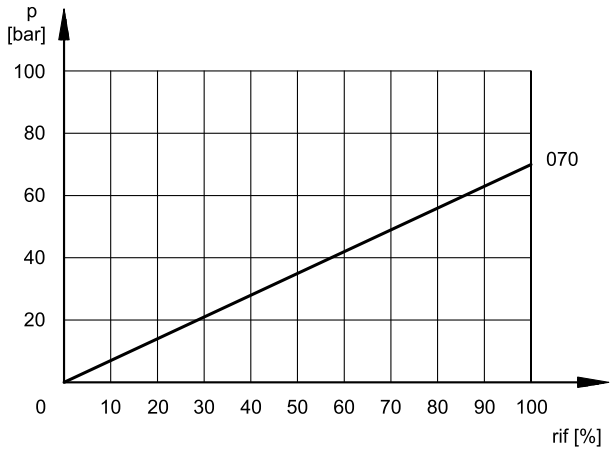
6 - CHARACTERISTIC CURVES

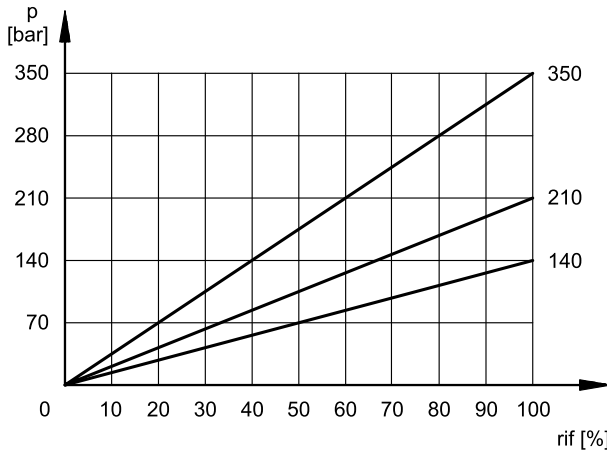
(measured with viscosity of 36 cSt at 50°C)

Typical control characteristics, according to the reference signal for available pressure control ranges, measured with input flow rate Q = 10 l/min. Characteristic curves measured without backpressure in T, with linearity compensation set by the onboard electronics.

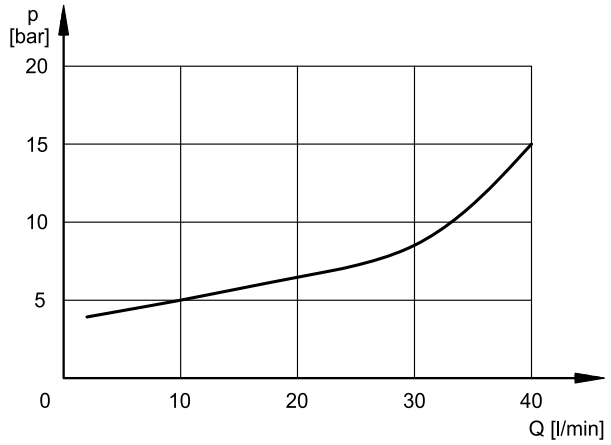
The full scale pressure is set in factory with a flow rate of 10 l/min. In case of higher flow rate, the full scale pressure will increase (see diagram p max = f (Q)).

PRESSURE CONTROL p = f (I)

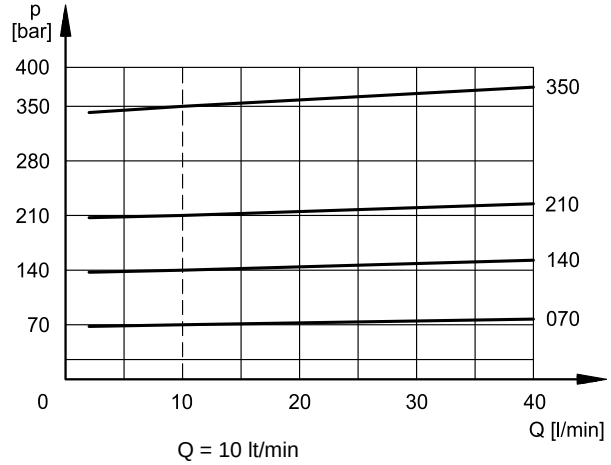




MINIMUM CONTROLLED PRESSURE p min = f (Q)



PRESSURE VARIATION p max = f (Q)



Q = 10 lt/min
factory setting

7 - STEP RESPONSE

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

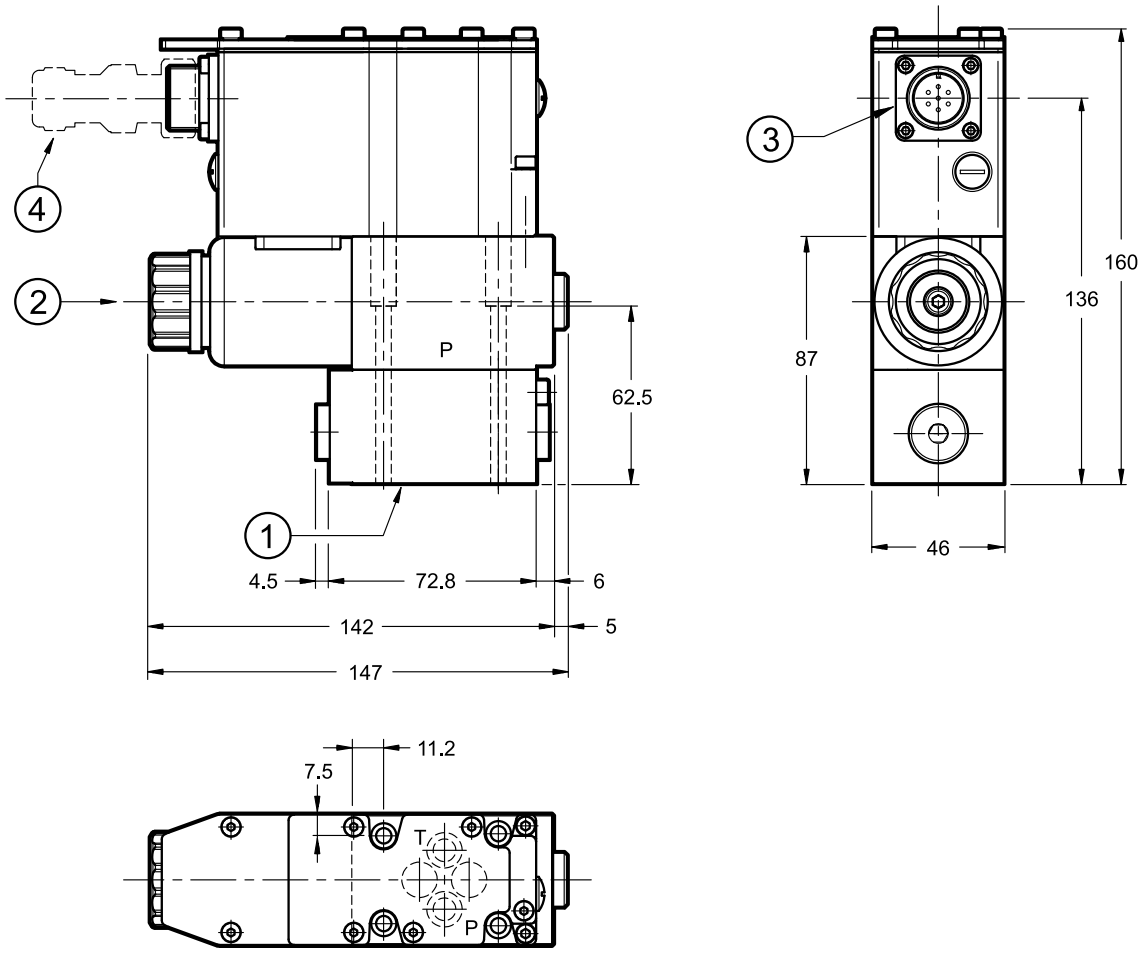
The table illustrates typical step response times measured with a PRE3G-210 and with an input flow rate of Q = 10 l/min and pressure oil volume of 0,1 litre.

The response time is affected both by the flow rate and the oil volume in the pipework.

REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms]	80	40

8 - PRE3G - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

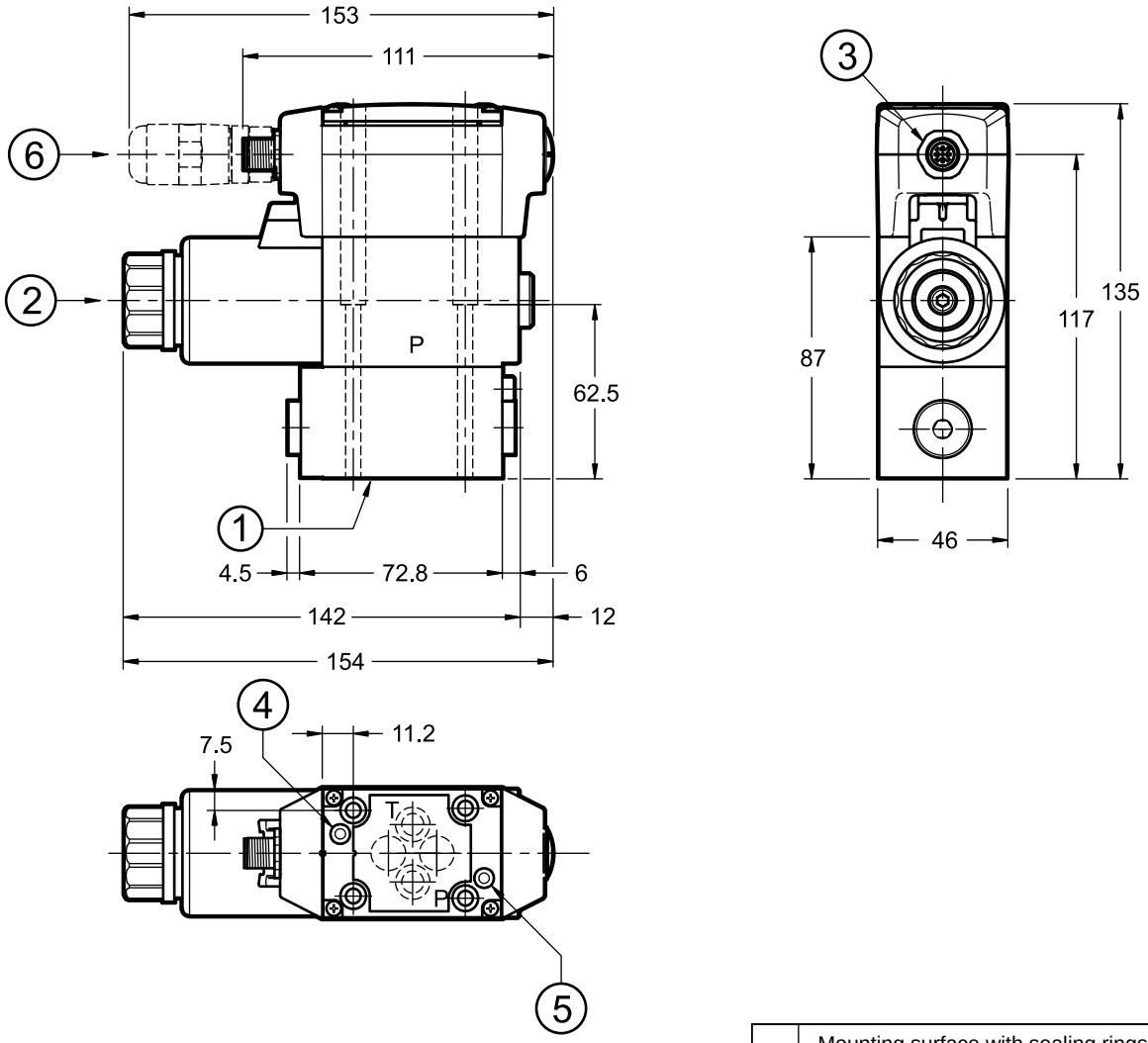


NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

Fastening bolts: 4 SHC screws M5x70 - ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

1	Mounting surface with sealing rings: 4 OR type 2037 - 90 shore (9.25 x 1.78)
2	Breather: Allen key 4
3	Main connection 6 pin + PE
4	Mating connector 6 poles + PE , female type MIL-5015-G **To be ordered separately.** See catalogue 89 000

9 - PRE3GL - OVERALL AND MOUNTING DIMENSIONS



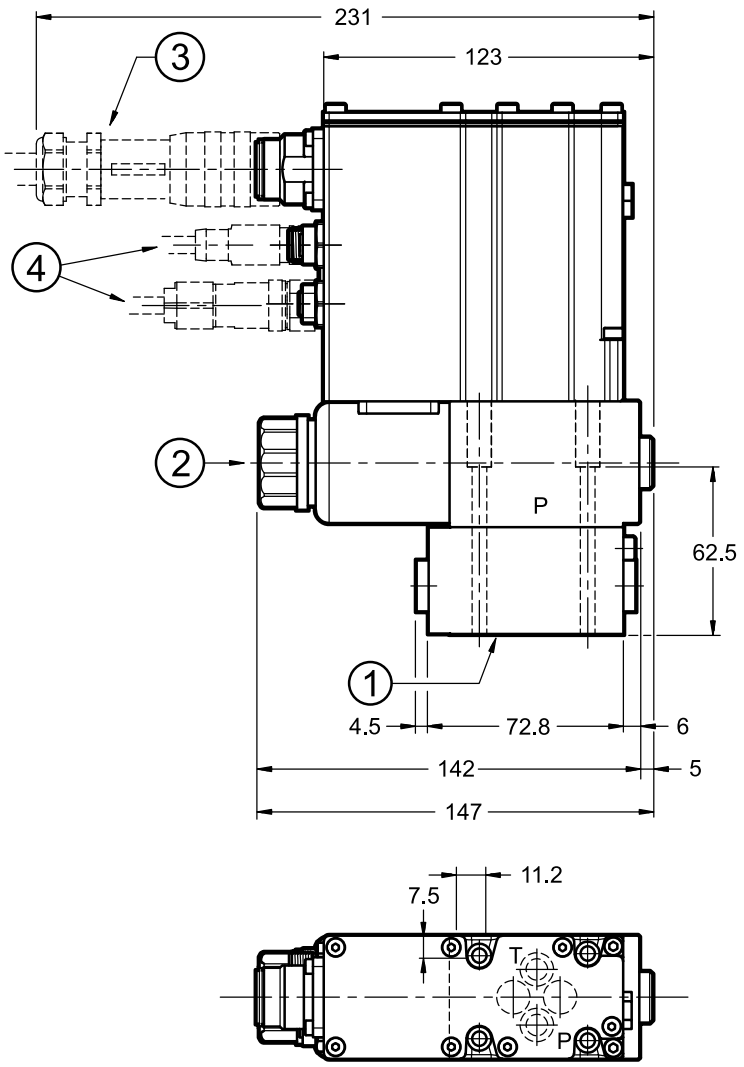
NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

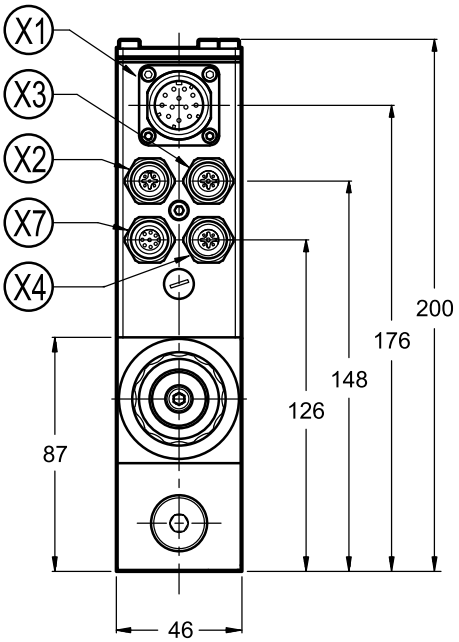
Fastening bolts: 4 bolts M5x70- ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Breather: Allen key 4
3	Connection M12 A 5 pin
4	L1 led
5	L2 led
6	Mating connector M12 5 poles code A, female **To be ordered separately.** See catalogue 89 000

10 - PRE3GH - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm





X1	Main connection 11 pin + PE
X2	Fieldbus communication (IN)
X3	Fieldbus communication (OUT)
X4	X4 connection for analogue transducer
X7	X7 connection for digital transducer

Fastening bolts: 4 bolts M5x70 - ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

NOTE 1: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

NOTE 2: Depending on the chosen version, X4 and X7 connections may not be present.

Please refer to section 5 for connection descriptions and pinout.

1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Breather: Allen key 4
3	Mating connector 11 poles + PE **To be ordered separately.** See catalogue 89 000
4	Mating connectors for fieldbus communication and signals **To be ordered separately.** See catalogue 89 000

11 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

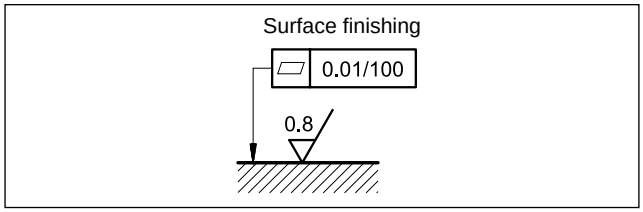
12 - INSTALLATION

We recommend to install the valves either in horizontal position, or vertical position with the solenoid downward. If the valve is installed in vertical position and with the solenoid upward, you must consider possible variations of the minimum controlled pressure, if compared to what is indicated in point 6.

Ensure that there is no air in the hydraulic circuit. In particular applications, can be necessary to vent the air entrapped in the solenoid tube, by using the appropriate drain screw in the solenoid tube. So, ensure the solenoid tube is always filled with oil. When finished, make sure you have screwed the screw back in correctly.

Connect the valve T port directly to the tank. Add any backpressure value detected in the T line to the controlled pressure value. Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.



13 - ACCESSORIES

(to be ordered separately)

13.1 - Mating connectors

Mating connectors must be ordered separately. See catalogue 89 000.

For K11 and K16 versions we recommend the choice of a metal connector to avoid electromagnetic disturbances and to comply with EMC regulations on electromagnetic compatibility. If you opt for a plastic connector, make sure that it guarantees and maintains the IP and EMC protection characteristics of the valve.

13.2 - Mating connectors and caps for fieldbus communication and for sensors.

Duplomatic offers spare parts to be wired and also ready-to-use cord sets. Please refer to cat. 89 000.

13.3 - Connection cable

The optimal wiring provides for 7 isolated conductors, with separate screen for the signal wires (command, monitor) and an overall screen.

Cross section for power supply:

- up to 20 m cable length : 1,0 mm^2
- up to 40 m cable length : 1,5 mm^2 (IO-Link excluded)

Cross section for signals (command, monitor):

- 0,50 mm^2

13.4 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic. See catalogue 89 850.

14 - SUBPLATES

(see catalogue 51 000)

PMMD-AI3G with ports on rear
PMMD-AL3G with side ports
Ports dimensions P, T, A, B: 3/8” BSP thread

DUPLOMATIC MOTION SOLUTIONS
a member of DAIKIN group

DUPLOMATIC MS Spa
via Mario Re Depaolini, 24 | 20015 Parabiago (MI) | Italy
T +39 0331 895111 | E vendite.ita@duplomatic.com | sales.exp@duplomatic.com
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PRE*

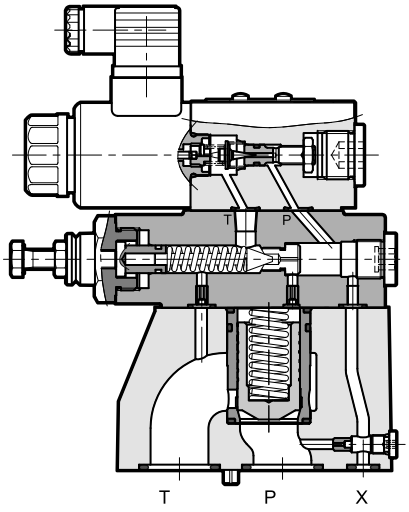
PROPORTIONAL PRESSURE RELIEF VALVES, PILOT OPERATED

SERIES 20

SUBPLATE MOUNTING ISO 6264

p max **350** bar
Q max (see table of performances)

OPERATING PRINCIPLE



— PRE* valves are pilot operated pressure relief valves with electric proportional control and mounting interface in compliance with ISO 6264 standards.

— These valves are used to control hydraulic circuit pressure and to enable the use of the full flow rate of the pump, even with settings approach the calibration value.

— The two-stage design and wide passages ensure reduced pressure drops thereby improving the system energy performance.

— The design of these valves has a mechanical pressure limitation feature inside the pilot stage, for higher safety of the application.

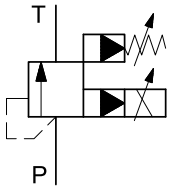
— Valves can be controlled directly by a current control supply unit or by means of an electronic control unit, to exploit valve performance to the full (see par. 11).

— They are fitted with a manual pressure relief valve which is factory set to ≥15% of the maximum value in the pressure control range.

— They are available in three sizes for flow rates up to 500 l/min and in five pressure control ranges up to 350 bar.

PERFORMANCES (obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)		**PRE10**	**PRE25**	**PRE32**
Maximum operating pressure:	bar	350		
Minimum controlled pressure		see Δp-Q diagram		
Maximum flow	l/min	200	400	500
Step response		see paragraph 6		
Hysteresis (PWM 200 Hz)	% of p nom	< 5%		
Repeatability	% of p nom	< ±1,5%		
Electrical characteristic		see paragraph 5		
Ambient temperature range	°C	-20 / +60		
Fluid temperature range	°C	-20 / +80		
Fluid viscosity range	cSt	10 ÷ 400		
Fluid contamination degree		According to ISO 4406:1999 class 18/16/13		
Recommended viscosity	cSt	25		
Mass:	kg	5	5,8	8

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

P	R	E		-		/	20		-		K1

Pilot operated pressure relief valve

Electric proportional control

Size:
10 = ISO 6264-06
25 = ISO 6264-08
32 = ISO 6264-10

Pressure control range:
025 = up to 25 bar
070 = up to 70 bar
140 = up to 140 bar
210 = up to 210 bar
350 = up to 350 bar

Series No.
(from 20 to 29 sizes and mounting dimensions remain unchanged)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

D12 = Nominal solenoid voltage 12V DC
D24 = Nominal solenoid voltage 24V DC

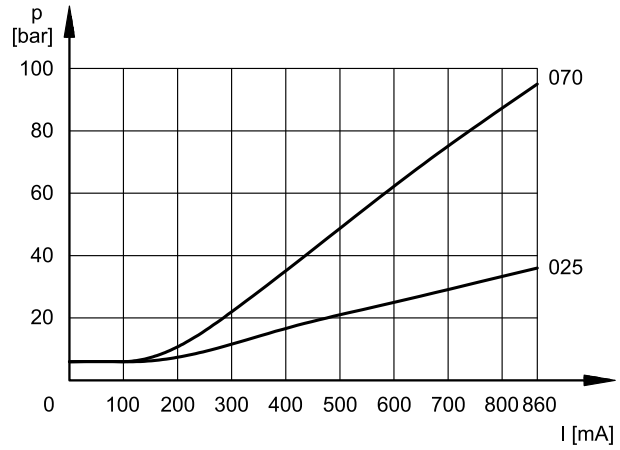
Coil electrical connection:
plug for connector type EN 175301-803 (ex DIN 43650) (**standard**)

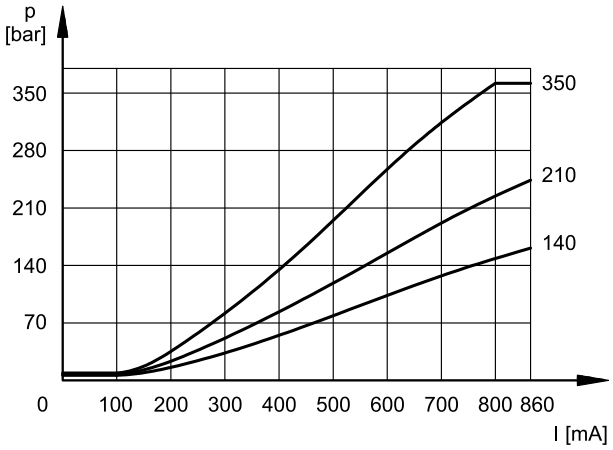
2 - CHARACTERISTIC CURVES

(measured with viscosity of 36 cSt at 50°C)

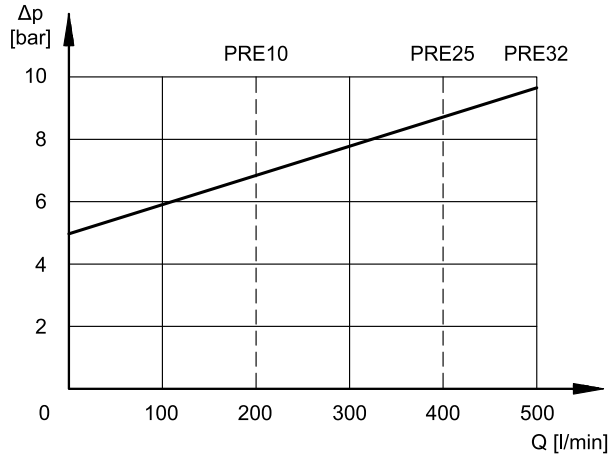
Typical control curves according to the current supplied to the solenoid (D24 version with maximum current 860 mA) for the available pressure control ranges, measured with input flow rate Q = 50 l/min. Curves have been obtained without any hysteresis and linearity compensation and they have been measured without any backpressure in T.

PRESSURE CONTROL p = f (I)

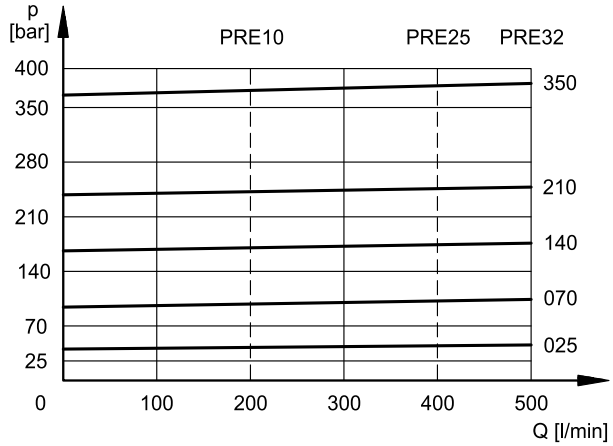




MINIMUM CONTROLLED PRESSURE pmin = f (Q)



PRESSURE VARIATION pmax = f (Q))



3 - MAX PRESSURE VALUES

This valve incorporates a mechanical limit of the maximum pressure, that operates independently of the applied current. This kind of design ensures the pressure cannot rise over even if the solenoid current exceeds the maximum current ($I > I_{max}$).

Values obtained with oil viscosity of 36 cSt at 50°C, Q = 50 l/min

	PRE*-025	PRE*-070	PRE*-140	PRE*-210	PRE*-350
pressure value at 800 mA (bar)	27	85	147	220	365
max pressure value when $I > I_{max}$ (bar)	35	95	165	255	370

4 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

5 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut and can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20°C)	Ω	3.66	17.6
NOMINAL CURRENT	A	1.88	0.86
DUTY CYCLE	100%		
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2014/30/EU		
CLASS OF PROTECTION atmospheric agents (IEC 60529) coil insulation (VDE 0580) impregnation	IP 65 class H class F		

6 - STEP RESPONSE

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

The table illustrates typical step response times measured with a PRE32-210 and with input flow rate Q = 50 l/min, and a pressure oil volume of 2 litres. The response time is affected by both the flow rate and the oil volume inside the piping.

REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms]	120	90

7 - INSTALLATION

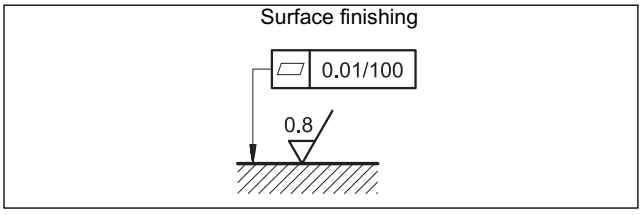
We recommend installing the PRE* valve either in horizontal position, or vertical position with the solenoid downward. If the valve is installed in vertical position and with the solenoid upward, you must consider possible variations of the minimum controlled pressure, if compared to what is indicated in paragraph 2.

Ensure there is no air in the hydraulic circuit. In particular applications, it can be necessary to vent the air entrapped inside the solenoid tube, by using the apposite drain screw (see par. 8 - 9 - 10). At the end of the operation, make sure of having correctly screwed the drain screw.

Connect the T port on the valve directly to the tank. Add any backpressure value detected in the T line to the controlled pressure value.

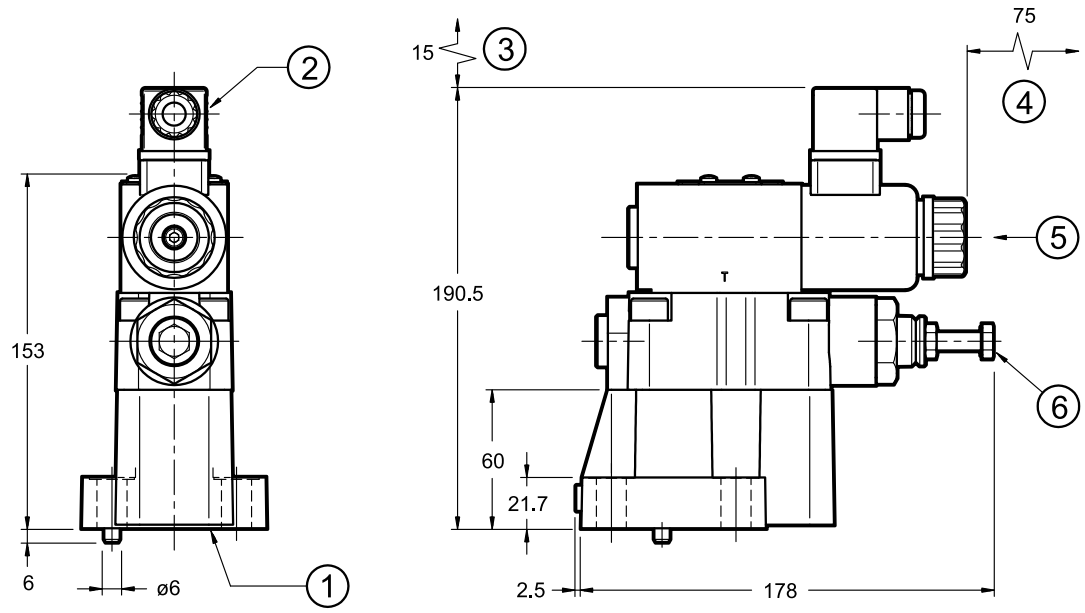
Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.

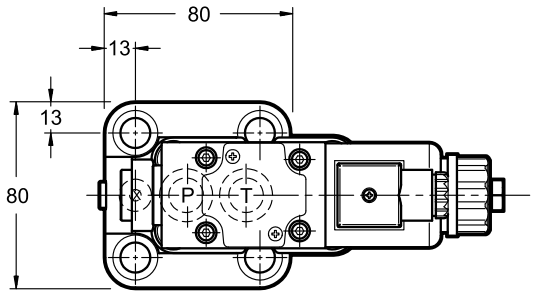
Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.



8 - PRE10 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



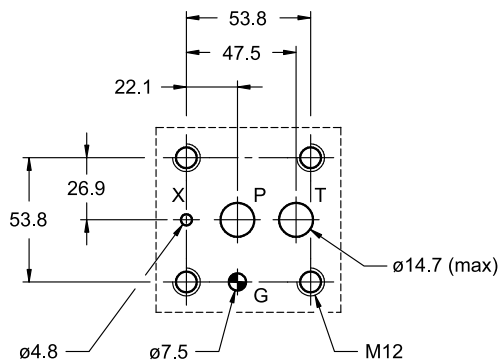


NOTE:
at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (5) placed at the end of the solenoid tube.

Fastening bolts: 4 SHCS M12x40 - ISO 4762
Torque: 69 Nm (A8.8 screws)
Thread of mounting holes: M12x20

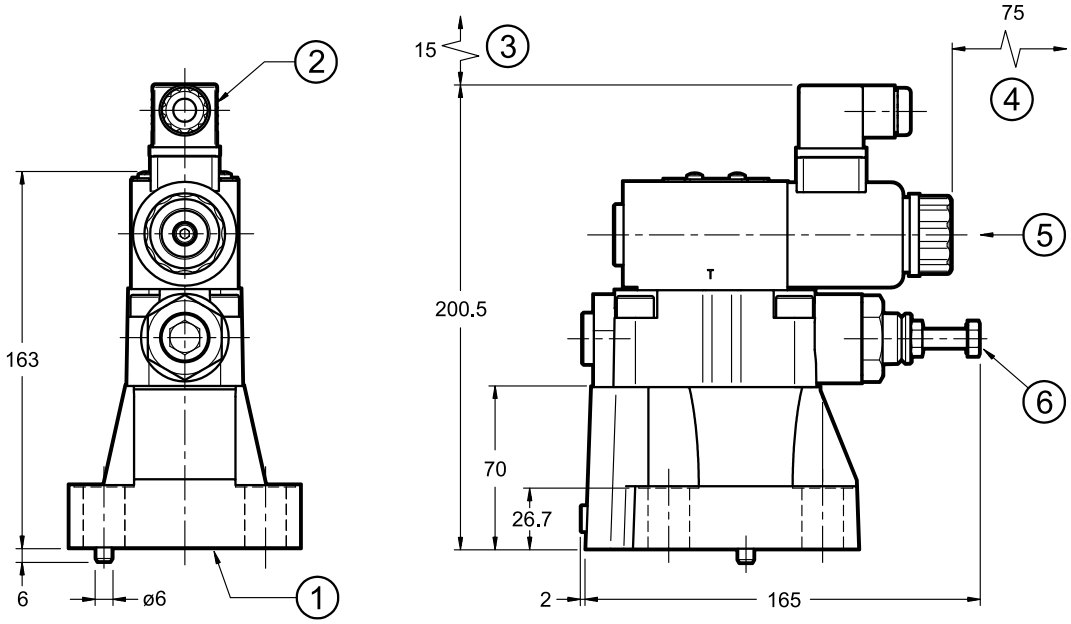
1	Mounting surface with sealing rings: 2 OR type 123 (17.86x2.62) - 90 Shore 1 OR type 109 (9.13x2.62) - 90 Shore
2	EN 175301-803 (ex DIN 43650) electric connector
3	Connector removal space
4	Coil removal space
5	Breather (male hexagonal spanner 4)
6	Pressure relief valve (factory set)

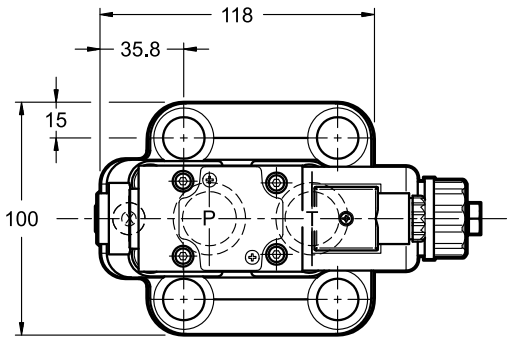
MOUNTING INTERFACE:
ISO 6264-06-09-*-97
(CETOP 4.4.2-2-R06-350)



9 - PRE25 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



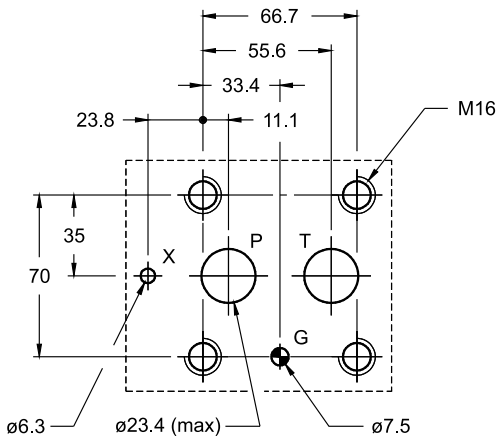


NOTE:
at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (5) placed at the end of the solenoid tube.

Fastening bolts: 4 SHCS M16x60 - ISO 4762
Torque: 170 Nm (A8.8 screws)
Thread of mounting holes: M16x25

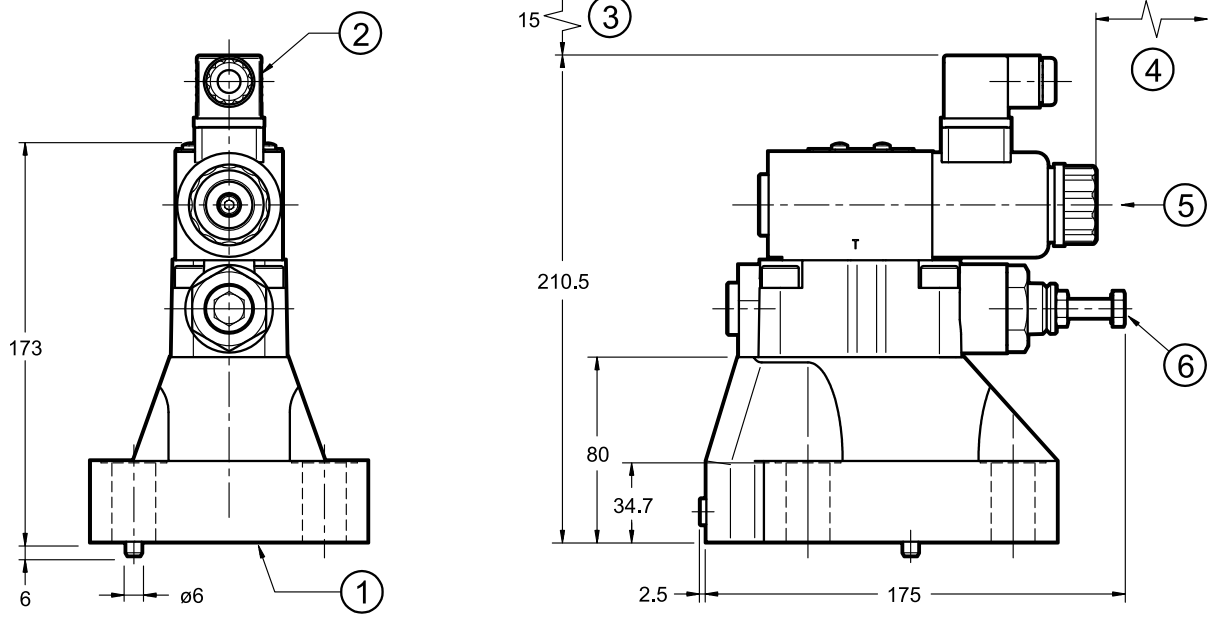
1	Mounting surface with sealing rings: 2 OR type 3118 (29.82x2.62) - 90 Shore 1 OR type 109 (9.13x2.62) - 90 Shore
2	EN 175301-803 (ex DIN 43650) electric connector
3	Connector removal space
4	Coil removal space
5	Breather (male hexagonal spanner 4)
6	Pressure relief valve (factory set)

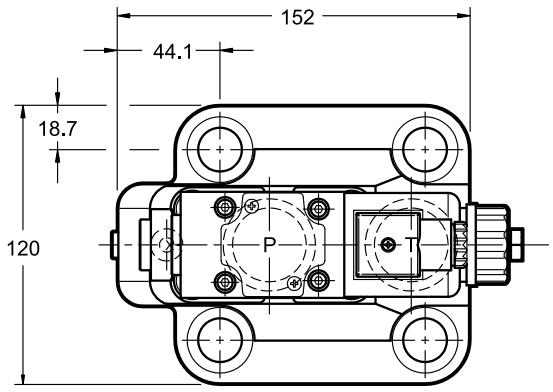
MOUNTING INTERFACE:
ISO 6264-08-13-*-97
(CETOP 4.4.2-2-R08-350)



10 - PRE32 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

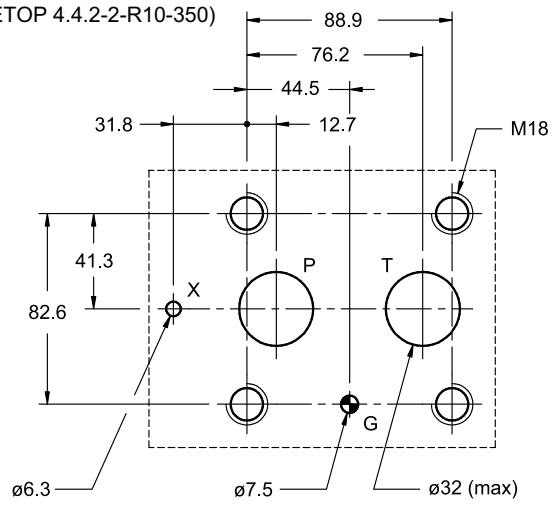




NOTE:
at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (5) placed at the end of the solenoid tube.

Fastening bolts: 4 SHCS M18x60 - ISO 4762
Torque: 235 Nm (A8.8 screws)
Thread of mounting holes: M18x27

MOUNTING INTERFACE
ISO 6264-10-17-*-97
(CETOP 4.4.2-2-R10-350)



1	Mounting surface with sealing rings: 2 OR type 4137 (34.52x3.53) - 90 Shore 1 OR type 109 (9.13x2.62) - 90 Shore)
2	EN 175301-803 (ex DIN 43650) electric connector
3	Connector removal space
4	Coil removal space
5	Breather (male hexagonal spanner 4)
6	Pressure relief valve (factory set)

11 - ELECTRONIC CONTROL UNITS

EDC-112	for solenoid 24V DC	plug version	see cat. 89 120
EDC-142	for solenoid 12V DC		
EDM-M112	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 251
EDM-M142	for solenoid 12V DC		

12 - SUBPLATES

(see catalogue 51 000)

	PRE10	**PRE25**	**PRE32**
Type	PMRQ3-AI4G rear ports	PMRQ5-AI5G rear ports	PMRQ7-AI7G rear ports
P, T ports dimensions	P: 1/2” BSP T: 3/4” BSP	1” BSP	1” ¼ BSP
X port dimensions	1/4” BSP	1/4” BSP	1/4” BSP

DUPLOMATIC MOTION SOLUTIONS

DUPLOMATIC MS S.p.A.
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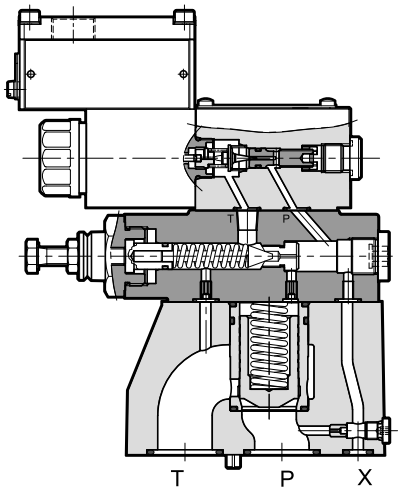


P*E*K*

EXPLOSION-PROOF PROPORTIONAL PRESSURE RELIEF VALVES, PILOT OPERATED ATEX, IECEX, PESO

PDE3K*	**ISO 4401- 03**
PRE3K*	**ISO 4401- 03**
PRE10K*	**ISO 6264 - 06**
PRE25K*	**ISO 6264 - 08**
PRE32K*	**ISO 6264 -10**

OPERATING PRINCIPLE



— PDE3K* and PRE*K* are explosion-proof pressure relief valves with proportional control.

— They are compliant with ATEX, IECEx or PESO requirements and are suitable for use in potentially explosive atmospheres, for surface plants or mines.

— A low temperature version (up to -40 °C) is also available.

— The valves can be controlled directly by a current power supply or by means of an electronic control unit, to exploit valve performance to the full (see p. 21).

— Upon request, these valves can be supplied with a finishing surface treatment (zinc-nickel) suitable to ensure a salt spray resistance up to 600 hours.

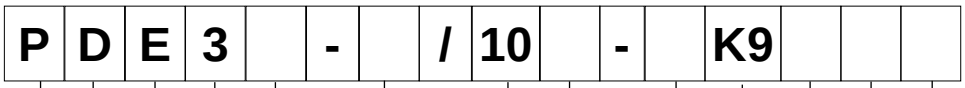
— **Details for classification, operating temperatures and electrical characteristics are in the technical data sheet 02 500 'Explosion proof classification'.**

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

		PDE3K*	PRE3K*	PRE10K*	PRE25K*	PRE32K*
Maximum operating pressure - P port - T port	bar	350 2	350 2	350 2		
Minimum flow Nominal flow Maximum flow	l/min	- 1 2	2 10 40	- - 200	- - 400	- - 500
Step response		see p. 11				
Hysteresis	% of p nom	< 5%				
Repeatability	% of p nom	< ±1,5%				
Electrical characteristic		see p. 5				
Operating temperatures (ambient and fluid)		see data sheet 02 500				
Fluid viscosity range	cSt	10 ÷ 400				
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13					
Recommended viscosity	cSt	25				
Mass	kg	1,8	3,8	5,3	6,1	8,3

1 - IDENTIFICATION CODE OF DIRECT OPERATED PROPORTIONAL VALVE



Pressure control valve

Direct operated

Electrical proportional control

Size ISO 4401-03

Explosion-proof certification:
See table 1.1

Pressure control range
025 = 0,9 - 25 bar
070 = 1,6 - 70 bar
140 = 2,4 - 140 bar
210 = 3,2 - 210 bar
350 = 5 - 350 bar

Series No.
(the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
For temperature range -20 / +80 °C
N = NBR seals for mineral oil (standard)
V = FPM seals for special fluids
For temperature range -40 / +80 °C
NL = seal for low temperatures (for mineral oil)

Nominal solenoid voltage:
D12 = 12V DC
D24 = 24V DC

Coil electrical connection:
junction box

Connection type for cable gland
upper connection:
T01 = M20x1.5 - ISO 261
T02 = Gk 1/2 - UNI EN 10226-2
T03 = 1/2" NPT - ANSI B1.20.1 (ex ANSI B2.1)
side connection:
S01 = M20x1.5 - ISO 261
S02 = Gk 1/2 - UNI EN 10226-2
S03 = 1/2" NPT - ANSI B1.20.1 (ex ANSI B2.1)
S04 = M16x1.5 - ISO 261

Option: **/T5**
version in T5 temperature class.
Omit if not required.

Option:
surface treatment not standard.
Omit if not required
(see **NOTE**)

NOTE: Valves are supplied with standard surface treatment of phosphating black.

The full zinc-nickel surface treatment is available upon request. It is suitable to ensure a salt spray resistance up to 600 h (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

For full zinc-nickel surface treatment add the suffix **/W7** at the end of the identification code.

Version with monobloc steel coil

Standard coils are made of zinc-nickel steel, with anodized aluminium junction box on it.

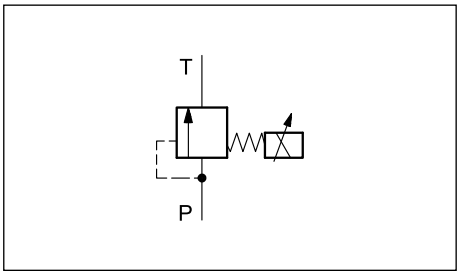
Monobloc coils **MD24K9S01** completely made of steel are available upon request. They have zinc-nickel treatment, power supply voltage D24 and cable gland connection type S01. Other variants for voltage and cable gland connection are available, always on request.

1.1 - Names of valves per certification

	ATEX		IECEx		PESO	
for gases for dusts	**KD2**	II 2GD	**KXD2**	IECEx Gb IECEx Db	**KPD2**	PESO Gb not applicable for dust
for mines	**KDM2**	I M2	**KXDM2**	IECEx Mb	not applicable for mines	

NOTE: Refer to the technical data sheet 02 500 for marking, operating temperatures and available versions.

2 - HYDRAULIC SYMBOL



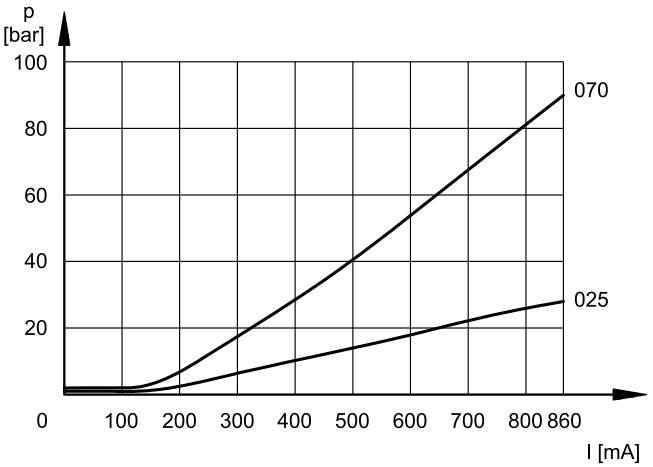
3 - CHARACTERISTIC CURVES FOR DIRECT OPERATED PROPORTIONAL VALVE

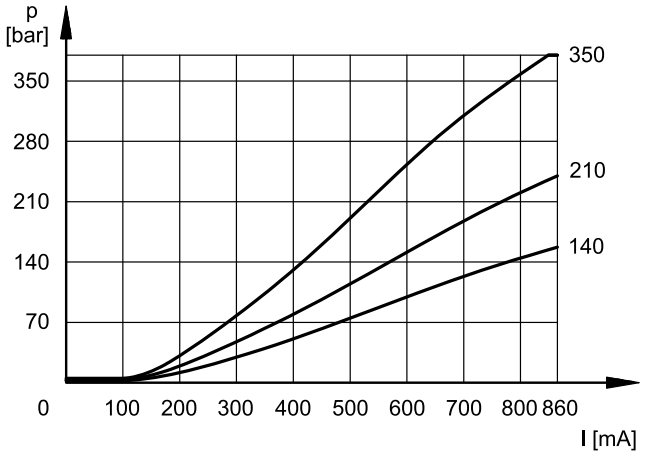
(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Typical control curves according to the current supplied to the solenoid for available pressure control ranges measured with input flow rate Q = 1 l/min.

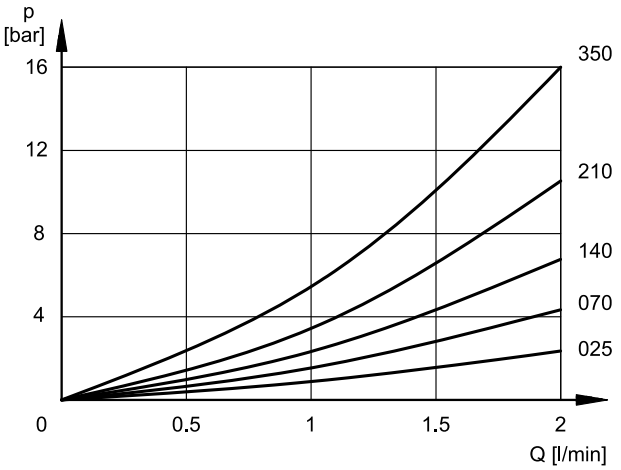
Curves have been obtained without any hysteresis and linearity compensation and they have been measured without any backpressure in T. The full scale pressure is set in factory with a flow rate of 1 l/min. In case of higher flow rate, the full scale pressure will increase considerably (see diagram pmax = f (Q)).

PRESSURE CONTROL p = f(I)

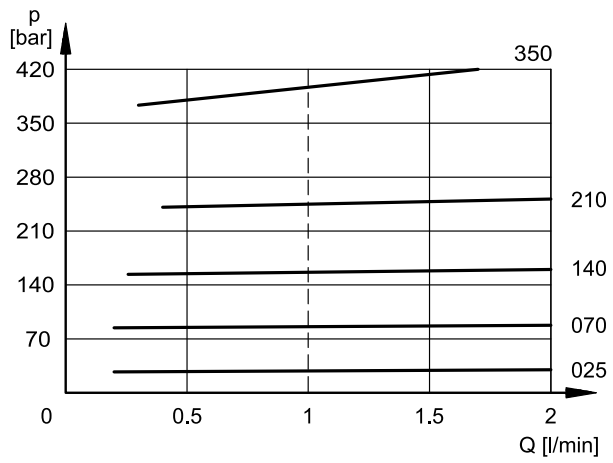




MINIMUM CONTROLLED PRESSURE p min = f (Q)



PRESSURE VARIATION p max = f (Q)



4 - MAX PRESSURE VALUES FOR DIRECT OPERATED PROPORTIONAL VALVE

This valve incorporates a mechanical limit of the maximum pressure, that operates independently of the applied current. This kind of design ensures the pressure cannot rise over even if the solenoid current exceeds the maximum current ($I > I_{max}$).

Values obtained with oil viscosity of 36 cSt at 50°C, Q = 1 l/min

		PDE3K*-025	PDE3K*-070	PDE3K*-140	PDE3K*-210	PDE3K*-350
pressure value at 800 mA	bar	25	77	142	217	360
max pressure value when $I > I_{max}$	bar	33,5	90	161	252	390

5 - ELECTRICAL CHARACTERISTICS

(values ± 5%)

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (AT 20°C)	Ω	3,8	15,6
NOMINAL CURRENT	A	1,88	0,86

DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2014/30/EU
CLASS OF PROTECTION Atmospheric agents Coil insulation (VDE 0580)	 IP66/IP68 class H

5.1 - Wiring

In order to realise the electrical connection of the coil, it is necessary to access the terminal block (1) unscrewing the 4 screws (2) that fasten the cover (3) with the box (4) that contains the terminal block.

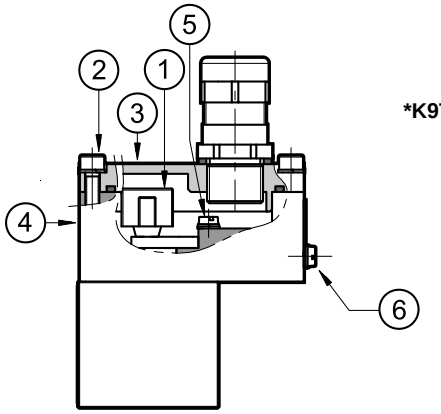
The electrical connection is polarity-independent.

By doing electrical connection it is important to connect also the grounding point (5) in the terminal block box (M4 screws), through suitable conductors with the general grounding line of the system.

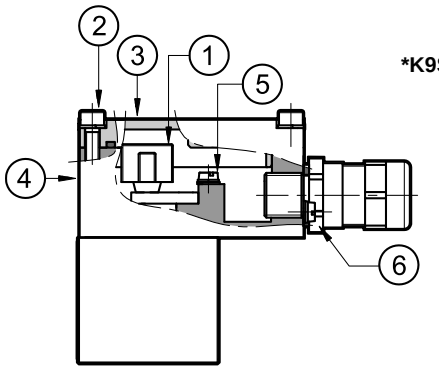
On the external body of the coil there is a grounding point (6) (M4 screw) that allow to ensure equipotentiality between the valve and the general grounding line of the system; connecting this point the regulation of the EN 13463-1 standard, that impose to verify the equipotentiality of the elements included in a potentially explosive environment (the maximum resistance between the elements must be 100 Ω), is guaranteed.

At the end of the electrical wiring, it is necessary to reassemble the cover (3) on the box (4), checking the correct positioning of the seal located in the cover seat and fastening the 4 M5 screws with a torque of 4.9 ÷ 6 Nm.

Electrical wiring must be done following the instructions of the rules in compliance with standard about protection against explosion hazards.



K9T



K9S

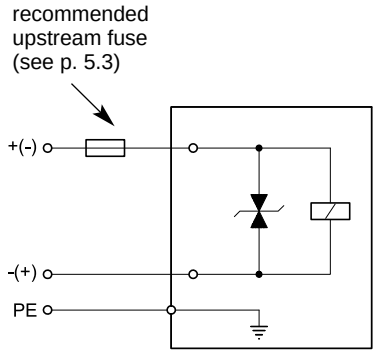
Characteristics of the cables connectable for wiring are indicated in the table below:

Function	Cable section
Operating voltage cables connection	max 2.5 mm²
Connection for internal grounding point	max 2.5 mm²
Connection for external equipotential grounding point	max 6 mm²

Cables for wiring must be non-armoured cables, with external covering sheath and must be suitable for use in environments with temperatures from - 20 °C to +110 °C (for valves either with N or V seals) or from - 40 °C to +110 °C (for valves with NL seals).

Cable glands (which must be ordered separately, see p. 18) allow to use cables with external diameter between 8 and 10 mm.

5.2 - Electrical diagrams



5.3 - Overcurrent fuse and switch-off voltage peak

Upstream of each valve, an appropriate fuse (max 3 x In according to IEC 60127) or a protective motor switch with short-circuit and thermal instantaneous tripping, as short-circuit protection, must be connected. The cut-off power of the fuse must correspond or exceed the short circuit current of the supply source. The breaking capacity of the fuse link shall be the same as or higher than the maximum short-circuit current expected to occur at the place of installation (normally 1500 A).

The fuse or the protective motor must be placed outside the dangerous area or they must be protected with an explosion-proof covering.

In order to safeguard the electronic device to which the valve is connected, there is a protection circuit in the coil, that reduces voltage peaks, which can occur when inductances are switched off.

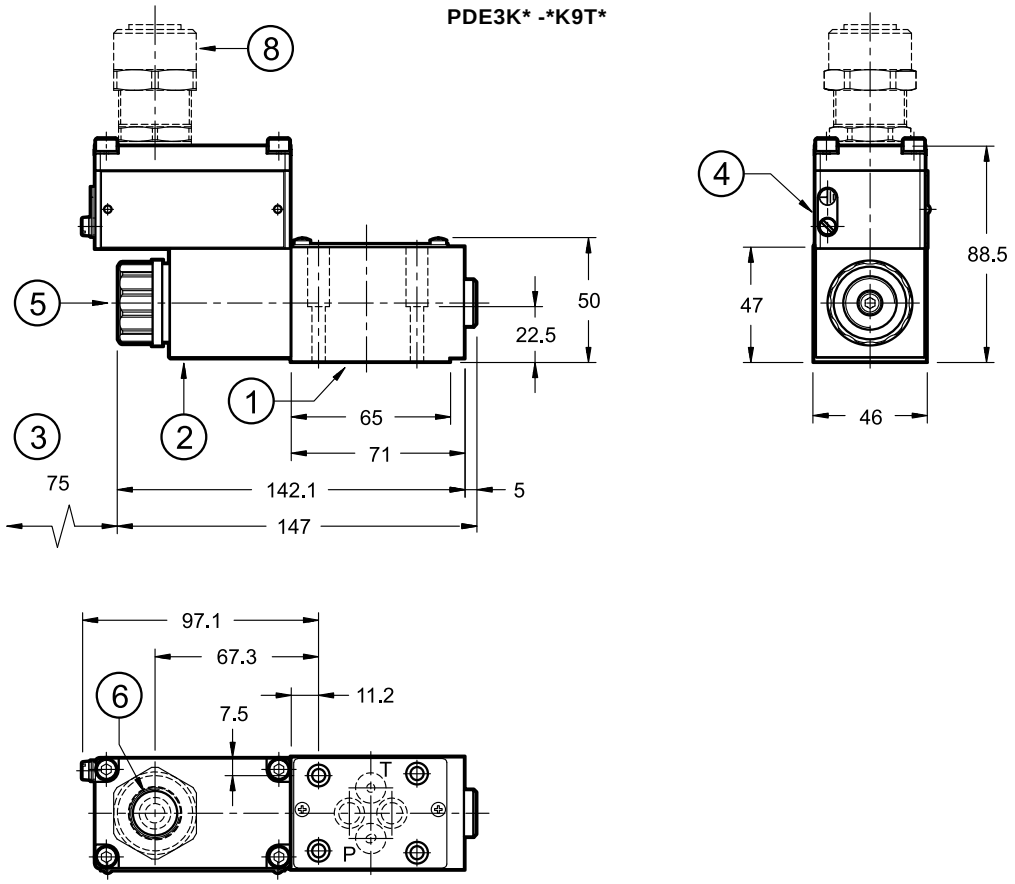
The table shows the type of fuse recommended according to the nominal voltage of the valve and to the value of the voltage peaks reduction.

Coil type	Nominal voltage [V]	Rated current [A]	**Recommended pre-fuse characteristics medium time-lag according to DIN 41571 [A]**	Maximum voltage value upon switch off [V]	Suppressor circuit
D12	12	1,88	2,5	- 49	Transient voltage suppressor bidirectional
D24	24	0,86	1,25	- 49	

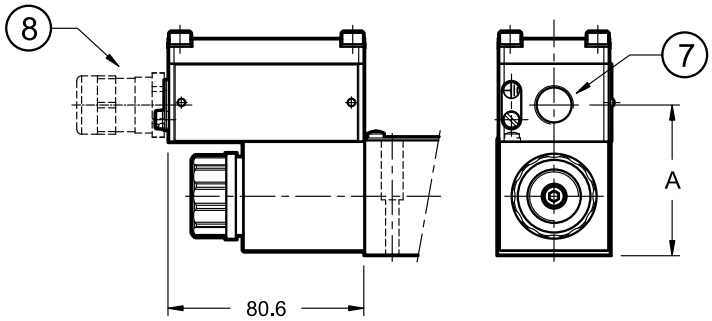
6 - PDE3K* OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

PDE3K* -*K9T*



PDE3K* -*K9S*



Side port type	A
S01, S04	60.5
S02, S03	60

1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25 x 1.78) - 90 shore
2	Explosion-proof coil
3	Minimum clear space required
4	Terminal for supplementary GND connection
5	Breather (Allen key 4)
6	Upper port for cable gland
7	Side port for cable gland
8	Cable gland To be ordered separately, see p. 20

NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (5) placed at the end of the solenoid tube.

Fastening of single valve: 4 SHC screws M5x30 - ISO 4762
Tightening torque: 5 Nm (A8.8 screws)
Threads of mounting holes: M5x10

7 - IDENTIFICATION CODE OF PILOT OPERATED PROPORTIONAL VALVES

P	R	E			-		/	20		-		K9			

Pilot operated pressure relief valve

Electric proportional control

Size:
3 = ISO 4401-03
10 = ISO 6264-06
25 = ISO 6264-08
32 = ISO 6264-10

Explosion-proof certification:
See table 1.1

Pressure control range:

PRE3K*:
025 = 4 - 25 bar
070 = 4 - 70 bar
140 = 4 - 140 bar
210 = 4 - 210 bar
350 = 5 - 350 bar

PRE10K*, PRE25K* and PRE32K*
025 = up to 25 bar
070 = up to 70 bar
140 = up to 140 bar
210 = up to 210 bar
350 = up to 350 bar

Series No.
(the overall and mounting dimensions remain unchanged from 20 to 29)

Seals:
For temperature range -20 / +80 °C
N = NBR seals for mineral oil (standard)
V = FPM seals for special fluids
For temperature range -40 / +80 °C
NL = seal for low temperatures (for mineral oil)

Nominal solenoid voltage:
D12 = 12V DC
D24 = 24V DC

Coil electrical connection:
junction box

Connection type for cable gland
upper connection:
T01 = M20x1.5 - ISO 261
T02 = Gk 1/2 - UNI EN 10226-2
T03 = 1/2" NPT - ANSI B1.20.1 (ex ANSI B2.1)
side connection:
S01 = M20x1.5 - ISO 261
S02 = Gk 1/2 - UNI EN 10226-2
S03 = 1/2" NPT - ANSI B1.20.1 (ex ANSI B2.1)
S04 = M16x1.5 - ISO 261

Option: **/T5**
version in T5 temperature class.
Omit if not required.

Option:
surface treatment not standard.
Omit if not required
(see **NOTE**)

NOTE: Valves are supplied with standard surface treatment of phosphating black.

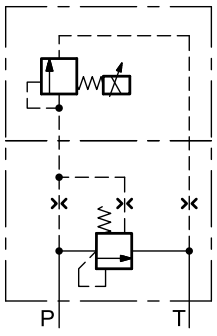
The full zinc-nickel surface treatment is available upon request. It is suitable to ensure a salt spray resistance up to 600 h (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

For full zinc-nickel surface treatment add the suffix **/W7** at the end of the identification code.

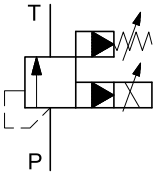
A version with monobloc coil made of steel is available. Please refer to details in page 2.

8 - HYDRAULIC SYMBOLS

PRE3K*



PRE10K*, PRE25K* and PRE32K*

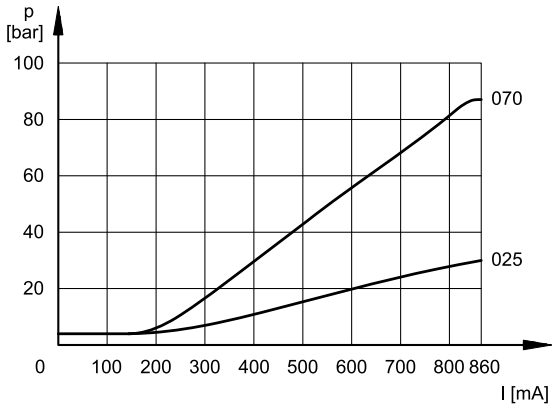


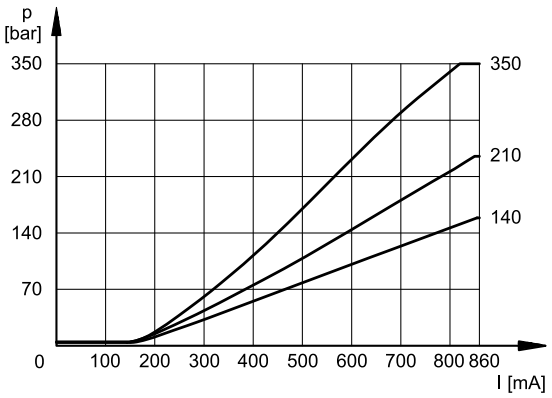
9 - CHARACTERISTIC CURVES OF PILOT OPERATED PROPORTIONAL VALVES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

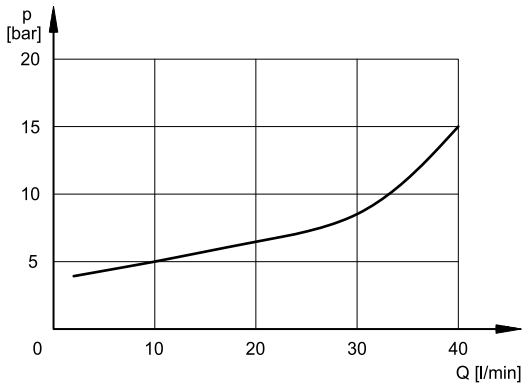
9.1 - PRE3K*

PRESSURE CONTROL p = f (I)

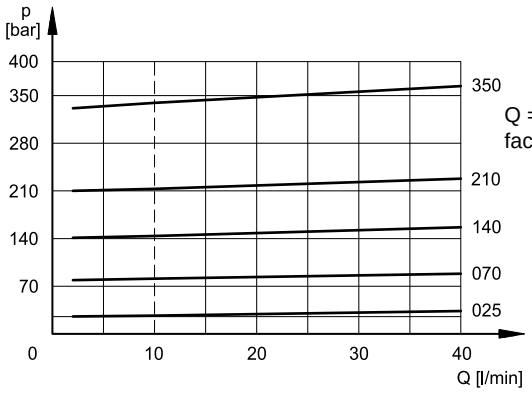




MINIMUM CONTROLLED PRESSURE p min = f (Q)



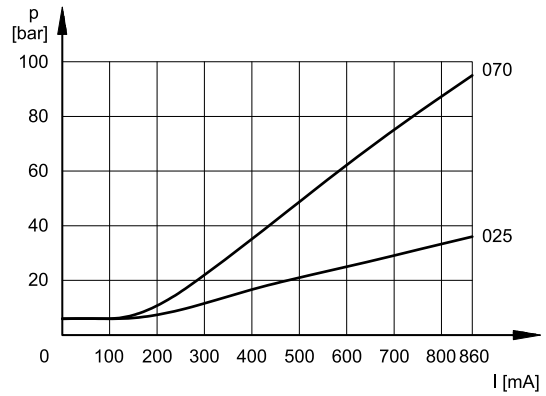
PRESSURE VARIATION p max = f (Q)

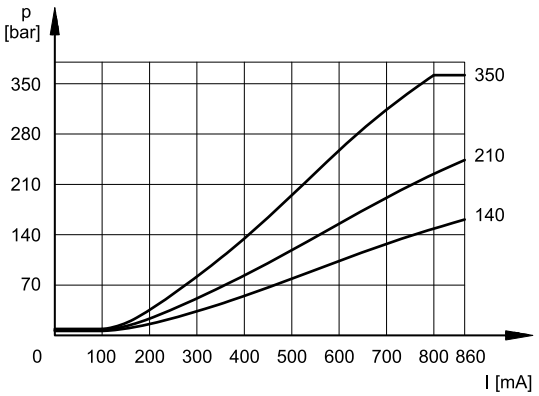


Q = 10 lt/min
factory setting

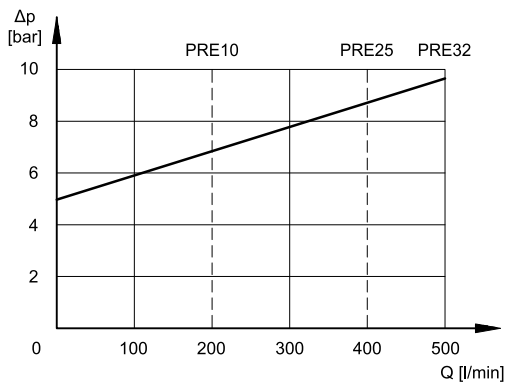
9.2 - PRE10K*, PRE25K* and PRE32K*

PRESSURE CONTROL p = f (I)

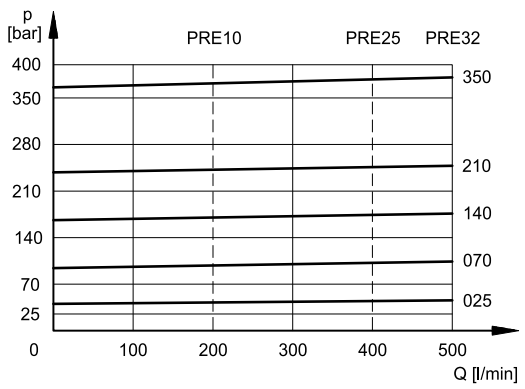




MINIMUM CONTROLLED PRESSURE p min = f (Q)



PRESSURE VARIATION p max = f (Q)



10 - MAX PRESSURE VALUES FOR PILOT OPERATED VALVES

These valves incorporate a mechanical limit of the maximum pressure, that operates independently of the applied current. This kind of design ensures the pressure cannot rise over, even if the solenoid current exceeds the maximum current ($I > I_{max}$).

Values obtained with oil viscosity of 36 cSt at 50°C, Q = 10 l/min

		PRE3-025	PRE3-070	PRE3-140	PRE3-210	PRE3-350
pressure value at 800 mA	bar	28	82	145	215	335
max pressure value when $I > I_{max}$	bar	30	86	155	230	350

Values obtained with oil viscosity of 36 cSt at 50°C, Q = 50 l/min

		PRE*-025	PRE*-070	PRE*-140	PRE*-210	PRE*-350
pressure value at 800 mA	bar	27	85	147	220	365
max pressure value when $I > I_{max}$	bar	35	95	165	255	370

11 - STEP RESPONSE

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

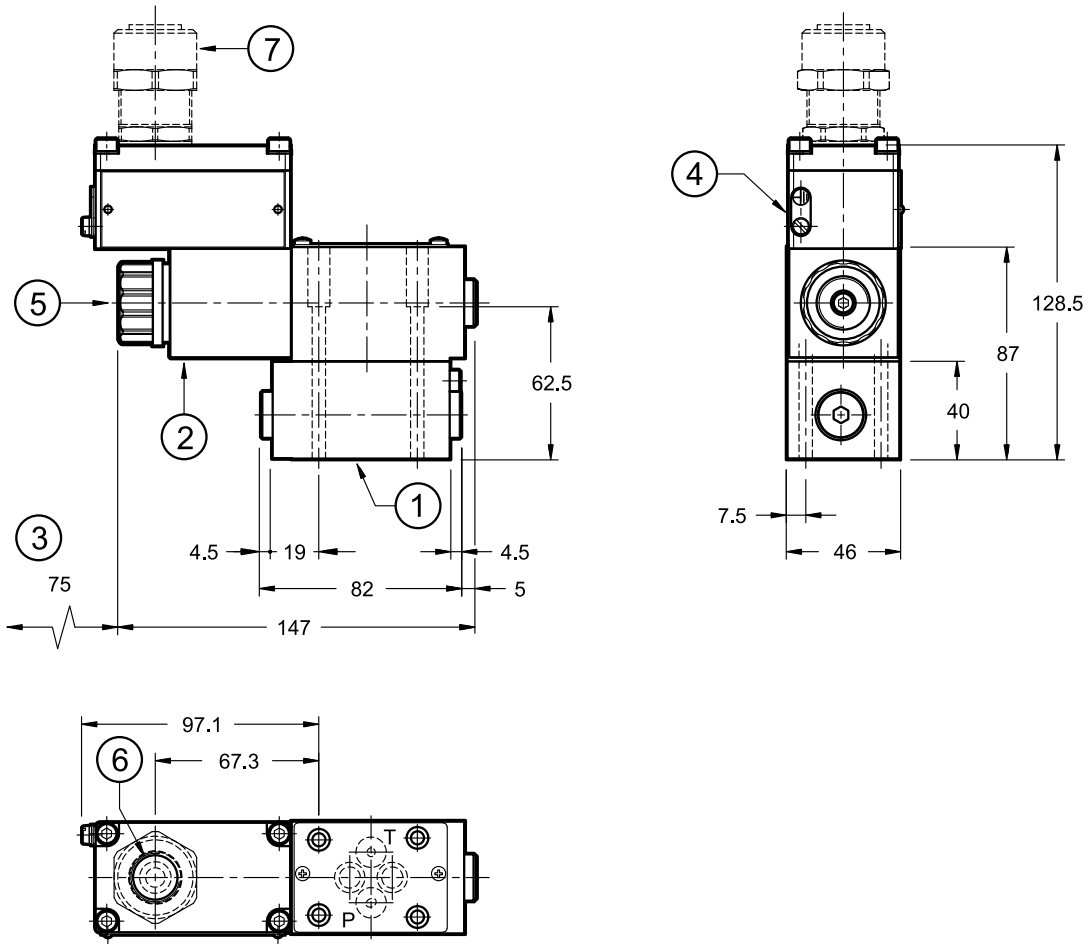
The table illustrates typical step response times measured with a valve of pressure range up to 210 bar and with input flow rate of Q = 1 l/min for PDE3K*, Q = 10 l/min for PRE3K* and Q = 50 l/min for PRE10K*, PRE25K* and PRE32K*.

REFERENCE SIGNAL	0 → 100%	100 → 0%
	Step response [ms]	
PDE3K*	60	70
PRE3K*	80	40
PRE10K*, PRE25K* and **PRE32K***	120	90

12 - PRE3K* WITH UPPER CONNECTION - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

PRE3K*-*/20*-*K9T*



NOTE 1: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (5) placed at the end of the solenoid tube.

NOTE 2: for side connections see p. 16.

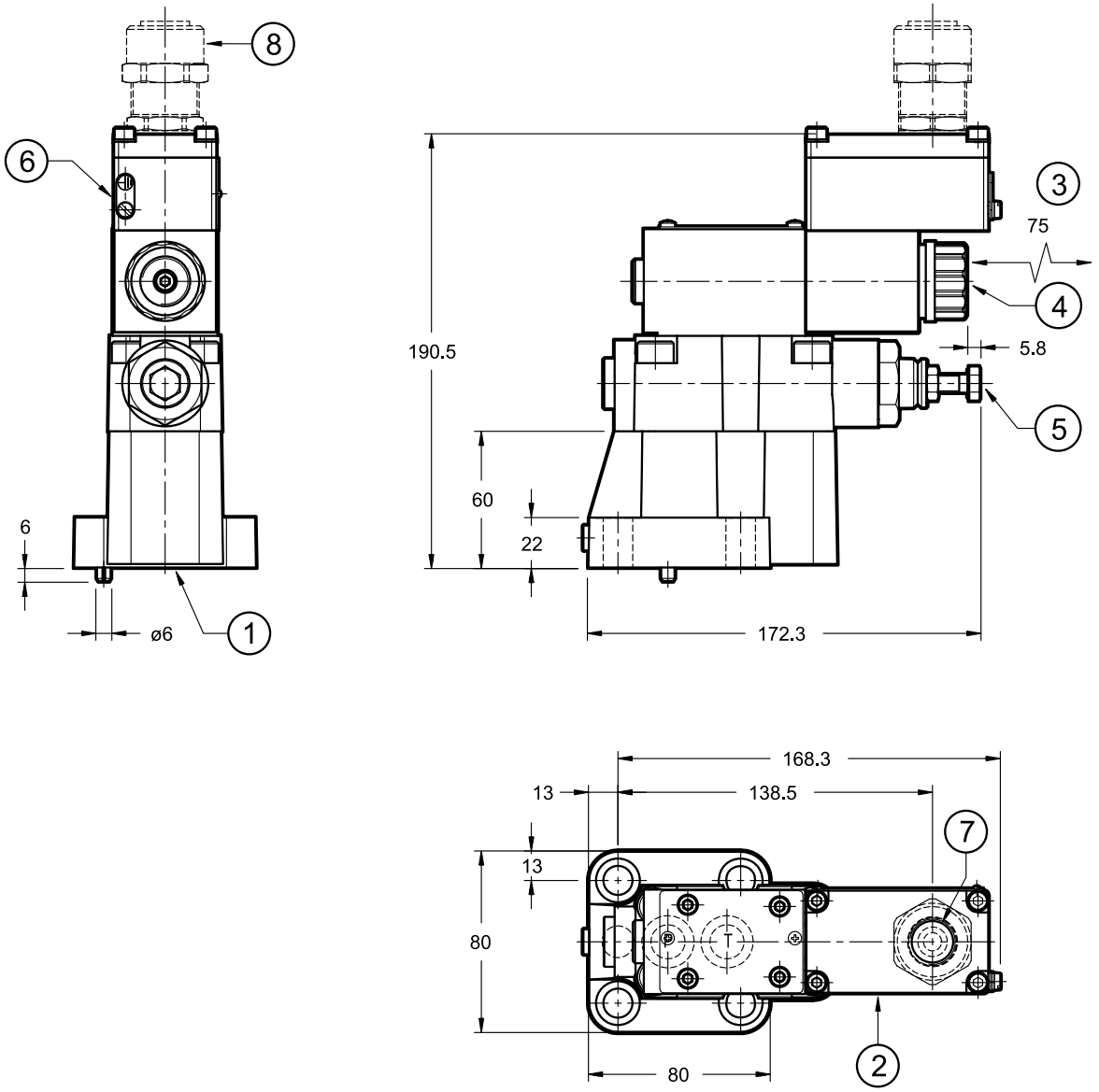
Fastening of single valve: 4 screws SHC M5x70 - ISO 4762
Tightening torque: 5 Nm (A8.8 screws)
Threads of mounting holes: M5x10

1	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) - 90 shore
2	Explosion-proof coil
3	Minimum clear space required
4	Terminal for supplementary GND connection
5	Breather (Allen key 4)
6	Upper port for cable gland
7	Cable gland. To be ordered separately, see p. 20

13 - PRE10K* WITH UPPER CONNECTION - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

PRE10K*-*/20*-*K9T*



1	Mounting surface with sealing rings: N. 2 OR type 123 (17.86 x 2.62) - 90 shore N. 1 OR type 109 (9.13 x 2.62) - 90 shore
2	Explosion-proof coil
3	Minimum clear space required
4	Breather (Allen key 4)
5	Pressure relief valve (factory set)
6	Terminal for supplementary GND connection
7	Upper port for cable gland
8	Cable gland. To be ordered separately, see p. 20

NOTE 1: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (4) placed at the end of the solenoid tube.

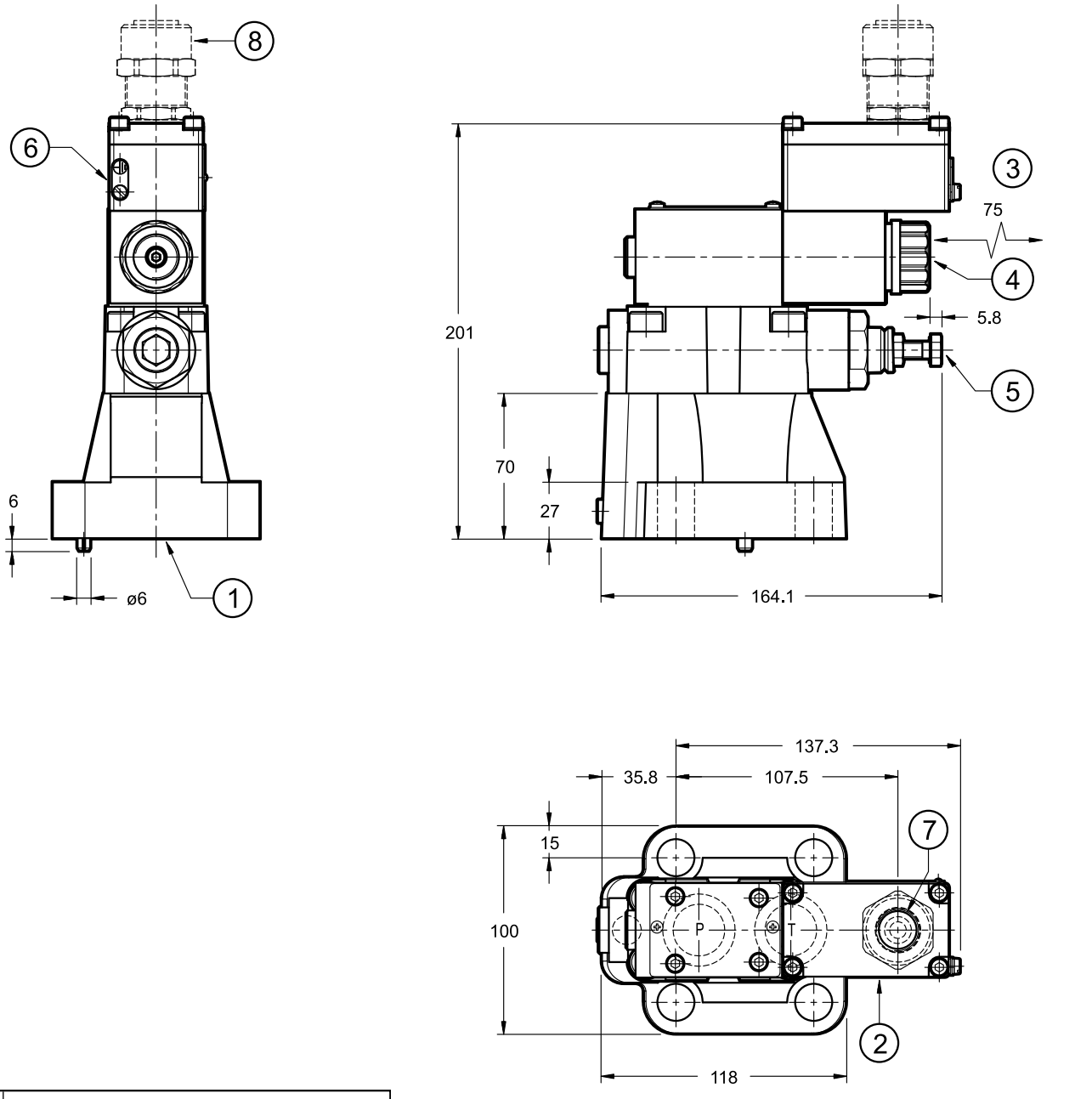
NOTE 2: for side connections see p. 16.

Fastening of single valve: 4 SHC screws M12x40 - ISO 4762
Tightening torque: 69 Nm (A8.8 screws)
Threads of mounting holes: M12x20

14 - PRE25K* WITH UPPER CONNECTION - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

PRE25K*-*/20*-*K9T*



1	Mounting surface with sealing rings: N. 2 OR type 3118 (29.82 x 2.62) - 90 shore N. 1 OR type 109 (9.13 x 2.62) - 90 shore
2	Explosion-proof coil
3	Minimum clear space required
4	Breather (Allen key 4)
5	Pressure relief valve (factory set)
6	Terminal for supplementary GND connection
7	Upper port for cable gland
8	Cable gland. To be ordered separately, see p. 20

NOTE 1: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (4) placed at the end of the solenoid tube.

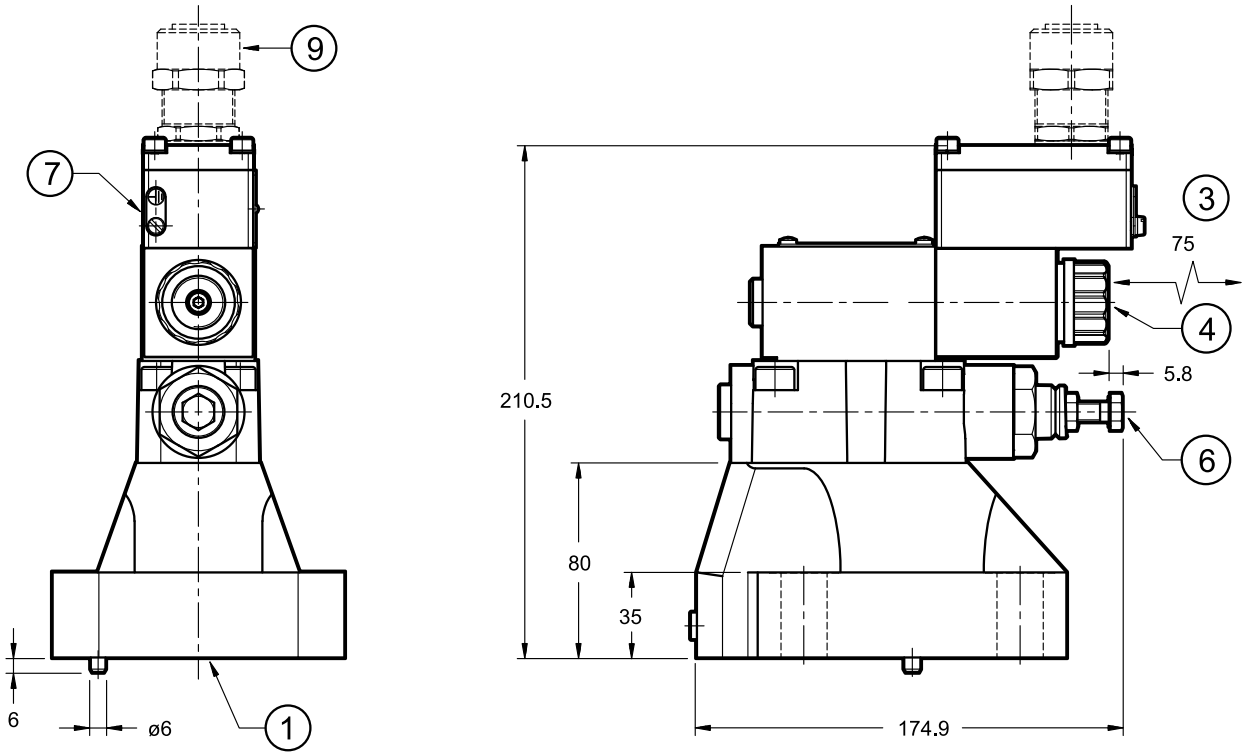
NOTE 2: for side connections see p. 16.

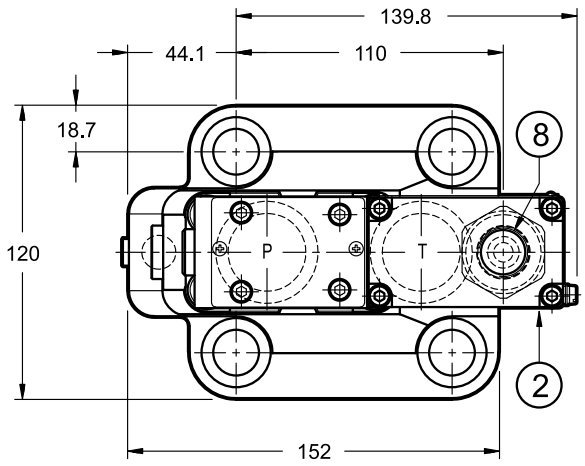
Fastening of single valve: 4 SHC screws M16x50 - ISO 4762
Tightening torque: 170 Nm (A8.8 screws)
Threads of mounting holes: M16x25

15 - PRE32K* WITH UPPER CONNECTION - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

PRE32K*-*/20*-*K9T*





1	Mounting surface with sealing rings: N. 2 OR type 4137 (34.52 x 3.53) - 90 shore N. 1 OR type 109 (9.13 x 2.62) - 90 shore
2	Explosion-proof coil
3	Minimum clear space required
4	Breather (Allen key 4)
5	Pressure relief valve (factory set)
6	Terminal for supplementary GND connection
7	Upper port for cable gland
8	Cable gland. To be ordered separately, see p. 20

NOTE 1: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (4) placed at the end of the solenoid tube.

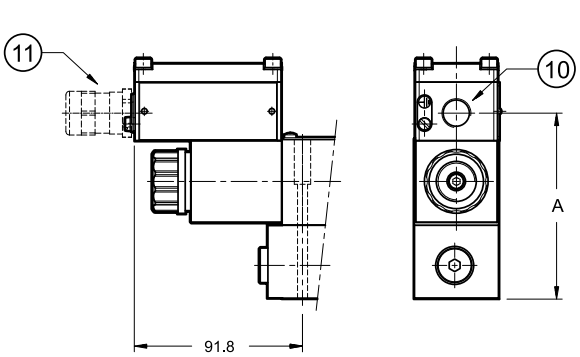
NOTE 2: for side connections see p. 16.

Fastening of single valve: N. 4 SHC screws M18x60 - ISO 4762
Tightening torque: 235 Nm (A8.8 screws)
Threads of mounting holes: M18x27

16 - PRE*K* WITH SIDE CONNECTION - OVERALL AND MOUNTING DIMENSIONS

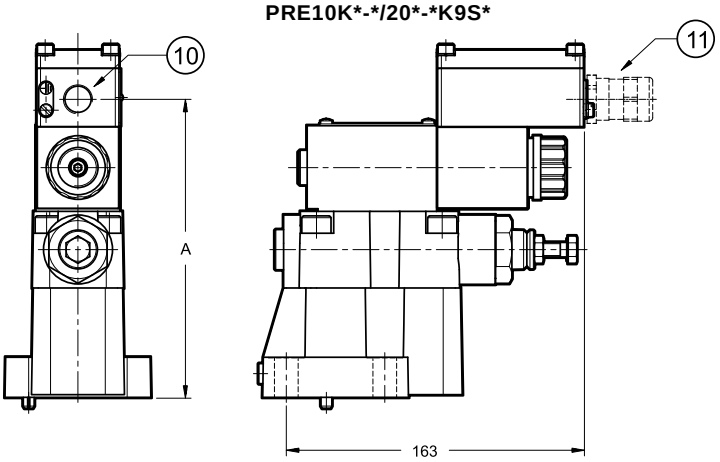
dimensions in mm

PRE3K*-*/20*-*K9S*



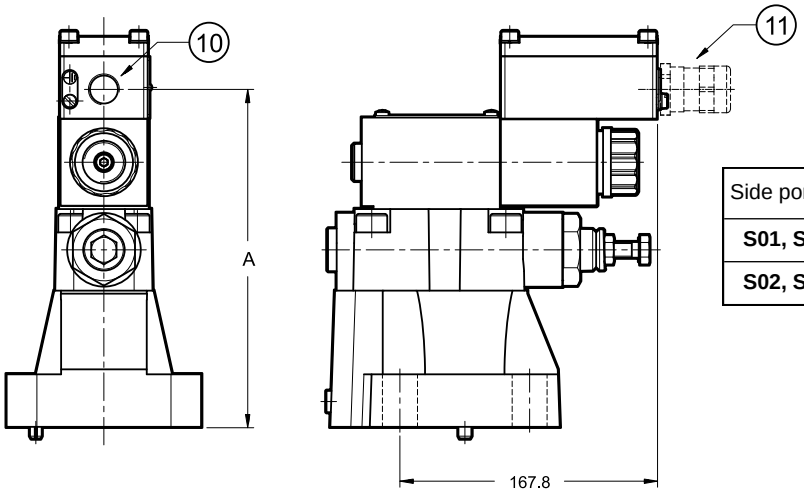
Side port type	A
S01, S04	100.5
S02, S03	100

PRE10K*-*/20*-*K9S*



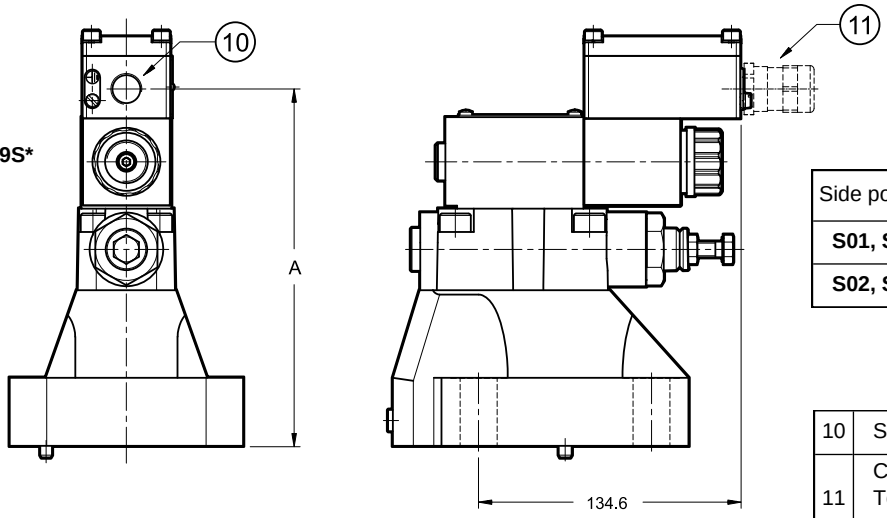
Side port type	A
S01, S04	162.5
S02, S03	162

PRE25K*-*/20*-*K9S*



Side port type	A
S01, S04	172.5
S02, S03	172

PRE32K*-*/20*-*K9S*

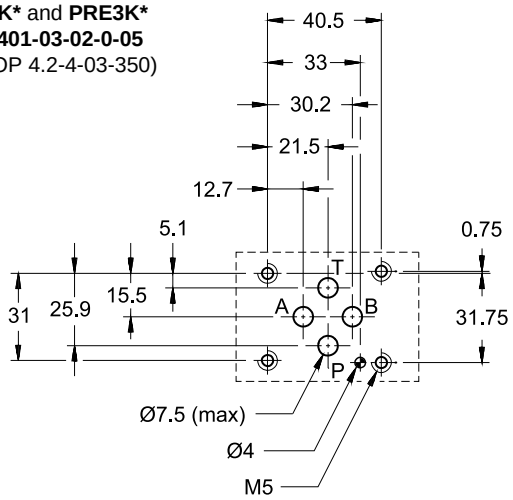


Side port type	A
S01, S04	182.5
S02, S03	182

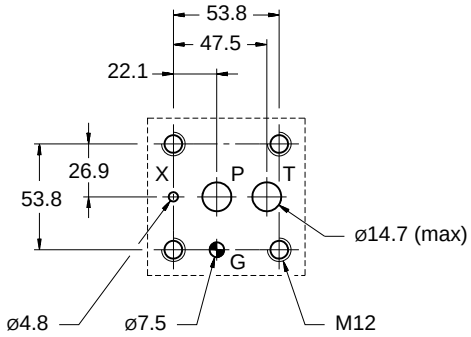
10	Side port for cable gland
11	Cable gland. To be ordered separately, see p. 20

17 - MOUNTING SURFACES

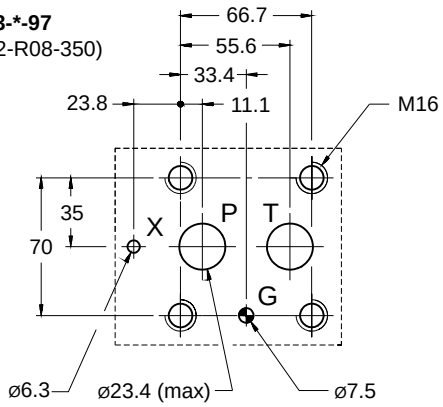
PDE3K* and **PRE3K***
ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)



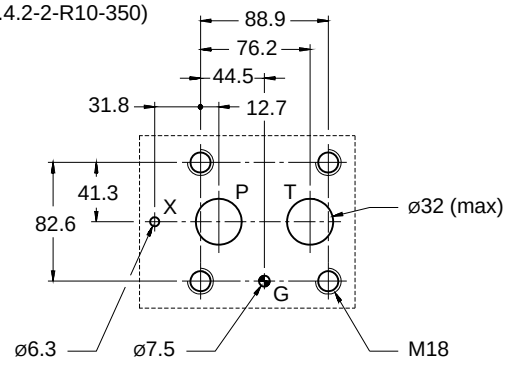
PRE10K*
ISO 6264-06-09-*-97
(CETOP 4.4.2-2-R06-350)



PRE25K*
ISO 6264-08-13-*-97
(CETOP 4.4.2-2-R08-350)



PRE32K*
ISO 6264-10-17-*-97
(CETOP 4.4.2-2-R10-350)



18 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

19 - INSTALLATION

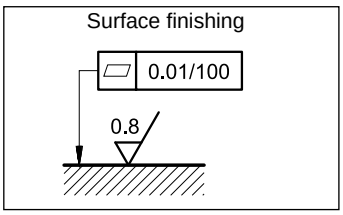
Installation must adheres to instructions reported in the *Use and Maintenance manual*, always attached to the valve. Unauthorized interventions can be harmful to people and goods because of the explosion hazards present in potentially explosive atmospheres.

We recommend to install the valves either in horizontal position, or vertical position with the solenoid downward. If the valve is installed in vertical position and with the solenoid upward, you must consider possible variations of the minimum controlled pressure, if compared to what is indicated in p.s 3 and 9.

Ensure that there is no air in the hydraulic circuit. In particular applications, it can be necessary to vent the air, by using the apposite drain screw in the solenoid tube. At the end of the operation, make sure of having correctly screwed the drain screw.

Connect the T port on the valve directly to the tank. Add any backpressure value detected in the T line to the controlled pressure value. **Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.**

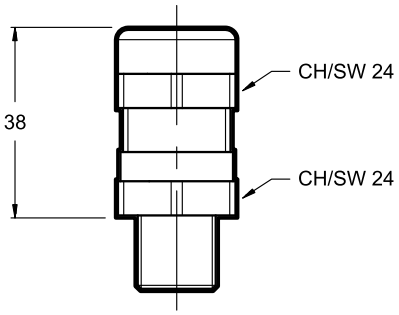
Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.



20 - CABLE GLANDS

Cable glands must be ordered separately; Duplomatic offers some types of cable glands with the following features:

- version for non-armoured cable, external seal on the cable (suitable for Ø 8 ÷ 10 mm cables);
- ATEX II 2GD, I M2; IECEx Gb, Db, Mb;
- cable gland material: nickel brass
- inner rubber tip material: silicone
- ambient temperature range: - 65 ºC ÷ +220 ºC
- protection degree: IP66/IP68



To order the desired cable glands, specify description, code and quantity.

Description: CGK2/NB-01/10

Code: 3908108001

M20x1.5 - ISO 261 male thread, suitable for coils with T01 and S01 connections. It is supplied equipped with copper washer, that must be assembled between the cable gland and the coil, so as to ensure IP66/IP68 protection degree.

Tightening torque: 45 ÷ 50 Nm

Description: CGK2/NB-02/10

Code: 3908108002

Gk 1/2 - UNI EN 10226-2 male thread, suitable for coils with T02 and S02 connections. The customer must apply LOCTITE® 243™ threadlocker or similar between the cable gland connection thread and the coil in order to ensure IP66/IP68 protection degree.

Tightening torque: 20 ÷ 25 Nm

Description: CGK2/NB-03/10

Code: 3908108003

1/2” NPT - ANSI B1.20.1 (ex ANSI B2.1), suitable for coils with T03 and S03 connections. The customer must apply LOCTITE® 243™ threadlocker or similar between the cable gland connection thread and the coil in order to ensure IP66/IP68 protection degree.

Tightening torque: 20 ÷ 25 Nm

Description: CGK2/NB-04/10

Code: 3908108004

M16x1.5 - ISO 261 male thread, suitable for coils with S04 connection. It is supplied equipped with copper washer, that must be assembled between the cable gland and the coil, so as to ensure IP66/IP68 protection degree.

Tightening torque: 45 ÷ 50 Nm

21 - ELECTRONIC CONTROL UNITS

EDM-M112	for solenoid 24V DC	DIN EN 50022 rail mounting	see catalogue 89 251
EDM-M142	for solenoid 12V DC		

NOTE: electronic control units offered are not explosion-proof certified; therefore, they must be installed outside classified areas.

22 - SUBPLATES

(see catalogue 51 000)

	PDE3K*	PRE3K*	PRE10K*	PRE25K*	PRE32K*
Type with rear ports	PMMD-AI3G	PMMD-AI3G	PMRQ3-AI4G	PMRQ5-AI5G	PMRQ7-AI7G
Type with side ports	PMMD-AL3G	PMMD-AL3G	-	-	-
P, T ports dimensions	3/8” BSP	3/8” BSP	P: 1/2” BSP T: 3/4” BSP	1” BSP	1” ¼ BSP
X port dimensions	-	-	1/4” BSP	1/4” BSP	1/4” BSP

NOTE: Subplates (to be ordered separately) contain neither aluminium nor magnesium at a rate higher than the value allowed by norms according to ATEX directive for category II 2GD and I M2.

The user will bear to do the complete assessment of the ignition risk that can occur from the relative use in potentially explosive environments.

DUPLOMATIC MOTION SOLUTIONS
a member of DAIKIN group

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duplomaticmotionsolutions.com

REPRODUCTION IS FORBIDDEN. THE COMPANY RESERVES THE RIGHT TO APPLY ANY MODIFICATIONS.

WWW.SUMY.IR

EXPLOSION-PROOF CLASSIFICATION for

SOLENOID AND PROPORTIONAL VALVES

ref. catalogues:

pressure control valves

RQM*K*-P	**21 515**
P*E*K*	**81 316**
ZDE3K*	**81 515**
DZCE*K*	**81 606**

flow control valves

QDE3K*	**82 225**

directional valves

D*K*	**41 515**
DT3K*	**42 215**
DS(P)E*K*	**83 510**

GENERAL INFO

This informative technical datasheet displays information about **classification and marking** of Duplomatic explosion-proof valves range.

Duplomatic MS offers valves with the following certifications:

ATEX	**II 2G**	**II 2D**	**I M2**
IECEx	**Gb**	**Db**	**Mb**
PESO	**Gb**		

Instructions for use and maintenance can be found in the related manuals, always supplied toghether with valves.

1 - ATEX CLASSIFICATION AND TEMPERATURES

Duplomatic certificates the combination valve-coil for the valves suitable for application and installation in potentially explosive atmospheres, according to ATEX directive; the supply always includes the declaration of conformity to the directive and the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environments.

Coils assembled on these valves have been separately certified according to ATEX directive and so they are suitable for use in potentially explosive atmospheres.

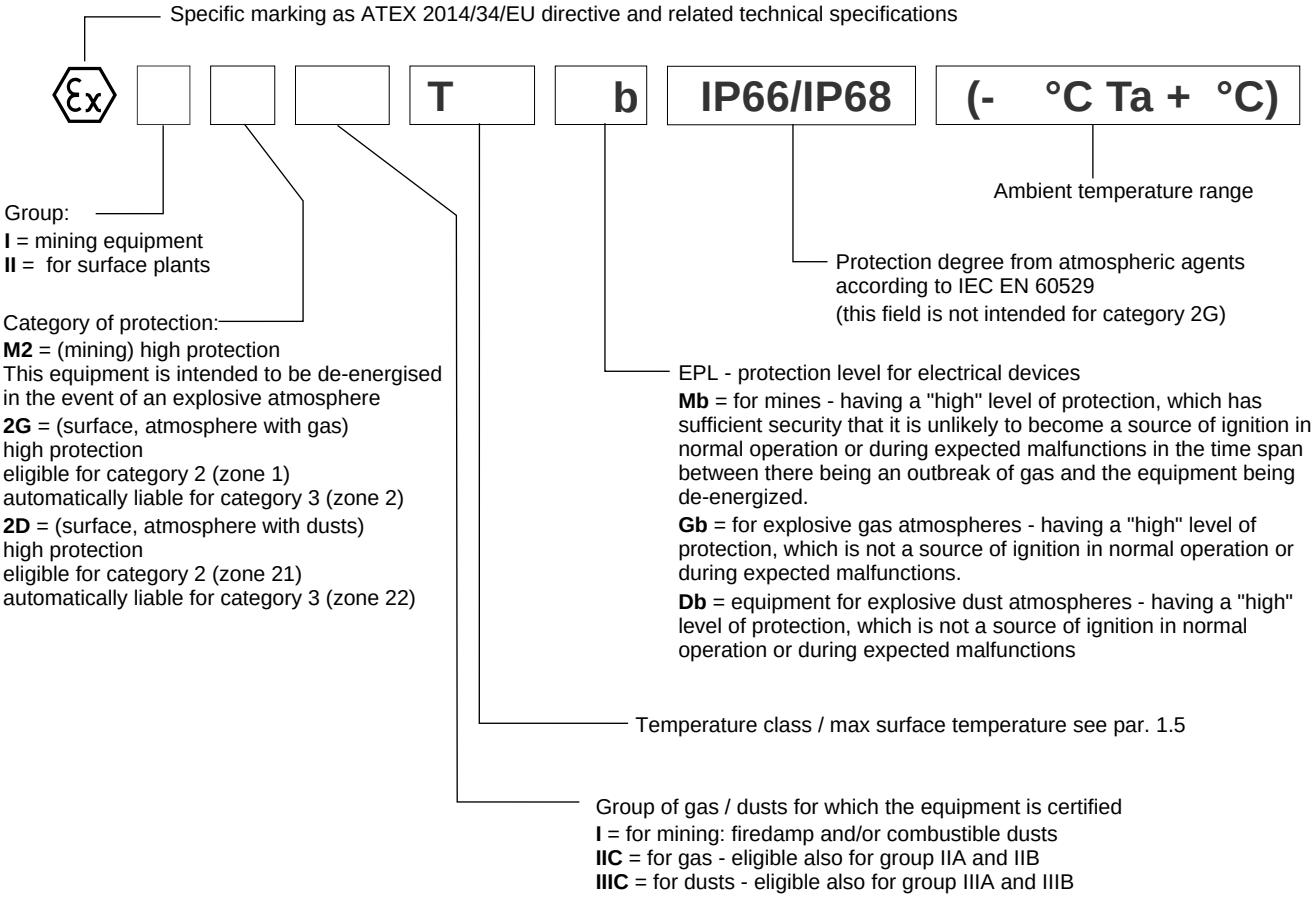
1.1 - ATEX classification for valves

Type examination certificate: AR18ATEX055
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

ATEX II 2G ATEX II 2D	***KD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur occasionally.The means of protection relating to equipment in this category ensure the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account.
ATEX I M2	***KDM2**	equipment intended for use in underground parts of mines as well as those parts of surface installations of such mines likely to be endangered by firedamp and/or combustible dust. This equipment is intended to be de-energised in the event of an explosive atmosphere.

1.2 - ATEX marking for valves

valve code		N and V seals	NL seals
***KD2**	for gas	Ex II 2G IIC T4 Gb (-20°C Ta +80°C)	Ex II 2G IIC T4 Gb (-40°C Ta +80°C)
	for dusts	Ex II 2D IIIC T154°C Db IP66/IP68 (-20°C Ta +80°C)	Ex II 2D IIIC T154°C Db IP66/IP68 (-40°C Ta +80°C)
***KD2 /T5**	for gas	Ex II 2G IIC T5 Gb (-20°C Ta +55°C)	Ex II 2G IIC T5 Gb (-40°C Ta +55°C)
	for dusts	Ex II 2D IIIC T129°C Db IP66/IP68 (-20°C Ta +55°C)	Ex II 2D IIIC T129°C Db IP66/IP68 (-40°C Ta +55°C)
***KDM2**	mining	Ex I M2 I T150°C Mb IP66/68 (-20°C Ta +75°C)	Ex I M2 I T150°C Mb IP66/68 (-40°C Ta +75°C)



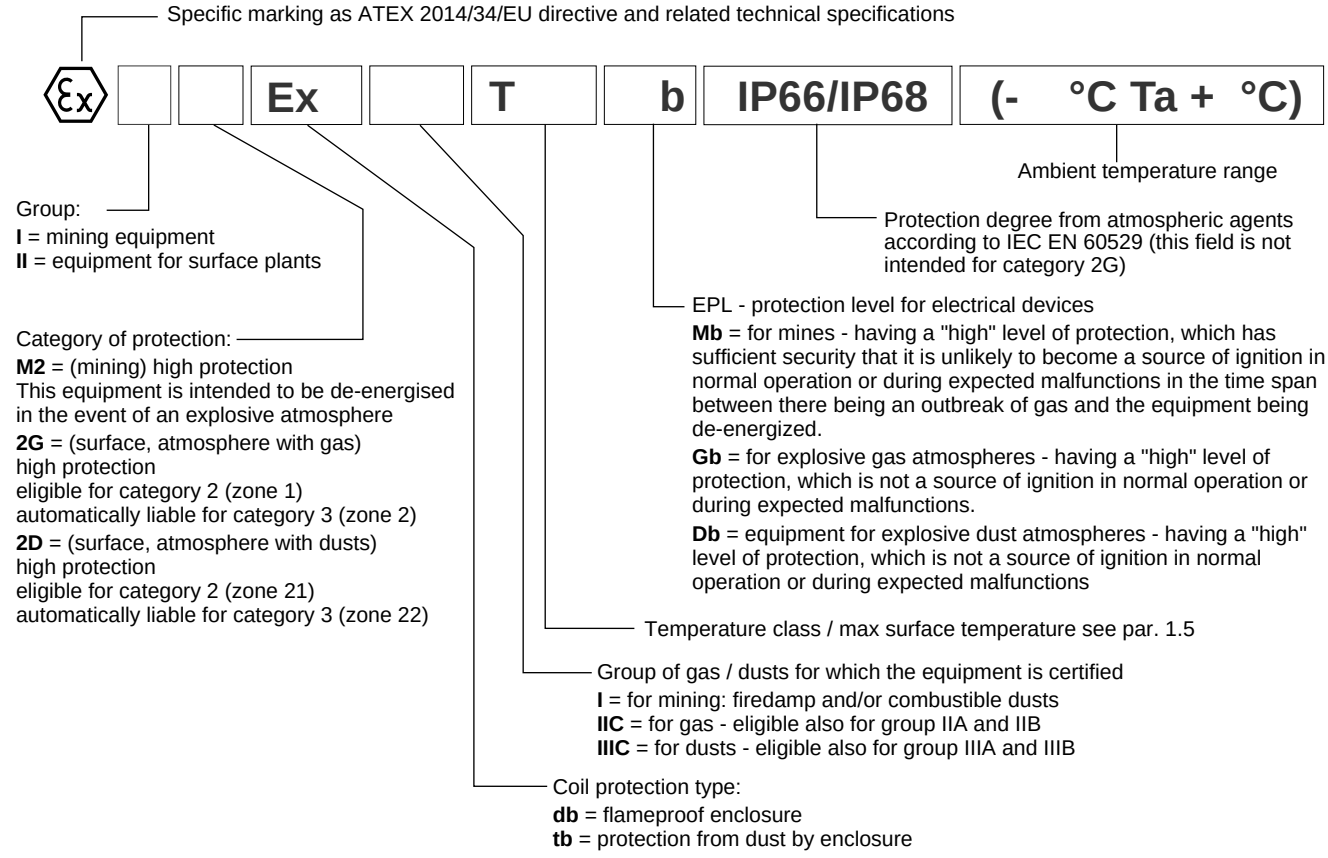
1.3 - ATEX classification of the coils

The coil of the explosion-proof valves is ATEX certified itself and, as such, is identified with its own tag, carries the relative ATEX marking. The mechanical construction of the coil housing is made in order to ensure its resistance to possible internal explosion and to avoid any explosion propagation to the outside environment, matching an “Ex db” type protection (explosion-proof coil).

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

1.4 - ATEX marking on coils

for valve type ***KD2**	for gas	II 2G Ex db IIC T4 Gb (-40°C Ta +80°C)
	for dusts	II 2D Ex tb IIIC T154°C Db IP66/IP68 (-40°C Ta +80°C)
for valve type ***KD2 /T5**	for gas	II 2G Ex db IIC T5 Gb (-40°C Ta +55°C)
	for dusts	II 2D Ex tb IIIC T129°C Db IP66/IP68 (-40°C Ta +55°C)
for valve type ***KDM2**	mining	I M2 Ex db I T150°C Mb IP66/IP68 (-40°C Ta +75°C)



1.5 - Operating temperatures

These valves are classified according to their maximum surface temperature (EN 13463-1), which must be lower than the ignition temperature of the gases, vapors and dusts for which the area in which they will be used is classified.

The valves in group II can also be used for less limiting temperature classes (surface temperature allowed higher).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
ATEX II 2G ATEX II 2D	***KD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas) T154°C (dusts)	T3, T2, T1 T200°C and higher
		of fluid				
	***KD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas) T129°C (dusts)	T4, T3, T2, T1 T135°C and higher
		of fluid	-20 / +60 °C	-40 / +60 °C		
ATEX I M2	***KDM2**	of ambient	-20 / +75 °C	-40 / +75 °C	T150°C	-
		of fluid				

2 - IECEX CLASSIFICATION AND TEMPERATURES

The IECEx certification requires the classification of the electrical equipment only.

Duplomatic supplies valves with IECEx certified coils, suitable for application and installation in potentially explosive atmospheres. The mechanical construction of the coil housing is made in order to ensure its resistance to possible internal explosion and to avoid any explosion propagation to the outside environment, matching an “Ex db” type protection (explosion-proof coil).

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

The supply always includes the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environment.

2.1 - IECEx classification

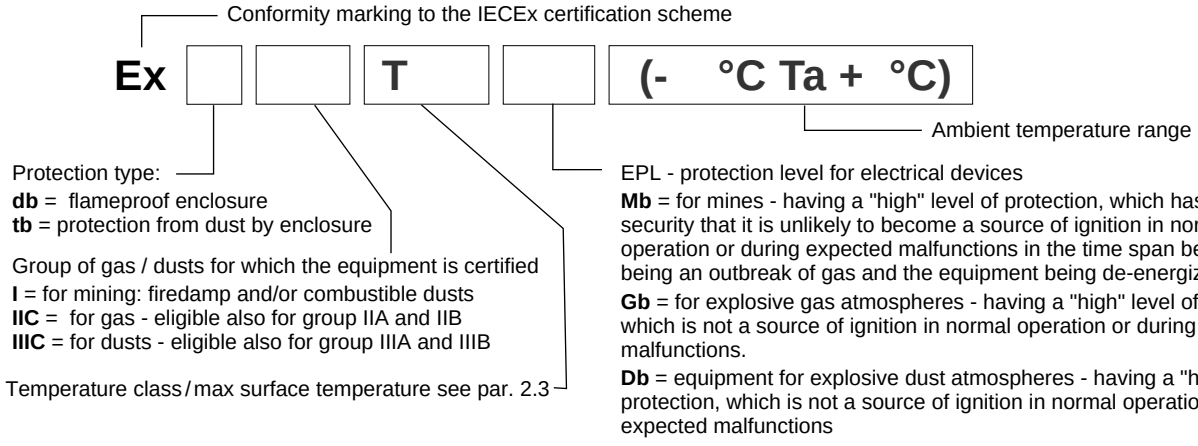
Certificate of conformity (CoC): IECEx TUN 15.0028X
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

IECEx Gb IECEx Db	***KXD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur occasionally.The means of protection relating to equipment in this category ensure the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account.
IECEx Mb	***KXDM2**	equipment intended for use in underground parts of mines as well as those parts of surface installations of such mines likely to be endangered by firedamp and/or combustible dust. This equipment is intended to be de-energised in the event of an explosive atmosphere.

2.2 - IECEx marking

There is a plate with the IECEx mark on each coil.

***KXD2** valves	for gas	Ex db IIC T4 Gb (-40°C Ta +80°C)
	for dusts	Ex tb IIIC T135°C Db (-40°C Ta +80°C)
***KXD2 /T5** valves	for gas	Ex db IIC T5 Gb (-40°C Ta +55°C)
	for dusts	Ex tb IIIC T100°C Db (-40°C Ta +55°C)
***KDM2** valves	mining	Ex db I Mb (-40°C Ta +80°C)



2.3 - Operating temperatures

These valves are classified according to their maximum surface temperature (EN 13463-1), which must be lower than the ignition temperature of the gases, vapors and dusts for which the area in which they will be used is classified.

Valves for surface plants can also be used for less limiting temperature classes (higher surface temperature allowed).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
IECEx Gb IECEx Db	***KXD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas) T135°C (dusts)	T3, T2, T1 T200°C and higher
		of fluid				
	***KXD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas) T100°C (dusts)	T4, T3, T2, T1 T135°C and higher
		of fluid	-20 / +60 °C	-40 / +60 °C		
IECEx Mb	***KXDM2**	of ambient	-20 / +80 °C	-40 / +80 °C	-	-
		of fluid				

2.4 - Protection degree from atmospheric agents (IEC EN 60529)

Protection degree from atmospheric agents according to IEC EN 60529 is IP66/IP68.

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3 - PESO CLASSIFICATION AND TEMPERATURES

The PESO certification requires the classification of the electrical equipment only.

Duplomatic supplies valves with PESO certified coils, suitable for application and installation in potentially explosive atmospheres. The mechanical construction of the coil housing is made in order to ensure its resistance to possible internal explosion and to avoid any explosion propagation to the outside environment, matching an “Ex db” type protection (explosion-proof coil).

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

The supply always includes the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environment.

3.1 - PESO classification

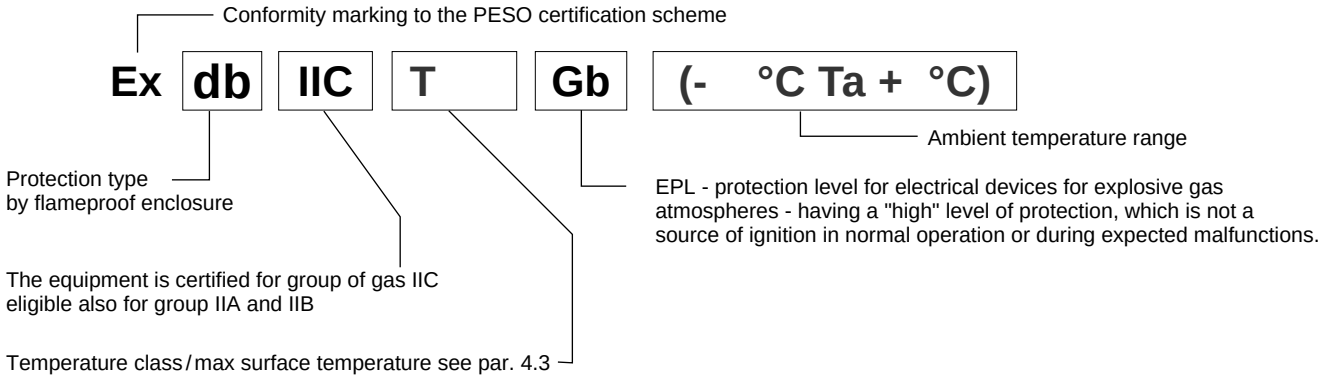
Certificate of conformity: P480801
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

PESO Gb	***KPD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists are likely to occur occasionally.The means of protection relating to equipment in this category ensure the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account.

3.2 - PESO marking

There is a plate with the PESO mark on each coil.

***KPD2** valves	for gas	Ex db IIC T4 Gb (-40°C Ta +80°C)
***KPD2 /T5** valves	for gas	Ex db IIC T5 Gb (-40°C Ta +55°C)



3.3 - Operating temperatures

These valves are classified according to their maximum surface temperature (EN 13463-1), which must be lower than the ignition temperature of the gases, vapors and dusts for which the area in which they will be used is classified.

Valves for surface plants can also be used for less limiting temperature classes (higher surface temperature allowed).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
PESO Gb	***KPD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas)	T3, T2, T1
		of fluid				
	***KPD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas)	T4, T3, T2, T1
		of fluid	-20 / +60 °C	-40 / +60 °C		

3.4 - Protection degree from atmospheric agents (IEC EN 60529)

Protection degree from atmospheric agents according to IEC EN 60529 is IP66/IP68.

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DUPLOMATIC
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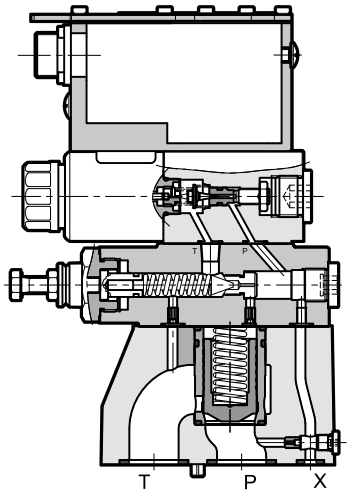
PRE*G*

PROPORTIONAL PRESSURE RELIEF VALVES, PILOT OPERATED, WITH INTEGRATED ELECTRONICS

SUBPLATE MOUNTING ISO 6264

p max **350** bar
Q max (see table of performances)

OPERATING PRINCIPLE



— The PRE*G* valves are proportional pressure relief valves, pilot operated, with integrated electronics and mounting interface in compliance with ISO 6264 standards.

— These valves are used to control hydraulic circuit pressure and enable the use of the full flow rate of the pump, even with settings approaching calibrated values.

— The two-stage design and wide passages ensure reduced pressure drops thereby improving the system energy performance.

— They are fitted with a manual pressure relief valve which is factory set to ≥15% of the maximum value in the pressure control range.

— Valves are available with different types of electronics, with analogue or fieldbus interfaces.

— They are available in three sizes with flow rates up to 500 l/min and in four pressure control ranges up to 350 bar.

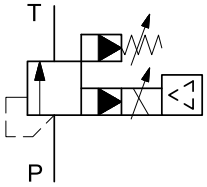
— The valves are easy to install. The driver directly manages digital settings.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50 °C and p = 140 bar)

		PRE10G*	PRE25G*	PRE32G*
Maximum operating pressure	bar	350		
Maximum flow	l/min	200	400	500
Step response		see point 8		
Hysteresis	% of p nom	< 3%		
Repeatability	% of p nom	< ±1%		
Electrical characteristic		see point 3		
Ambient temperature range	°C	-20 / +60		
Fluid temperature range	°C	-20 / +80		
Fluid viscosity range	cSt	10 ÷ 400		
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13			
Recommended viscosity	cSt	25		
Mass	kg	5.5	6.3	8.5

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

1.1 - Standard electronics

P	R	E		G	-		/	32		-		K11		

Pilot operated pressure relief valve

Electro-proportional control

Size:
10 = ISO 6264-06
25 = ISO 6264-08
32 = ISO 6264-10

Standard electronics for pressure control in open loop

Pressure control range
070 = up to 70 bar **210** = up to 210 bar
140 = up to 140 bar **350** = up to 350 bar

Series No.
(the overall and mounting dimensions remain unchanged from 30 to 39)

Option:
/ W7 = Zinc-nickel surface treatment
(see **NOTE**)
Omit if not required

Pin C function:
A = external enable
B = internal enable
C = 0V monitor

Connection 6 pin + PE

Reference signal:
E0 = voltage 0 ÷ 10 V **E1** = current 4 ÷ 20 mA

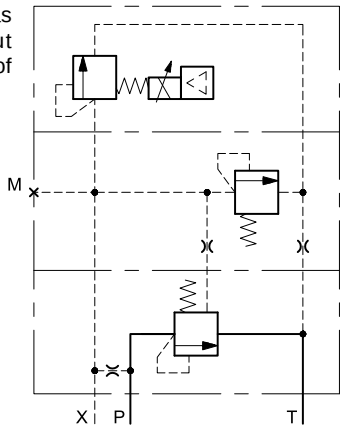
Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

NOTE: The standard valve is supplied with surface treatment of phosphating black on the valve body.

The zinc-nickel finishing makes the valve suitable to ensure a salt spray resistance up to 240 hours (test operated according to EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

1.2 - Detailed symbol

Port X is not intended as a pilot supply line, but exclusively as a signal of the input pressure .



1.3 - Compact electronics

P	R	E		GL	-		/			-		K12	

Pilot operated pressure relief valve

Electro-proportional control

Size:
10 = ISO 6264-06
25 = ISO 6264-08
32 = ISO 6264-10

Digital integrated electronics for open loop compact box

Pressure control range
070 = up to 70 bar **210** = up to 210 bar
140 = up to 140 bar **350** = up to 350 bar

Series No. (the overall and mounting dimensions remain unchanged from 10 to 19):
10 = versions with E0, E1 and CA interfaces
12 = version with IOL interface

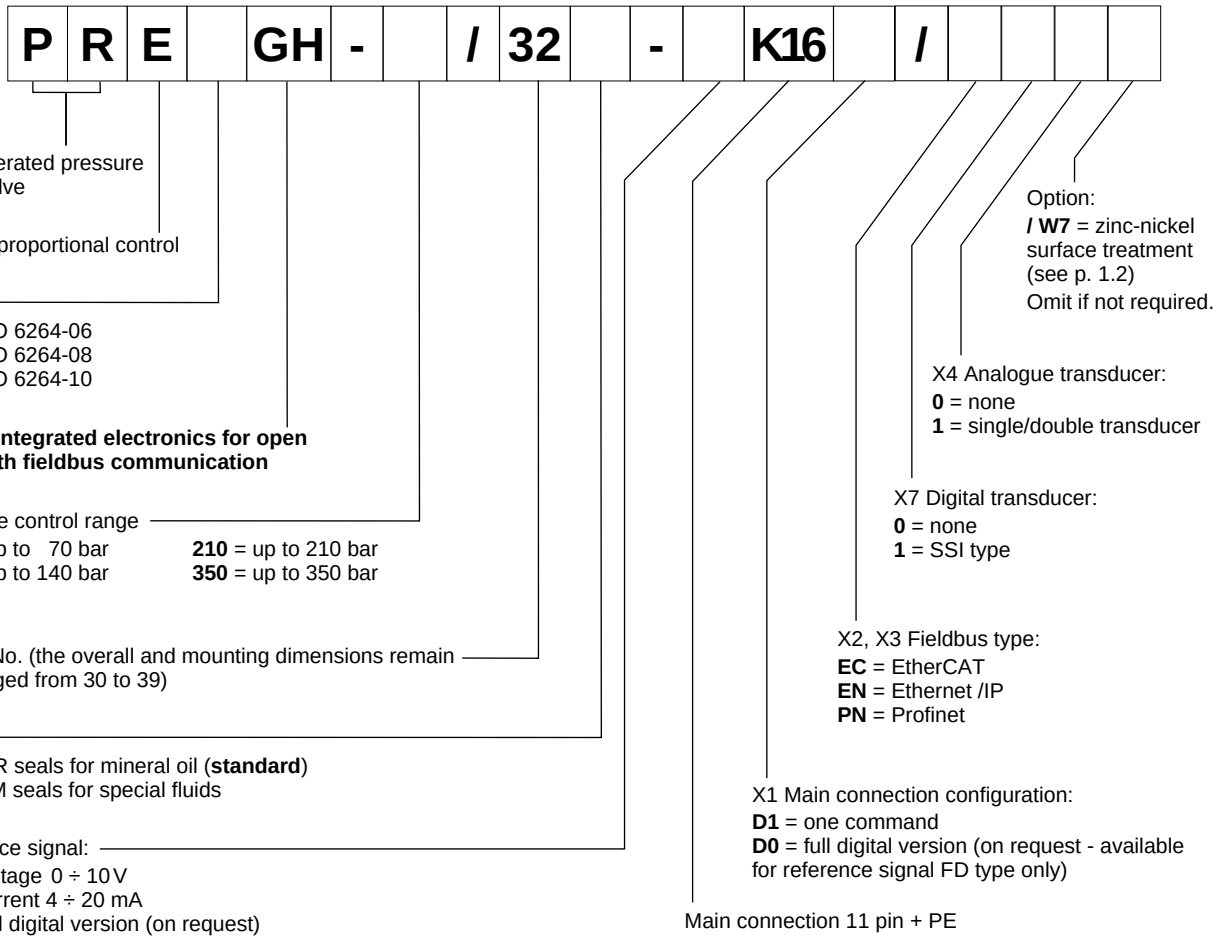
Option:
/ W7 = Zinc-nickel surface treatment
(see **NOTE** p. 1.1)
Omit if not required

Connection 5 pin M12

Interfaces:
E0 = analogue, voltage 0 ÷ 10 V
E1 = analogue, current 4 ÷ 20 mA
IOL = IO-Link interface
CA = CAN Open

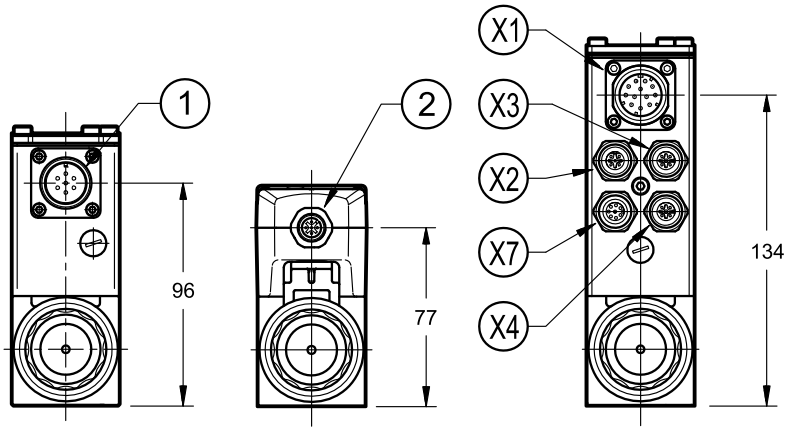
Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

1.4 - Electronics with fieldbus communication



2 - COMPARISON AMONG INTEGRATED ELECTRONICS

G type **GL type** **GH type** dimensions in mm



1	Connection 6 pin + PE
2	Connection M12 5 pin, code A, male
X1	Main connection 11 pin + PE
X2	Fieldbus communication (IN)
X3	Fieldbus communication (OUT)
X4	Connection for analogue transducer
X7	Connection for digital transducer

NOTE 1: Depending on the chosen version, X4 and X7 connections may not be present. Please refer to sections 4, 5 and 6 for connections descriptions and pinouts.
NOTE 2: Related mating connectors have to be ordered separately. See catalogue 89 000.

3 - ELECTRONICS COMMON DATA

Duty cycle		100% (continuous operation)
Protection class according to EN 60529		IP65 / IP67 (**NOTE**)
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	25
Maximum solenoid current	A	1.88
Fuse protection, external	A	2A time lag
Managed breakdowns		Overload and electronics overheating, cable breakdown, supply voltage failures
Electromagnetic compatibility (EMC) emissions EN 61000-6-4, immunity EN 61000-6-2		According to 2014/30/EU standards

NOTE: The IP degree is guaranteed only with mating connector of equivalent IP degree, installed and tightened correctly. Moreover, on the GH versions it is necessary to protect any unused connections with caps.

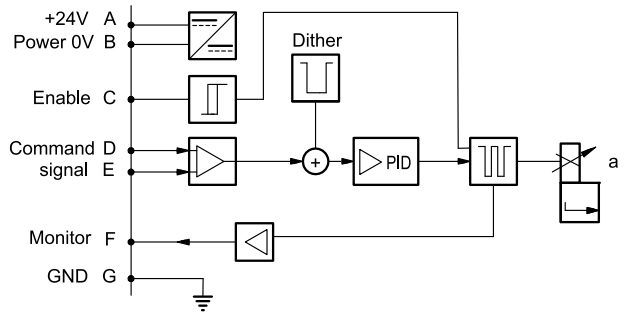
4 - PRE*G - STANDARD ELECTRONICS

4.1 - Electrical characteristics

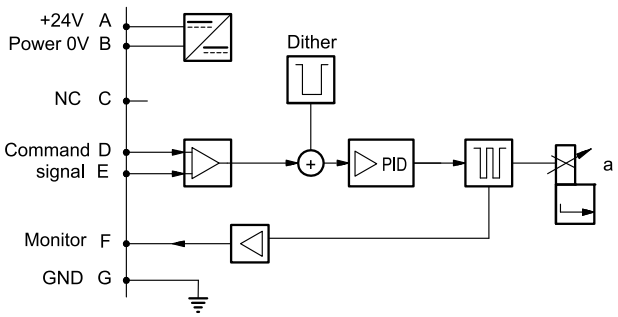
Command signal:	voltage (E0) current (E1)	V DC mA	0 ÷ 10 (impedance Ri > 11 kOhm) 4 ÷ 20 (impedance Ri = 58 Ohm)
Monitor signal (current to solenoid):	voltage (E0) current (E1)	V DC mA	0 ÷ 10 (impedance Ro > 1 kOhm) 4 ÷ 20 (impedance Ro = 500 Ohm)
Communication for diagnostic			LIN-bus Interface (by means of the optional kit)
Connection			6 pin + PE (MIL-C-5015-G - DIN EN 175201-804)

4.2 - On-board electronics diagrams

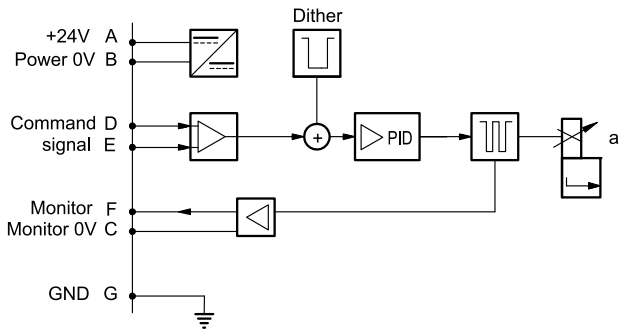
VERSION A - External Enable



VERSION B - Internal Enable

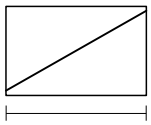


VERSION C - 0V Monitor

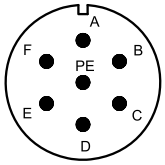


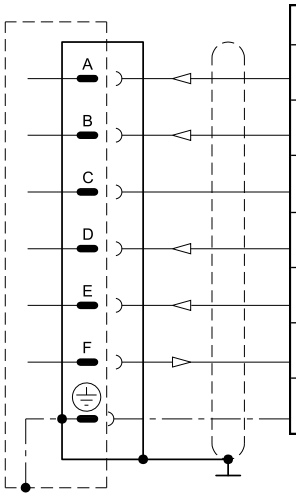
4.3 - Versions with voltage command (E0)

The reference signal is between 0 ÷ 10V. The monitor feature of versions B and C becomes available with a delay of 0.5 sec from the power-on of the card.



COMMAND	**0V**	**+10V**
MONITOR	**0V**	**+10V**



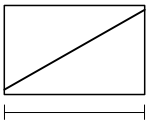


Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	0 ÷ 10 V	Command		
E	0 V	Command reference		
F	0 ÷ 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

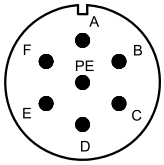
4.4 - Versions with current command (E1)

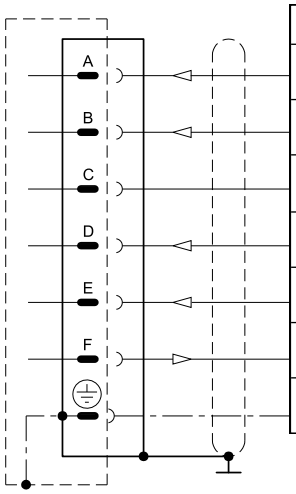
The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower, the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**4 mA**	**20 mA**
MONITOR	**4 mA**	**20 mA**





Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	Command reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

5 - PRE*GL - COMPACT ELECTRONICS

In IO-Link networks, the length of the connecting cables is limited to 20 metres. In CA versions, pin 3 and pin 5 are galvanic isolated up to 100 V to avoid earth loops.

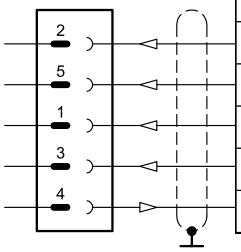
5.1 - Electrical characteristics

Command signal: voltage (E0) current (E1)	V DC mA	0 ÷ 10 (impedance Ri > 11 kOhm) 4 ÷ 20 (impedance Ri = 58 Ohm)
Monitor signal (current to solenoid): voltage (E0) current (E1)	 V DC mA	 0 ÷ 5 (impedance Ro > 1 kOhm) 4 ÷ 20 (impedance Ro = 500 Ohm)
IO-Link communication (IOL): Data rate	 kBaud	IO-Link Port Class B 38.4
Can Open communication (CA): Data rate	 kbit	 10 ÷ 1000
Data register (IOL and CA versions only)		card voltage supply, solenoid faults (shortcircuit, bad configuration), box temperature.
Connection		5-pin M12 code A (IEC 61076-2-101)

5.2 - Pin tables

'E0' connection

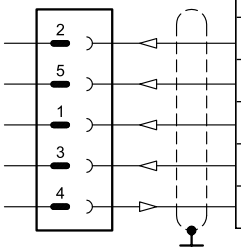




Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	0 ÷ 10 V	Command
3	0 V	Command reference
4	0 ÷ 5 V	Monitor (0V reference: pin 5)

'E1' connection

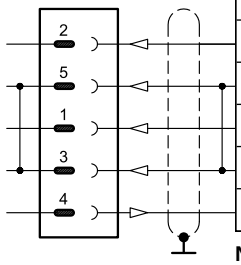




Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	4 ÷ 20 mA	Command
3	0V	Command reference
4	4 ÷ 20 mA	Monitor (0V reference: pin 5)

'IOL' connection



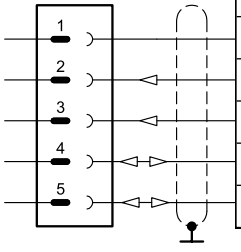


Pin	Values	Function
2	2L+ 24 V DC	Solenoid supply voltage
5	2L- 0 V (GND)	
1	1L+ +24 V DC	Logic and IO-Link supply voltage
3	1L- 0V (GND)	
4	C/Q	IO-Link Communication

NOTE: Pin 3 and pin 5 are linked with each other in the valve electronics. The reference potentials 1L- and 2L- of the two supply voltages must also be linked with each other on the customer side.

'CA' connection





Pin	Values	Function
1	CAN_SH	Shield
2	24 V DC	Supply voltage
3	0 V (GND)	
4	CAN H	Bus line (high)
5	CAN_L	Bus line (low)

6 - PRE*GH - FIELDBUS ELECTRONICS

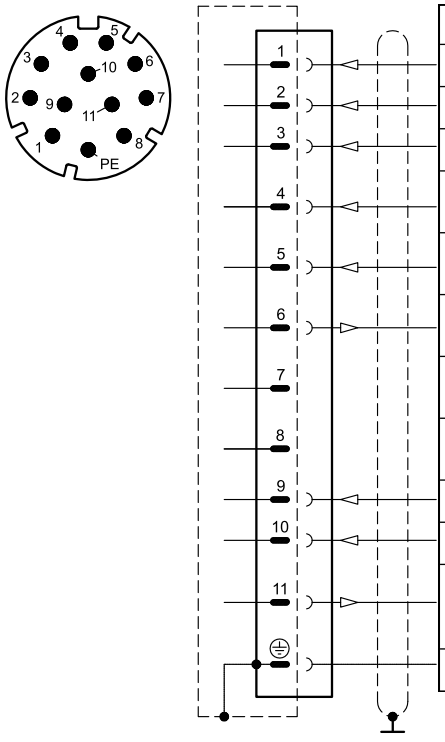
The 11+ PE pin connection allows separate supply voltage for electronics and solenoids.

Command - valve position schemes as for the standard electronics. Please refer to pictures in p. 4.3 and 4.4.

6.1 - Electrical characteristics

Command signal: voltage (E0) current (E1) digital (FD)	 V DC mA	 0 ÷ 10 (impedance Ri > 11 kOhm) 4 ÷ 20 (impedance Ri = 58 Ohm) via fieldbus
Monitor signal (current to solenoid): voltage (E0) current (E1)	 V DC mA	 0 ÷ 10 (impedance Ro > 1 kOhm) 4 ÷ 20 (impedance Ro = 500 Ohm)
Communication / diagnostic		via Bus register
Communication interface standards		IEC 61158
Communication physical layer		fast ethernet, insulated 100 Base TX
Power connection		11 pin + PE (DIN 43651)

6.2 - X1 Main connection pin table



D1: one command

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	0 ÷ 10 V (E0) 4 ÷ 20 (E1)	Command
5	0 V	Command reference signal
6	0 ÷ 10 V (E0) 4 ÷ 20 (E1)	Monitor (0V reference pin 10)
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V reference pin 2)
12	GND	Ground (Earth)

D0: full digital

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	NC	do not connect
5	NC	do not connect
6	NC	do not connect
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V reference pin 2)
12	GND	Ground (Earth)

6.3 - FIELDBUS connections

Please wire following guidelines provided by the related standards communication protocol. Any connections present and not used must be protected with special caps so as not to nullify the protection against atmospheric agents.

X2 (IN) connection: M12 D 4 pin female



Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

X3 (OUT) connection: M12 D 4 pin female



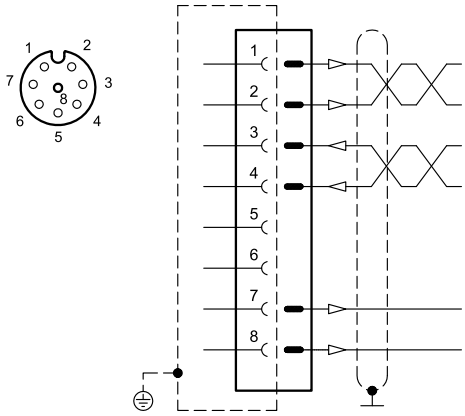
Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

NOTE: Shield connection on connector housing is recommended.

6.4 - Digital transducer connection

X7 connection: M12 A 8 pin female

VERSION 1: SSI type



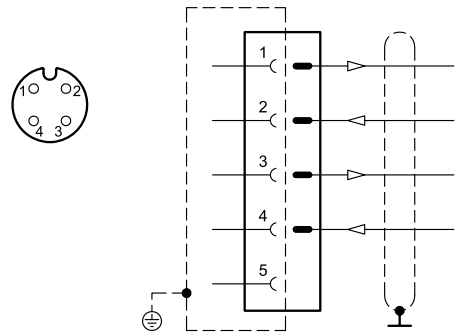
Pin	SSI Values	Function	Notes
1	CLK+	Serial synchronous clock (+)	Input - digital signal
2	CLK-	Serial synchronous clock (-)	
3	MIS0+	Serial position data (+)	
4	MIS0-	Serial position data (-)	
5	NC	-	do not connect
6	NC	-	
7	+24 V	transducer power supply	Output power supply
8	0 V	-	Common GND

6.5 - Analogue transducer connection

X4 connection: M12 A 4 pin female

VERSION 1: single / double transducer

(single or double is a software-selectable option)



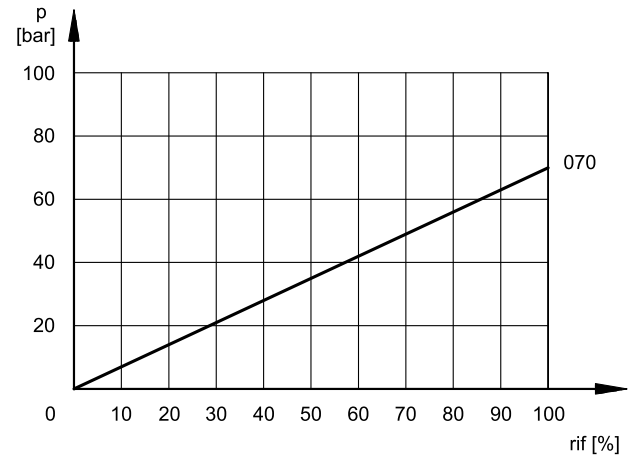
Pin	Values	Notes
1	+24 V	Remote transducer power supply (out) 100 mA
2	±10 V 4 ÷20 mA	Input signal of transducer 1 (range software selectable)
3	0 V	Common reference signal for transducer power and signals
4	±10 V 4 ÷20 mA	Input signal of transducer 2 (range software selectable)
5	-	

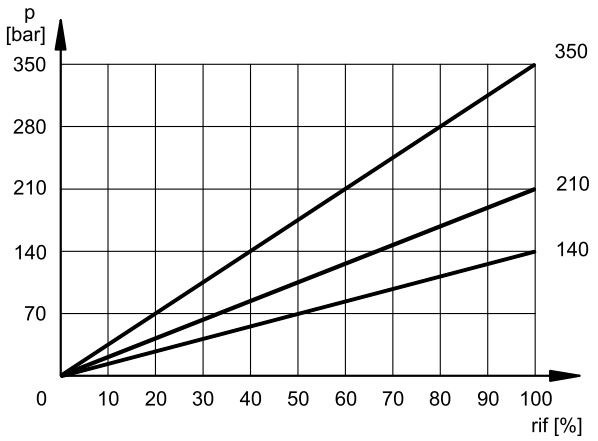
7 - CHARACTERISTIC CURVES

(obtained with mineral oil with viscosity of 36 cSt at 50°C)

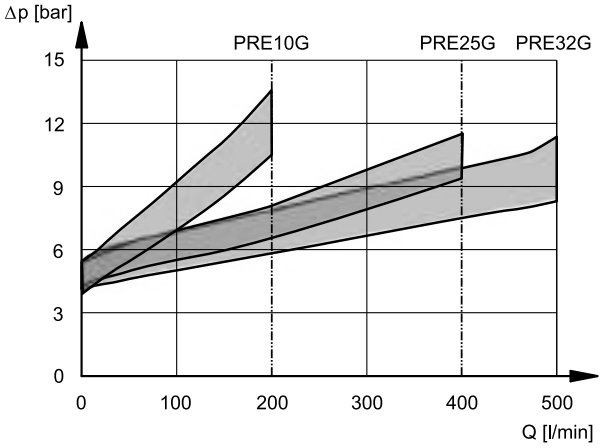
Typical control characteristics, according to the reference signal for available pressure control ranges, measured with input flow rate Q = 50 l/min. Characteristic curves measured without backpressure in T, with linearity compensation set by the onboard electronics.

PRESSURE CONTROL p = f (I)



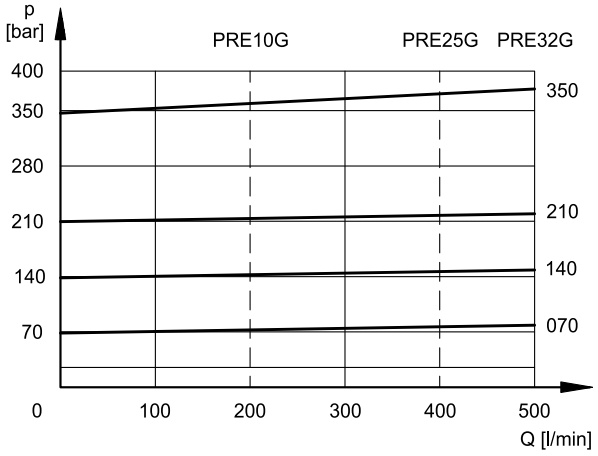


MINIMUM CONTROLLED PRESSURE p min = f (Q)



minimum regulated pressure for pressure control ranges between 70 bar and 350 bar.

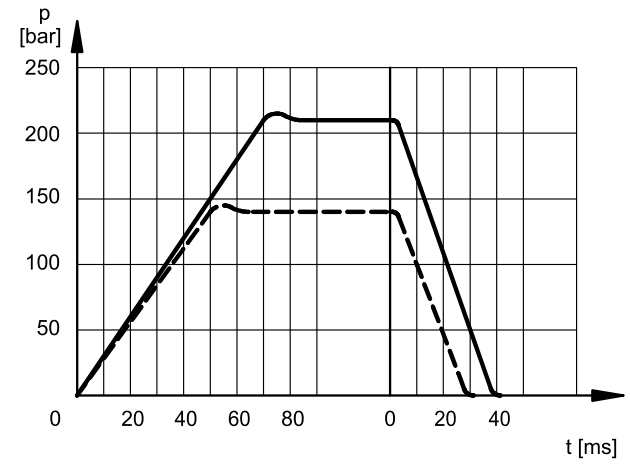
PRESSURE VARIATION p max = f (Q)



8 - STEP RESPONSE

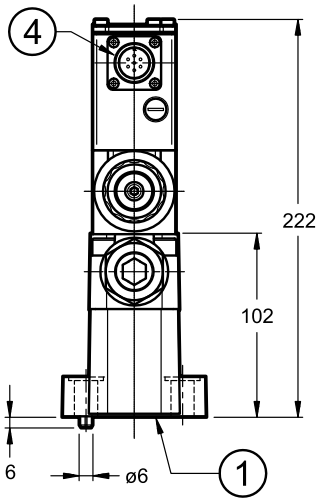
(obtained with mineral oil with viscosity of 36 cSt at 50°C)

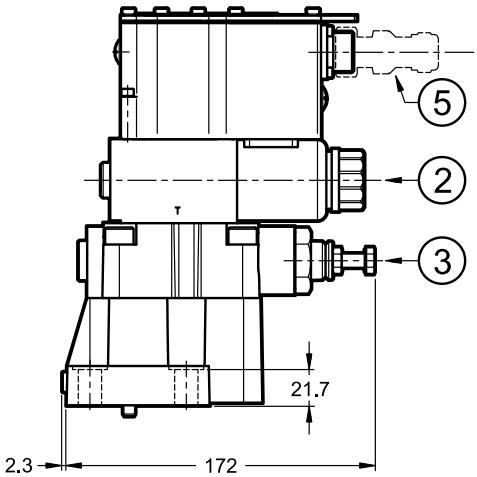
Response times obtained withh PRE*G-210 valves, with an input flow rate of 50 l/min and a pressure oil volume of 2 litres. The response time is affected both by the flow rate and the oil volume in the pipework.

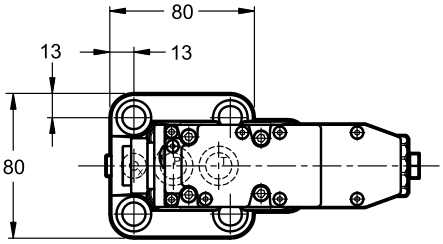


9 - PRE10G* - OVERALL AND MOUNTING DIMENSIONS

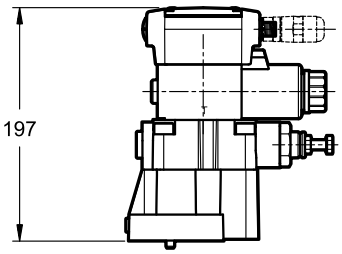
dimensions in mm



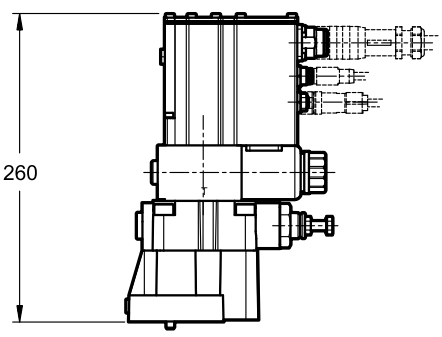




PRE10GL



PRE10GH



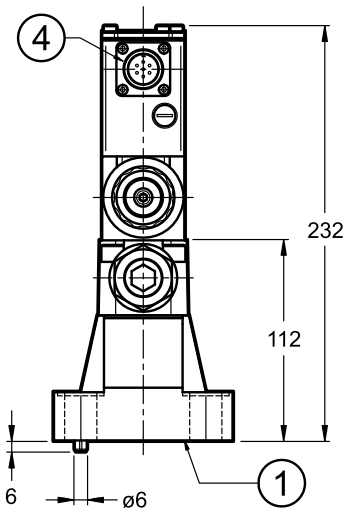
NOTE 1: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.
NOTE 2: Mounting interface at point 12.

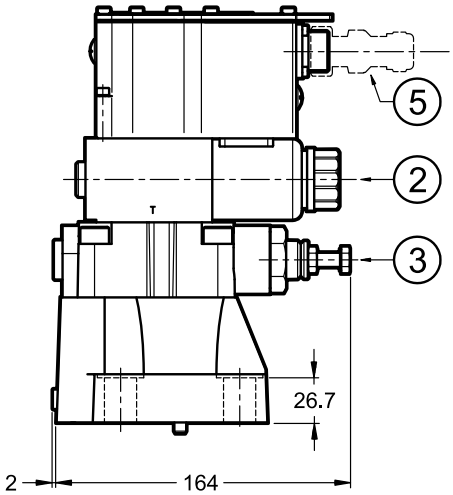
1	Mounting surface with sealing rings: 2 OR type 123 (17.86x2.62) - 90 Shore 1 OR type 109 (9.13x2.62) - 90 Shore
2	Breather: Allen key 4
3	Factory-set pressure relief valve
4	Main connection 6 pin + PE
5	Mating connector **To be ordered separately**. See catalogue 89 000

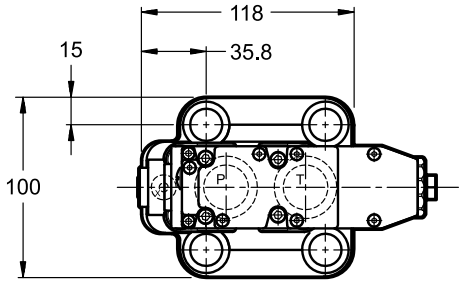
Valve fastening: 4 SHCS M12x40 - ISO 4762
Torque: 69 Nm (screws A8.8)
Thread of mounting holes: M12x20

10 - PRE25G* - OVERALL AND MOUNTING DIMENSIONS

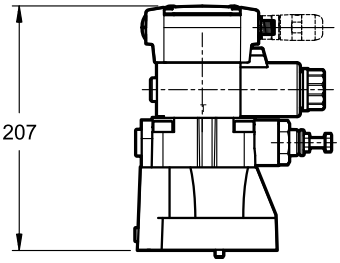
dimensions in mm



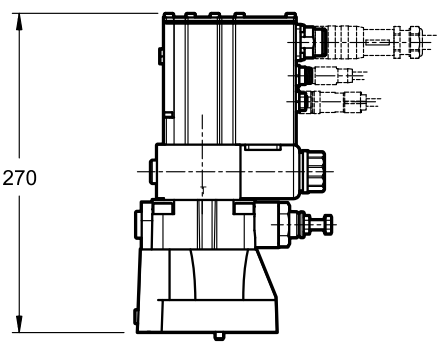




PRE25GL



PRE25GH



NOTE 1: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

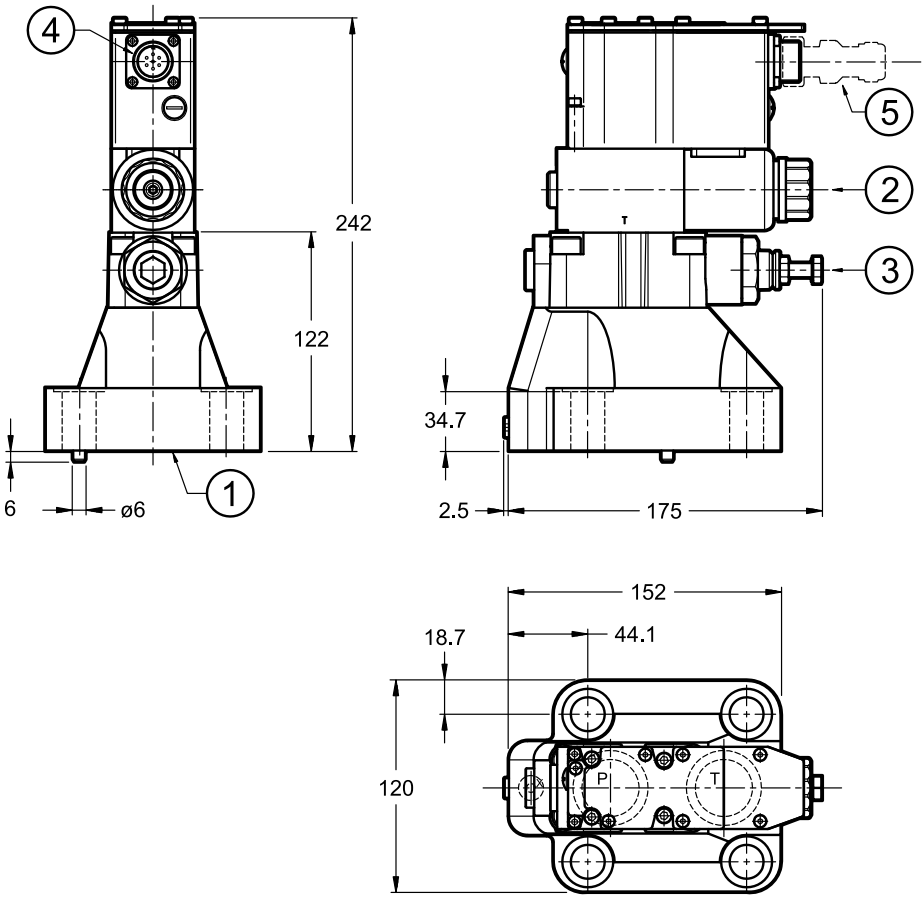
NOTE 2: Mounting interface at point 12.

1	Mounting surface with sealing rings: 2 OR type 3118 (29.82x2.62) - 90 Shore 1 OR type 109 (9.13x2.62) - 90 Shore
2	Breather: Allen key 4
3	Factory-set pressure relief valve
4	Main connection 6 pin + PE
5	Mating connector **To be ordered separately**. See catalogue 89 000

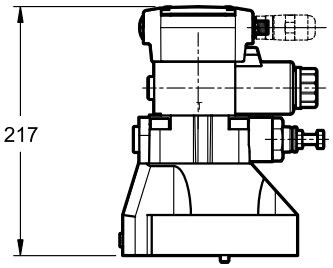
Valve fastening: 4 SHCS M16x60 - ISO 4762
Torque: 170 Nm (screws A8.8)
Thread of mounting holes: M16x25

11 - PRE32G* - OVERALL AND MOUNTING DIMENSIONS

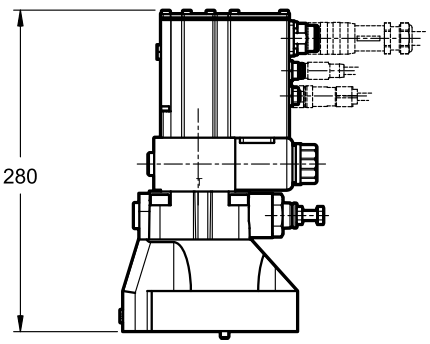
dimensions in mm



PRE32GL



PRE32GH



NOTE 1: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

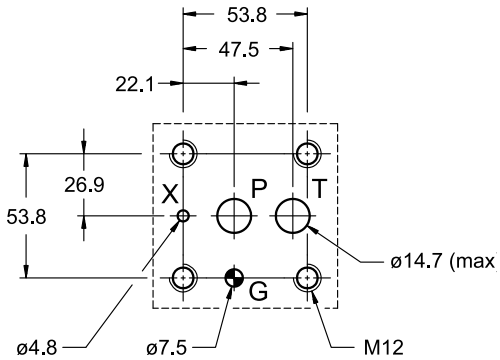
NOTE 2: Mounting interface at point 12.

1	Mounting surface with sealing rings: 2 OR type 4137 (34.52x3.53) - 90 Shore 1 OR type 109 (9.13x2.62) - 90 Shore
2	Breather: Allen key 4
3	Factory-set pressure relief valve
4	Main connection 6 pin + PE
5	Mating electrical connector **To be ordered separately**. See catalogue 89 000

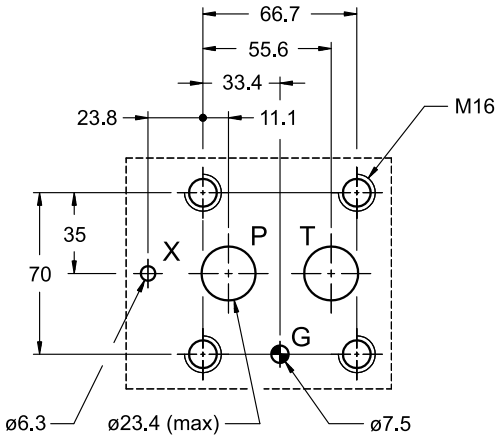
Valve fastening: 4 SHCS M18x60 - ISO 4762
Torque: 235 Nm (screws A8.8)
Thread of mounting holes: M18x27

12 - MOUNTING INTERFACES

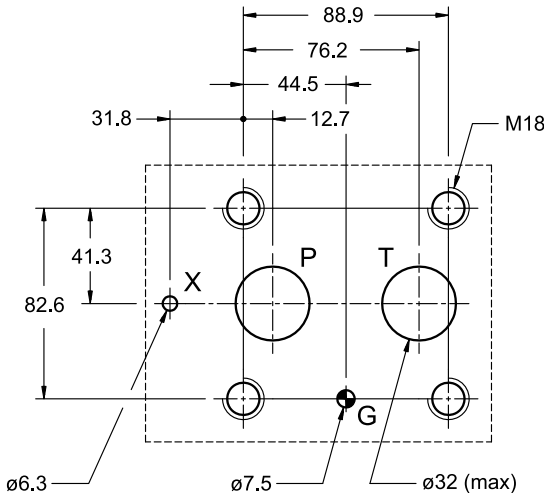
PRE10G*:
ISO 6264-06-09-*-97
(CETOP 4.4.2-2-R06-350)



PRE25G*:
ISO 6264-08-13-*-97
(CETOP 4.4.2-2-R08-350)



PRE32G*:
ISO 6264-10-17-*-97
(CETOP 4.4.2-2-R10-350)



13 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

14 - INSTALLATION

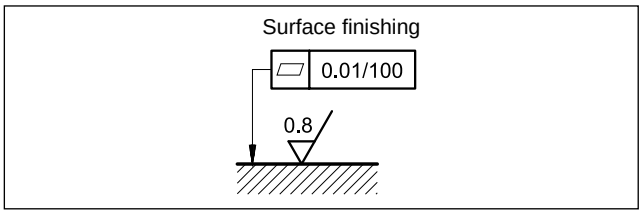
We recommend to install the valves either in horizontal position, or vertical position with the solenoid downward. If the valve is installed in vertical position and with the solenoid upward, you must consider possible variations of the minimum controlled pressure, if compared to what is indicated in point 7.

Ensure that there is no air in the hydraulic circuit. In particular applications, can be necessary to vent the air entrapped in the solenoid tube, by using the appropriate drain screw in the solenoid tube.

Ensure the solenoid tube is always filled with oil. At the end of the operation, make sure of having correctly replaced the drain screw. Connect the valve T port directly to the tank.

Add any backpressure value detected in the T line to the controlled pressure value. Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.



15 - ACCESSORIES

(to be ordered separately)

15.1 - Mating connectors

Mating connectors must be ordered separately. See catalogue 89 000.

For K11 and K16 versions we recommend the choice of a metal connector to avoid electromagnetic disturbances and to comply with EMC regulations on electromagnetic compatibility. If you opt for a plastic connector, make sure that it guarantees and maintains the IP and EMC protection characteristics of the valve.

15.2 - Mating connectors and caps for fieldbus communication and for sensors.

Duplomatic offers spare parts to be wired and also ready-to-use cord sets. Please refer to cat. 89 000.

15.3 - Connection cable

The optimal wiring provides for 7 isolated conductors, with separate screen for the signal wires (command, monitor) and an overall screen.

Cross section for power supply:
- up to 20 m cable length : 1,0 mm^2
- up to 40 m cable length : 1,5 mm^2 (IO-Link excluded)

Cross section for signals (command, monitor):
- 0,50 mm^2

15.4 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic. See catalogue 89 850.

16 - SUBPLATES

(see catalogue 51 000)

	PRE10G*	**PRE25G***	**PRE32G***
Type	PMRQ3-AI4G rear ports	PMRQ5-AI5G rear ports	PMRQ7-AI7G rear ports
P, **T** port dimensions	P: 1/2” BSP T: 3/4” BSP	1” BSP	1” ¼ BSP
X port dimensions	1/4” BSP	1/4” BSP	1/4” BSP

DUPLOMATIC MOTION SOLUTIONS
a member of DAIKIN group

DUPLOMATIC MS Spa
via Mario Re Depaolini, 24 | 20015 Parabiago (MI) | Italy
T +39 0331 895111 | E vendite.ita@duplomatic.com | sales.exp@duplomatic.com
duplomaticmotionsolutions.com

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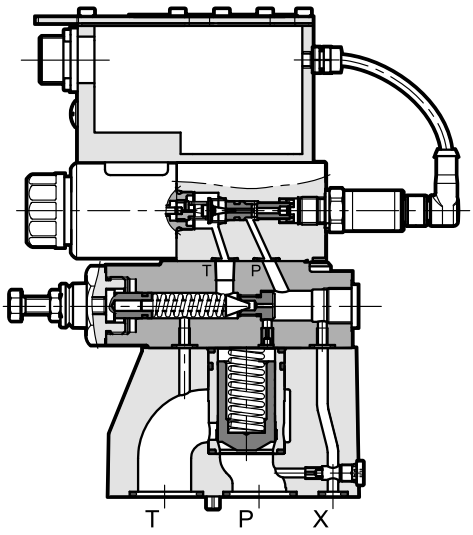
PRE*J*

PROPORTIONAL PRESSURE RELIEF VALVES, PILOT OPERATED, WITH PRESSURE FEEDBACK AND INTEGRATED ELECTRONICS

SUBPLATE MOUNTING

p max **350** bar
Q max (see table of performances)

OPERATING PRINCIPLE



— PRE*J* valves are proportional pressure relief valves, pilot operated, with integrated electronics and pressure closed loop, with mounting interface in compliance with ISO 6264 standard.

— These valves are used to control hydraulic circuit pressure and enable the use of the full flow rate of the pump, even with settings approaching calibrated values.

— The two-stage design and wide passages ensure reduced pressure drops thereby improving the system energy performance.

— They are fitted with a manual pressure relief valve which is factory set to ≥15% of the maximum value in the pressure control range.

— Valves are available with different types of electronics, with analogue or fieldbus interfaces.

— They are available in three sizes with flow rates up to 500 l/min and in four pressure control ranges up to 350 bar.

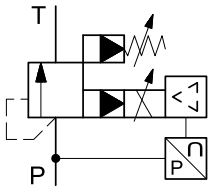
— The valves are easy to install. The driver directly manages digital settings.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50 °C and p = 140 bar)

		PRE10J*	PRE25J*	PRE32J*
Maximum operating pressure	bar	350		
Maximum flow	l/min	200	400	500
Step response		see point 8		
Hysteresis	% of p nom	< 1%		
Repeatability	% of p nom	< ± 0,5%		
Electrical characteristic		see point 3		
Ambient temperature range	°C	-20 / +60		
Fluid temperature range	°C	-20 / +80		
Fluid viscosity range	cSt	10 ÷ 400		
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13			
Recommended viscosity	cSt	25		
Mass	kg	5,5	6,3	8,5

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

1.1 - Standard electronics

P	R	E		J	-		/	33		-		K11		

Pilot operated pressure relief valve

Electro-proportional control

Size:
10 = ISO 6264-06
25 = ISO 6264-08
32 = ISO 6264-10

Integrated electronics for valves with pressure feedback

Pressure control range
140 = up to 140 bar **210** = up to 210 bar
350 = up to 350 bar

Series No.
(the overall and mounting dimensions remain unchanged from 30 to 39)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Reference signal:
E0 = voltage 0 ÷ 10 V **E1** = current 4 ÷ 20 mA

Connection 6 pin + PE

Pin C function:
A = external enable
B = internal enable
C = 0V monitor

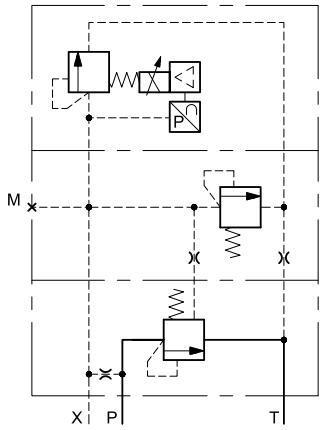
Option:
/ W7 = Zinc-nickel surface treatment
(see **NOTE**)
Omit if not required

NOTE: The standard valve is supplied with surface treatment of phosphating black on the valve body.

The zinc-nickel finishing makes the valve suitable to ensure a salt spray resistance up to 240 hours (test operated according to EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

1.2 - Detailed symbol

Port X is not intended as a pilot supply line, but exclusively as a signal of the input pressure .



1.3 - Compact electronics

P	R	E		JL	-		/			-		K12	

Pilot operated pressure relief valve

Electro-proportional control

Size:
10 = ISO 6264-06
25 = ISO 6264-08
32 = ISO 6264-10

Integrated electronics for valves with pressure feedback - compact version

Pressure control range
140 = up to 140 bar
210 = up to 210 bar
350 = up to 350 bar

Series No. (the overall and mounting dimensions remain unchanged from 10 to 19):
10 = versions with E0, E1 and CA interfaces
12 = version with IOL interface

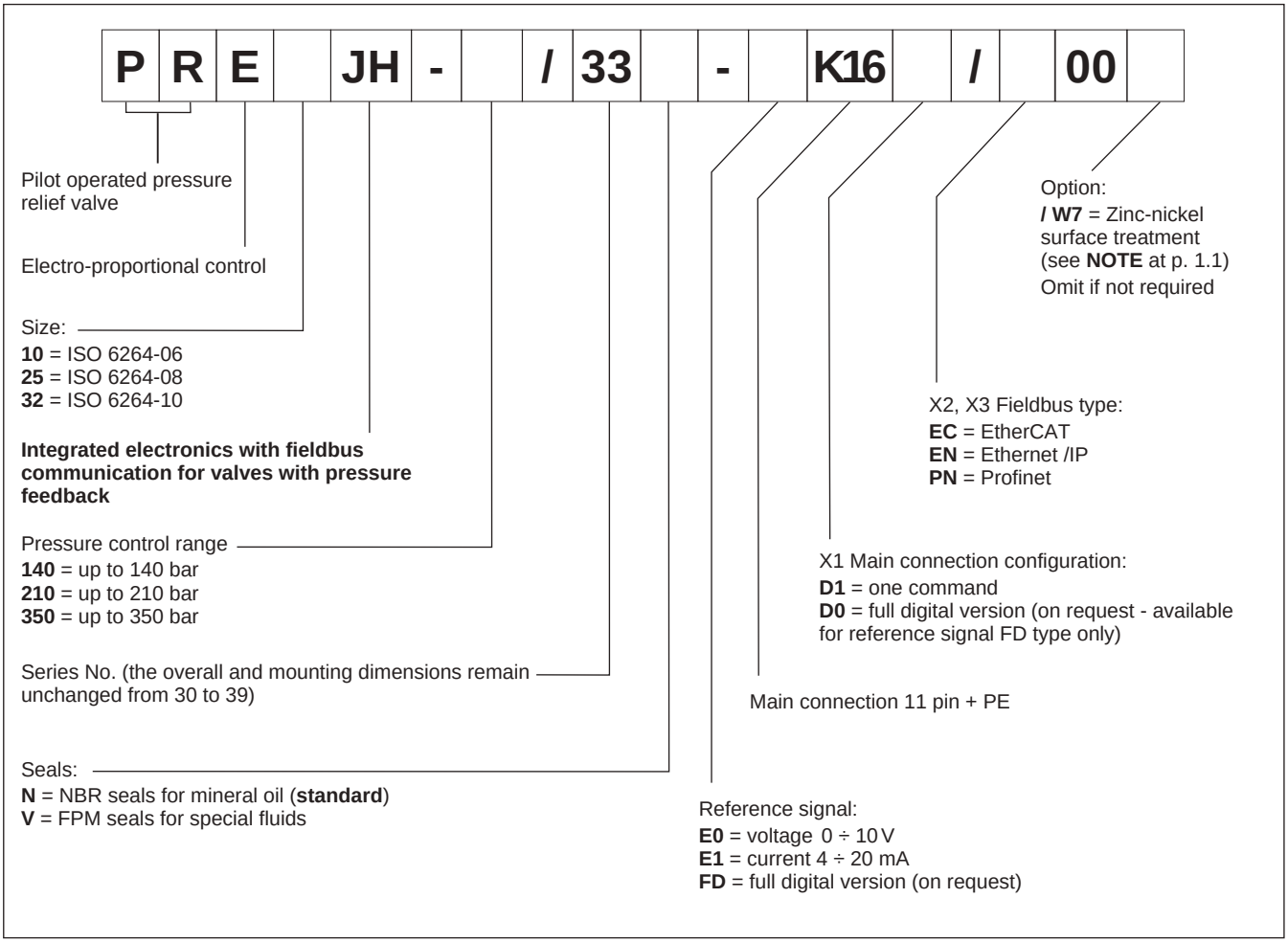
Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Interfaces:
E0 = analogue, voltage 0 ÷ 10 V
E1 = analogue, current 4 ÷ 20 mA
IOL = IO-Link interface
CA = CAN Open

Connection 5 pin M12

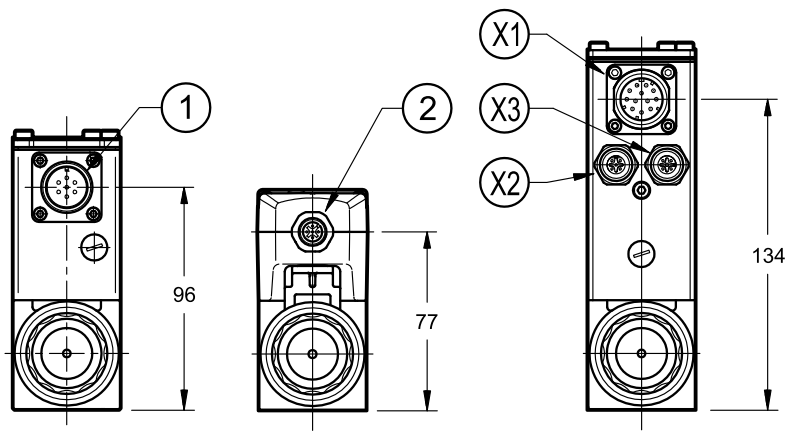
Option:
/ W7 = Zinc-nickel surface treatment
(see **NOTE** point 1.1)
Omit if not required

1.4 - Electronics with fieldbus communication



2 - COMPARISON AMONG INTEGRATED ELECTRONICS

J type **JL type** **JH type** dimensions in mm



1	Connection 6 pin + PE
2	Connection M12 5 pin, code A, male
X1	Main connection 11 pin + PE
X2	Fieldbus communication (IN)
X3	Fieldbus communication (OUT)

NOTE 1: Please refer to sections 6 for connections descriptions and pinouts.
NOTE 2: Related mating connectors have to be ordered separately.
See catalogue 89 000.

3 - ELECTRONICS COMMON DATA

Duty cycle		100% (continuous operation)
Protection class according to EN 60529		IP65/IP67 (**NOTE**)
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	25
Maximum solenoid current	A	1.88
Fuse protection, external	A	2A time lag
Managed breakdowns		Overload and electronics overheating, cable breakdown, supply voltage failures
Electromagnetic compatibility (EMC) emissions EN 61000-6-4, immunity EN 61000-6-2		According to 2014/30/EU standards

NOTE: The IP degree is guaranteed only with mating connector of equivalent IP degree, installed and tightened correctly. Moreover, on the JH versions it is necessary to protect any unused connections with caps.

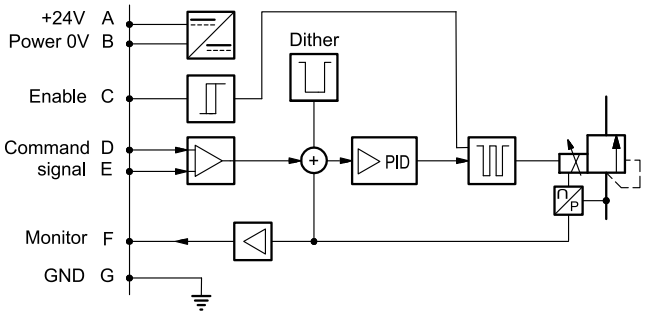
4 - PRE*J - STANDARD ELECTRONICS

4.1 - Electrical characteristics

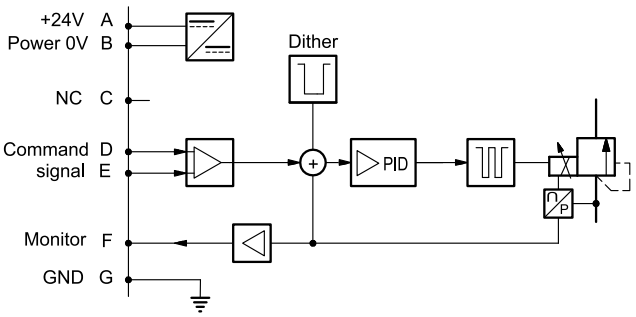
Command signal:	voltage (E0) current (E1)	V DC mA	0 ÷ 10 (impedance Ri > 11 kOhm) 4 ÷ 20 (impedance Ri = 58 Ohm)
Monitor signal (pressure at transducer):	voltage (E0) current (E1)	V DC mA	0 ÷ 10 (impedance Ro > 1 kOhm) 4 ÷ 20 (impedance Ro = 500 Ohm)
Communication for diagnostic			LIN-bus Interface (by means of the optional kit)
Connection			6 pin + PE (MIL-C-5015-G - DIN EN 175201-804)

4.2 - On-board electronics diagrams

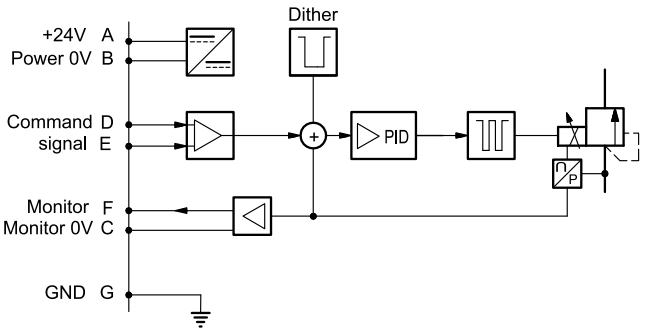
VERSION A - External Enable



VERSION B - Internal Enable

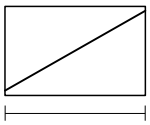


VERSION C - 0V Monitor

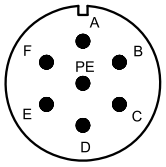


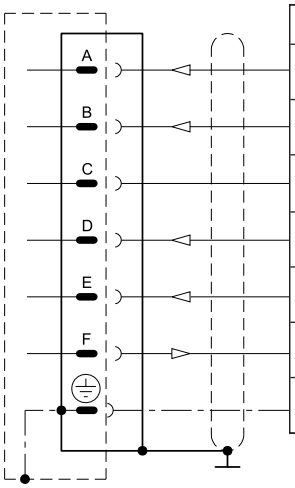
4.3 - Version with voltage command (E0)

The reference signal is between 0 ÷ 10V. The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**0V**	**+10V**
MONITOR	**0V**	**+10V**



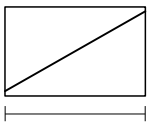


Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	0 ÷ 10 V	Command		
E	0 V	Command reference		
F	0 ÷ 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

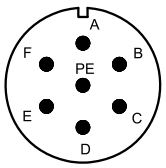
4.4 - Version with current command (E1)

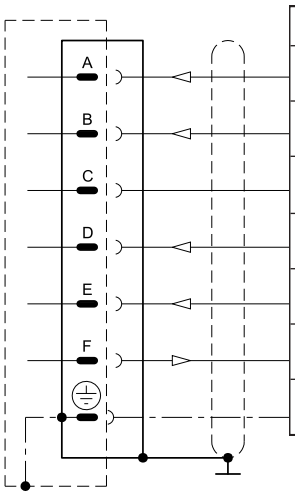
The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower, the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**4 mA**	**20 mA**
MONITOR	**4 mA**	**20 mA**





Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	Command reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

5 - PRE*JL - COMPACT ELECTRONICS

In IO-Link networks, the length of the connecting cables is limited to 20 metres. In CA versions, pin 3 and pin 5 are galvanic isolated up to 100 V to avoid earth loops.

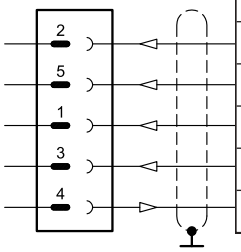
5.1 - Electrical characteristics

Command signal: voltage (E0) current (E1)	V DC mA	0 ÷ 10 (impedance Ri > 11 kOhm) 4 ÷ 20 (impedance Ri = 58 Ohm)
Monitor signal (pressure at transducer): voltage (E0) current (E1)	 V DC mA	 0 ÷ 5 (impedance Ro > 1 kOhm) 4 ÷ 20 (impedance Ro = 500 Ohm)
IO-Link communication (IOL): Data rate	 kBaud	IO-Link Port Class B 38.4
Can Open communication (CA): Data rate	 kbit	 10 ÷ 1000
Data register (IOL and CA versions only)		card voltage supply, solenoid faults (shortcircuit, bad configuration), box temperature.
Connection		5-pin M12 code A (IEC 61076-2-101)

5.2 - Pin tables

'E0' connection

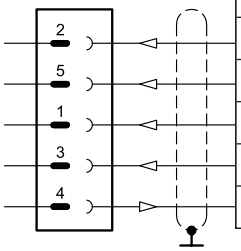




Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	0 ÷ 10 V	Command
3	0 V	Command reference
4	0 ÷ 5 V	Monitor (0V reference: pin 5)

'E1' connection

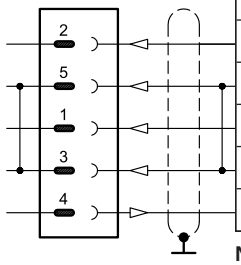




Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	4 ÷ 20 mA	Command
3	0V	Command reference
4	4 ÷ 20 mA	Monitor (0V reference: pin 5)

'IOL' connection



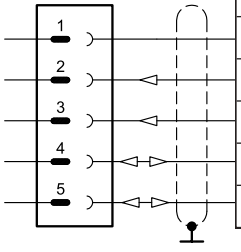


Pin	Values	Function
2	2L+ 24 V DC	Solenoid supply voltage
5	2L- 0 V (GND)	
1	1L+ +24 V DC	Logic and IO-Link supply voltage
3	1L- 0V (GND)	
4	C/Q	IO-Link Communication

NOTE: Pin 3 and pin 5 are linked with each other in the valve electronics. The reference potentials 1L- and 2L- of the two supply voltages must also be linked with each other on the customer side.

'CA' connection





Pin	Values	Function
1	CAN_SH	Shield
2	24 V DC	Supply voltage
3	0 V (GND)	
4	CAN H	Bus line (high)
5	CAN_L	Bus line (low)

6 - PRE*JH - FIELDBUS ELECTRONICS

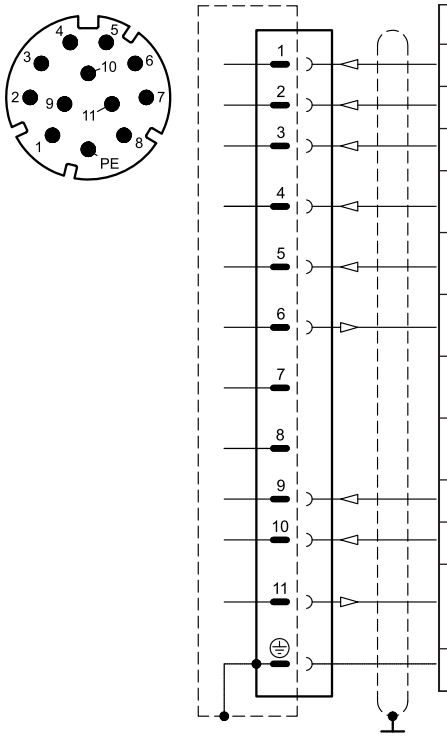
The 11+ PE pin connection allows separate supply voltage for electronics and solenoid.

Command - valve position schemes as for the standard electronics. Please refer to pictures in point 4.3 and 4.4.

6.1 - Electrical characteristics

Command signal: voltage (E0) current (E1) digital (FD)	V DC mA	0 ÷ 10 (impedance Ri > 11 kOhm) 4 ÷ 20 (impedance Ri = 58 Ohm) via fieldbus
Monitor signal (pressure at transducer): voltage (E0) current (E1)	V DC mA	0 ÷ 10 (impedance Ro > 1 kOhm) 4 ÷ 20 (impedance Ro = 500 Ohm)
Communication / diagnostic		via Bus register
Communication interface standards		IEC 61158
Communication physical layer		fast ethernet, insulated 100 Base TX
Power connection		11 pin + PE (DIN 43651)

6.2 - X1 Main connection pin table



D1: one command

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	0 ÷ 10 V (E0) 4 ÷ 20 (E1)	Command
5	0 V	Command reference signal
6	0 ÷ 10 V (E0) 4 ÷ 20 (E1)	Monitor (0V reference pin 10)
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V reference pin 2)
12	GND	Ground (Earth)

D0: full digital

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	NC	do not connect
5	NC	do not connect
6	NC	do not connect
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V ref. pin 2)
12	GND	Ground (Earth)

6.3 - FIELDBUS connections

Please wire following guidelines provided by the related standards communication protocol. Any connections present and not used must be protected with special caps so as not to nullify the protection against atmospheric agents.

X2 (IN) connection: M12 D 4 pin female



Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

X3 (OUT) connection: M12 D 4 pin female



Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

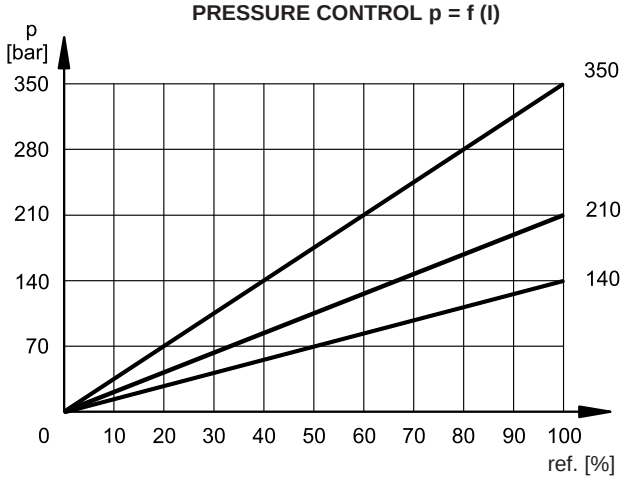
NOTE: Shield connection on connector housing is recommended.

7 - CHARACTERISTIC CURVES

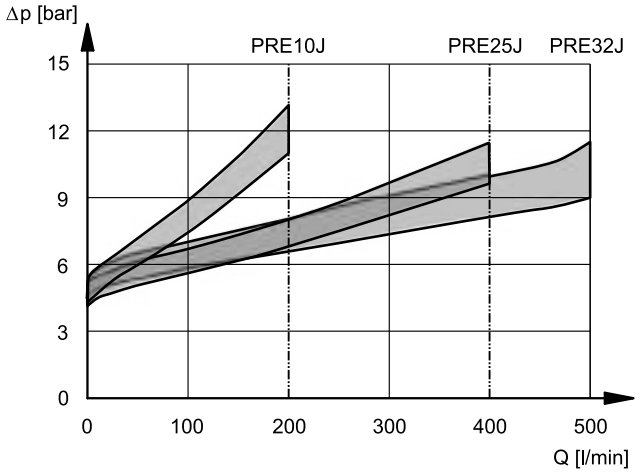
(measured with viscosity of 36 cSt at 50°C)

Typical control characteristics, according to the reference signal for available pressure control ranges, measured with input flow rate Q = 50 l/min. Characteristic curves measured without backpressure in T, with linearity and hysteresis compensation set by the onboard electronics.

PRESSURE CONTROL p = f (I)

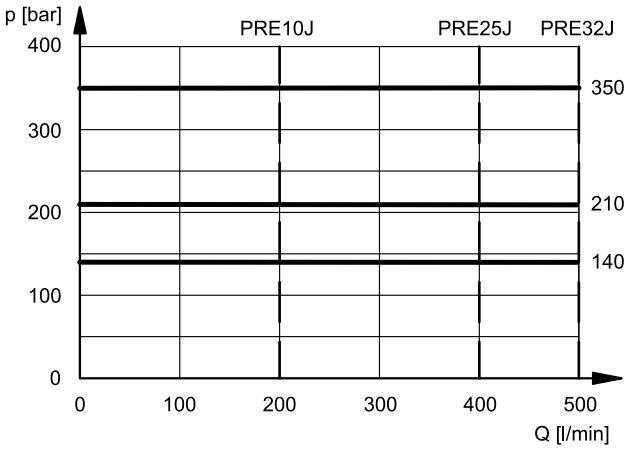


MINIMUM CONTROLLED PRESSURE p min = f (Q)



minimum controlled pressure for pressure control ranges between 140 bar and 350 bar.

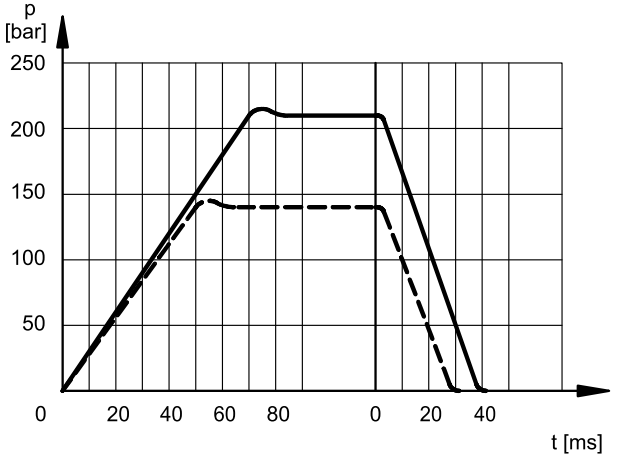
PRESSURE VARIATION p max = f (Q)



8 - STEP RESPONSE

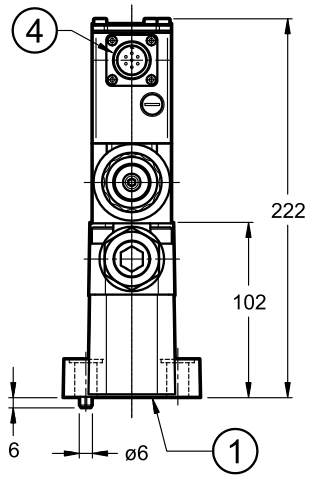
(obtained with mineral oil with viscosity of 36 cSt at 50 °C)

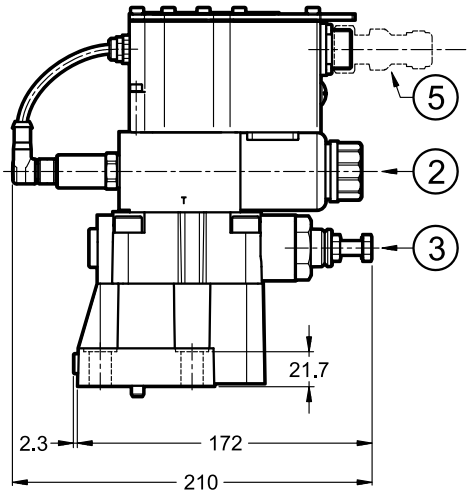
Response times obtained with PRE*J-210 valves, with an input flow rate of 50 l/min and a pressure oil volume of 2 litres. The response time is affected both by the flow rate and the oil volume in the pipework.

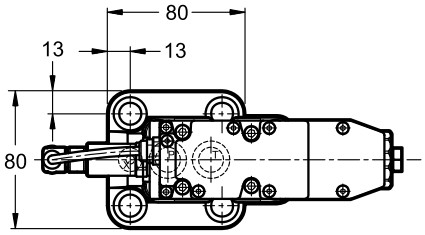


9 - PRE10J* - OVERALL AND MOUNTING DIMENSIONS

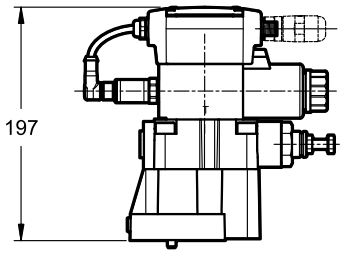
dimensions in mm



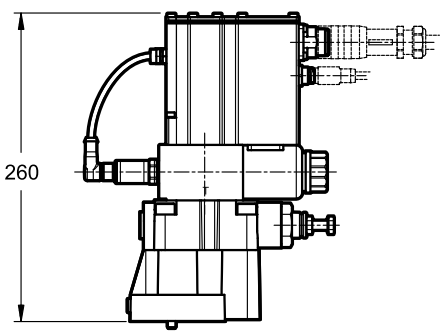




PRE10JL



PRE10JH



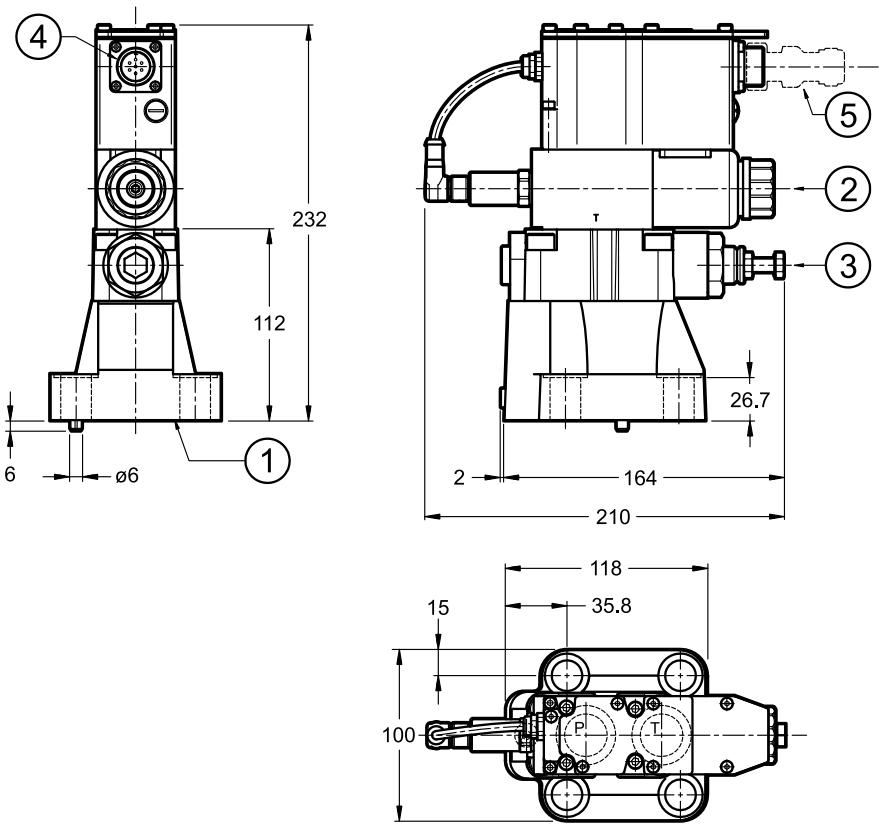
NOTE 1: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.
NOTE 2: Mounting interface at par. 12.

1	Mounting surface with sealing rings: 2 OR type 123 (17.86x2.62) - 90 Shore 1 OR type 109 (9.13x2.62) - 90 Shore
2	Breather: Allen key 4
3	Factory-set pressure relief valve
4	Main connection 6 pin + PE
5	Mating connector **To be ordered separately**. See catalogue 89 000

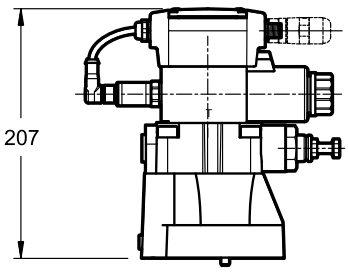
Valve fastening: 4 SHCS M12x40 - ISO 4762
Torque: 69 Nm (viti A8.8)
Thread of mounting holes: M12x20

10 - PRE25J* - OVERALL AND MOUNTING DIMENSIONS

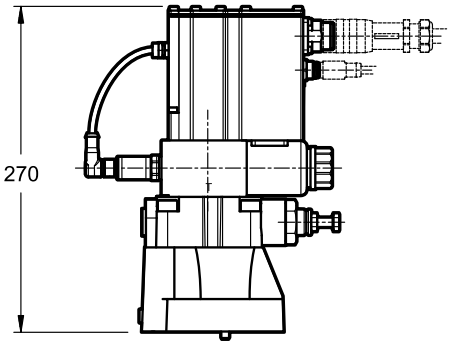
dimensions in mm



PRE25JL



PRE25JH



NOTE 1: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

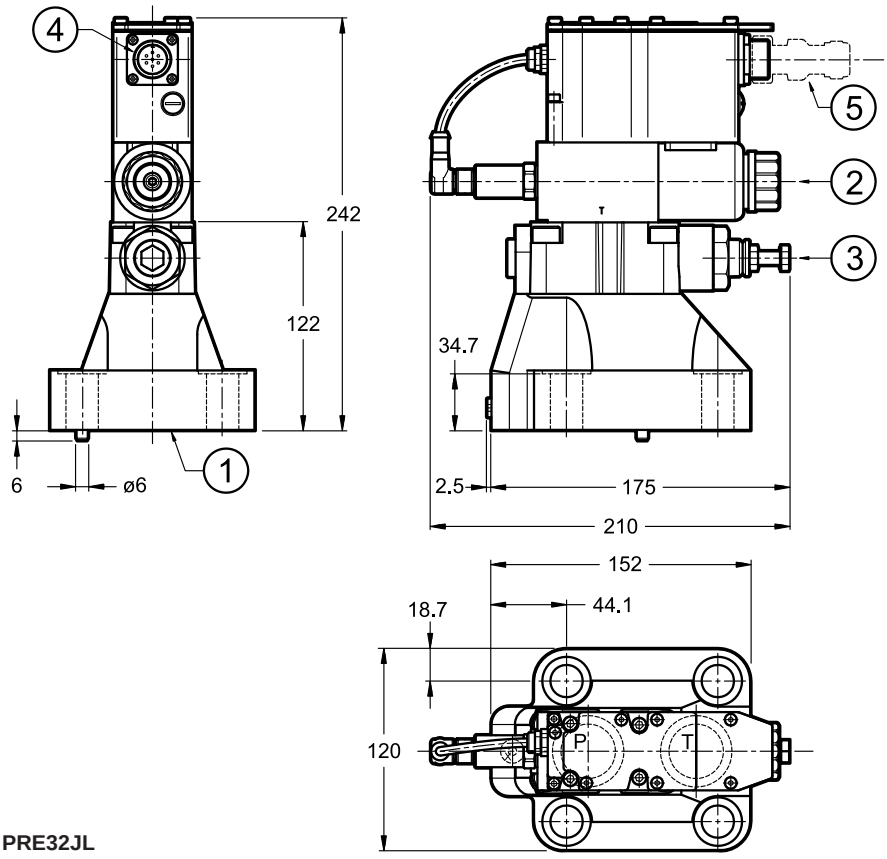
NOTE 2: Mounting interface at par. 12.

1	Mounting surface with sealing rings: 2 OR type 3118 (29.82x2.62) - 90 Shore 1 OR type 109 (9.13x2.62) - 90 Shore
2	Breather: Allen key 4
3	Factory-set pressure relief valve
4	Main connection 6 pin + PE
5	Mating connector **To be ordered separately**. See catalogue 89 000

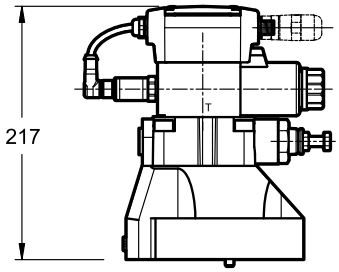
Valve fastening: 4 SHCS M16x60 - ISO 4762
Torque: 170 Nm (viti A8.8)
Thread of mounting holes: M16x25

11 - PRE32J* - OVERALL AND MOUNTING DIMENSIONS

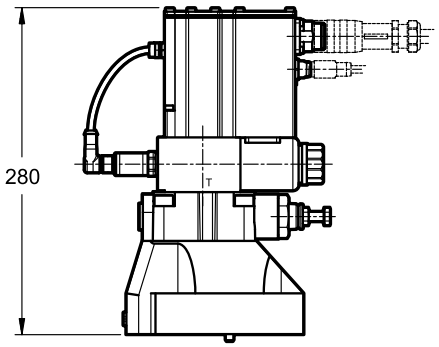
dimensions in mm



PRE32JL



PRE32JH



NOTE 1: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

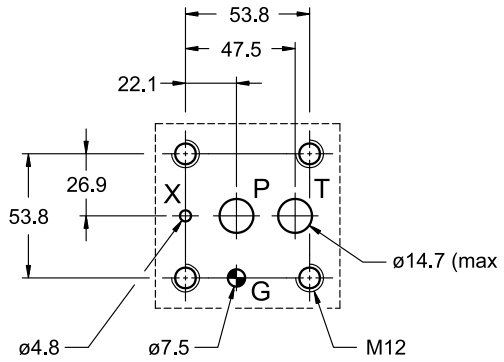
NOTE 2: Mounting interface at par. 12.

1	Mounting surface with sealing rings: 2 OR type 4137 (34.52x3.53) - 90 Shore 1 OR type 109 (9.13x2.62) - 90 Shore
2	Breather: Allen key 4
3	Factory-set pressure relief valve
4	Main connection 6 pin + PE
5	Mating electrical connector **To be ordered separately**. See catalogue 89 000

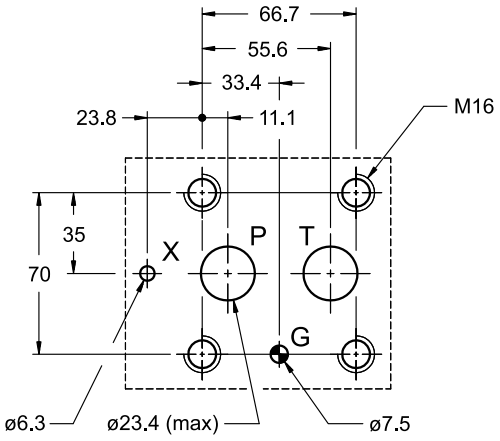
Valve fastening: 4 SHCS M18x60 - ISO 4762
Torque: 235 Nm (viti A8.8)
Thread of mounting holes: M18x27

12 - MOUNTING INTERFACES

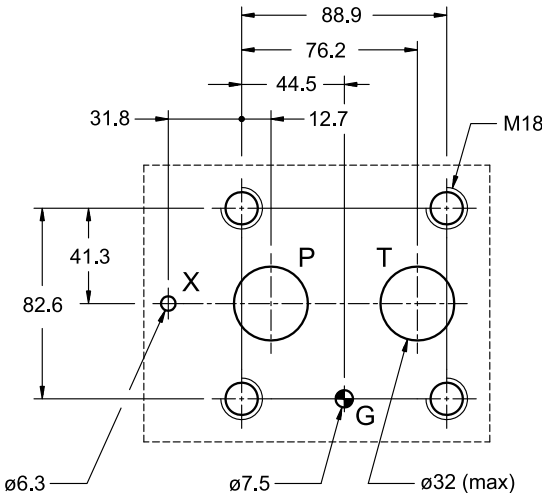
PRE10J*:
ISO 6264-06-09-*-97
(CETOP 4.4.2-2-R06-350)



PRE25J*:
ISO 6264-08-13-*-97
(CETOP 4.4.2-2-R08-350)



PRE32J*:
ISO 6264-10-17-*-97
(CETOP 4.4.2-2-R10-350)



13 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

14 - INSTALLATION

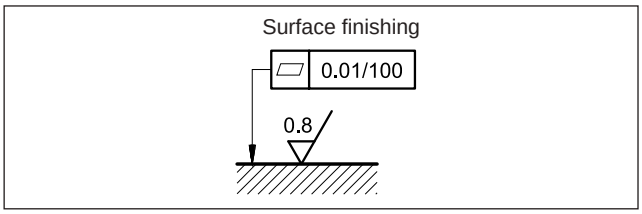
We recommend to install the valves either in horizontal position, or vertical position with the solenoid downward. If the valve is installed in vertical position and with the solenoid upward, you must consider possible variations of the minimum controlled pressure, if compared to what is indicated in point 7.

Ensure that there is no air in the hydraulic circuit. In particular applications, can be necessary to vent the air entrapped in the solenoid tube, by using the appropriate drain screw in the solenoid tube.

Ensure the solenoid tube is always filled with oil. At the end of the operation, make sure of having correctly replaced the drain screw. Connect the valve T port directly to the tank.

Add any backpressure value detected in the T line to the controlled pressure value. Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.



15 - ACCESSORIES

(to be ordered separately)

15.1 -Mating connectors

Mating connectors must be ordered separately. See catalogue 89 000.

For K11 and K16 versions we recommend the choice of a metal connector to avoid electromagnetic disturbances and to comply with EMC regulations on electromagnetic compatibility. If you opt for a plastic connector, make sure that it guarantees and maintains the IP and EMC protection characteristics of the valve.

15.2 - Mating connectors and caps for fieldbus communication

Duplomatic offers spare parts to be wired and also ready-to-use cord sets. Please refer to cat. 89 000.

15.3 - Connection cable

The optimal wiring provides for 7 isolated conductors, with separate screen for the signal wires (command, monitor) and an overall screen.

Cross section for power supply:
- up to 20 m cable length : 1,0 mm^2
- up to 40 m cable length : 1,5 mm^2 (IO-Link excluded)

Cross section for signals (command, monitor):
- 0,50 mm^2

15.4 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic. See catalogue 89 850.

16 - SUBPLATES

(see catalogue 51 000)

	PRE10J*	PRE25J*	PRE32J*
Type	PMRQ3-AI4G rear ports	PMRQ5-AI5G rear ports	PMRQ7-AI7G rear ports
P, T port dimensions	P: 1/2” BSP T: 3/4” BSP	1” BSP	1” 1/4 BSP
X port dimensions	1/4” BSP	1/4” BSP	1/4” BSP

DUPLOMATIC MOTION SOLUTIONS
a member of DAIKIN group

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duplomaticmotionsolutions.com

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PZE3

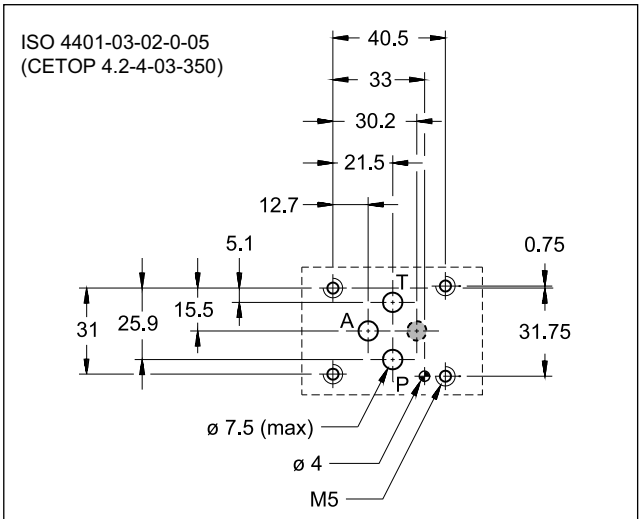
PROPORTIONAL 3-WAY PRESSURE REDUCING VALVE, PILOT OPERATED

SERIES 11

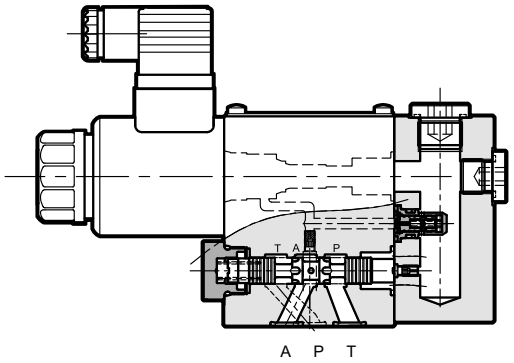
SUBPLATE MOUNTING ISO 4401-03

p max **350** bar
Q max **40** l/min

MOUNTING SURFACE



OPERATING PRINCIPLE



— The PZE3 valve is a proportional 3-way pressure reducing valve, pilot operated with mounting surface according to ISO 4401-03 standards.

— This valve controls the outlet pressure on port A by an electrical proportional control, reducing the inlet pressure from line P or relieving the overpressure from line A into T keeping it at the set value. (typically: hydraulic counter-weight or load balancing)

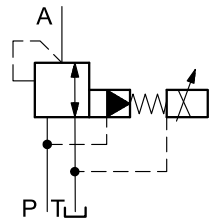
— PZE3 valves can be controlled directly by an amplifier or a proper electronic control unit

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

Maximum operating pressure: - P port - T port	bar	 350 2
Maximum flow (see p max = f(Q) diagram)	l/min	40
Step response	see paragraph 5	
Hysteresis	% of p nom	< 5%
Repeatability	% of p nom	< ±2%
Electrical characteristic	see paragraph 4	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass	kg	2,4

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

P	Z	E	3	-		/	11		/		K1

3-way pressure reducing valve, pilot operated

Electrical proportional control

Size ISO 4401-03

Pressure control range:
025 = 0 ÷ 25 bar
070 = 0 ÷ 70 bar
140 = 0 ÷ 140 bar
210 = 0 ÷ 210 bar
310 = 0 ÷ 310 bar

Series No.
(the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

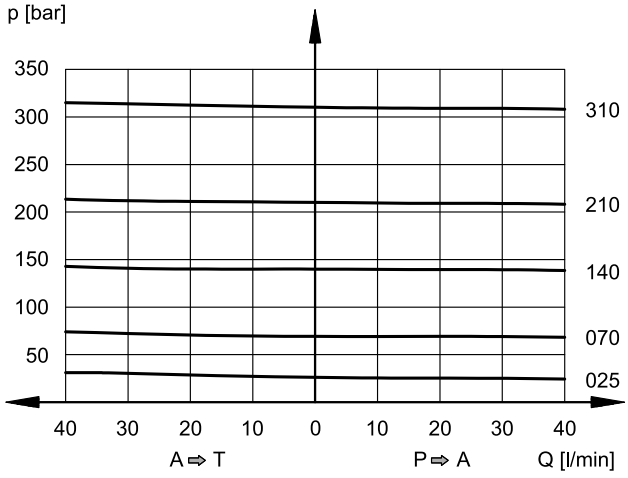
Nominal solenoids voltage:
D12 = 12 V CC
D24 = 24 V CC

Coil electrical connection:
for connector type EN 175301-803
(ex DIN 43650) (**standard**)

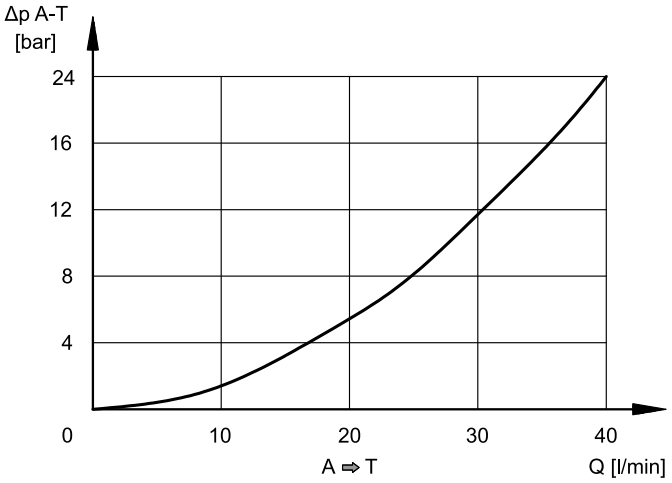
2 - CHARACTERISTIC CURVES

(measured with viscosity of 36 cSt at 50°C)

SET PRESSURE

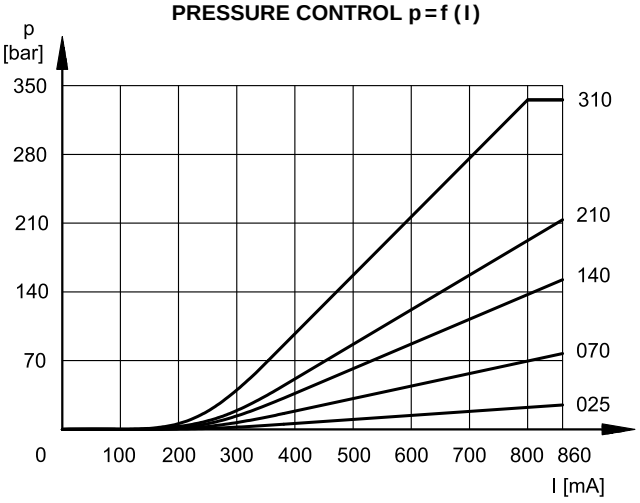


MINIMUM PRESSURE Δp = f (Q)



Pressure drops A →T vs. flow, without backpressure in T port and command signal = 0V.

PRESSURE CONTROL p = f (I)



3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

4 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube, secured by means of a lock nut and can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20°C)	Ω	3.66	17.6
MAXIMUM CURRENT	A	1.88	0.86
DUTY CYCLE	100%		
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2014/30/EU		
PROTECTION FROM: Atmospheric agents (EN 60529)	IP 65		
CLASS OF PROTECTION: Coil insulation (VDE 0580) Impregnation	class H class F		

5 - STEP RESPONSE

(obtained with mineral oil with viscosity of 36 cSt at 50°C)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms]	80	80

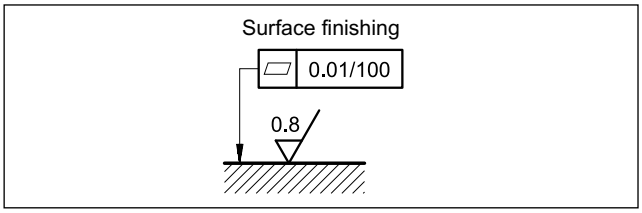
6 - INSTALLATION

We recommend installing the PZE3 valve either in horizontal position, or vertical position with the solenoid downward. If the valve is installed in vertical position and with the solenoid upward, you must consider possible variations of the minimum controlled pressure, if compared to what shown in paragraph 2.

Ensure that there is no air in the hydraulic circuit. In particular applications, it can be necessary to vent the air entrapped in the solenoid tube, by using the apposite drain screw in the solenoid tube. Ensure that the solenoid tube is always filled with oil. At the end of the operation, make sure of having screwed correctly the drain screw.

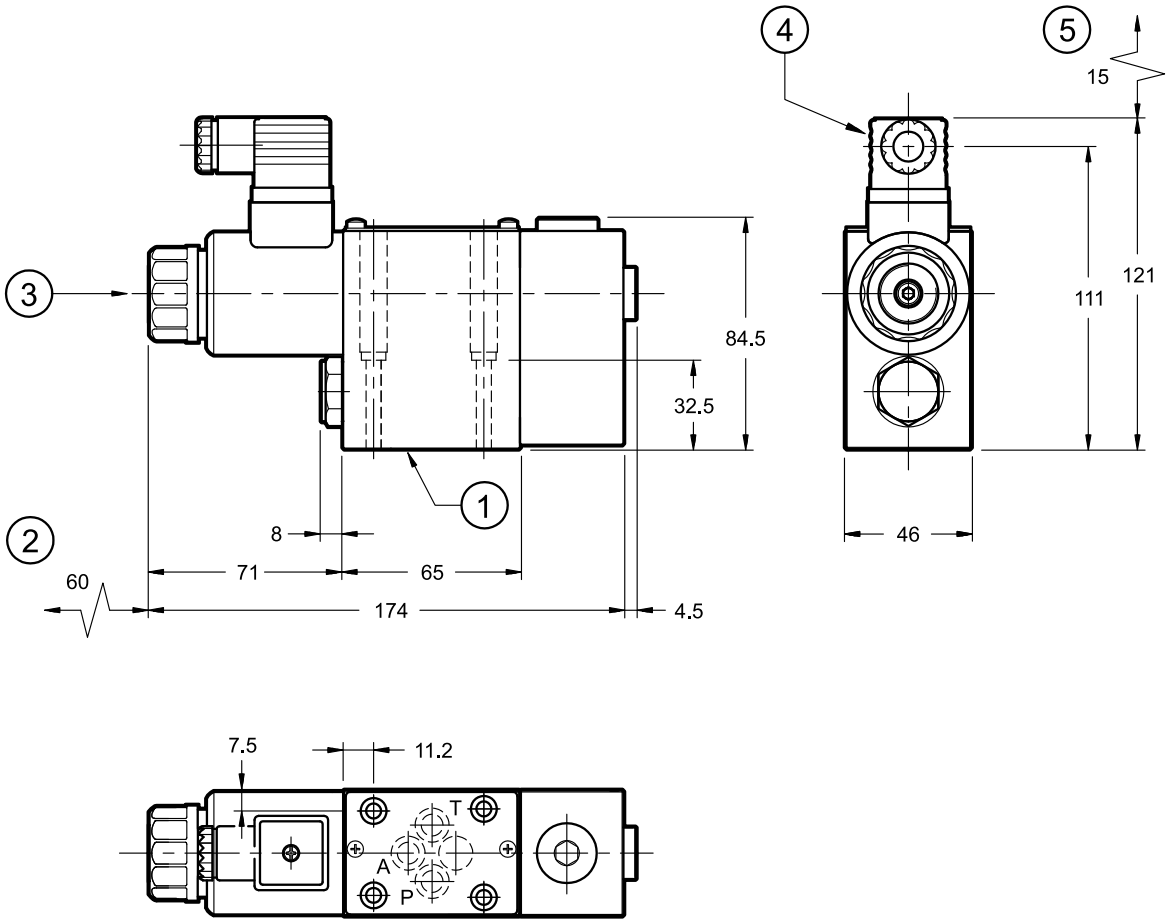
Connect the valve T port directly to the tank. **Add any backpressure value detected in the T line to the controlled pressure value. Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.**

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those shown in the relative symbol. If minimum values are not observed, fluid can easily leaks between valve and support surface.



7 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



NOTE: at first start up, or after a long period of no use, it is necessary to vent the air through the breather (3) placed at the end of the solenoid tube.

Valve fastening: N. 4 bolts M5x40 - ISO 4762	
Tightening torque: 5 Nm (A8.8 screws)	
Threads of mounting holes: M5x10	

1	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) - 90 shore
2	Coil removal space
3	Breather (male hexagonal spanner 4)
4	EN 175301-803 (ex DIN 43650) electric connector (included in the delivery)
5	Connector removal space

8 - ELECTRONIC CONTROL UNITS

EDC-112	for solenoid 24V DC	plug version	see cat. 89 120
EDC-142	for solenoid 12V DC		
EDM-M112	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 251
EDM-M142	for solenoid 12V DC		

9 - SUBPLATES

(see catalogue 51 000)

PMMD-AI3G with ports on rear
PMMD-AL3G with side ports
Ports dimensions P, T, A and B: 3/8” BSP thread

DUPLOMATIC MOTION SOLUTIONS

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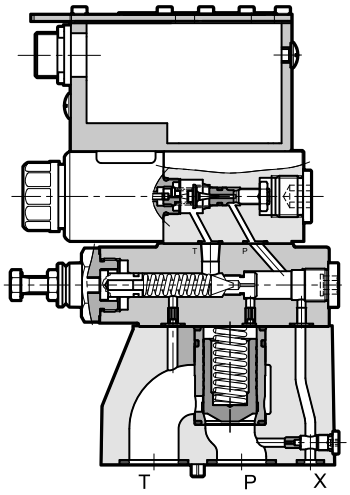
PRE*G*

PROPORTIONAL PRESSURE RELIEF VALVES, PILOT OPERATED, WITH INTEGRATED ELECTRONICS

SUBPLATE MOUNTING ISO 6264

p max **350** bar
Q max (see table of performances)

OPERATING PRINCIPLE



— The PRE*G* valves are proportional pressure relief valves, pilot operated, with integrated electronics and mounting interface in compliance with ISO 6264 standards.

— These valves are used to control hydraulic circuit pressure and enable the use of the full flow rate of the pump, even with settings approaching calibrated values.

— The two-stage design and wide passages ensure reduced pressure drops thereby improving the system energy performance.

— They are fitted with a manual pressure relief valve which is factory set to ≥15% of the maximum value in the pressure control range.

— Valves are available with different types of electronics, with analogue or fieldbus interfaces.

— They are available in three sizes with flow rates up to 500 l/min and in four pressure control ranges up to 350 bar.

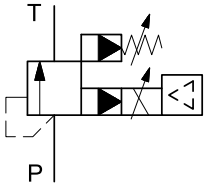
— The valves are easy to install. The driver directly manages digital settings.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50 °C and p = 140 bar)

		PRE10G*	PRE25G*	PRE32G*
Maximum operating pressure	bar	350		
Maximum flow	l/min	200	400	500
Step response		see point 8		
Hysteresis	% of p nom	< 3%		
Repeatability	% of p nom	< ±1%		
Electrical characteristic		see point 3		
Ambient temperature range	°C	-20 / +60		
Fluid temperature range	°C	-20 / +80		
Fluid viscosity range	cSt	10 ÷ 400		
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13			
Recommended viscosity	cSt	25		
Mass	kg	5.5	6.3	8.5

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

1.1 - Standard electronics

P R E _ G - _ / 32 _ - _ K11 _ _

Pilot operated pressure relief valve

Electro-proportional control

Size:
10 = ISO 6264-06
25 = ISO 6264-08
32 = ISO 6264-10

Standard electronics for pressure control in open loop

Pressure control range
070 = up to 70 bar **210** = up to 210 bar
140 = up to 140 bar **350** = up to 350 bar

Series No.
(the overall and mounting dimensions remain unchanged from 30 to 39)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Reference signal:
E0 = voltage 0 ÷ 10 V **E1** = current 4 ÷ 20 mA

Connection 6 pin + PE

Pin C function:
A = external enable
B = internal enable
C = 0V monitor

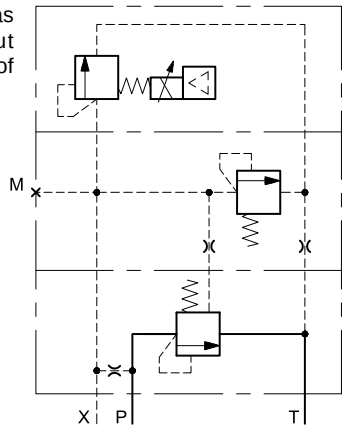
Option:
/ W7 = Zinc-nickel surface treatment
(see **NOTE**)
Omit if not required

NOTE: The standard valve is supplied with surface treatment of phosphating black on the valve body.

The zinc-nickel finishing makes the valve suitable to ensure a salt spray resistance up to 240 hours (test operated according to EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

1.2 - Detailed symbol

Port X is not intended as a pilot supply line, but exclusively as a signal of the input pressure .



1.3 - Compact electronics

P R E _ GL - _ / _ _ - _ K12 _

Pilot operated pressure relief valve

Electro-proportional control

Size:
10 = ISO 6264-06
25 = ISO 6264-08
32 = ISO 6264-10

Digital integrated electronics for open loop compact box

Pressure control range
070 = up to 70 bar **210** = up to 210 bar
140 = up to 140 bar **350** = up to 350 bar

Series No. (the overall and mounting dimensions remain unchanged from 10 to 19):
10 = versions with E0, E1 and CA interfaces
12 = version with IOL interface

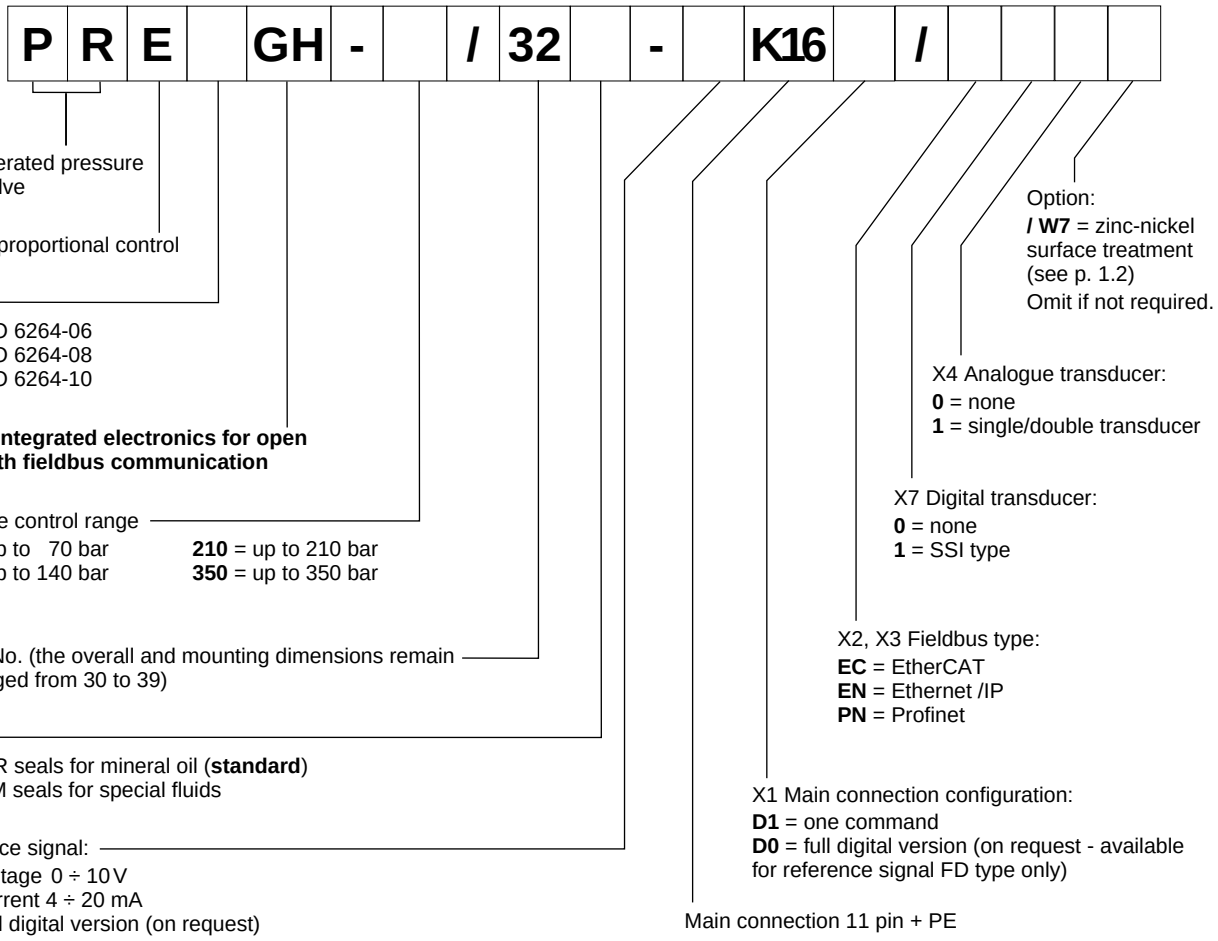
Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Interfaces:
E0 = analogue, voltage 0 ÷ 10 V
E1 = analogue, current 4 ÷ 20 mA
IOL = IO-Link interface
CA = CAN Open

Connection 5 pin M12

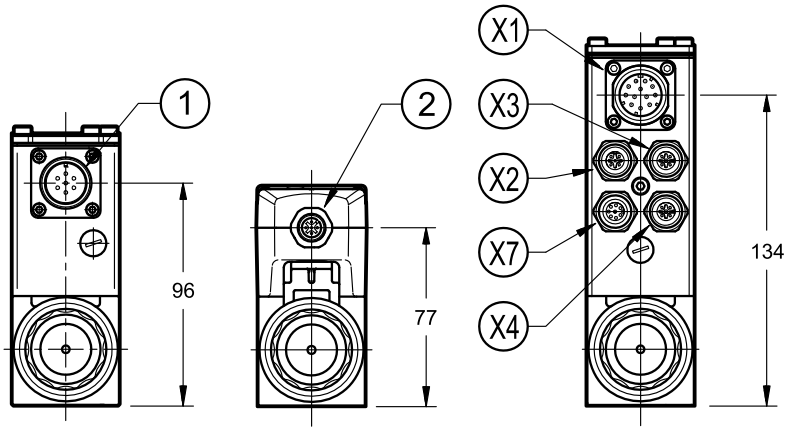
Option:
/ W7 = Zinc-nickel surface treatment
(see **NOTE** p. 1.1)
Omit if not required

1.4 - Electronics with fieldbus communication



2 - COMPARISON AMONG INTEGRATED ELECTRONICS

G type **GL type** **GH type** dimensions in mm



1	Connection 6 pin + PE
2	Connection M12 5 pin, code A, male
X1	Main connection 11 pin + PE
X2	Fieldbus communication (IN)
X3	Fieldbus communication (OUT)
X4	Connection for analogue transducer
X7	Connection for digital transducer

NOTE 1: Depending on the chosen version, X4 and X7 connections may not be present. Please refer to sections 4, 5 and 6 for connections descriptions and pinouts.
NOTE 2: Related mating connectors have to be ordered separately. See catalogue 89 000.

3 - ELECTRONICS COMMON DATA

Duty cycle		100% (continuous operation)
Protection class according to EN 60529		IP65 / IP67 (**NOTE**)
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	25
Maximum solenoid current	A	1.88
Fuse protection, external	A	2A time lag
Managed breakdowns		Overload and electronics overheating, cable breakdown, supply voltage failures
Electromagnetic compatibility (EMC) emissions EN 61000-6-4, immunity EN 61000-6-2		According to 2014/30/EU standards

NOTE: The IP degree is guaranteed only with mating connector of equivalent IP degree, installed and tightened correctly. Moreover, on the GH versions it is necessary to protect any unused connections with caps.

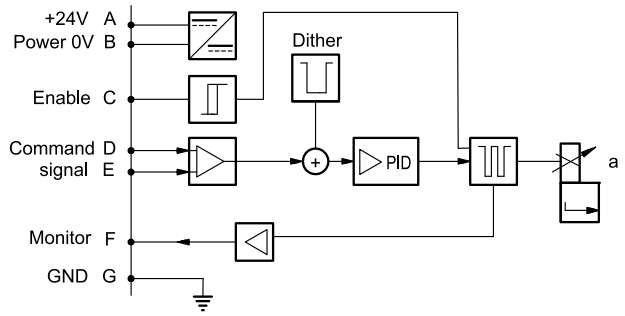
4 - PRE*G - STANDARD ELECTRONICS

4.1 - Electrical characteristics

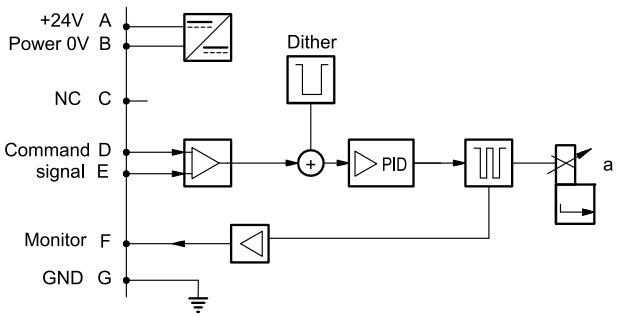
Command signal:	voltage (E0) current (E1)	V DC mA	0 ÷ 10 (impedance Ri > 11 kOhm) 4 ÷ 20 (impedance Ri = 58 Ohm)
Monitor signal (current to solenoid):	voltage (E0) current (E1)	V DC mA	0 ÷ 10 (impedance Ro > 1 kOhm) 4 ÷ 20 (impedance Ro = 500 Ohm)
Communication for diagnostic			LIN-bus Interface (by means of the optional kit)
Connection			6 pin + PE (MIL-C-5015-G - DIN EN 175201-804)

4.2 - On-board electronics diagrams

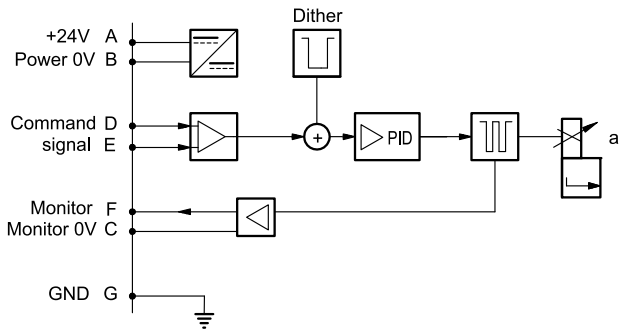
VERSION A - External Enable



VERSION B - Internal Enable

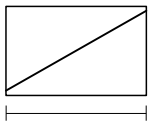


VERSION C - 0V Monitor

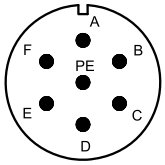


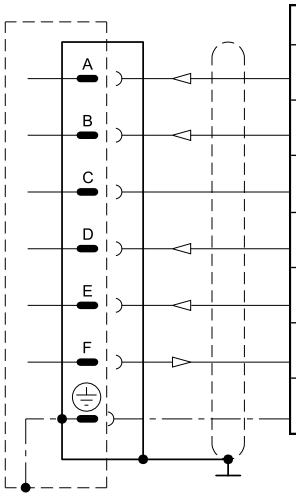
4.3 - Versions with voltage command (E0)

The reference signal is between 0 ÷ 10V. The monitor feature of versions B and C becomes available with a delay of 0.5 sec from the power-on of the card.



COMMAND	**0V**	**+10V**
MONITOR	**0V**	**+10V**



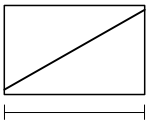


Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	0 ÷ 10 V	Command		
E	0 V	Command reference		
F	0 ÷ 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

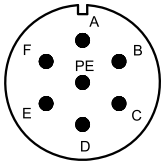
4.4 - Versions with current command (E1)

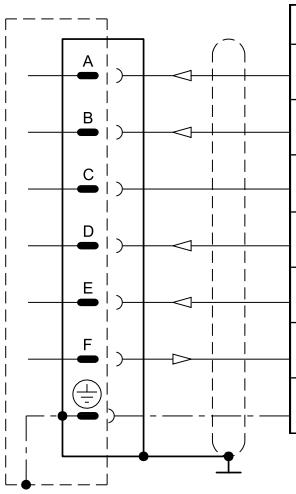
The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower, the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**4 mA**	**20 mA**
MONITOR	**4 mA**	**20 mA**





Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	Command reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

5 - PRE*GL - COMPACT ELECTRONICS

In IO-Link networks, the length of the connecting cables is limited to 20 metres. In CA versions, pin 3 and pin 5 are galvanic isolated up to 100 V to avoid earth loops.

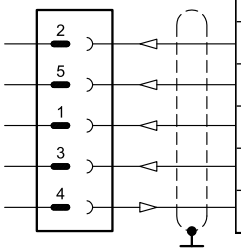
5.1 - Electrical characteristics

Command signal: voltage (E0) current (E1)	V DC mA	0 ÷ 10 (impedance Ri > 11 kOhm) 4 ÷ 20 (impedance Ri = 58 Ohm)
Monitor signal (current to solenoid): voltage (E0) current (E1)	 V DC mA	 0 ÷ 5 (impedance Ro > 1 kOhm) 4 ÷ 20 (impedance Ro = 500 Ohm)
IO-Link communication (IOL): Data rate	 kBaud	IO-Link Port Class B 38.4
Can Open communication (CA): Data rate	 kbit	 10 ÷ 1000
Data register (IOL and CA versions only)		card voltage supply, solenoid faults (shortcircuit, bad configuration), box temperature.
Connection		5-pin M12 code A (IEC 61076-2-101)

5.2 - Pin tables

'E0' connection

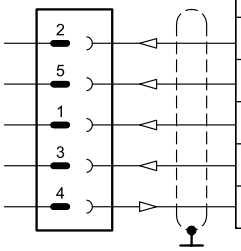




Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	0 ÷ 10 V	Command
3	0 V	Command reference
4	0 ÷ 5 V	Monitor (0V reference: pin 5)

'E1' connection

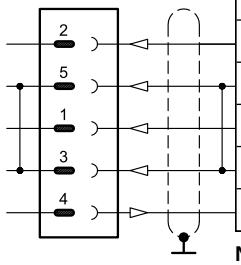




Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	4 ÷ 20 mA	Command
3	0V	Command reference
4	4 ÷ 20 mA	Monitor (0V reference: pin 5)

'IOL' connection



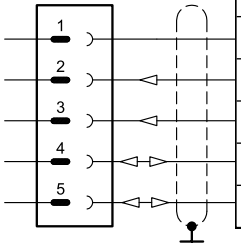


Pin	Values	Function
2	2L+ 24 V DC	Solenoid supply voltage
5	2L- 0 V (GND)	
1	1L+ +24 V DC	Logic and IO-Link supply voltage
3	1L- 0V (GND)	
4	C/Q	IO-Link Communication

NOTE: Pin 3 and pin 5 are linked with each other in the valve electronics. The reference potentials 1L- and 2L- of the two supply voltages must also be linked with each other on the customer side.

'CA' connection





Pin	Values	Function
1	CAN_SH	Shield
2	24 V DC	Supply voltage
3	0 V (GND)	
4	CAN H	Bus line (high)
5	CAN_L	Bus line (low)

6 - PRE*GH - FIELDBUS ELECTRONICS

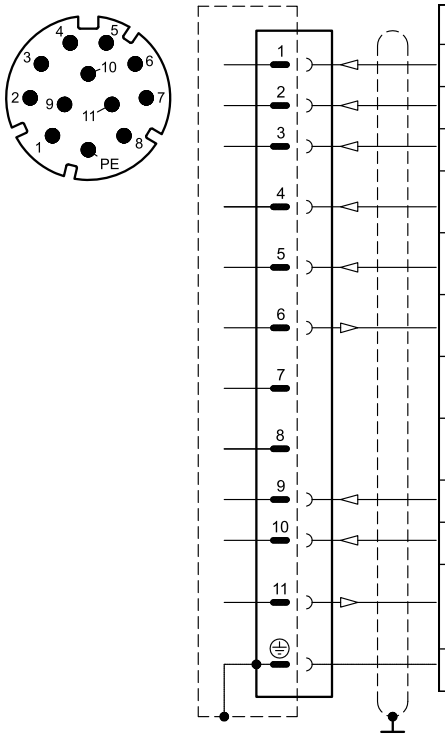
The 11+ PE pin connection allows separate supply voltage for electronics and solenoids.

Command - valve position schemes as for the standard electronics. Please refer to pictures in p. 4.3 and 4.4.

6.1 - Electrical characteristics

Command signal: voltage (E0) current (E1) digital (FD)	 V DC mA	 0 ÷ 10 (impedance Ri > 11 kOhm) 4 ÷ 20 (impedance Ri = 58 Ohm) via fieldbus
Monitor signal (current to solenoid): voltage (E0) current (E1)	 V DC mA	 0 ÷ 10 (impedance Ro > 1 kOhm) 4 ÷ 20 (impedance Ro = 500 Ohm)
Communication / diagnostic		via Bus register
Communication interface standards		IEC 61158
Communication physical layer		fast ethernet, insulated 100 Base TX
Power connection		11 pin + PE (DIN 43651)

6.2 - X1 Main connection pin table



D1: one command

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	0 ÷ 10 V (E0) 4 ÷ 20 (E1)	Command
5	0 V	Command reference signal
6	0 ÷ 10 V (E0) 4 ÷ 20 (E1)	Monitor (0V reference pin 10)
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V reference pin 2)
12	GND	Ground (Earth)

D0: full digital

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	NC	do not connect
5	NC	do not connect
6	NC	do not connect
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V reference pin 2)
12	GND	Ground (Earth)

6.3 - FIELDBUS connections

Please wire following guidelines provided by the related standards communication protocol. Any connections present and not used must be protected with special caps so as not to nullify the protection against atmospheric agents.

X2 (IN) connection: M12 D 4 pin female



Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

X3 (OUT) connection: M12 D 4 pin female



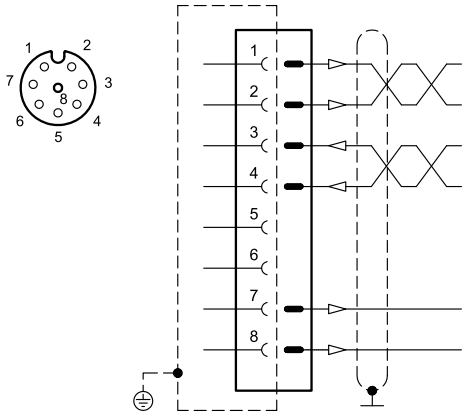
Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

NOTE: Shield connection on connector housing is recommended.

6.4 - Digital transducer connection

X7 connection: M12 A 8 pin female

VERSION 1: SSI type



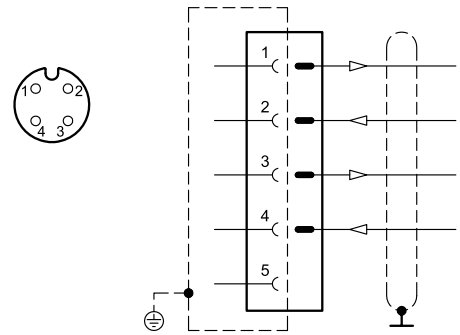
Pin	SSI Values	Function	Notes
1	CLK+	Serial synchronous clock (+)	Input - digital signal
2	CLK-	Serial synchronous clock (-)	
3	MIS0+	Serial position data (+)	
4	MIS0-	Serial position data (-)	
5	NC	-	do not connect
6	NC	-	
7	+24 V	transducer power supply	Output power supply
8	0 V	-	Common GND

6.5 - Analogue transducer connection

X4 connection: M12 A 4 pin female

VERSION 1: single / double transducer

(single or double is a software-selectable option)



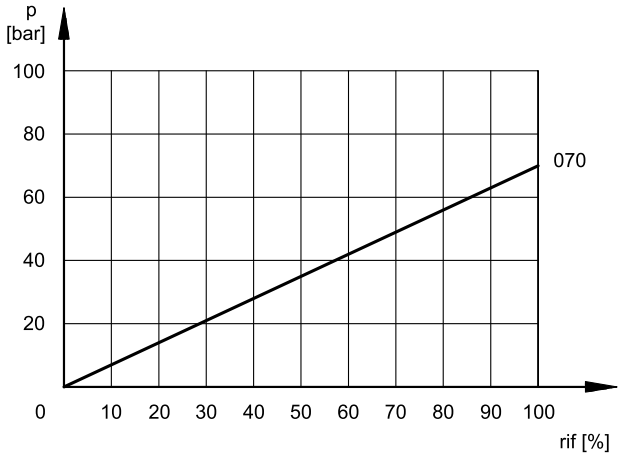
Pin	Values	Notes
1	+24 V	Remote transducer power supply (out) 100 mA
2	±10 V 4 ÷20 mA	Input signal of transducer 1 (range software selectable)
3	0 V	Common reference signal for transducer power and signals
4	±10 V 4 ÷20 mA	Input signal of transducer 2 (range software selectable)
5	-	

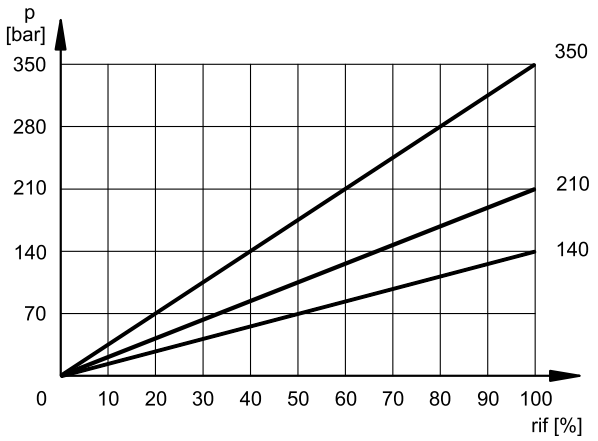
7 - CHARACTERISTIC CURVES

(obtained with mineral oil with viscosity of 36 cSt at 50°C)

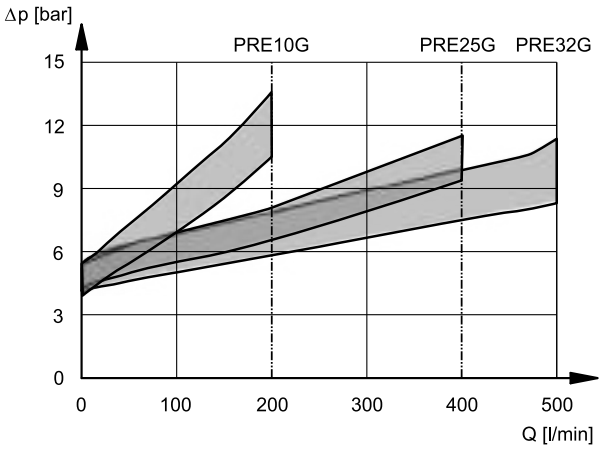
Typical control characteristics, according to the reference signal for available pressure control ranges, measured with input flow rate Q = 50 l/min. Characteristic curves measured without backpressure in T, with linearity compensation set by the onboard electronics.

PRESSURE CONTROL p = f (I)



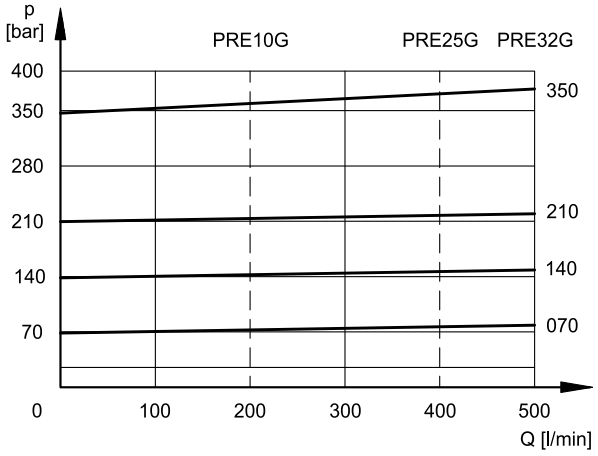


MINIMUM CONTROLLED PRESSURE p min = f (Q)



minimum regulated pressure for pressure control ranges between 70 bar and 350 bar.

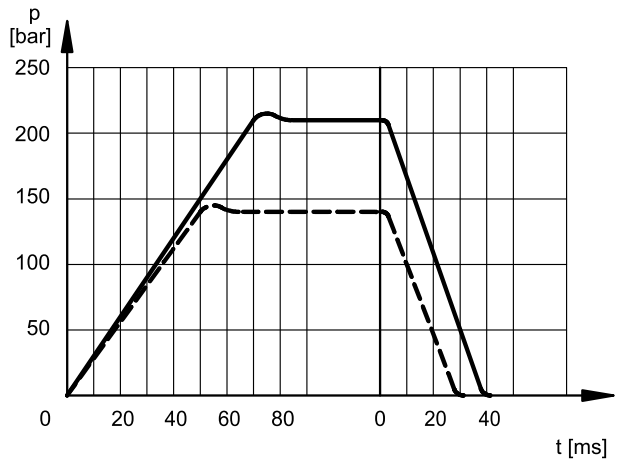
PRESSURE VARIATION p max = f (Q)



8 - STEP RESPONSE

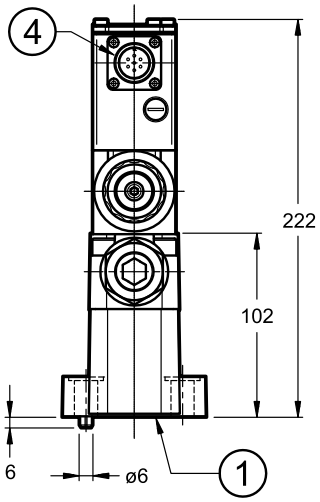
(obtained with mineral oil with viscosity of 36 cSt at 50°C)

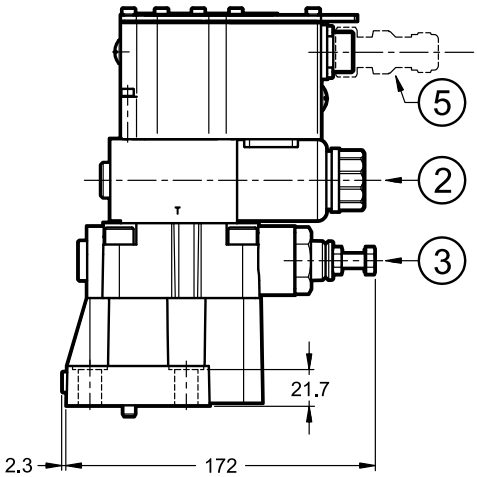
Response times obtained withh PRE*G-210 valves, with an input flow rate of 50 l/min and a pressure oil volume of 2 litres. The response time is affected both by the flow rate and the oil volume in the pipework.

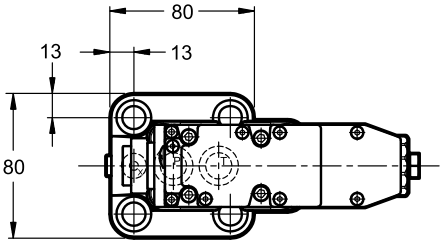


9 - PRE10G* - OVERALL AND MOUNTING DIMENSIONS

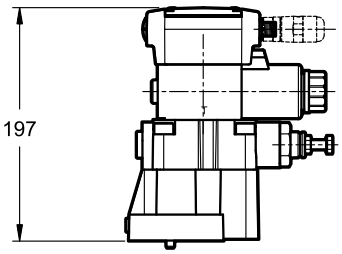
dimensions in mm



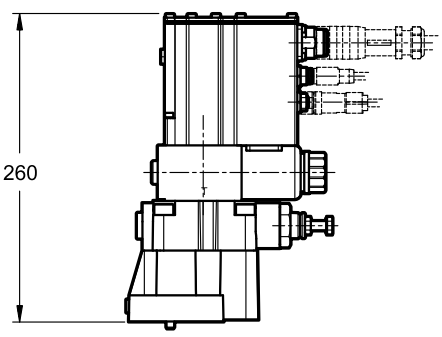




PRE10GL



PRE10GH



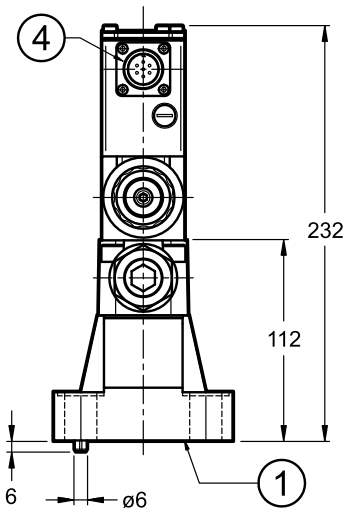
NOTE 1: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.
NOTE 2: Mounting interface at point 12.

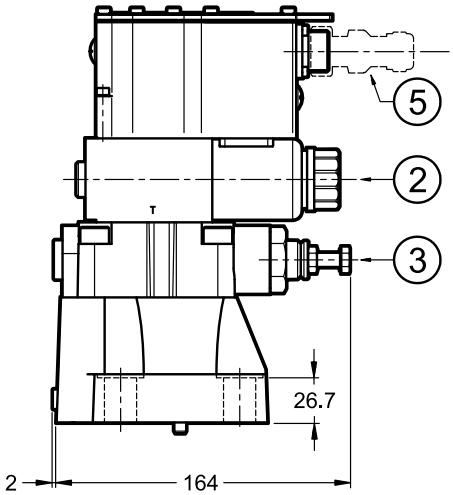
1	Mounting surface with sealing rings: 2 OR type 123 (17.86x2.62) - 90 Shore 1 OR type 109 (9.13x2.62) - 90 Shore
2	Breather: Allen key 4
3	Factory-set pressure relief valve
4	Main connection 6 pin + PE
5	Mating connector **To be ordered separately**. See catalogue 89 000

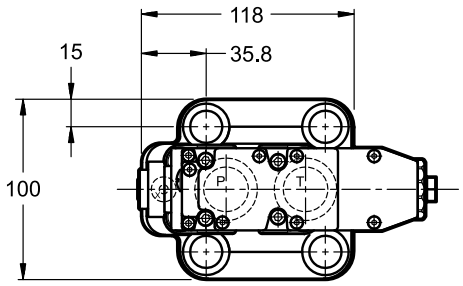
Valve fastening: 4 SHCS M12x40 - ISO 4762
Torque: 69 Nm (screws A8.8)
Thread of mounting holes: M12x20

10 - PRE25G* - OVERALL AND MOUNTING DIMENSIONS

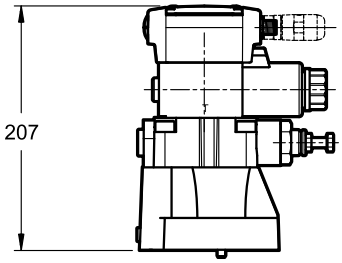
dimensions in mm



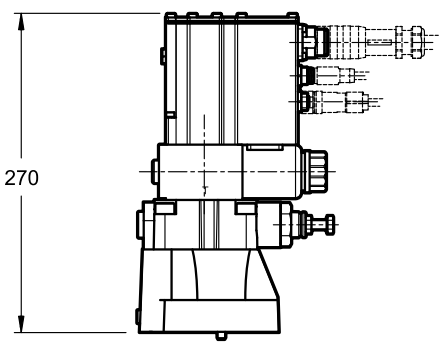




PRE25GL



PRE25GH



NOTE 1: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

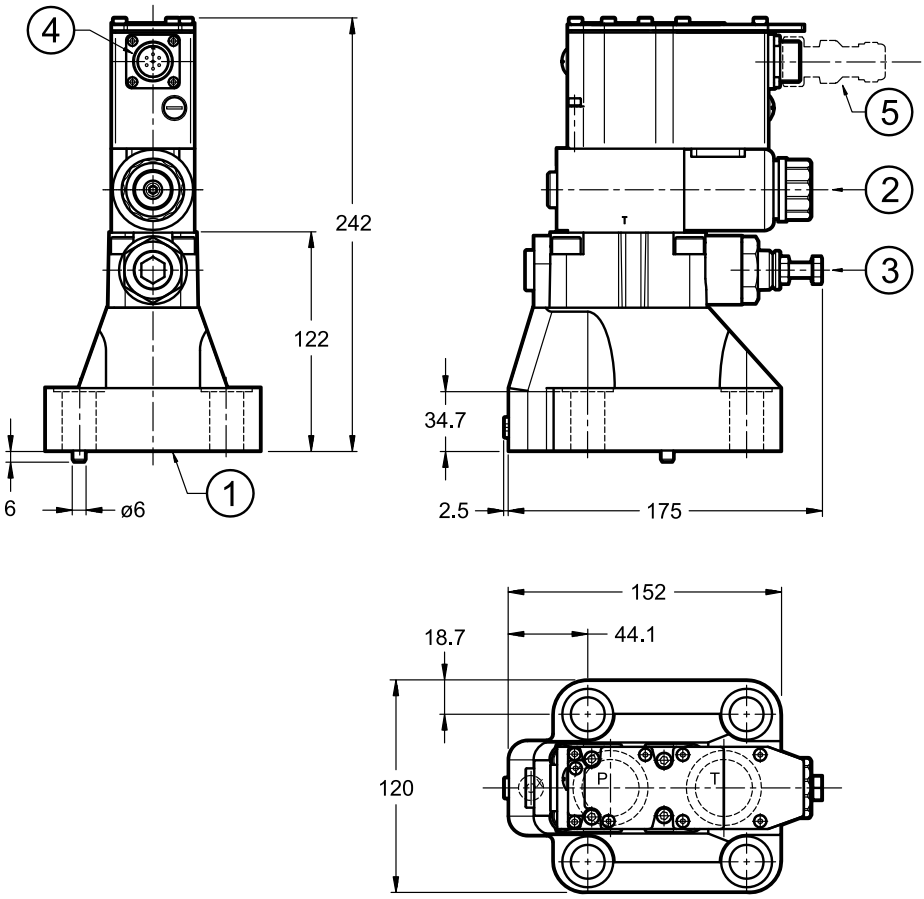
NOTE 2: Mounting interface at point 12.

1	Mounting surface with sealing rings: 2 OR type 3118 (29.82x2.62) - 90 Shore 1 OR type 109 (9.13x2.62) - 90 Shore
2	Breather: Allen key 4
3	Factory-set pressure relief valve
4	Main connection 6 pin + PE
5	Mating connector **To be ordered separately**. See catalogue 89 000

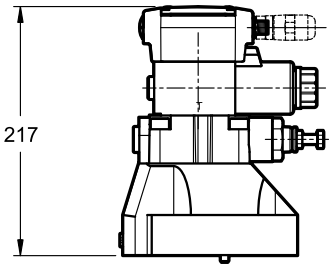
Valve fastening: 4 SHCS M16x60 - ISO 4762
Torque: 170 Nm (screws A8.8)
Thread of mounting holes: M16x25

11 - PRE32G* - OVERALL AND MOUNTING DIMENSIONS

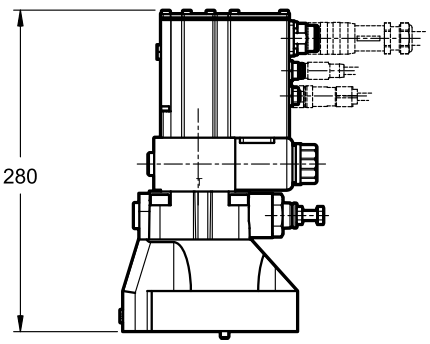
dimensions in mm



PRE32GL



PRE32GH



NOTE 1: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

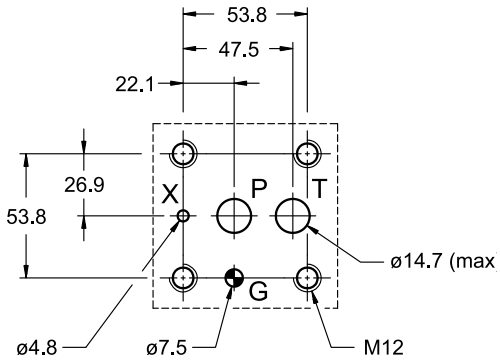
NOTE 2: Mounting interface at point 12.

1	Mounting surface with sealing rings: 2 OR type 4137 (34.52x3.53) - 90 Shore 1 OR type 109 (9.13x2.62) - 90 Shore
2	Breather: Allen key 4
3	Factory-set pressure relief valve
4	Main connection 6 pin + PE
5	Mating electrical connector **To be ordered separately**. See catalogue 89 000

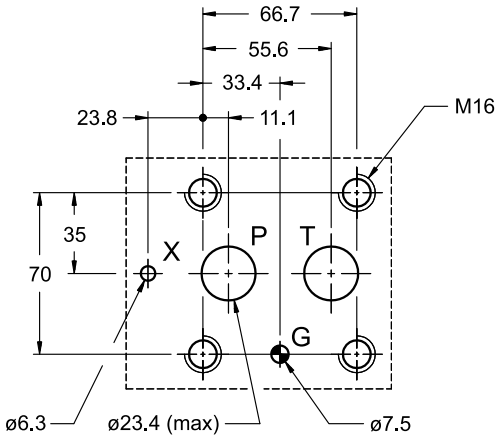
Valve fastening: 4 SHCS M18x60 - ISO 4762
Torque: 235 Nm (screws A8.8)
Thread of mounting holes: M18x27

12 - MOUNTING INTERFACES

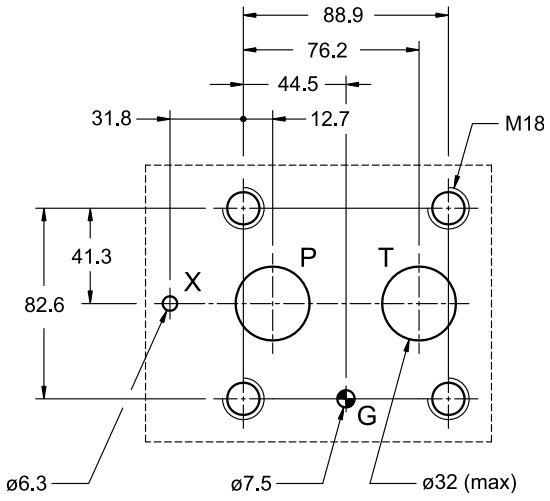
PRE10G*:
ISO 6264-06-09-*-97
(CETOP 4.4.2-2-R06-350)



PRE25G*:
ISO 6264-08-13-*-97
(CETOP 4.4.2-2-R08-350)



PRE32G*:
ISO 6264-10-17-*-97
(CETOP 4.4.2-2-R10-350)



13 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

14 - INSTALLATION

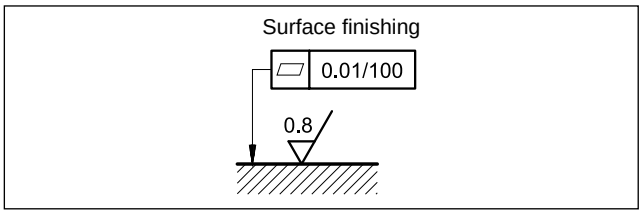
We recommend to install the valves either in horizontal position, or vertical position with the solenoid downward. If the valve is installed in vertical position and with the solenoid upward, you must consider possible variations of the minimum controlled pressure, if compared to what is indicated in point 7.

Ensure that there is no air in the hydraulic circuit. In particular applications, can be necessary to vent the air entrapped in the solenoid tube, by using the appropriate drain screw in the solenoid tube.

Ensure the solenoid tube is always filled with oil. At the end of the operation, make sure of having correctly replaced the drain screw. Connect the valve T port directly to the tank.

Add any backpressure value detected in the T line to the controlled pressure value. Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.



15 - ACCESSORIES

(to be ordered separately)

15.1 - Mating connectors

Mating connectors must be ordered separately. See catalogue 89 000.

For K11 and K16 versions we recommend the choice of a metal connector to avoid electromagnetic disturbances and to comply with EMC regulations on electromagnetic compatibility. If you opt for a plastic connector, make sure that it guarantees and maintains the IP and EMC protection characteristics of the valve.

15.2 - Mating connectors and caps for fieldbus communication and for sensors.

Duplomatic offers spare parts to be wired and also ready-to-use cord sets. Please refer to cat. 89 000.

15.3 - Connection cable

The optimal wiring provides for 7 isolated conductors, with separate screen for the signal wires (command, monitor) and an overall screen.

Cross section for power supply:
- up to 20 m cable length : 1,0 mm^2
- up to 40 m cable length : 1,5 mm^2 (IO-Link excluded)

Cross section for signals (command, monitor):
- 0,50 mm^2

15.4 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic. See catalogue 89 850.

16 - SUBPLATES

(see catalogue 51 000)

	PRE10G*	**PRE25G***	**PRE32G***
Type	PMRQ3-AI4G rear ports	PMRQ5-AI5G rear ports	PMRQ7-AI7G rear ports
P, **T** port dimensions	P: 1/2” BSP T: 3/4” BSP	1” BSP	1” ¼ BSP
X port dimensions	1/4” BSP	1/4” BSP	1/4” BSP

DUPLOMATIC MOTION SOLUTIONS
a member of DAIKIN group

DUPLOMATIC MS Spa
via Mario Re Depaolini, 24 | 20015 Parabiago (MI) | Italy
T +39 0331 895111 | E vendite.ita@duplomatic.com | sales.exp@duplomatic.com
duplomaticmotionsolutions.com

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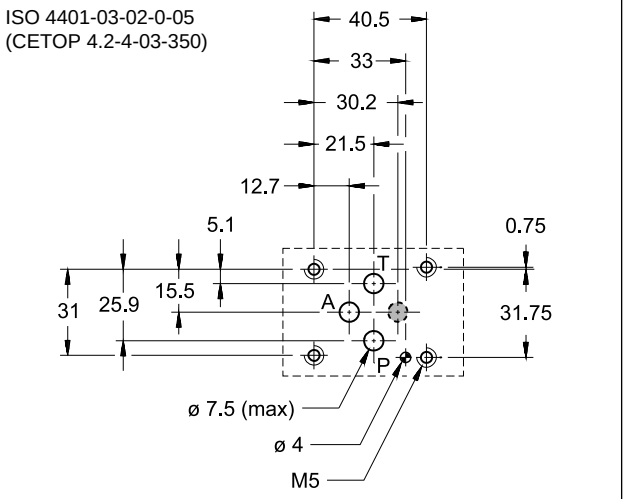
PZE3J*

PROPORTIONAL THREE-PORT PRESSURE REDUCING VALVE, WITH PRESSURE CLOSED LOOP AND INTEGRATED ELECTRONICS

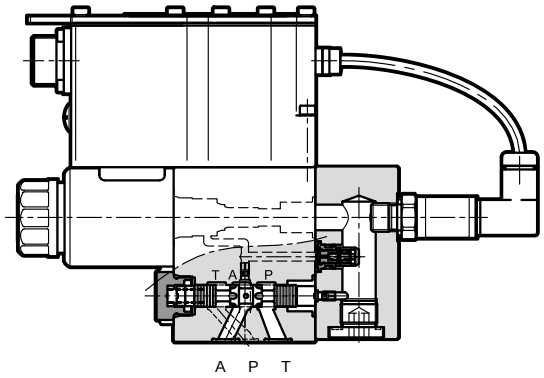
SUBPLATE MOUNTING ISO 4401-03

p max **350** bar
Q max **40** l/min

MOUNTING SURFACE



OPERATING PRINCIPLE



— PZE3J* valve is a proportional three-port pressure reducing valve, pilot operated, with pressure feedback, on-board electronics and mounting surface according to ISO 4401-03 standards.

— This valve controls the outlet pressure on port A, reducing the inlet pressure from line P or relieving the overpressure from line A into T keeping it at the set value. (typically: hydraulic counter-weight or load balancing)

— The valve is available with different types of electronics, with analogue or fieldbus interfaces.

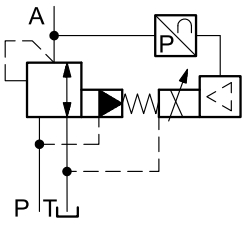
— The valve is easy to install. The driver directly manages digital settings.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

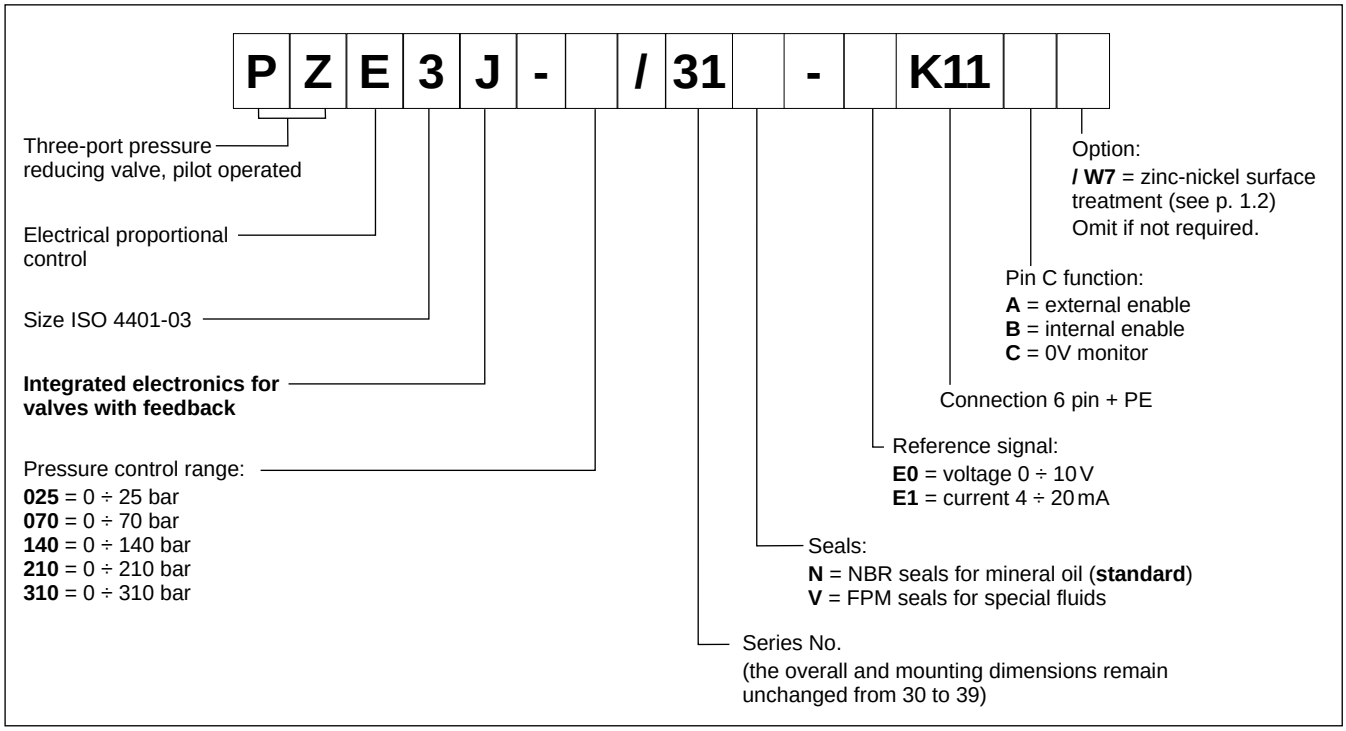
Maximum operating pressure: - P port - T port	bar	 350 2
Maximum flow (see p max = f(Q) diagram)	l/min	40
Step response	see point 7	
Hysteresis	% of p nom	< 1 %
Repeatability	% of p nom	< ± 0.5%
Electrical characteristic	see point 2	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass	kg	3

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

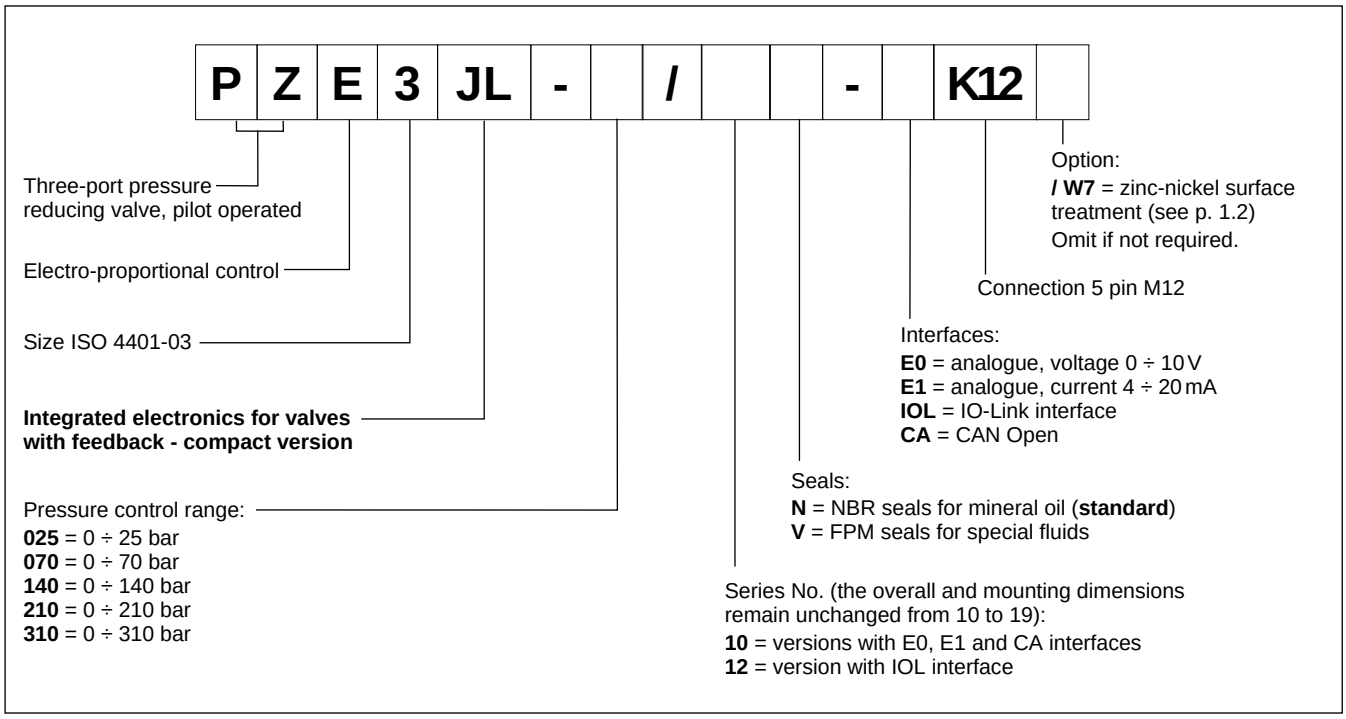
1.1 - Standard electronics



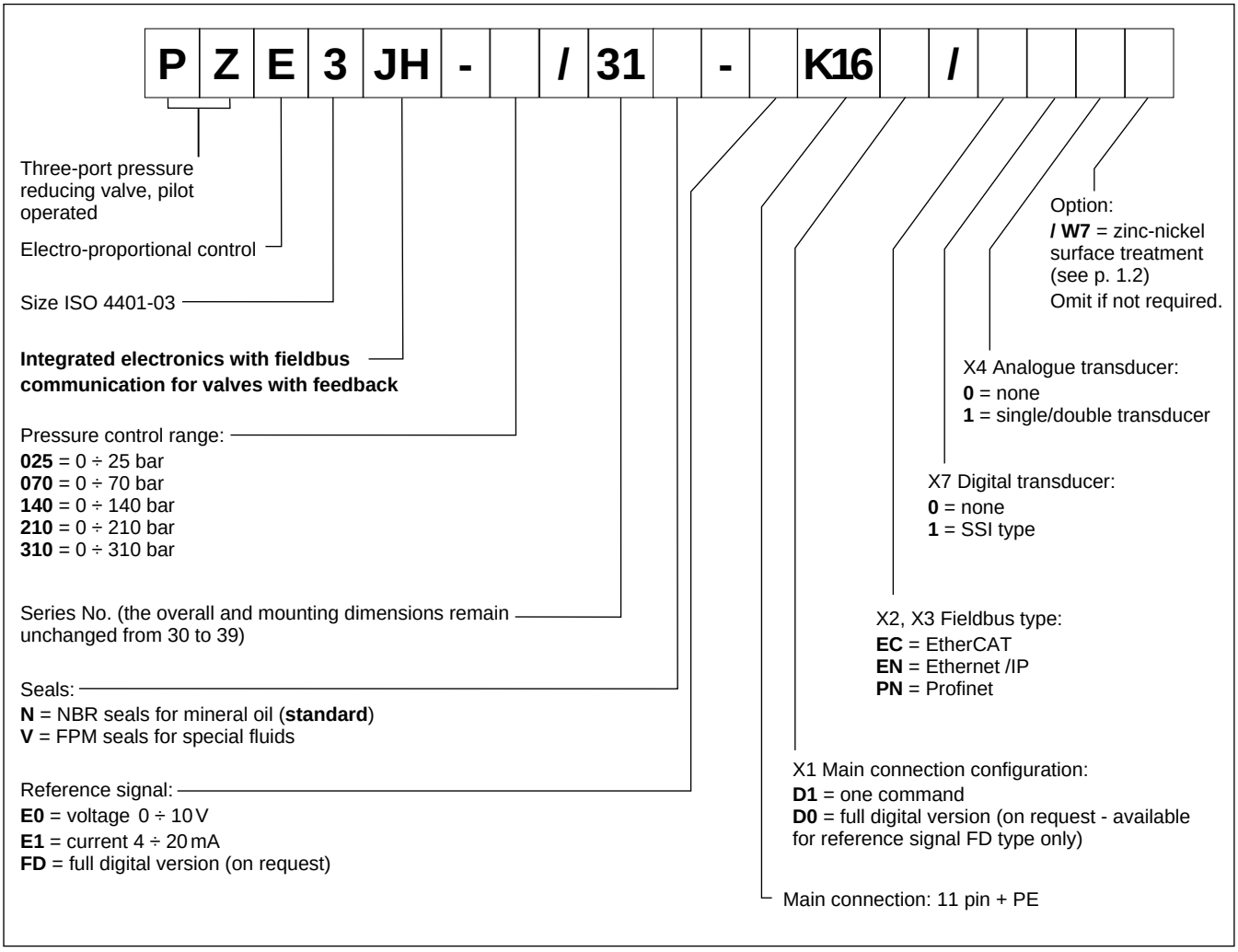
1.2 - Surface treatments

The standard valve is supplied with surface treatment of phosphating black. The zinc-nickel finishing on the valve body makes the valve suitable to ensure a salt spray resistance up to 240 hours. (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

1.3 - Compact electronics



1.4 - Electronics with fieldbus communication



2 - ELECTRONICS COMMON DATA

Duty cycle		100% (continuous operation)
Protection class according to EN 60529		IP65 / IP67 (**NOTE**)
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	25
Maximum solenoid current	A	1.88
Fuse protection, external	A	2A time lag
Managed breakdowns		Overload and electronics overheating, cable breakdown, supply voltage failures
Electromagnetic compatibility (EMC) emissions EN 61000-6-4, immunity EN 61000-6-2		According to 2014/30/EU standards

NOTE: The IP degree is guaranteed only with mating connector of equivalent IP degree, installed and tightened correctly. Moreover, on the JH versions it is necessary to protect any unused connections with caps.

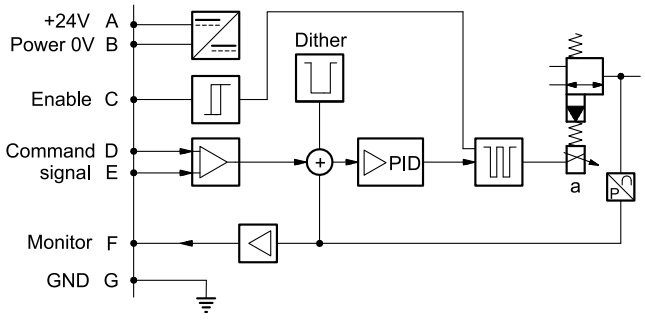
3 - PZE3J - STANDARD ELECTRONICS

3.1 - Electrical characteristics

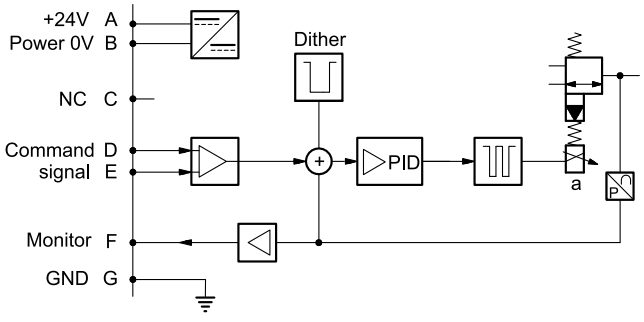
Command signal: voltage (E0) current (E1)	V DC mA	0 ÷ 10 (impedance Ri > 11 kOhm) 4 ÷ 20 (impedance Ri = 58 Ohm)
Monitor signal (pressure at transducer): voltage (E0) current (E1)	V DC mA	0 ÷ 10 (impedance Ro > 1 kOhm) 4 ÷ 20 (impedance Ro = 500 Ohm)
Communication for diagnostic		LIN-bus Interface (by means of the optional kit)
Connection		6 pin + PE (MIL-C-5015-G - DIN EN 175201-804)

3.2 - On-board electronics diagrams

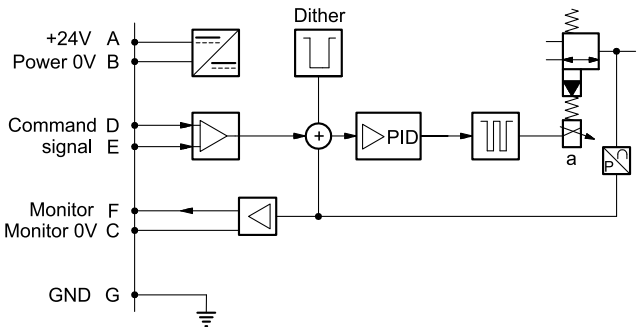
VERSION A - External Enable



VERSION B - Internal Enable

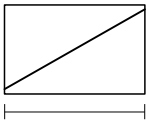


VERSION C - 0V Monitor

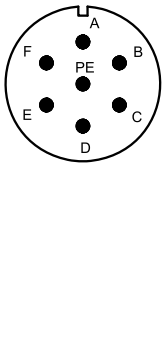


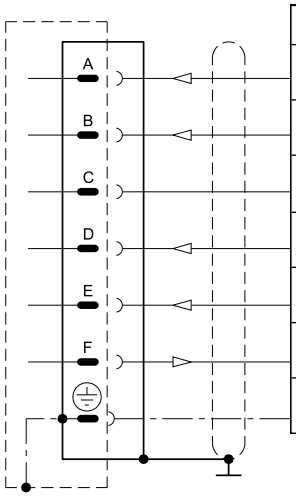
3.3 - Versions with voltage command (E0)

The reference signal is between 0 ÷ 10V. The monitor feature of versions B and C becomes available with a delay of 0.5 sec from the power-on of the card.



COMMAND	**0V**	**+10V**
MONITOR	**0V**	**+10V**



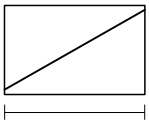


Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	0 ÷ 10 V	Command (differential input)		
E	0 V	Command reference		
F	0 ÷ 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

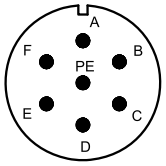
3.4 - Versions with current command (E1)

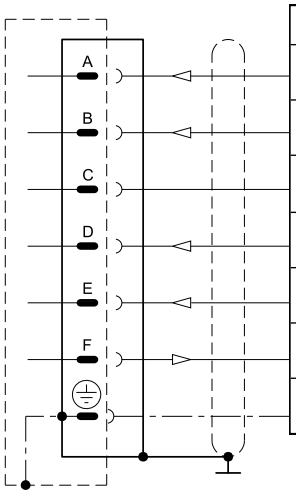
The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

The monitor feature of versions B and C becomes available with a delay of 0.5 sec from the power-on of the card.



COMMAND	**4 mA**	**20 mA**
MONITOR	**4 mA**	**20 mA**





Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	Command reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

4 - PZE3JL - COMPACT ELECTRONICS

In IO-Link networks, the length of the connecting cables is limited to 20 metres. In CA versions, pin 3 and pin 5 are galvanic isolated up to 100 V to avoid earth loops.

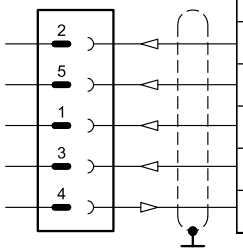
4.1 - Electrical characteristics

Command signal: voltage (E0) current (E1)	V DC mA	0 ÷ 10 (impedance Ri > 11 kOhm) 4 ÷ 20 (impedance Ri = 58 Ohm)
Monitor signal (pressure at transducer): voltage (E0) current (E1)	 V DC mA	 0 ÷ 5 (impedance Ro > 1 kOhm) 4 ÷ 20 (impedance Ro = 500 Ohm)
IO-Link communication (IOL): Data rate	 kBaud	IO-Link Port Class B 38.4
Can Open communication (CA): Data rate	 kbit	 10 ÷ 1000
Data register (IOL and CA versions only)		card voltage supply, solenoid faults (shortcircuit, bad configuration), box temperature.
Connection		5-pin M12 code A (IEC 61076-2-101)

4.2 - Pin tables

'E0' connection

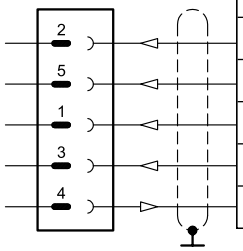




Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	0 ÷ 10 V	Command
3	0 V	Command reference
4	0 ÷ 5 V	Monitor (0V reference: pin 5)

'E1' connection

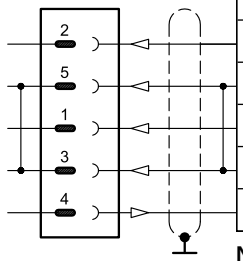




Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	4 ÷ 20 mA	Command
3	0V	Command reference
4	4 ÷ 20 mA	Monitor (0V reference: pin 5)

'IOL' connection



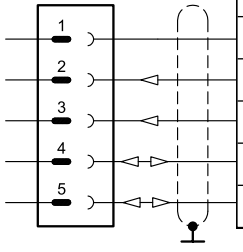


Pin	Values	Function
2	2L+ 24 V DC	Solenoid supply voltage
5	2L- 0 V (GND)	
1	1L+ +24 V DC	Logic and IO-Link supply voltage
3	1L- 0V (GND)	
4	C/Q	IO-Link Communication

NOTE: Pin 3 and pin 5 are linked with each other in the valve electronics. The reference potentials 1L- and 2L- of the two supply voltages must also be linked with each other on the customer side.

'CA' connection





Pin	Values	Function
1	CAN_SH	Shield
2	24 V DC	Supply voltage
3	0 V (GND)	
4	CAN H	Bus line (high)
5	CAN_L	Bus line (low)

5 - PZE3JH - FIELDBUS ELECTRONICS

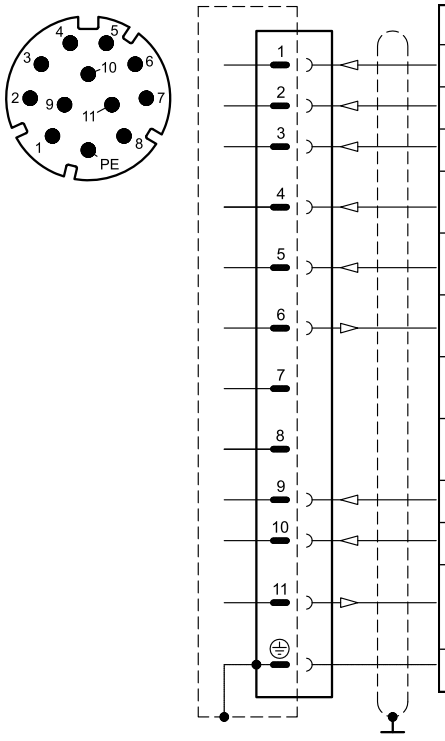
The 11+ PE pin connection allows separate supply voltage for electronics and solenoid.

Command - valve position schemes as for the standard electronics. Please refer to pictures in point 3.3 and 3.4.

5.1 - Electrical characteristics

Command signal: voltage (E0) current (E1) digital (FD)	V DC mA	0 ÷ 10 (impedance Ri > 11 kOhm) 4 ÷ 20 (impedance Ri = 58 Ohm) via fieldbus
Monitor signal (pressure at transducer): voltage (E0) current (E1)	V DC mA	0 ÷ 10 (impedance Ro > 1 kOhm) 4 ÷ 20 (impedance Ro = 500 Ohm)
Communication / diagnostic		via Bus register
Communication interface standard		IEC 61158
Communication physical layer		fast ethernet, insulated 100 Base TX
Power connection		11 pin + PE (DIN 43651)

5.2 - X1 Main connection pin table



D1: one command

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	0 ÷ 10 V (E0) 4 ÷ 20 (E1)	Command
5	0 V	Command reference signal
6	0 ÷ 10 V (E0) 4 ÷ 20 (E1)	Monitor (0V reference pin 10)
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V reference pin 2)
12	GND	Ground (Earth)

D0: full digital

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	NC	do not connect
5	NC	do not connect
6	NC	do not connect
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V reference pin 2)
12	GND	Ground (Earth)

5.3 - FIELDBUS connections

Please wire following guidelines provided by the related standards communication protocol. Any connections present and not used must be protected with special caps so as not to nullify the protection against atmospheric agents.

X2 (IN) connection M12 D 4 pin female



Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

X3 (OUT) connection: M12 D 4 pin female

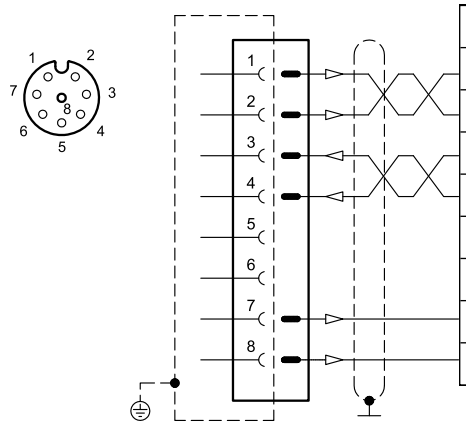


Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

NOTE: Shield connection on connector housing is recommended.

5.4 - Digital transducer connection
X7 connection: M12 A 8 pin female

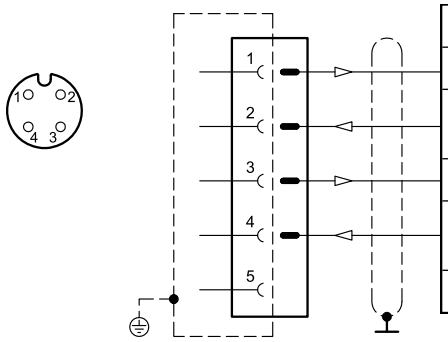
VERSION 1: SSI type



Pin	SSI Values	Function	Notes
1	CLK+	Serial synchronous clock (+)	Input - digital signal
2	CLK-	Serial synchronous clock (-)	
3	MIS0+	Serial position data (+)	
4	MIS0-	Serial position data (-)	
5	NC	-	do not connect
6	NC	-	
7	+24 V	transducer power supply	Output power supply
8	0 V	-	Common GND

5.5 - Analogue transducer connection
X4 connection: M12 A 4 pin female

VERSION 1: single / double transducer
(single or double is a software-selectable option)



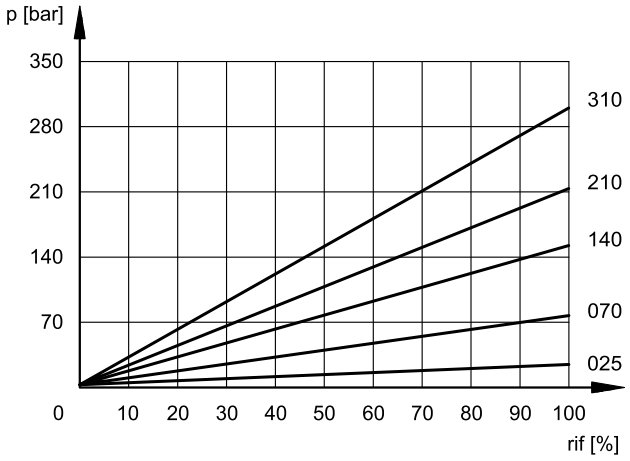
Pin	Values	Notes
1	+24 V	Remote transducer power supply (out) 100 mA
2	±10 V 4 ÷20 mA	Input signal of transducer 1 (range software selectable)
3	0 V	Common reference signal for transducer power and signals
4	±10 V 4 ÷20 mA	Input signal of transducer 2 (range software selectable)
5	-	

6 - CHARACTERISTIC CURVES

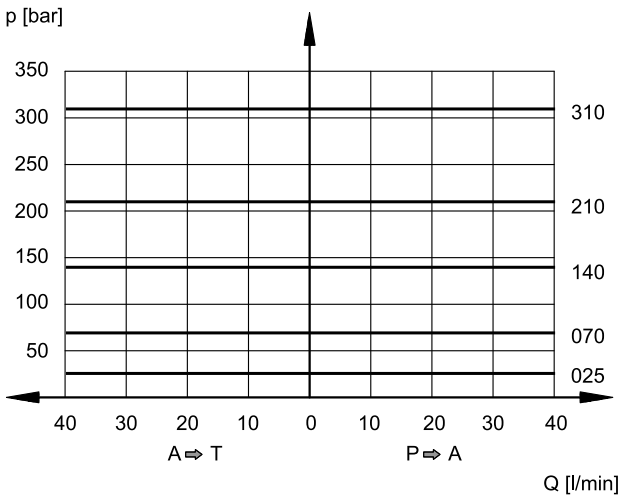
(measured with viscosity of 36 cSt at 50°C)

Typical control characteristics, according to the reference signal for available pressure control ranges. Characteristic curves measured without backpressure in T, with linearity and hysteresis compensation set by the onboard electronics.

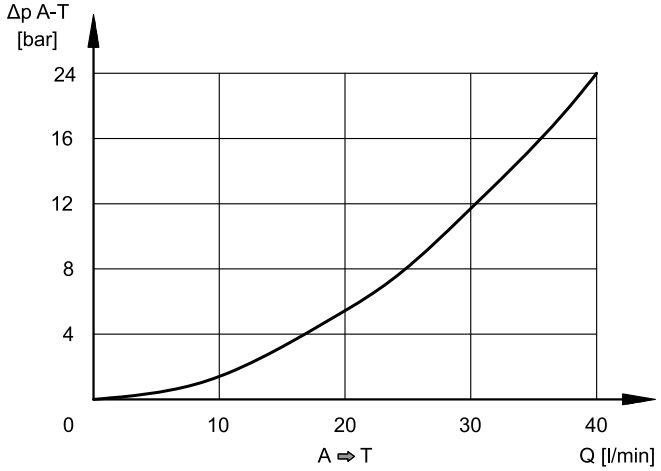
PRESSURE CONTROL p = f (I)



SET PRESSURE p max = f (Q)



MIN CONTROLLED PRESSURE p min = f (Q)

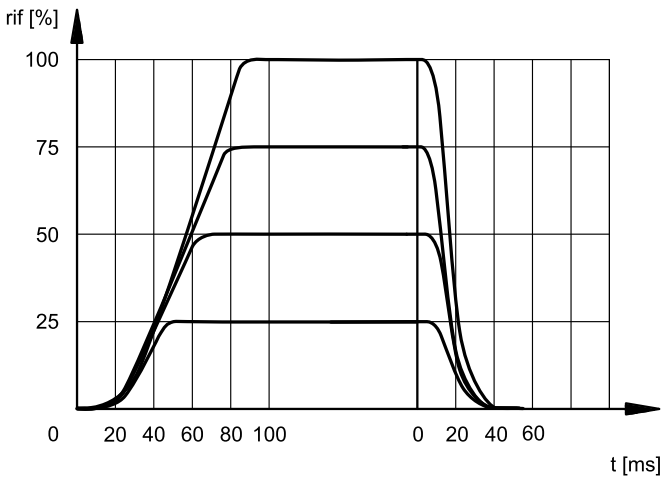


Pressure drops A →T vs. flow, without backpressure in T port and reference signal = 0 %

7 - RESPONSE TIMES

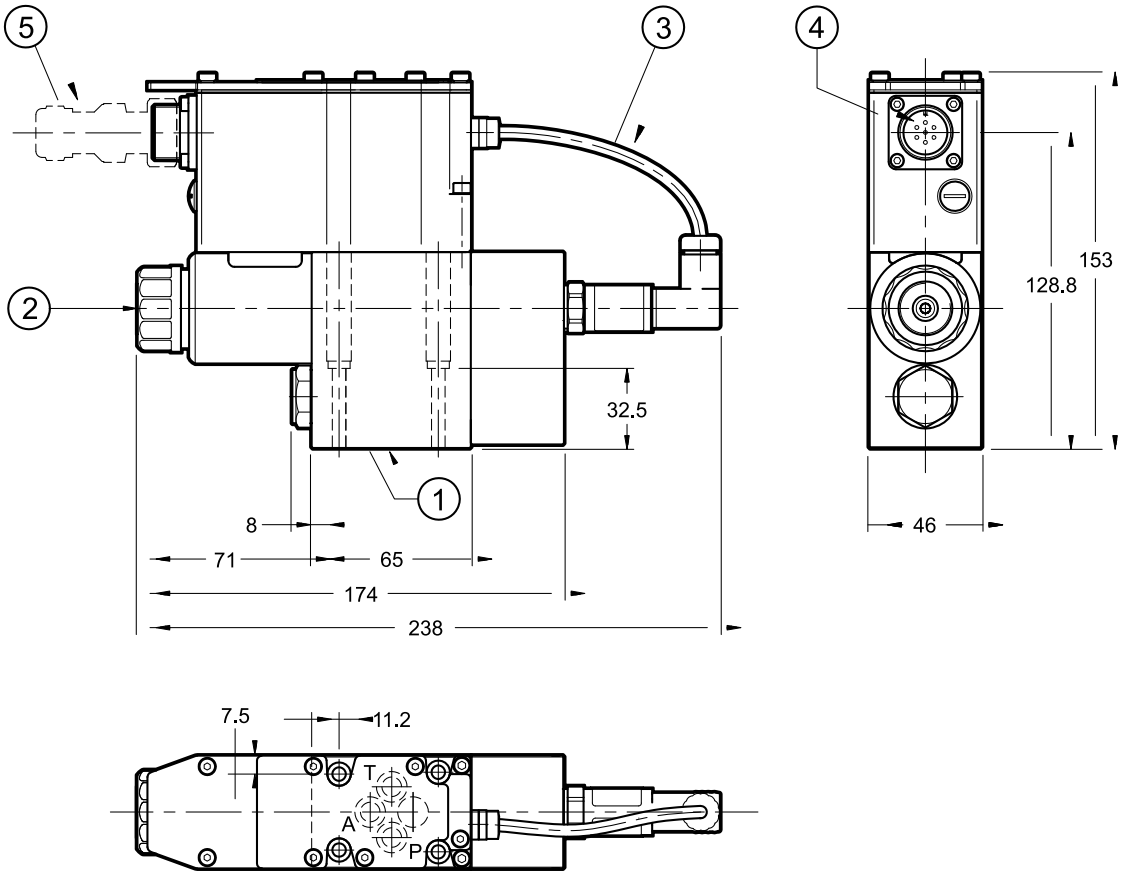
(obtained with mineral oil with viscosity of 36 cSt at 50°C)

The response time is affected by both the flow rate and the oil volume in the pipework.



8 - PZE3J - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



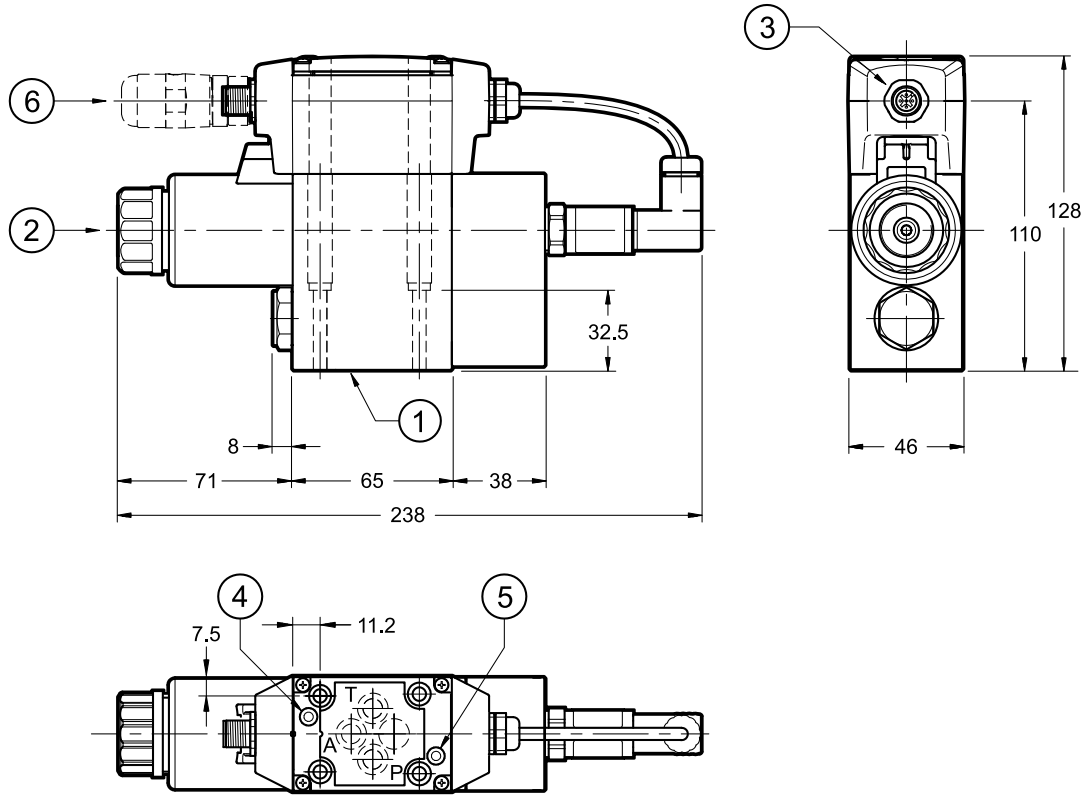
NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

Fastening bolts: 4 SHC screws M5x40 - ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

1	Mounting surface with sealing rings: 4 OR type 2037 (9.25 x 1.78) - 90 shore
2	Breather: Allen key 4
3	Cable with connector for pressure transducer
4	Main connection
5	Mating connector 6 poles + PE , female type MIL-5015-G **To be ordered separately.** See catalogue 89 000 0

9 - PZE3JL - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



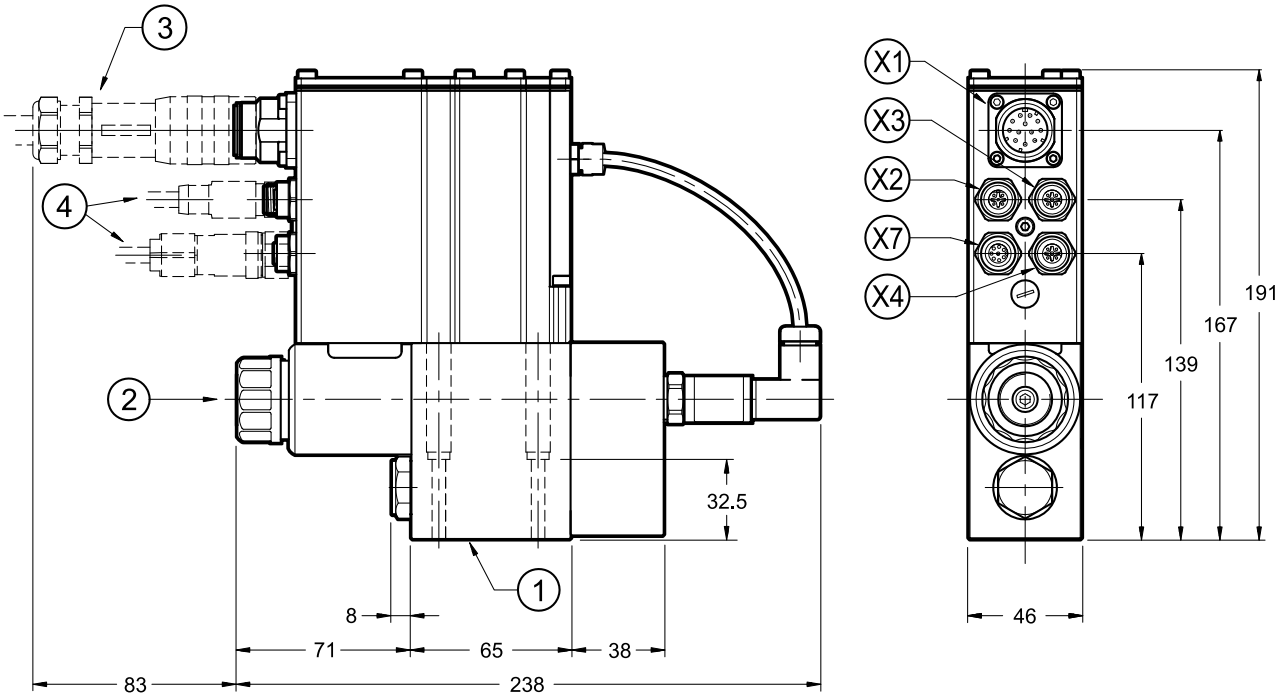
NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

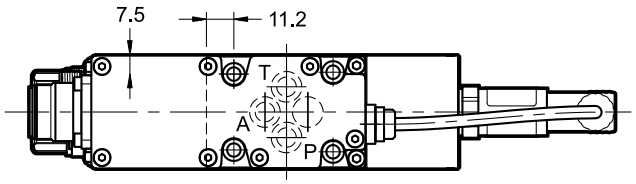
Fastening bolts: 4 SHC screws M5x40 - ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Breather: Allen key 4
3	Connection M12 A 5 pin
4	L1 LED
5	L2 LED
6	Mating connector M12 5 poles - code A, female **To be ordered separately.** See catalogue 89 000

10 - PZE3JH - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm





X1	Main connection 11 pin + PE
X2	Fieldbus communication (IN)
X3	Fieldbus communication (OUT)
X4	X4 connection for analogue transducer
X7	X7 connection for digital transducer

1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Breather: Allen key 4
3	Mating connector 11 poles + PE **To be ordered separately.** See catalogue 89 000
4	Mating connectors for fieldbus communication and signals **To be ordered separately.** See catalogue 89 000

Fastening bolts: 4 SHC screws M5x40 ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

NOTE 1: Depending on the chosen version, X4 and X7 connections may not be present.
Please refer to section 5 for connection descriptions and pinout.

NOTE 2: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

11 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

12 - INSTALLATION

We recommend installing these valves with the solenoid downward, either in horizontal or vertical position. If the valve is installed on vertical axis with the solenoid upward, you should consider possible variations of the minimum controlled pressure from those indicated in point 5.

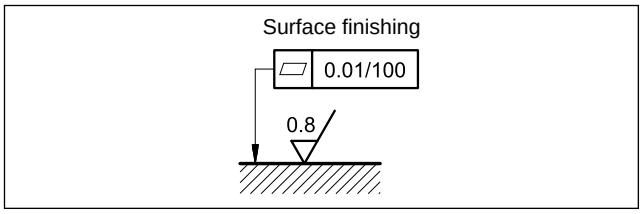
Ensure that there is no air in the hydraulic circuit. In certain applications it might be necessary to vent the air entrapped in the solenoid tube by unfastening the drain screw placed in the solenoid tube.

Ensure the solenoid tube is always filled with oil. Make sure the drain screw has been put back correctly at the end of the task. Connect the valve T port directly to the tank.

Add any backpressure value detected in the T line to the controlled pressure value. Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols.

If minimum values are not observed, fluid can easily leaks between the valve and support surface.



13 - ACCESSORIES

(to be ordered separately)

13.1 - Mating connectors

Mating connectors must be ordered separately. See catalogue 89 000.

For K11 and K16 versions we recommend the choice of a metal connector to avoid electromagnetic disturbances and to comply with EMC regulations on electromagnetic compatibility. If you opt for a plastic connector, make sure that it guarantees and maintains the IP and EMC protection characteristics of the valve.

13.2 - Mating connectors and caps for fieldbus communication and for sensors.

Duplomatic offers spare parts to be wired and also ready-to-use cord sets. Please refer to cat. 89 000.

13.3 - Connection cable

The optimal wiring provides for 7 isolated conductors, with separate screen for the signal wires (command, monitor) and an overall screen.

Cross section for power supply:
- up to 20 m cable length : 1,0 mm^2
- up to 40 m cable length : 1,5 mm^2 (IO-Link excluded)

Cross section for signals (command, monitor):
- 0,50 mm^2

13.4 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic. See catalogue 89 850.

14 - SUBPLATES

(see catalogue 51 000)

PMMD-AI3G with ports on rear
PMMD-AL3G with side ports
Ports dimensions P, T, A, B: 3/8" BSP thread

DUPLOMATIC MOTION SOLUTIONS
a member of DAIKIN group

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duplomaticmotionsolutions.com

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DUPLOMATIC MOTION SOLUTIONS

WWW.SUMY.IR



PZME3

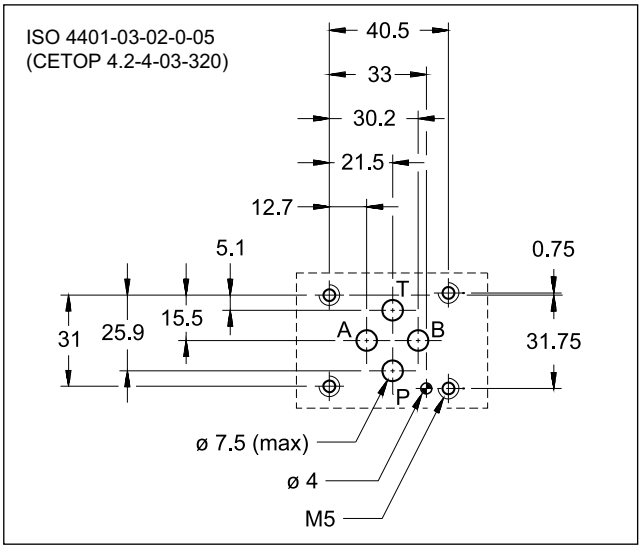
PROPORTIONAL THREE-PORT PRESSURE REDUCING VALVE PILOT OPERATED

SERIES 10

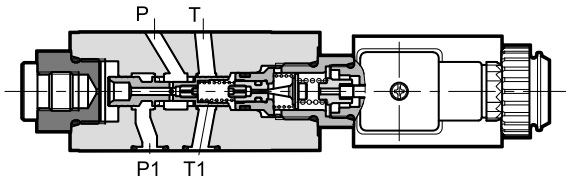
MODULAR VERSION ISO 4401-03

p max **320** bar
Q max (see table of performances)

MOUNTING SURFACE



OPERATING PRINCIPLE



— PZME3 valves are three-port pressure reducing valves, pilot operated, with proportional control. They are designed in modular version with mounting interface in compliance with ISO 4401-03 standards.

— These valves reduce pressure in the secondary branches of the circuit thus ensuring stability of controlled pressure in the event of variations in the flow rate through the valve.

— The valve can be controlled directly by a current control supply unit or by an electronic control card, to maximize the valve performance (see point. 9).

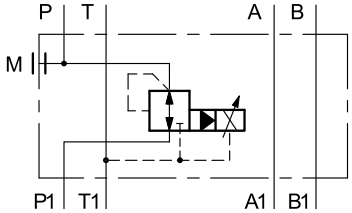
— The PZME3 valve is available in three pressure control ranges of up to 230 bar.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Maximum operating pressure: - P-A-B ports - T port	bar	 320 2
Minimum controlled pressure	see Δp-Q diagram	
Maximum flow in P line Maximum flow on free flow paths Drain flow	l/min	40 50 0,4
Step response	see point 6	
Hysteresis (with PWM 200 Hz)	% of p nom	< 3%
Repeatability	% of p nom	< ±1,5%
Electrical characteristic	see point 5	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass	kg	1.5

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

PZ	M	E	3	-		/	10		-			/	

Three-port pressure reducing valve

Modular version

Electrical proportional control

Size: ISO 4401-03

Pressure control range
070 = from 5 to 70 bar
150 = from 5.5 to 150 bar
230 = from 6 to 230 bar

Series No.
(from 10 to 19 sizes and mounting dimensions remain unchanged)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

D12 = Nominal solenoid voltage 12 V DC
D24 = Nominal solenoid voltage 24 V DC

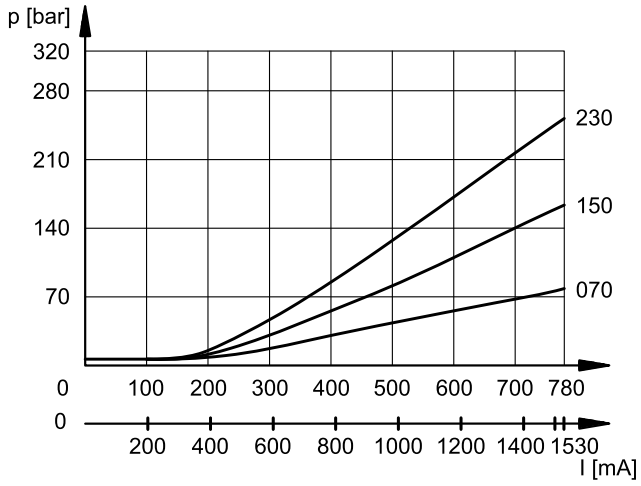
Coil electrical connection:
K1 = plug for connector type EN 175301-803 (ex DIN 43650) (**standard**)
K2 = plug for connector type AMP JUNIOR
K7 = plug for connector type DEUTSCH DT04-2P male

Option: manual override (see point 9)

2 - CHARACTERISTIC CURVES

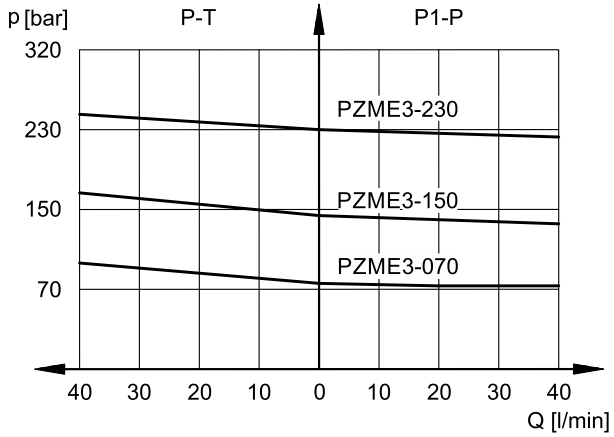
(measured with viscosity 36 cSt at 50 °C)

PRESSURE CONTROL p = f (I)



The curves have been obtained with working lines closed (without flow).

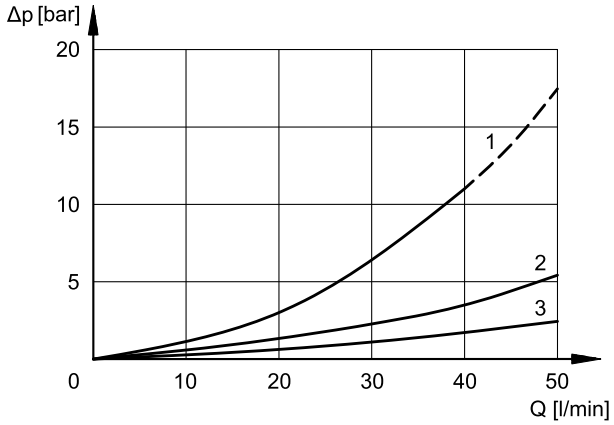
PRESSURE VARIATION p = f(Q)



The curves have been obtained with inlet pressure 50 bar greater than nominal pressure.

Pressure values in P1 greater than 50 bar reduce flow values considerably.

PRESSURE DROP Δp = f(Q)



1. pressure drops P1→ P
2. pressure drop in passing lines (ex. A ↔ A1)
3. pressure drops T 1→T

3 - MAX PRESSURE VALUES

This valve incorporates a mechanical limit of the maximum pressure, that operates independently of the applied current. This kind of design ensures that the pressure cannot rise over even if the solenoid current exceeds the maximum current ($I > I_{max}$).

Values obtained with oil viscosity of 36 cSt at 50°C. Values obtained with working lines closed (without flow).

		PZME3-070	PZME3-150	PZME3-230
pressure value at 780 mA	bar	75	155	240
max pressure value when $I > I_{max}$	bar	95	185	260

4 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals.

For fluids HFDR type (phosphate esters) use FPM seals (code V).

For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

5 - ELECTRICAL CHARACTERISTICS

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube and is secured by means of a lock nut. It can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20°C)	Ω	4.98	21
NOMINAL CURRENT	A	1.53	0.78
DUTY CYCLE		100%	
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2014/30/EU		
CLASS OF PROTECTION Coil insulation (VDE 0580) Impregnation	class H class F		

Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree correctly connected and installed.

electric connection	electric connection protection	whole valve protection
K1	IP65	IP65
K2	IP65	
K7	IP65/67	

6 - STEP RESPONSE

(obtained with mineral oil with viscosity of 36 cSt at 50 °C and electronic control card)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

The table illustrates typical step response times measured with input flow rate of Q = 25 l/min.

REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms]	60	60

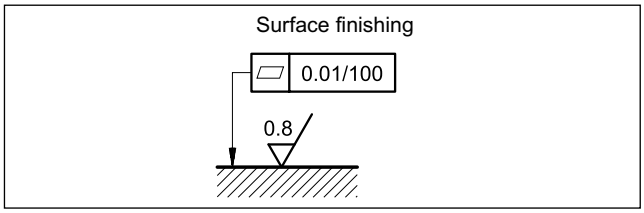
7 - INSTALLATION

These valves can be installed in any position without impairing correct operation if it is ensured that there is no air in the hydraulic circuit. Otherwise, vertical mounting with solenoid downward is preferable. In this case you must consider possible variations of the minimum controlled pressure values reported in point 2. Connect the valve T port directly to the reservoir.

Add any return pressure value detected in the T line to the reduced pressure value.

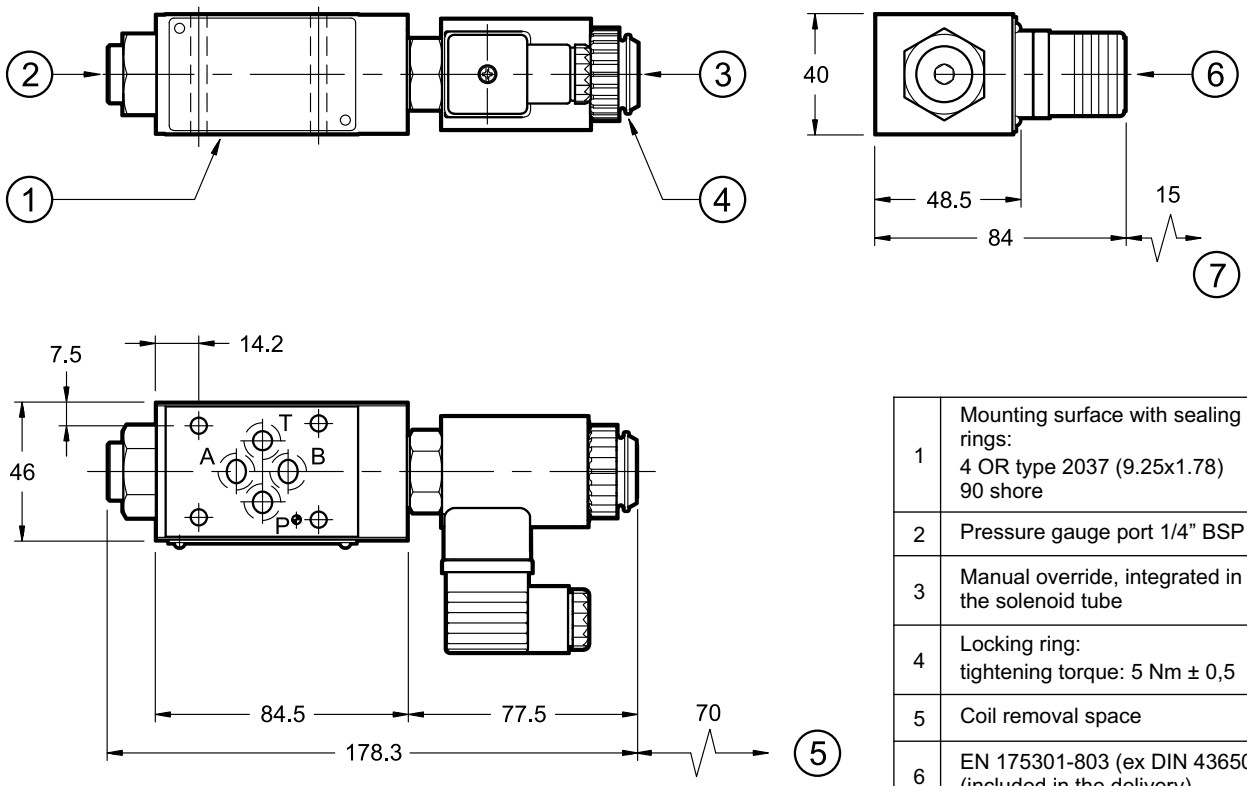
NOTE: Occurring return pressures are to be added up to the value of pressure setting at T port.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed fluid can easily leak between the valve and support surface.



8 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) 90 shore
2	Pressure gauge port 1/4” BSP
3	Manual override, integrated in the solenoid tube
4	Locking ring: tightening torque: 5 Nm ± 0,5
5	Coil removal space
6	EN 175301-803 (ex DIN 43650) (included in the delivery)
7	Connector removal space

NOTE: Refer to catalog 81 101 for the dimensions of the K2 and K7 type electrical connections

9 - MANUAL OVERRIDE

These valves have solenoids whose pin for manual operation is integrated in the tube. Actuate this override by pushing it with a suitable tool, minding not to damage the sliding surface. Two different manual override versions are available upon request: **CM** version, manual override boot protected, and **CK1** version, knob to screw.

For more information about these manual overrides, see the catalogue 81 101.

10 - ELECTRONIC CONTROL UNITS

EDM-M102	24V DC solenoids	rail mounting DIN EN 50022	see cat. 89 251
EDM-M163	12V DC solenoids		

DUPLOMATIC MOTION SOLUTIONS

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ZDE3

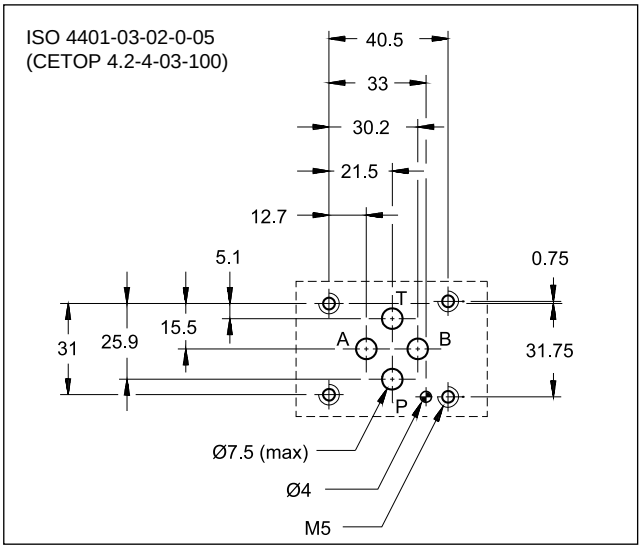
DIRECT OPERATED PRESSURE REDUCING VALVE WITH ELECTRIC PROPORTIONAL CONTROL

SERIES 30

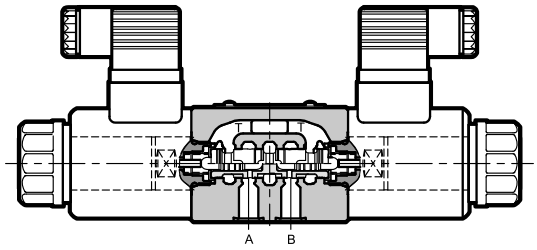
SUBPLATE MOUNTING ISO 4401-03

p max **100** bar
Q max **15** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



— ZDE3 valves are direct operated pressure reducing valves with electric proportional control, with mounting interface in compliance with ISO 4401 standards.

— These valves are used to reduce pressure in the secondary circuit branches thus ensuring stability of controlled pressure in the event of variations of the flow rate through the valve.

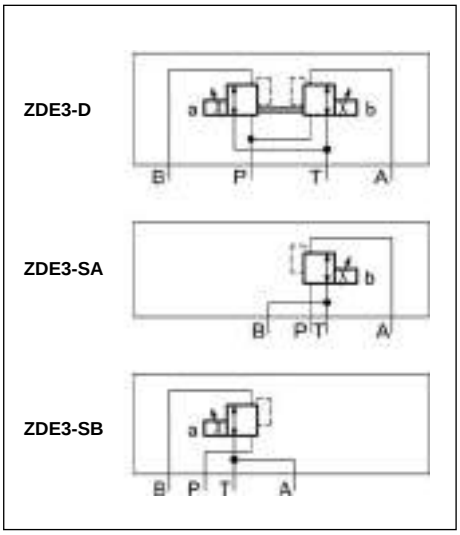
— The valves can be actuated by a current control supply unitor by an external electronic card, to maximize the valve performances (see p. 11).

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Pressure allowed on P port	bar	30 ÷ 100
Pressure allowed on T port (see p. 3)	bar	0 ÷ 30
Controlled pressure	bar	23
Minimum controlled pressure	see Δp-Q diagram	
Maximum flow	l/min	15
Step response	see point 4	
Hysteresis (with PWM 200 Hz)	% of p nom	< 4%
Repeatability	% of p nom	< ±1%
Electrical characteristic	see point 3	
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass: single solenoid valve double solenoid valve	kg	1,6 2

HYDRAULIC SYMBOLS



1 - IDENTIFICATION CODE

Z	D	E	3	-		/	30		-			/		

Pressure reducing valve

Electric proportional control

Size ISO 4401-03

Solenoids:
D = pressure reduction in A and B ports
SA = pressure reduction in A port (solenoid on side B)
SB = pressure reduction in B port (solenoid on side A)

Series No.
(from 30 to 39 sizes and mounting dimensions remain unchanged)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Coil electrical connection:
(see point 5)
K1 = plug for connector type
EN 175301-803 (ex DIN 43650) (**standard**)
K7 = plug for connector type
DEUTSCH DT04-2P male

D12 = Nominal solenoid voltage 12V DC
D24 = Nominal solenoid voltage 24V DC

Manual override (see p. 7)

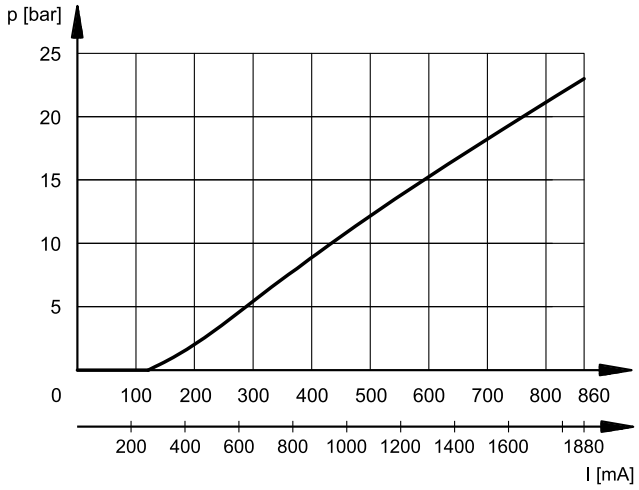
Option:
/ W7 = Zinc-nickel surface treatment (see **NOTE**)
Omit if not required

NOTE: The standard valve is supplied with surface treatment of phosphating black.
The zinc-nickel finishing makes the valve suitable to ensure a salt spray resistance up to 240 hours. For a salt spray resistance up to **600** hours refer to **paragraph 8**.
(test operated according to EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

2 - CHARACTERISTIC CURVES

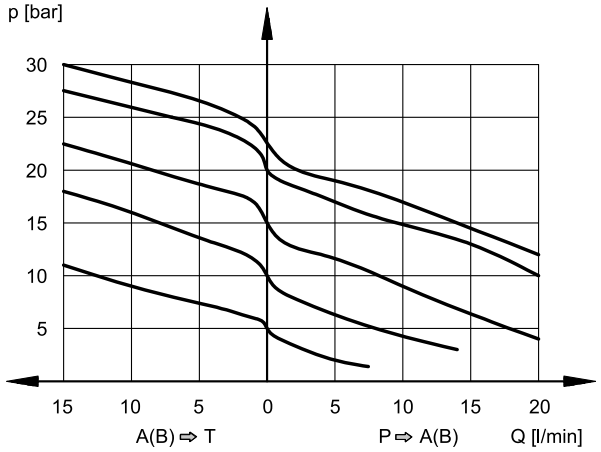
(values obtained with a ZDE3-D/30N-D24K1 PWM 100 Hz and oil with viscosity 36 cSt at 50°C)

PRESSURE CONTROL p = f (I)



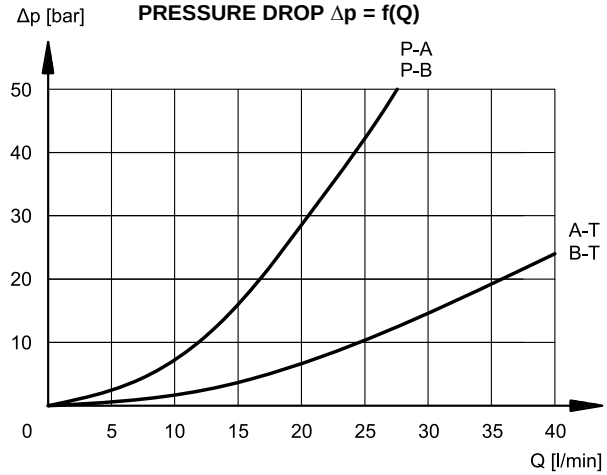
Pressure regulation is 0.5 bar lower in versions SA and SB

PRESSURE VARIATION p = f(Q)



Curves have been obtained with inlet pressure 100 bar.

PRESSURE DROP Δp = f(Q)



3 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut and can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20°C) K1 coil K7, WK1, WK7 coil	Ω	 3.66 4.4	 17.6 18.6
NOMINAL CURRENT	A	1.88	0.86
DUTY CYCLE		100%	
PWM FREQUENCY	Hz	200	100
ELECTROMAGNETIC COMPATIBILITY (EMC)		According to 2014/30/EU	
CLASS OF PROTECTION : Coil insulation (VDE 0580) Impregnation		 class H class F	

Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree correctly connected and installed.

electric connection	electric connection protection	whole valve protection
K1	IP65	IP65
K7	IP65/67	

4 - STEP RESPONSE

(with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

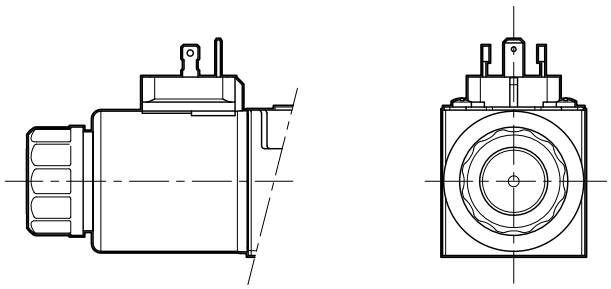
The table illustrates typical step response times measured with input flow rate of Q = 5 l/min and p = 50 bar.

REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms]	30	30

5 - ELECTRIC CONNECTIONS

Connectors for standard K1 connection are always supplied with the valve.

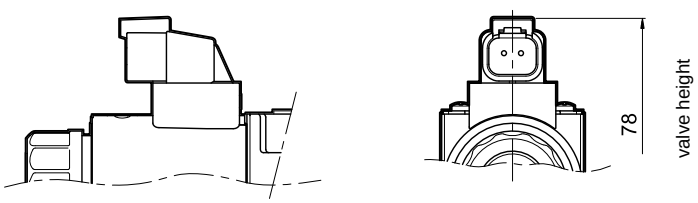
connection for EN 175301-803
(ex DIN 43650) connector
code **K1** (**standard**)
code **WK1** (W7 version only)



connection for
DEUTSCH DT06-2S male connector
code **K7**



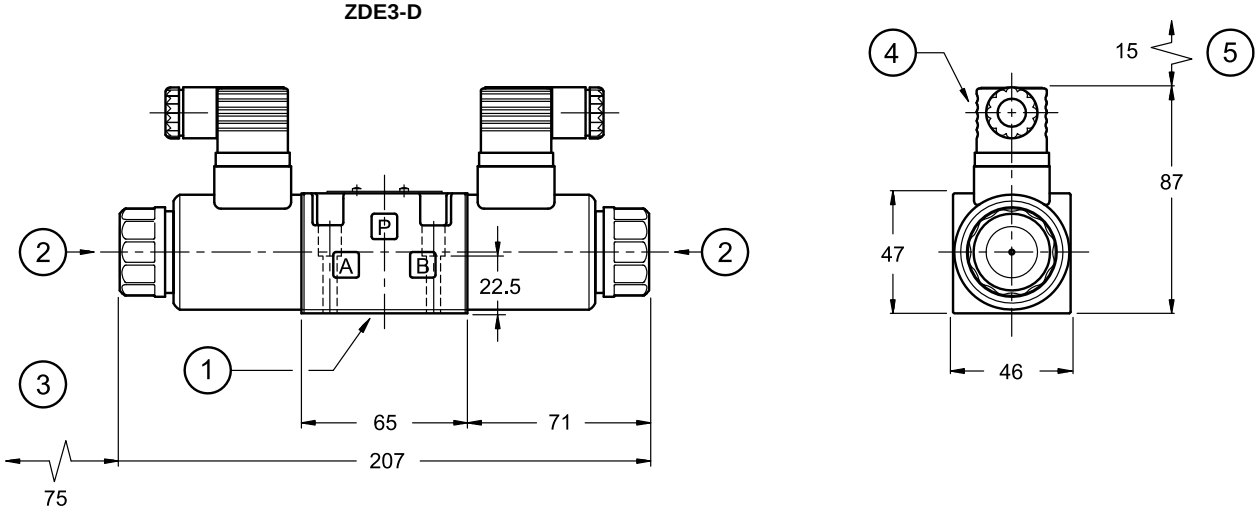
connection for
DEUTSCH DT06-2S male connector
code **WK7** (W7 version only)

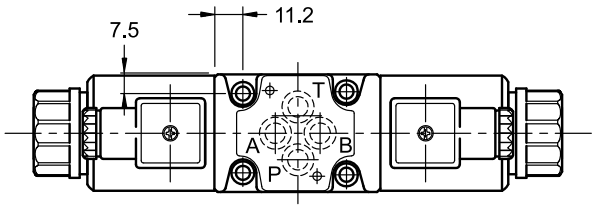


6 - OVERALL AND MOUNTING DIMENSIONS

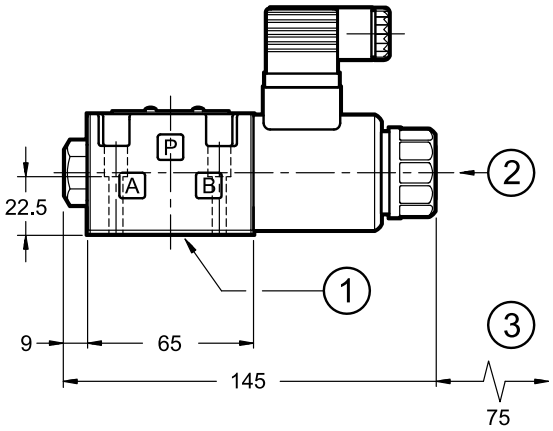
dimensions in mm

ZDE3-D

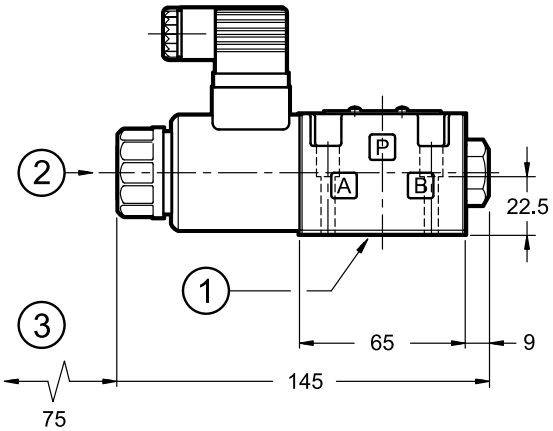




ZDE3-SA



ZDE3-SB



1	Mounting surface with sealing rings: 4 OR type 2037 - 90 shore (9.25x1.78)
2	Locking ring with boot protected manual override
3	Coil removal space
4	EN 175301-803 (ex DIN 43650) electrical connector
5	Connector removal space

Fastening bolts: 4 bolts M5x30 - ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

7 - MANUAL OVERRIDE

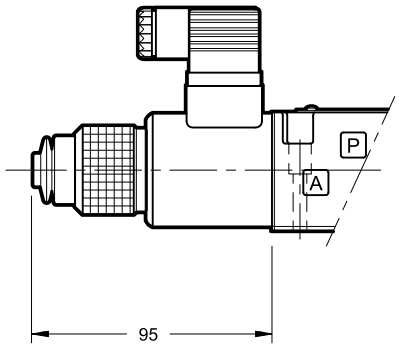
The standard valve has solenoids whose pin for the manual operation is integrated in the tube. The operation of this control must be executed with a suitable tool, minding not to damage the sliding surface.

Two different manual override version are available upon request:

- **CM** version, manual override belt protected
- **CS** version, screw override with metal ring nut, provided with a M4 screw and a blocking locknut to allow the continuous mechanical operation.

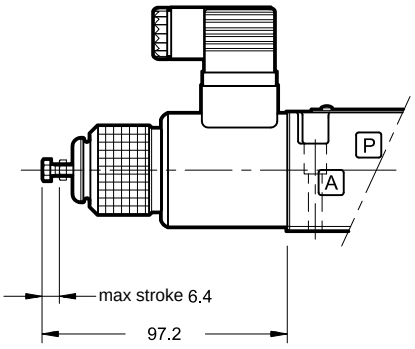
NOTE: The manual override use doesn't allow any proportional regulation; indeed using this kind of override, the main stage spool will open completely and the whole inlet pressure will pass through A or B line.

CM Version



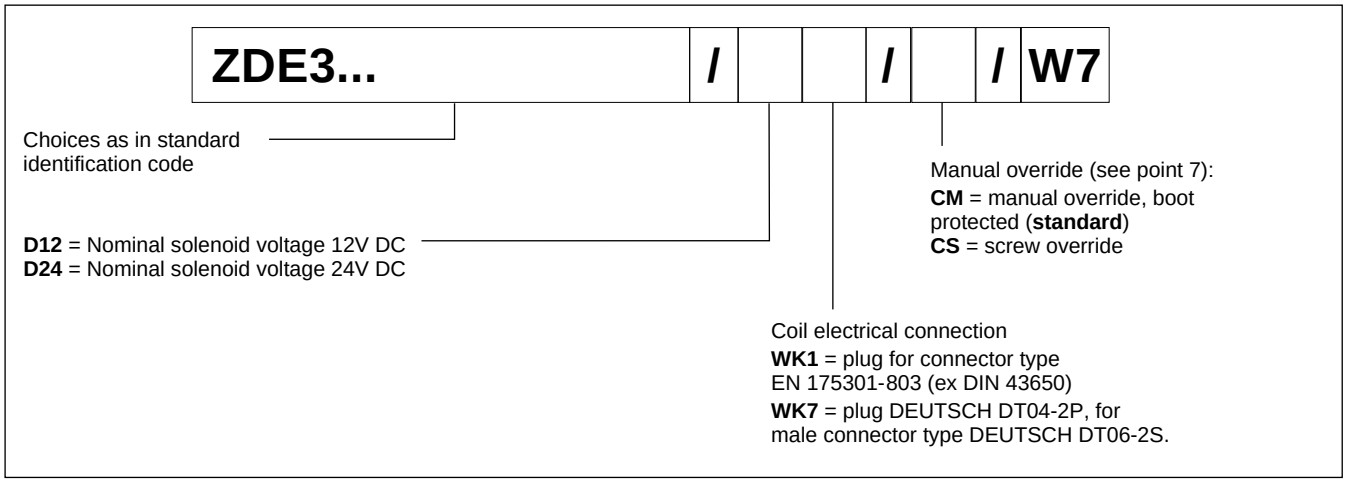
Code: 3803210003

CS Version



Code: 3803210004

8 - HIGH IP AND CORROSION RESISTANCE VERSION



8.1 - Corrosion resistance

This version features the zinc-nickel coating on all exposed metal parts of the valve, making it resistant to exposure to the salt spray for **600** hours (test performed according to UNI EN ISO 9227 and assessment test performed according to UNI EN ISO 10289).

The boot protected manual override is fitted as standard in order to protect the solenoid tube. See the dimensions of the CM manual override in point 7.

8.2 - Coils

The coils feature a zinc-nickel surface treatment. The electrical characteristics do not change compared to the standard version: see table in point 3.

8.3 - Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree correctly connected and installed.

electric connection	electric connection protection	whole valve protection
WK1 EN 175301-803 (ex DIN 43650)	IP66	IP66
WK7 DEUTSCH DT04 male	IP66/IP68/IP69 IP69K*	IP66/IP68/IP69 IP69K*

(*****) The IP69K protection degree is not taken into account in IEC 60529 but it is included in ISO 20653.

NOTE: As regards the liquid ingress protection (second digit), there are three means of protection.

Codes from 1 to 6 are related to water jets.

Rates 7 and 8 are related to immersion.

Rate 9 is reserved for high pressure and temperature water jets.

This means that IPX6 covers all the lower steps, rate IPX8 covers IPX7 but not IPX6 and lower, instead IPX9 does not cover any of them.

Whether a device meets two types of protection requirements it must be indicated by listing both the tests separated by a slash.

(E.g. a marking of an equipment covered both by temporary immersion and water jets is IP66/IP68).

9 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

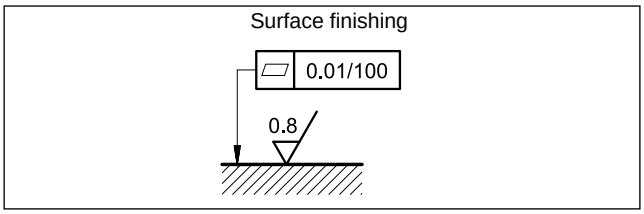
10 - INSTALLATION

The ZDE3 valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed fluid can easily leak between the valve and support surface.

Connect the valve T port directly to the tank. Add any backpressure value detected in the T line to the reduced pressure value.



Maximum admissible backpressure in the T line, under operational conditions, is 30 bar.

11 - ELECTRONIC CONTROL UNITS

ZDE3-SA* ZDE3-SB*

EDC-111	for solenoid 24V DC	plug version	see cat. 89 120
EDC-142	for solenoid 12V DC		
EDM-M111	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 252
EDM-M142	for solenoid 12V DC		

ZDE3-D*

EDM-M211	for solenoid 24V DC	rail mounting DIN EN 50022	see cat. 89 252
EDM-M242	for solenoid 12V DC		

12 - SUBPLATES

(see catalogue 51 000)

Type PMMD-AI3G ports on rear
Type PMMD-AL3G side ports
P, T, A, B port threading: 3/8” BSP

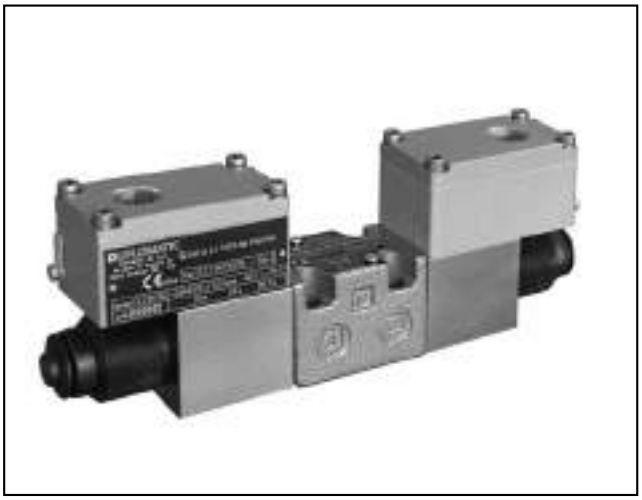
DUPLOMATIC
MOTION SOLUTIONS
a member of DAIKIN group

DUPLOMATIC MS Spa
via Mario Re Depaolini, 24 | 20015 Parabiago (MI) | Italy
T +39 0331 895111 | E vendite.ita@duplomatic.com | sales.exp@duplomatic.com
duplomaticmotionsolutions.com

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ZDE3K*

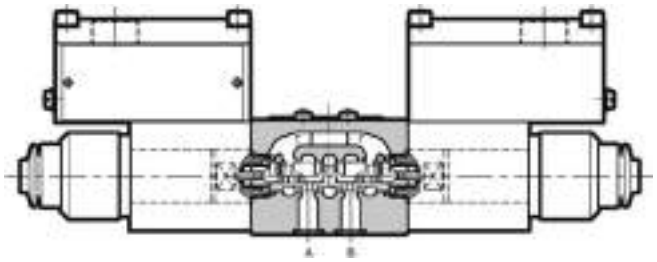
EXPLOSION-PROOF PRESSURE REDUCING VALVES ATEX, IECEx, PESO

SERIES 10

SUBPLATE MOUNTING ISO 4401-03

p max **100** bar
Q max **15** l/min

OPERATING PRINCIPLE



— ZDE3K* are direct operated pressure reducing valves, with electric proportional control, with ISO 4401-03 mounting surface.

— They are compliant with ATEX, IECEx or PESO requirements and are suitable for use in potentially explosive atmospheres, for surface plants or mines.

— A low temperature version (up to -40 °C) is also available.

— The valves are used to reduce pressure in the secondary circuit branches thus ensuring stability of controlled pressure in the event of variations of the flow rate through the valve.

— ZDE3K* valves are supplied with a finishing surface treatment (zinc-nickel) suitable to ensure a salt spray resistance up to 600 hours.

— Details for classification, operating temperatures and electrical characteristics are in the technical data sheet 02 500 'Explosion proof classification'.

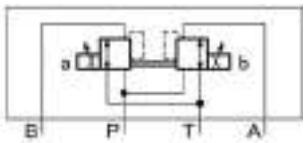
PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

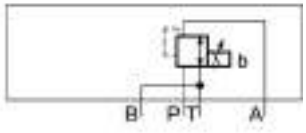
Pressure allowed in P port	bar	30 ÷ 100
Pressure allowed in T port (see p. 2)	bar	0 ÷ 30
Controlled pressure	bar	23
Maximum flow	l/min	15
Step response	ms	30
Hysteresis (with PWM 200 Hz)	% of p nom	< 4%
Repeatability	% of p nom	< ±1%
Electrical characteristic	see point 4	
Operating temperatures (ambient and fluid)	see data sheet 02 500	
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass: single solenoid valve double solenoid valve	kg	1,9 2,8

HYDRAULIC SYMBOLS

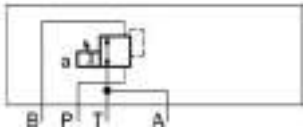
ZDE3K*-D



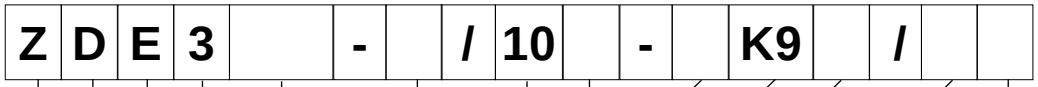
ZDE3K*-SA



ZDE3K*-SB



1 - IDENTIFICATION CODE



Pressure reducing valve

Electric proportional control

Size ISO 4401-03

Explosion-proof certification:
See table 1.1

Solenoids:
D = pressure reduction in A and B ports
SA = pressure reduction in A port (solenoid on side B)
SB = pressure reduction in B port (solenoid on side A)

Series No.
(from 30 to 39 sizes and mounting dimensions remain unchanged)

Seals:
For temperature range -20 / +80 °C
N = NBR seals for mineral oil (standard)
V = FPM seals for special fluids
For temperature range -40 / +80 °C
NL = seal for low temperatures (for mineral oil)

Nominal solenoid voltage
D12 = 12 V DC
D24 = 24 V DC

Coil electrical connection: junction box

Connection type for cable gland
upper connection:
T01 = M20x1.5 - ISO 261
T02 = Gk 1/2 - UNI EN 10226-2
T03 = 1/2" NPT - ANSI B1.20.1 (ex ANSI B2.1)
side connection:
S01 = M20x1.5 - ISO 261
S02 = Gk 1/2 - UNI EN 10226-2
S03 = 1/2" NPT - ANSI B1.20.1 (ex ANSI B2.1)
S04 = M16x1.5 - ISO 261

Manual override:
CM = boot protected
standard for both N and V seals
not available for NL seals
CB = blind ring nut
standard for NL seals
available upon request for both N and V seals
see point 8

Option: **/T5**
version in T5 temperature class.
Omit if not required.

NOTE: Valves are supplied with zinc-nickel surface treatment, that is suitable to ensure a salt spray resistance up to 600 h (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

Version with monobloc steel coil

Standard coils are made of zinc-nickel steel, with anodized aluminium junction box on it.

Monobloc coils **MD24K9S01** completely made of steel are available upon request. They have zinc-nickel treatment, power supply voltage D24 and cable gland connection type S01. Other variants for voltage and cable gland connection are available, always on request.

1.1 - Names of valves per certification

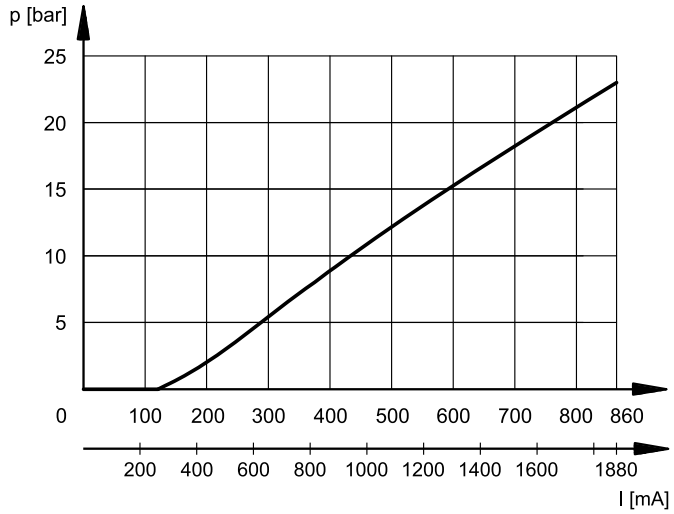
	ATEX		IECEx		PESO	
for gases for dusts	**KD2**	II 2GD	**KXD2**	IECEx Gb IECEx Db	**KPD2**	PESO Gb not applicable for dust
for mines	**KDM2**	I M2	**KXDM2**	IECEx Mb	not applicable for mines	

NOTE: Refer to the technical data sheet 02 500 for marking, operating temperatures and available versions.

2 - CHARACTERISTIC CURVES

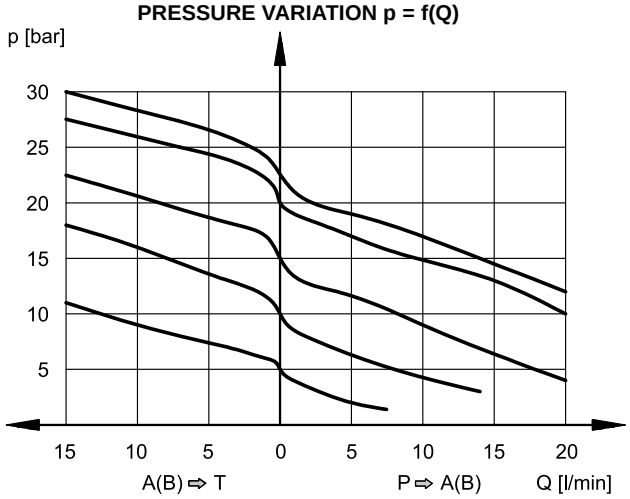
(obtained with ZDE3K*-D/10N-D24K9T01/CM with PWM 100Hz and oil with viscosity 36 cSt at 50°C)

PRESSURE CONTROL p=f (I)



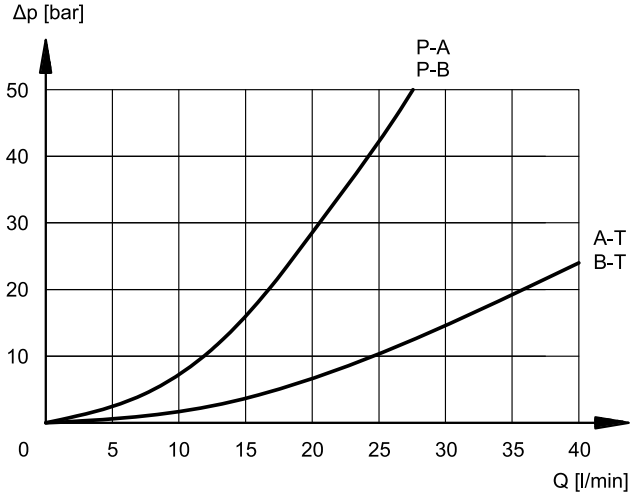
SA and SB versions pressure regulation is less than 0.5 bar.

PRESSURE VARIATION p = f(Q)



The curves have been obtained with inlet pressure 100 bar.

PRESSURE DROP Δp = f(Q)



3 - STEP RESPONSE

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

The table illustrates typical step response times measured with input flow rate of Q = 5 l/min and p = 50 bar.

REFERENCE SIGNAL STEP	0 → 100%	100% → 0
response time [ms]	30	30

4 - ELECTRICAL CHARACTERISTICS

(values ± 5%)

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20°C)	Ω	3.8	15.6
NOMINAL CURRENT	A	1.88	0.86
PWM FREQUENCY	Hz	200	100

DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2014/30/EU
CLASS OF PROTECTION Atmospheric agents Coil insulation (VDE 0580)	IP66/IP68 class H

4.1 - Wiring

In order to realise the electrical connection of the coil, it is necessary to access the terminal block (1) unscrewing the 4 screws (2) that fasten the cover (3) with the box (4) that contains the terminal block.

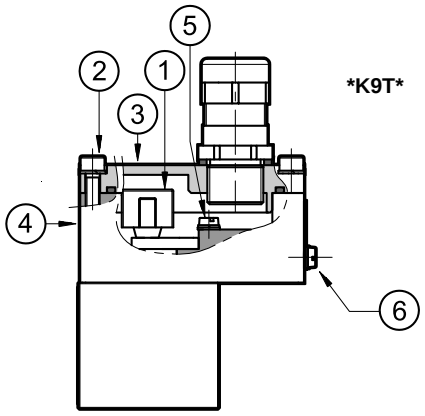
The electrical connection is polarity-independent.

By doing electrical connection it is important to connect also the grounding point (5) in the terminal block box (M4 screws), through suitable conductors with the general grounding line of the system.

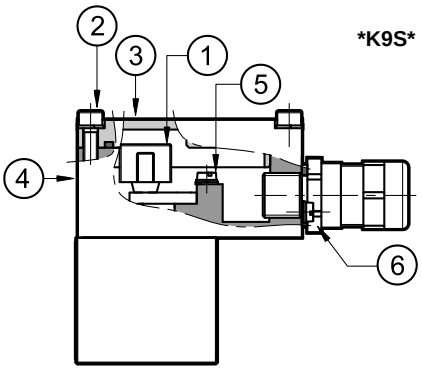
On the external body of the coil there is a grounding point (6) (M4 screw) that allow to ensure equipotentiality between the valve and the general grounding line of the system; connecting this point the regulation of the EN 13463-1 standard, that impose to verify the equipotentiality of the elements included in a potentially explosive environment (the maximum resistance between the elements must be 100 Ω), is guaranteed.

At the end of the electrical wiring, it is necessary to reassemble the cover (3) on the box (4), checking the correct positioning of the seal located in the cover seat and fastening the 4 M5 screws with a torque of 4.9÷6 Nm.

Electrical wiring must be done following in compliance with standards about protection against explosion hazards.



K9T



K9S

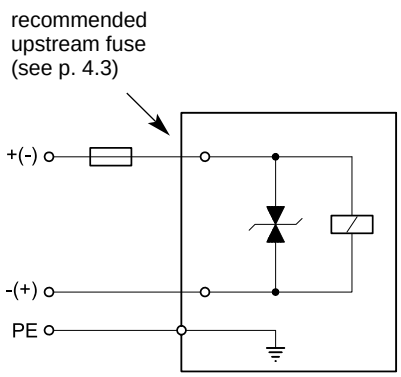
Characteristics of the cables connectable for wiring are indicated in the table below:

Function	Cable section
Operating voltage cables connection	max 2.5 mm²
Connection for internal grounding point	max 2.5 mm²
Connection for external equipotential grounding point	max 6 mm²

Cables for wiring must be non-armoured cables, with external covering sheath and must be suitable for use in environments with temperatures from - 20 °C to +110 °C (for valves either with N or V seals) or from - 40 °C to +110 °C (for valves with NL seals).

Cable glands (which must be ordered separately, see point 9) allow to use cables with external diameter between 8 and 10 mm.

4.2 - Electrical diagram



4.3 - Overcurrent fuse and switch-off voltage peak

Upstream of each valve, an appropriate fuse (max 3 x In according to IEC 60127) or a protective motor switch with short-circuit and thermal instantaneous tripping, as short-circuit protection, must be connected. The cut-off power of the fuse must correspond or exceed the short circuit current of the supply source. The breaking capacity of the fuse link shall be the same as or higher than the maximum short-circuit current expected to occur at the place of installation (normally 1500 A).

The fuse or the protective motor must be placed outside the dangerous area or they must be protected with an explosion-proof covering.

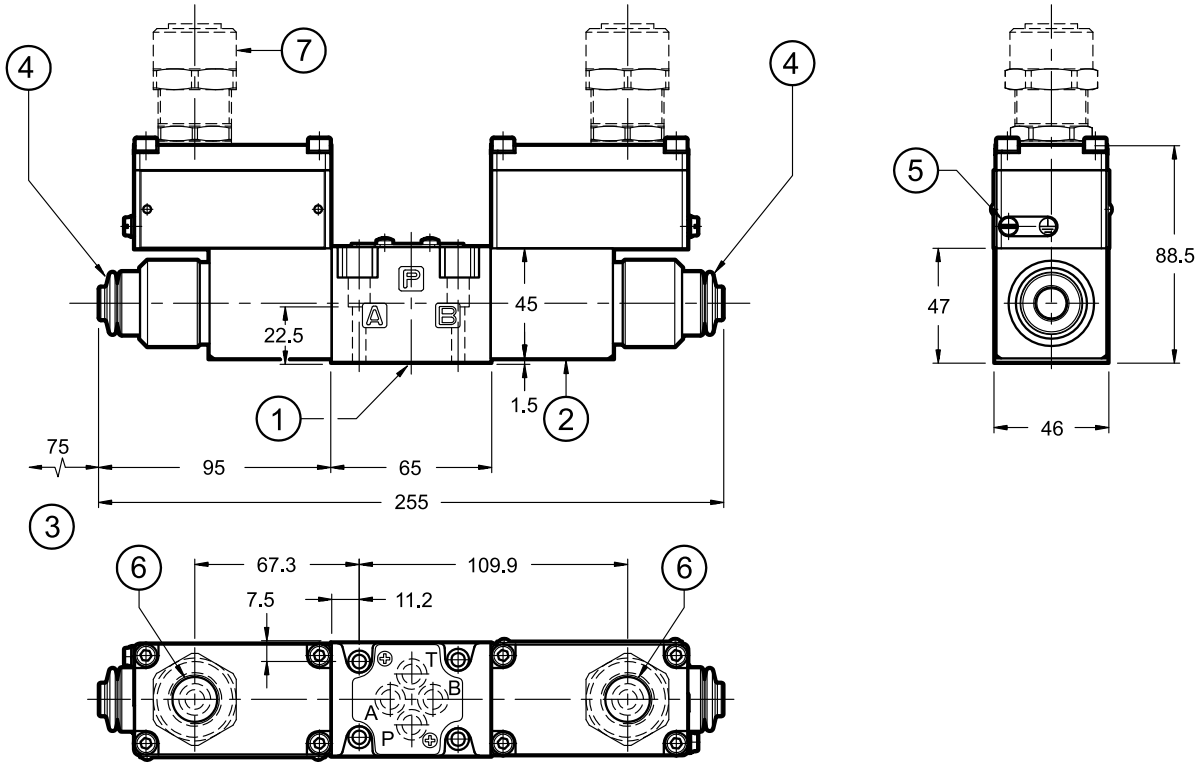
In order to safeguard the electronic device to which the valve is connected, there is a protection circuit in the coil, that reduces voltage peaks, which can occur when inductances are switched off.

The table shows the type of fuse recommended according to the nominal voltage of the valve and to the value of the voltage peaks reduction.

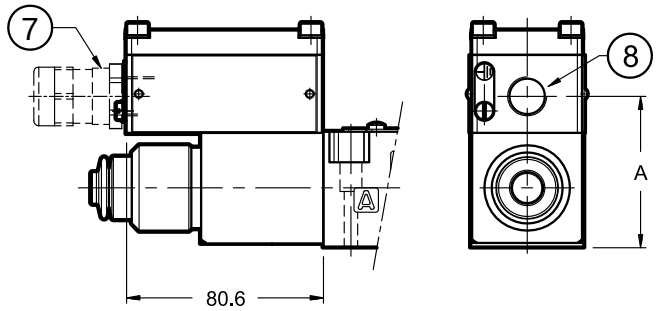
Coil type	Nominal voltage [V]	Rated current [A]	**Recommended pre-fuse characteristics medium time-lag according to DIN 41571 [A]**	Maximum voltage value upon switch off [V]	Suppressor circuit
D12	12	1,88	2,5	- 49	Transient voltage suppressor bidirectional
D24	24	0,86	1,25	- 49	

5 - OVERALL AND MOUNTING DIMENSIONS

ZDE3K*- D/10*-*K9T*/CM dimensions in mm

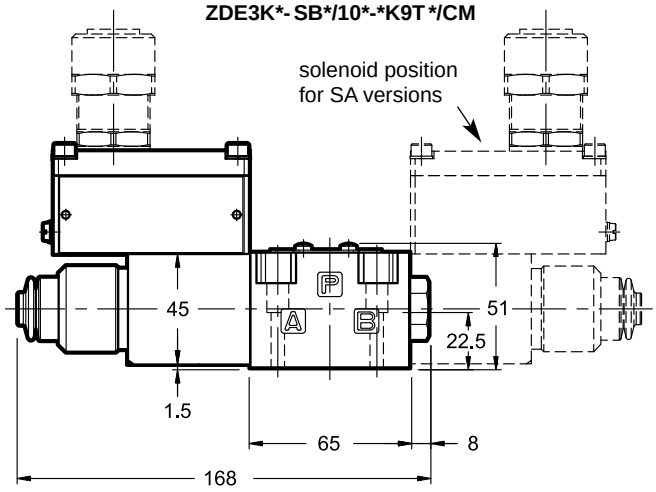


ZDE3K*-*/10*-*K9S*/CM



Side port type	A
S01, S04	60.5
S02, S03	60

ZDE3K*- SB*/10*-*K9T*/CM



Fastening of single valve: 4 SHC screws ISO 4762 M5x30
Tightening torque: 5 Nm (A8.8 screws)
Threads of mounting holes: M5x10

1	Mounting surface with sealing rings 4 OR type 2037 (9.25x1.78) - 90 Shore
2	Explosion-proof coil
3	Minimum clear space required
4	Manual override, boot protected (**standard for both N and V seals**) for blind ring nut dimensions (standard with NL seals) see p. 8
5	Terminal for supplementary GND connection
6	Upper port for cable gland
7	Cable gland To be ordered separately, see p. 9
8	Side port for cable gland

6 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

7 - INSTALLATION

Installation must adheres to instruction reported in the *Use and Maintenance manual*, always attached to the valve. Unauthorized interventions can be harmful to people and goods because of the explosion hazards present in potentially explosive atmospheres.

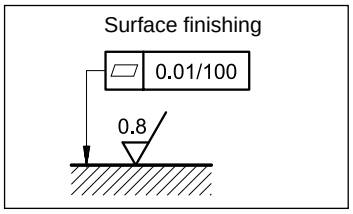
The valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

Connect the valve T port directly to the tank. Add any backpressure value detected in the T line to the reduced pressure value.

In the T line the maximum admissible backpressure is 30 bar, under operational conditions.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed fluid can easily leaks between the valve and support surface.



8 - MANUAL OVERRIDE CB

CB - Blind ring nut

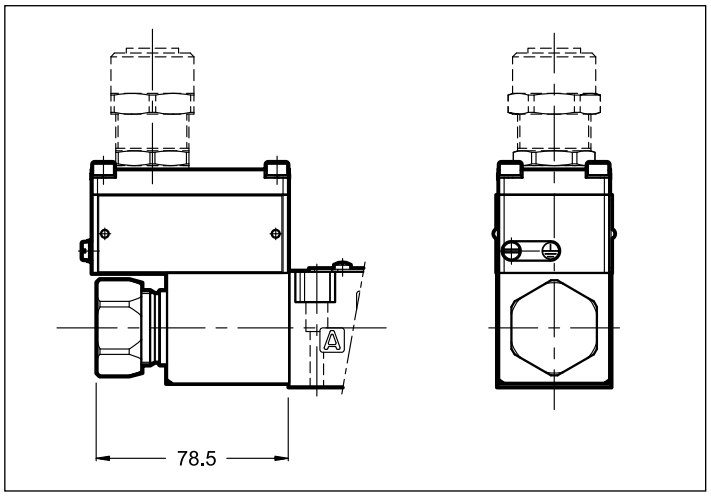
The metal ring nut protects the solenoid tube from atmospheric agents and isolates the manual override from accidental operations. The ring nut is tightened on a threaded fastener that keeps the coil in its position even without the ring nut.

To access the manual override loose the ring nut and remove it; then reassemble hand tightening, until it stops.

Activate the manual override always and only with non-sparking tools suitable for use in potentially explosive atmospheres.

More information on safe use of explosion-proof components are provided in the instruction manual, always supplied with the valve.

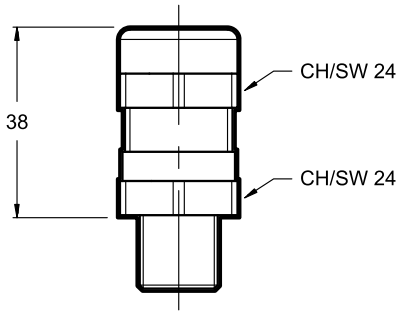
CAUTION!: The manual override doesn't allow any proportional regulation; indeed using this kind of override, the spool opens the path completely and the whole inlet pressure will pass through A or B line.



9 - CABLE GLANDS

Cable glands must be ordered separately; Duplomatic offers some types of cable glands with the following features:

- version for non-armoured cable, external seal on the cable (suitable for Ø 8 ÷ 10 mm cables);
- ATEX II 2GD, I M2; IECEx Gb, Db, Mb
- cable gland material: nickel brass
- inner rubber tip material: silicone
- ambient temperature range: -65 ºC ÷ +220 ºC
- protection degree: IP66/IP68



To order the desired cable glands, specify description, code and quantity.

Description: CGK2/NB-01/10

Code: 3908108001

M20x1.5 - ISO 261 male thread, suitable for coils with T01 and S01 connections. It is supplied equipped with copper washer, that must be assembled between the cable gland and the coil, so as to ensure IP66/IP68 protection degree.

Tightening torque: 45 ÷ 50 Nm

Description: CGK2/NB-02/10

Code: 3908108002

Gk 1/2 - UNI EN 10226-2 male thread, suitable for coils with T02 and S02 connections. The customer must apply LOCTITE® 243™ threadlocker or similar between the cable gland connection thread and the coil in order to ensure IP66/IP68 protection degree.

Tightening torque: 20 ÷ 25 Nm

Description: CGK2/NB-03/10

Code: 3908108003

1/2” NPT - ANSI B1.20.1 (ex ANSI B2.1), suitable for coils with T03 and S03 connections. The customer must apply LOCTITE® 243™ threadlocker or similar between the cable gland connection thread and the coil in order to ensure IP66/IP68 protection degree.

Tightening torque: 20 ÷ 25 Nm

Description: CGK2/NB-04/10

Code: 3908108004

M16x1.5 - ISO 261 male thread, suitable for coils with S04 connection. It is supplied equipped with copper washer, that must be assembled between the cable gland and the coil, so as to ensure IP66/IP68 protection degree.

Tightening torque: 45 ÷ 50 Nm

10 - ELECTRONIC CONTROL UNITS

ZDE3K*- SA* ZDE3K*- SB*

EDM-M111	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 251
EDM-M142	for solenoid 12V DC		

ZDE3K*- D*

EDM-M211	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 251
EDM-M242	for solenoid 12V DC		

NOTE: electronic control units offered are not explosion proof certified; therefore, they must be installed outside the classified area.

11 - SUBPLATES

(see catalogue 51 000)

Type PMMD-AI3G with rear ports
Type PMMD-AL3G with side ports
P, T, A, B port threading: 3/8” BSP

NOTE: Subplates (to be ordered separately) contain neither aluminium nor magnesium at a rate higher than the value allowed by norms according to ATEX directive for category II 2GD and I M2.

The user will bear to do the complete assessment of the ignition risk that can occur from the relative use in potentially explosive environments.

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duplomaticmotionsolutions.com

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EXPLOSION-PROOF CLASSIFICATION for

SOLENOID AND PROPORTIONAL VALVES

ref. catalogues:

pressure control valves

RQM*K*-P	**21 515**
P*E*K*	**81 316**
ZDE3K*	**81 515**
DZCE*K*	**81 606**

flow control valves

QDE3K*	**82 225**

directional valves

D*K*	**41 515**
DT3K*	**42 215**
DS(P)E*K*	**83 510**

GENERAL INFO

This informative technical datasheet displays information about **classification and marking** of Duplomatic explosion-proof valves range.

Duplomatic MS offers valves with the following certifications:

ATEX	**II 2G**	**II 2D**	**I M2**
IECEx	**Gb**	**Db**	**Mb**
PESO	**Gb**		

Instructions for use and maintenance can be found in the related manuals, always supplied toghether with valves.

1 - ATEX CLASSIFICATION AND TEMPERATURES

Duplomatic certificates the combination valve-coil for the valves suitable for application and installation in potentially explosive atmospheres, according to ATEX directive; the supply always includes the declaration of conformity to the directive and the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environments.

Coils assembled on these valves have been separately certified according to ATEX directive and so they are suitable for use in potentially explosive atmospheres.

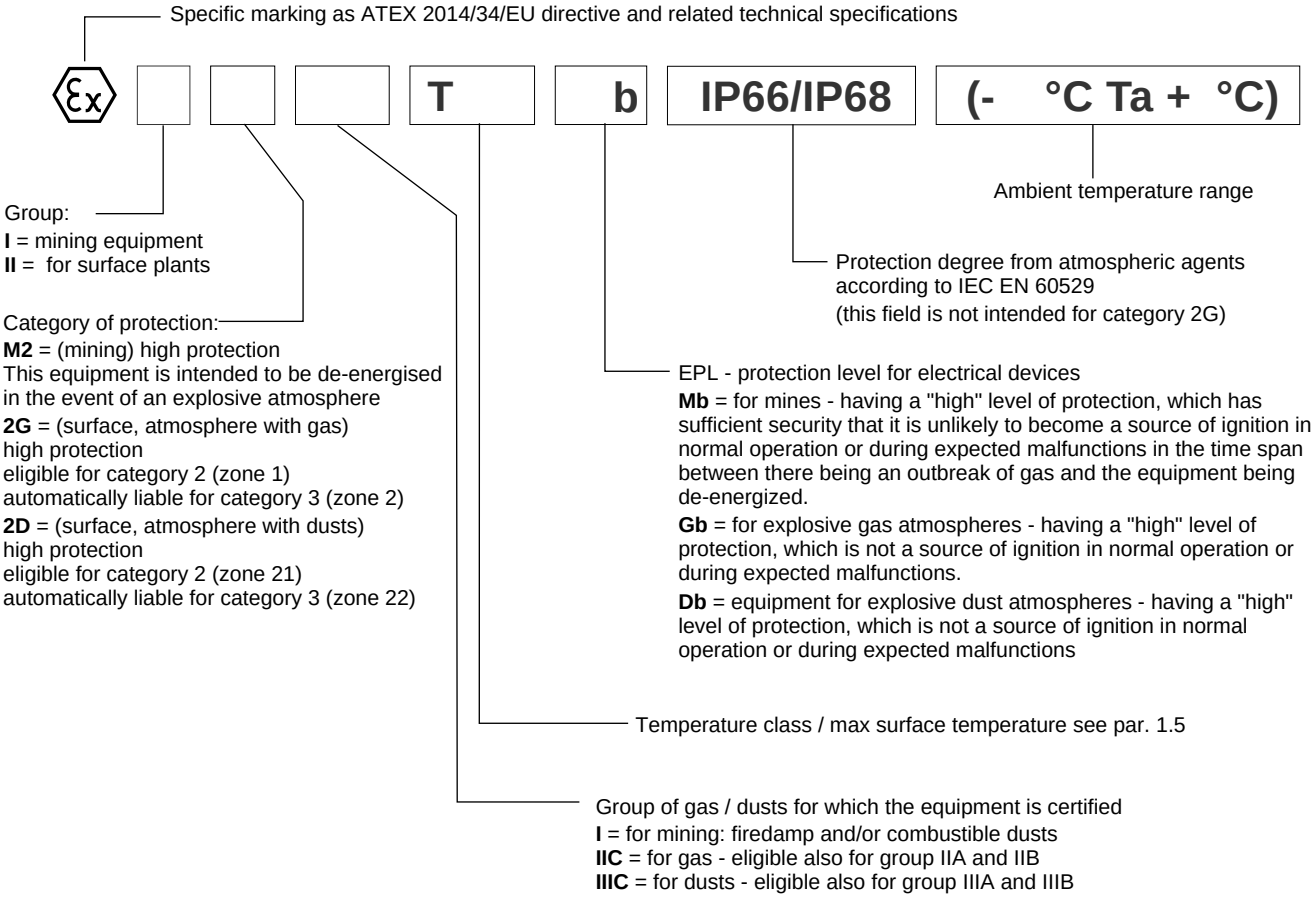
1.1 - ATEX classification for valves

Type examination certificate: AR18ATEX055
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

ATEX II 2G ATEX II 2D	***KD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur occasionally.The means of protection relating to equipment in this category ensure the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account.
ATEX I M2	***KDM2**	equipment intended for use in underground parts of mines as well as those parts of surface installations of such mines likely to be endangered by firedamp and/or combustible dust. This equipment is intended to be de-energised in the event of an explosive atmosphere.

1.2 - ATEX marking for valves

valve code		N and V seals	NL seals
***KD2**	for gas	Ex II 2G IIC T4 Gb (-20°C Ta +80°C)	Ex II 2G IIC T4 Gb (-40°C Ta +80°C)
	for dusts	Ex II 2D IIIC T154°C Db IP66/IP68 (-20°C Ta +80°C)	Ex II 2D IIIC T154°C Db IP66/IP68 (-40°C Ta +80°C)
***KD2 /T5**	for gas	Ex II 2G IIC T5 Gb (-20°C Ta +55°C)	Ex II 2G IIC T5 Gb (-40°C Ta +55°C)
	for dusts	Ex II 2D IIIC T129°C Db IP66/IP68 (-20°C Ta +55°C)	Ex II 2D IIIC T129°C Db IP66/IP68 (-40°C Ta +55°C)
***KDM2**	mining	Ex I M2 I T150°C Mb IP66/68 (-20°C Ta +75°C)	Ex I M2 I T150°C Mb IP66/68 (-40°C Ta +75°C)



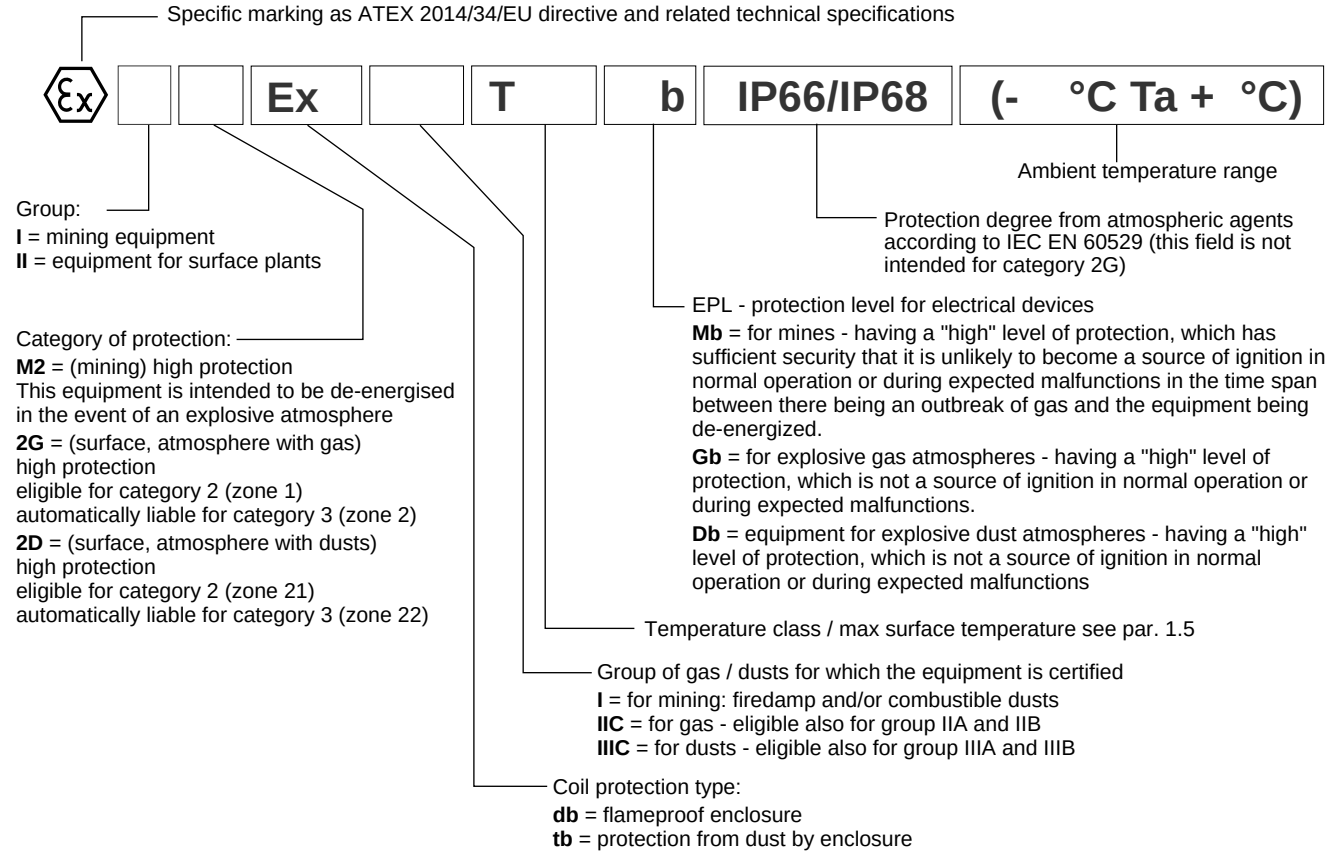
1.3 - ATEX classification of the coils

The coil of the explosion-proof valves is ATEX certified itself and, as such, is identified with its own tag, carries the relative ATEX marking. The mechanical construction of the coil housing is made in order to ensure its resistance to possible internal explosion and to avoid any explosion propagation to the outside environment, matching an “Ex db” type protection (explosion-proof coil).

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

1.4 - ATEX marking on coils

for valve type ***KD2**	for gas	II 2G Ex db IIC T4 Gb (-40°C Ta +80°C)
	for dusts	II 2D Ex tb IIIC T154°C Db IP66/IP68 (-40°C Ta +80°C)
for valve type ***KD2 /T5**	for gas	II 2G Ex db IIC T5 Gb (-40°C Ta +55°C)
	for dusts	II 2D Ex tb IIIC T129°C Db IP66/IP68 (-40°C Ta +55°C)
for valve type ***KDM2**	mining	I M2 Ex db I T150°C Mb IP66/IP68 (-40°C Ta +75°C)



1.5 - Operating temperatures

These valves are classified according to their maximum surface temperature (EN 13463-1), which must be lower than the ignition temperature of the gases, vapors and dusts for which the area in which they will be used is classified.

The valves in group II can also be used for less limiting temperature classes (surface temperature allowed higher).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
ATEX II 2G ATEX II 2D	***KD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas) T154°C (dusts)	T3, T2, T1 T200°C and higher
		of fluid				
	***KD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas) T129°C (dusts)	T4, T3, T2, T1 T135°C and higher
		of fluid	-20 / +60 °C	-40 / +60 °C		
ATEX I M2	***KDM2**	of ambient	-20 / +75 °C	-40 / +75 °C	T150°C	-
		of fluid				

2 - IECEX CLASSIFICATION AND TEMPERATURES

The IECEx certification requires the classification of the electrical equipment only.

Duplomatic supplies valves with IECEx certified coils, suitable for application and installation in potentially explosive atmospheres. The mechanical construction of the coil housing is made in order to ensure its resistance to possible internal explosion and to avoid any explosion propagation to the outside environment, matching an “Ex db” type protection (explosion-proof coil).

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

The supply always includes the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environment.

2.1 - IECEx classification

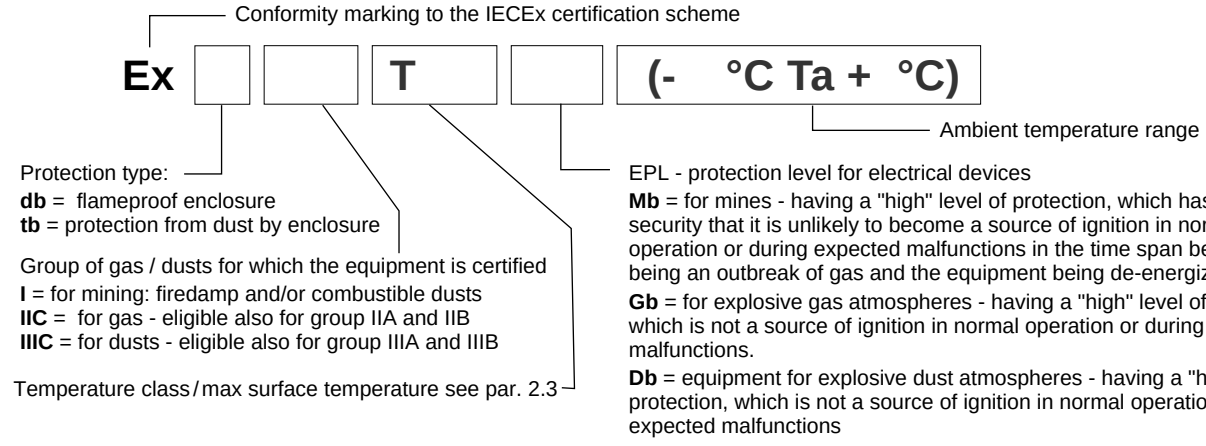
Certificate of conformity (CoC): IECEx TUN 15.0028X
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

IECEx Gb IECEx Db	***KXD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur occasionally.The means of protection relating to equipment in this category ensure the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account.
IECEx Mb	***KXDM2**	equipment intended for use in underground parts of mines as well as those parts of surface installations of such mines likely to be endangered by firedamp and/or combustible dust. This equipment is intended to be de-energised in the event of an explosive atmosphere.

2.2 - IECEx marking

There is a plate with the IECEx mark on each coil.

***KXD2** valves	for gas for dusts	Ex db IIC T4 Gb (-40°C Ta +80°C) Ex tb IIIC T135°C Db (-40°C Ta +80°C)
***KXD2 /T5** valves	for gas for dusts	Ex db IIC T5 Gb (-40°C Ta +55°C) Ex tb IIIC T100°C Db (-40°C Ta +55°C)
***KDM2** valves	mining	Ex db I Mb (-40°C Ta +80°C)



2.3 - Operating temperatures

These valves are classified according to their maximum surface temperature (EN 13463-1), which must be lower than the ignition temperature of the gases, vapors and dusts for which the area in which they will be used is classified.

Valves for surface plants can also be used for less limiting temperature classes (higher surface temperature allowed).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
IECEx Gb IECEx Db	***KXD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas) T135°C (dusts)	T3, T2, T1 T200°C and higher
		of fluid				
	***KXD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas) T100°C (dusts)	T4, T3, T2, T1 T135°C and higher
		of fluid	-20 / +60 °C	-40 / +60 °C		
IECEx Mb	***KXDM2**	of ambient	-20 / +80 °C	-40 / +80 °C	-	-
		of fluid				

2.4 - Protection degree from atmospheric agents (IEC EN 60529)

Protection degree from atmospheric agents according to IEC EN 60529 is IP66/IP68.

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3 - PESO CLASSIFICATION AND TEMPERATURES

The PESO certification requires the classification of the electrical equipment only.

Duplomatic supplies valves with PESO certified coils, suitable for application and installation in potentially explosive atmospheres. The mechanical construction of the coil housing is made in order to ensure its resistance to possible internal explosion and to avoid any explosion propagation to the outside environment, matching an “Ex db” type protection (explosion-proof coil).

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

The supply always includes the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environment.

3.1 - PESO classification

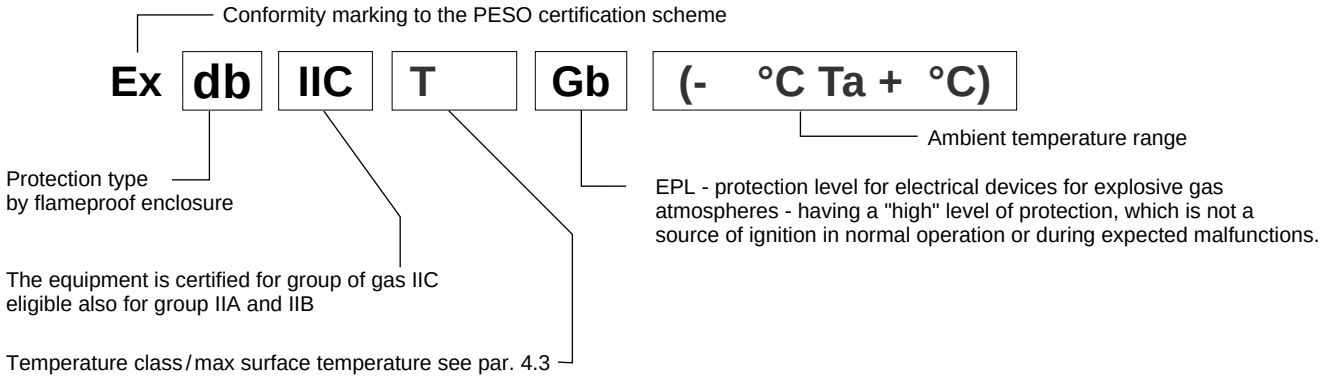
Certificate of conformity: P480801
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

PESO Gb	***KPD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists are likely to occur occasionally.The means of protection relating to equipment in this category ensure the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account.

3.2 - PESO marking

There is a plate with the PESO mark on each coil.

***KPD2** valves	for gas	Ex db IIC T4 Gb (-40°C Ta +80°C)
***KPD2 /T5** valves	for gas	Ex db IIC T5 Gb (-40°C Ta +55°C)



3.3 - Operating temperatures

These valves are classified according to their maximum surface temperature (EN 13463-1), which must be lower than the ignition temperature of the gases, vapors and dusts for which the area in which they will be used is classified.

Valves for surface plants can also be used for less limiting temperature classes (higher surface temperature allowed).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
PESO Gb	***KPD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas)	T3, T2, T1
		of fluid				
	***KPD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas)	T4, T3, T2, T1
		of fluid	-20 / +60 °C	-40 / +60 °C		

3.4 - Protection degree from atmospheric agents (IEC EN 60529)

Protection degree from atmospheric agents according to IEC EN 60529 is IP66/IP68.

DUPLOMATIC MOTION SOLUTIONS
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duplomaticmotionsolutions.com

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ZDE3G*

PROPORTIONAL PRESSURE REDUCING VALVE, DIRECT OPERATED, WITH INTEGRATED ELECTRONICS

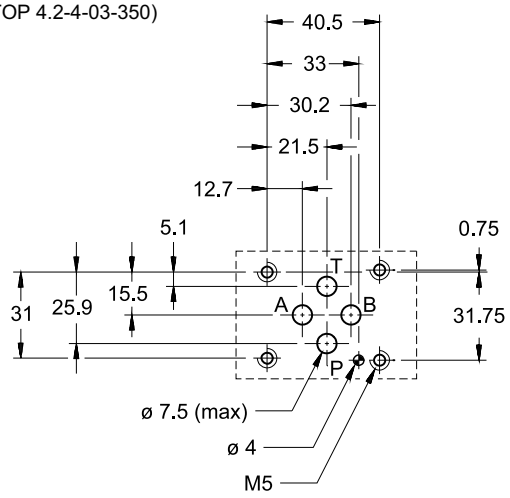
SERIES 32

SUBPLATE MOUNTING ISO 4401-03

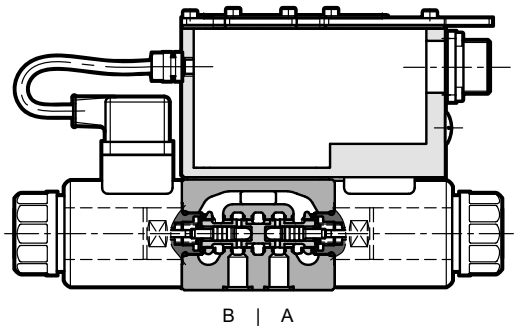
p max **100** bar
Q max **15** l/min

MOUNTING INTERFACE

ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)



OPERATING PRINCIPLE



— The ZDE3G* are direct operated pressure reducing valves with electric proportional control and integrated electronics and with mounting interface in compliance with ISO 4401 standards.

— The valves are used to reduce pressure in the secondary circuit branches thus ensuring stability of controlled pressure in the event of variations of the flow rate through the valve.

— They are available with different types of electronics, with analogue or fieldbus interfaces.

— A solenoid current monitoring signal is available.

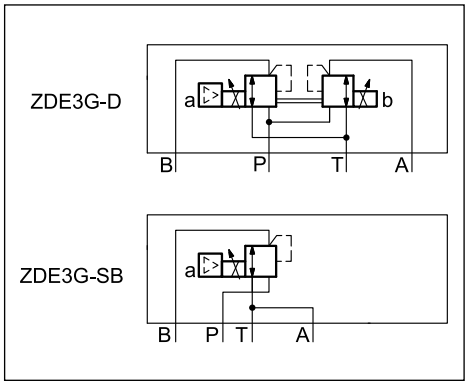
— The valve is easy to install. The driver directly manages digital settings.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

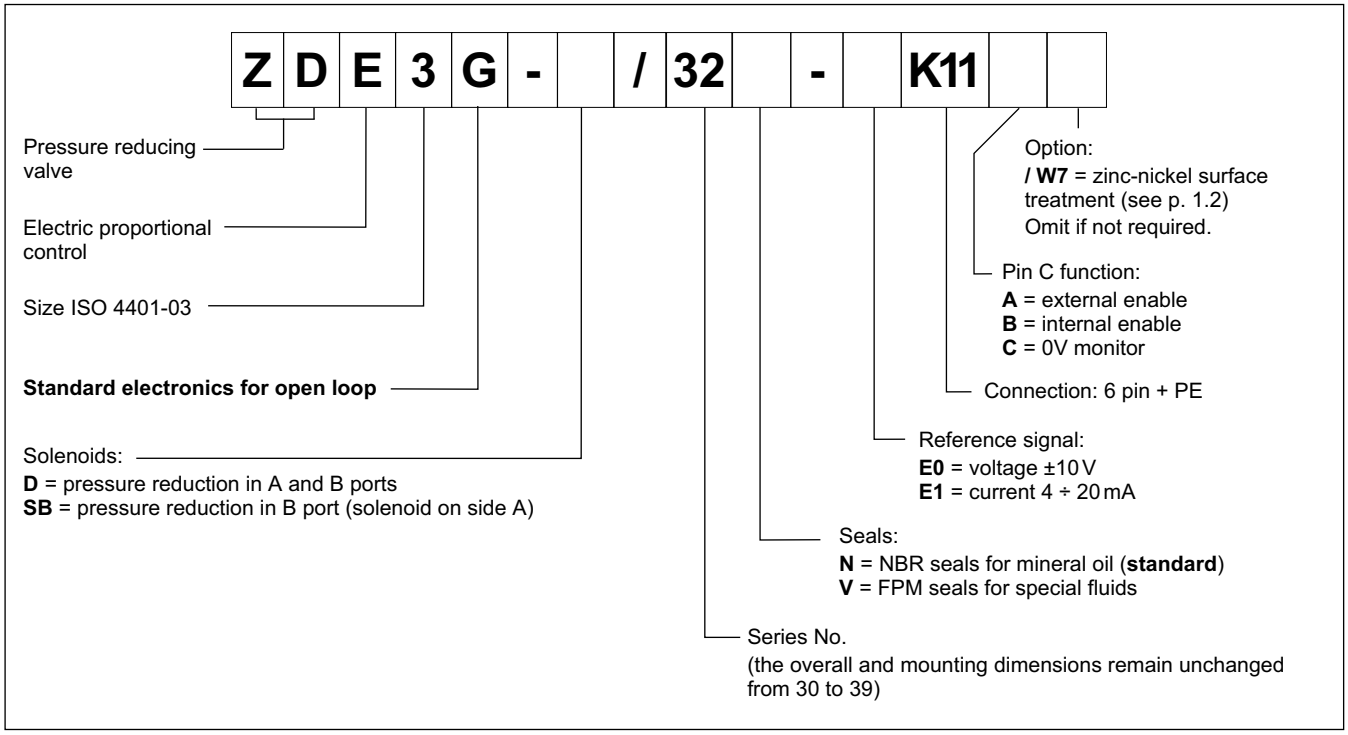
Operating pressure range port P	bar	30 ÷ 100
Operating pressure range port T (par. 5)	bar	0 ÷ 30
Controlled pressure	bar	23
Maximum flow	l/min	15
Hysteresis	% Q max	< 3 %
Repeatability	% Q max	< 1 %
Electrical characteristics	see point 2	
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass: single solenoid valve double solenoid valve	kg	1,9 2,4

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODES AND CONFIGURATION

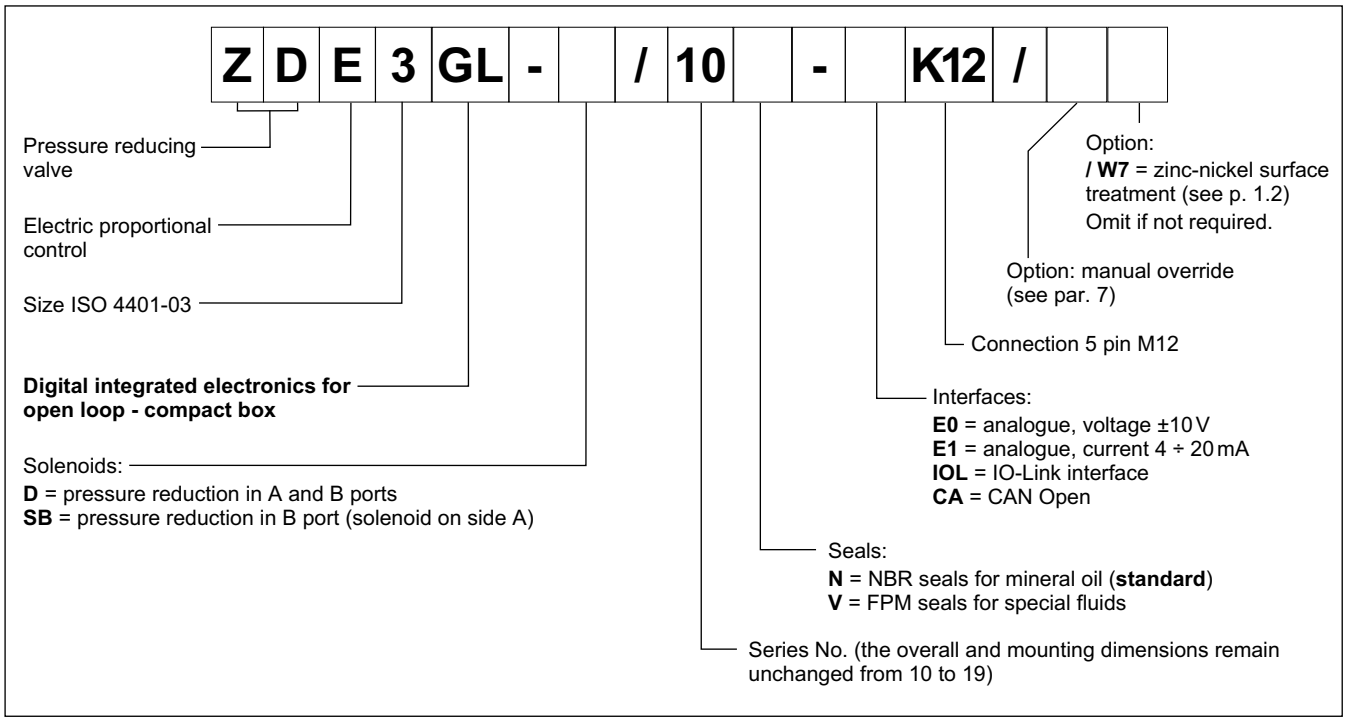
1.1 - Standard electronics



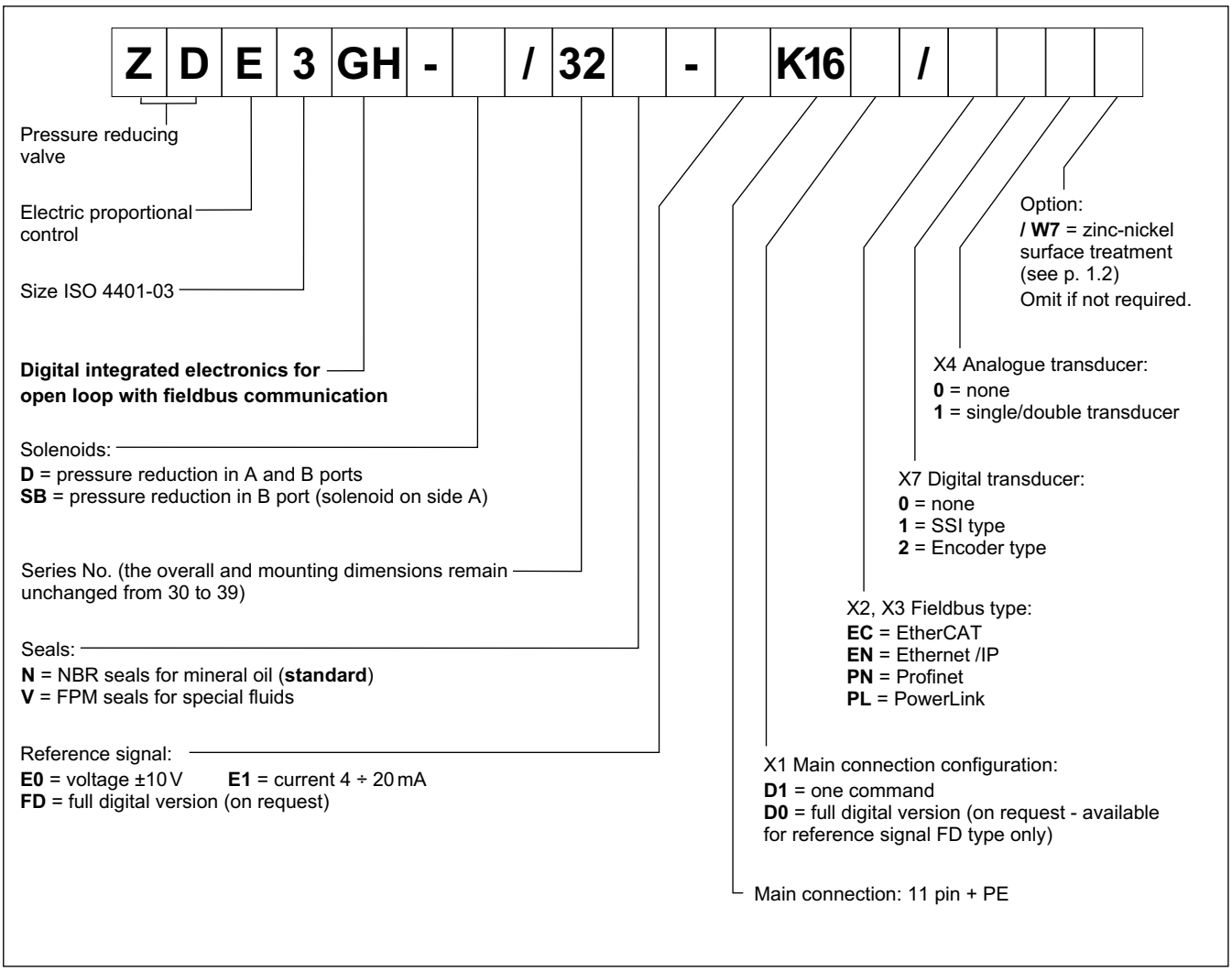
1.2 - Surface treatments

The standard valve is supplied with surface treatment of phosphating black. The zinc-nickel finishing on the valve body makes the valve suitable to ensure a salt spray resistance up to 240 hours. (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

1.3 - Compact version



1.4 - Electronics with fieldbus communication



2 - ELECTRONICS COMMON DATA

Duty cycle		100% (continuous operation)
Protection class according to EN 60529		IP65 / IP67 (**NOTE**)
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	25
Maximum solenoid current	A	1.88
Fuse protection, external	A	3
Managed breakdowns		Overload and electronics overheating, cable breakdown, supply voltage failures
Electromagnetic compatibility (EMC) emissions EN 61000-6-4, immunity EN 61000-6-2		According to 2014/30/EU standards

NOTE: The IP degree is guaranteed only with mating connector of equivalent IP degree, installed and tightened correctly. Moreover, on the GH versions it is necessary to protect with caps any unused connections.

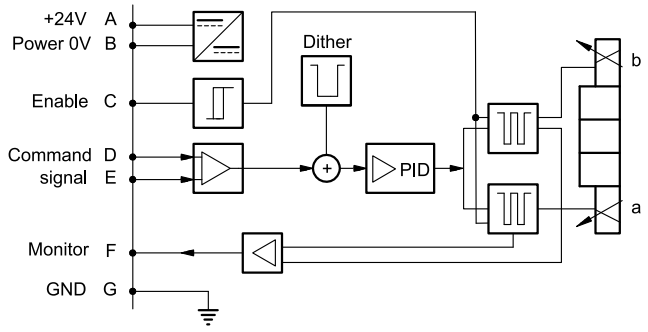
3 - ZDE3G - STANDARD ELECTRONICS

3.1 - Electrical characteristics

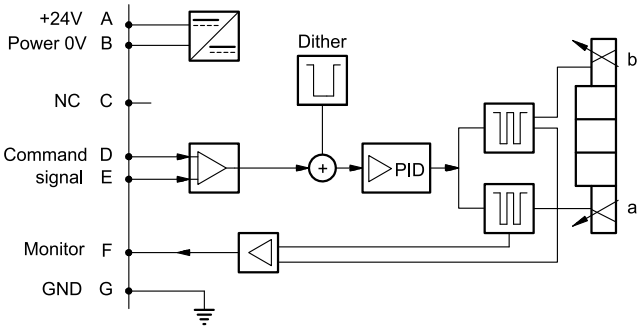
Command signal: voltage (E0) current (E1)	V DC mA	± 10 (Impedance Ri = 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm)
Monitor signal (current to solenoid): voltage (E0) current (E1)	V DC mA	± 10 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
Communication for diagnostic		LIN-bus Interface (by means of the optional kit)
Connection		6 pin + PE (MIL-C-5015-G - DIN EN 175201-804)

3.2 - On-board electronics diagrams

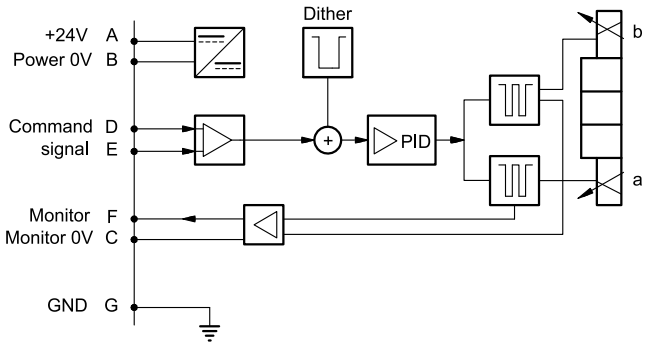
VERSION A - External Enable



VERSION B - Internal Enable

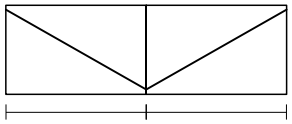


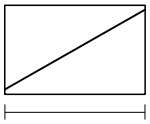
VERSION C - 0V Monitor



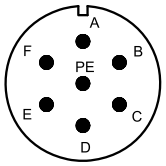
3.3 - Versions with voltage command (E0)

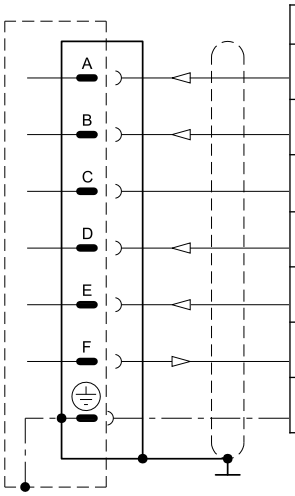
The reference signal is between -10V and +10V on double solenoid valve, and 0 ÷ 10V on single solenoid valve SB. The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.





COMMAND	**-10V**	**0V**	**+10V**	**COMMAND**	**0V**	**+10V**
MONITOR	**-10V**	**0V**	**+10V**	**MONITOR**	**0V**	**+10V**



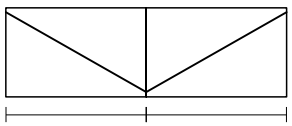


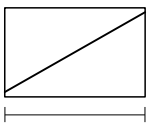
Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	±10 V	Command (differential input)		
E	0 V	Command reference		
F	±10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

3.4 - Versions with current command (E1)

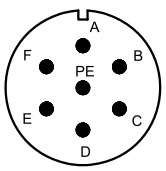
The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower, the card shows a breakdown cable error. To reset the error is sufficient restoring the signal.

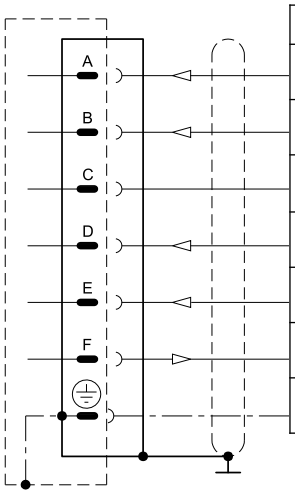
The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.





COMMAND	**4 mA**	**12 mA**	**20 mA**	**COMMAND**	**4 mA**	**20 mA**
MONITOR	**4 mA**	**12 mA**	**20 mA**	**MONITOR**	**4 mA**	**20 mA**





Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	Command reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

4 - ZDE3GL - COMPACT ELECTRONICS

In versions 'IOL' and 'CA' pin 3 and pin 5 are galvanic isolated up to100 V to avoid earth loops. In IO-Link networks, the length of the connecting cables is limited to 20 metres.

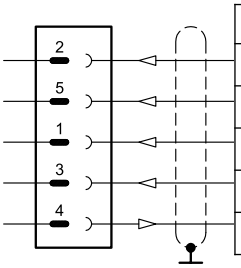
4.1 - Electrical characteristics

Command signal: voltage (E0) current (E1)	V DC mA	±10 (Impedance Ri = 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm)
Monitor signal (current to solenoid): voltage (E0) current (E1)	 V DC mA	 0 ÷ 5 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
IO-Link communication (IOL): Data rate	 kBaud	 IO-Link Port Class B 230,4
Can Open communication (CA): Data rate	 kbit	 10 ÷ 1000
Connection		5-pin M12 code A (IEC 61076-2-101)

4.2 - Pin tables

'E0' connection

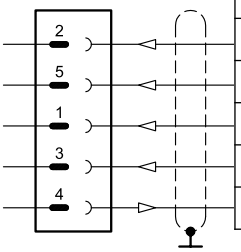




Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	± 10 V	Command
3	0V	Command reference
4	0 ÷ 5V	Monitor (0V reference: pin 5)

'E1' connection

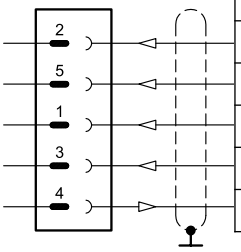




Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	4 ÷ 20 mA	Command
3	0V	Command reference
4	4 ÷ 20 mA	Monitor (0V reference: pin 5)

'IOL' connection

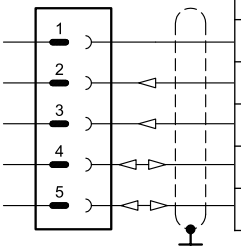




Pin	Values		Function
2	2L+	24 V DC	Supply of the power stage
5	2L-	0 V (GND)	Internal galvanic isolation from PIN 3
1	1L+	+24 V DC	IO-Link supply voltage
3	1L-	0V (GND)	
4	C/Q		IO-Link Communication

'CA' connection





Pin	Values	Function
1	CAN_SH	Shield
2	24 V DC	Supply voltage
3	0 V (GND)	
4	CAN H	Bus line (high)
5	CAN_L	Bus line (low)

5 - ZDE3GH - FIELDBUS ELECTRONICS

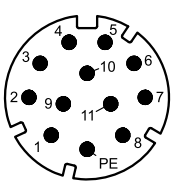
The 11+ PE pin connection allows separate supply voltage for electronics and solenoids.

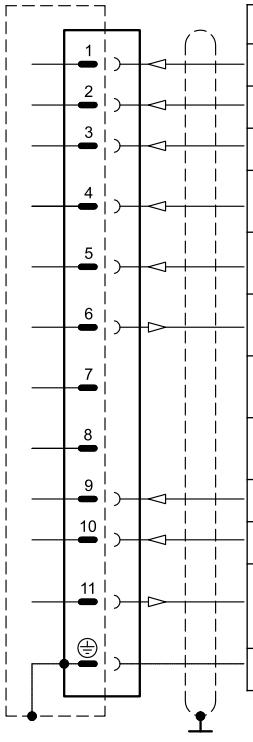
Command - valve position schemes as for the standard electronics. Please refer to pictures in par. 3.3 and 3.4.

5.1 - Electrical characteristics

Command signal: voltage (E0) current (E1) digital (FD)	 V DC mA	 ±10 (Impedance Ri = 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm) via fieldbus
Monitor signal (current to solenoid): voltage (E0) current (E1)	 V DC mA	 ±10 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
Communication / diagnostic		via Bus register
Communication interface standard		IEC 61158
Communication physical layer		fast ethernet, insulated 100 Base TX
Power connection		11 pin + PE (DIN 43651)

5.2 - X1 Main connection pin table





D1: one command

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	± 10 V (E0) 4 ÷ 20 (E1)	Command
5	0 V	Command reference signal
6	± 10 V (E0) 4 ÷ 20 (E1)	Monitor (0V reference pin 10)
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V reference pin 2)
12	GND	Ground (Earth)

D0: full digital

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	NC	do not connect
5	NC	do not connect
6	NC	do not connect
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V ref. pin 2)
12	GND	Ground (Earth)

5.3 - FIELDBUS connections

Please wire following guidelines provided by the related standards communication protocol. Any connections present and not used must be protected with special caps so as not to nullify the protection against atmospheric agents.

X2 (IN) connection M12 D 4 pin female



Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

X3 (OUT) connection: M12 D 4 pin female

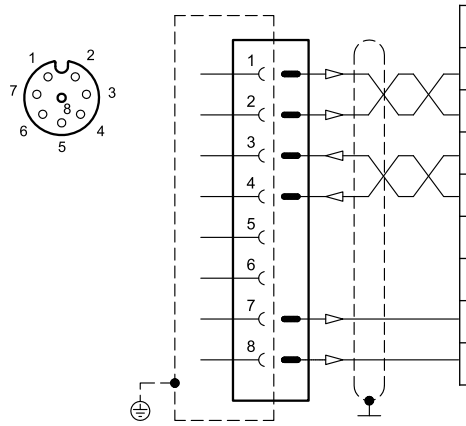


Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

NOTE: Shield connection on connector housing is recommended.

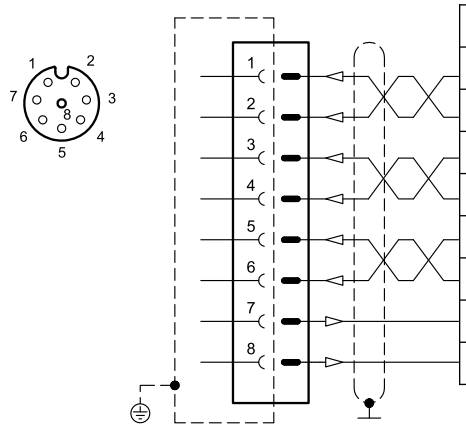
5.4 - Digital transducer connection
X7 connection: M12 A 8 pin female

VERSION 1: SSI type



Pin	SSI Values	Function	Notes
1	CLK+	Serial synchronous clock (+)	Input - digital signal
2	CLK-	Serial synchronous clock (-)	
3	MIS0+	Serial position data (+)	
4	MIS0-	Serial position data (-)	
5	NC	-	do not connect
6	NC	-	
7	+24 V	transducer power supply	Output power supply
8	0 V	-	Common GND

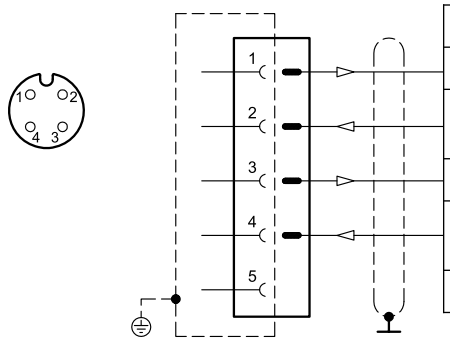
VERSION 2: ENCODER type



Pin	Values	Function	Notes
1	ENC_Z+	input channel Z+	Input - digital signal
2	ENC_Z-	input channel Z-	
3	ENC_A+	input channel A+	
4	ENC_A-	input channel A+	
5	ENC_B+	input channel B+	
6	ENC_B-	input channel B+	
7	+5 V	transducer power supply	Output power supply
8	0 V	-	Common GND

5.5 - Analogue transducer connection
X4 connection: M12 A 4 pin female

VERSION 1: single / double transducer
(single or double is a software-selectable option)



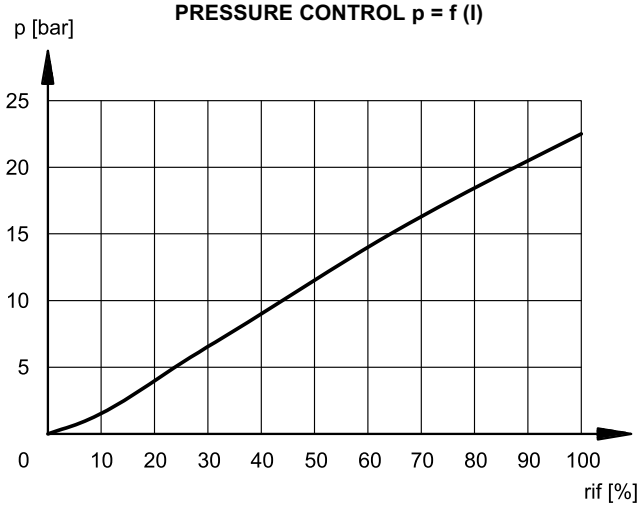
Pin	Values	Notes
1	+24 V	Remote transducer power supply (out) 100 mA
2	±10 V 4 ÷20 mA	Input signal of transducer 1 (range software selectable)
3	0 V	Common reference signal for transducer power and signals
4	±10 V 4 ÷20 mA	Input signal of transducer 2 (range software selectable)
5	-	

6 - CHARACTERISTIC CURVES

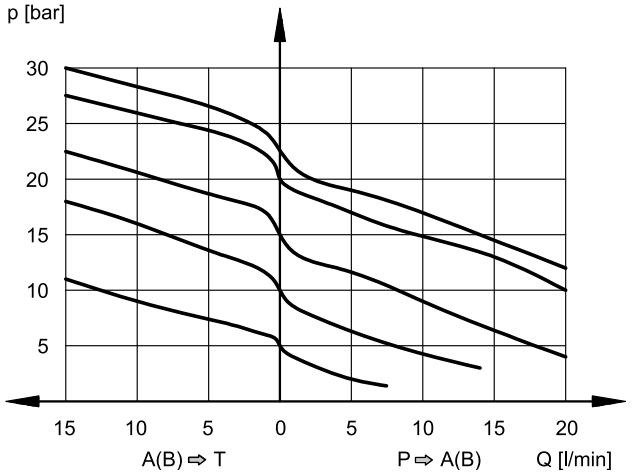
(obtained with oil with viscosity 36 cSt at 50°C)

Adjustment characteristics depending from reference signal, obtained with inlet pressure = 100 bar.

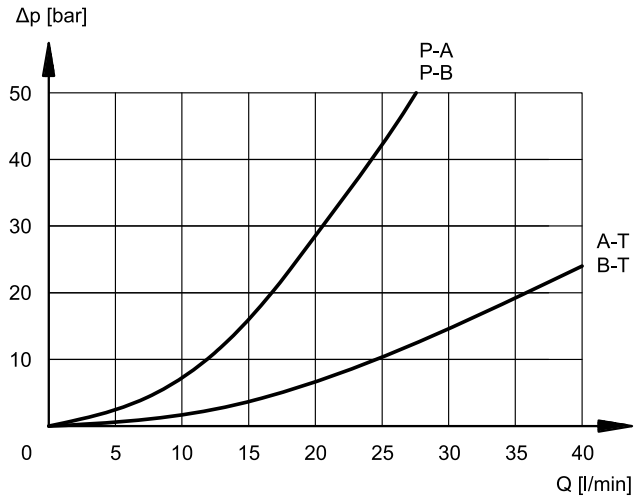
PRESSURE CONTROL p = f (I)



PRESSURE VARIATION p = f(Q)

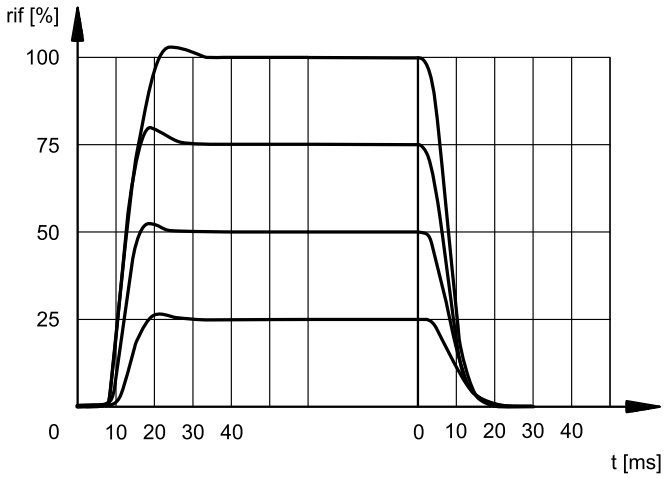


PRESSURE DROP Δp = f(Q)



7 - STEP RESPONSE

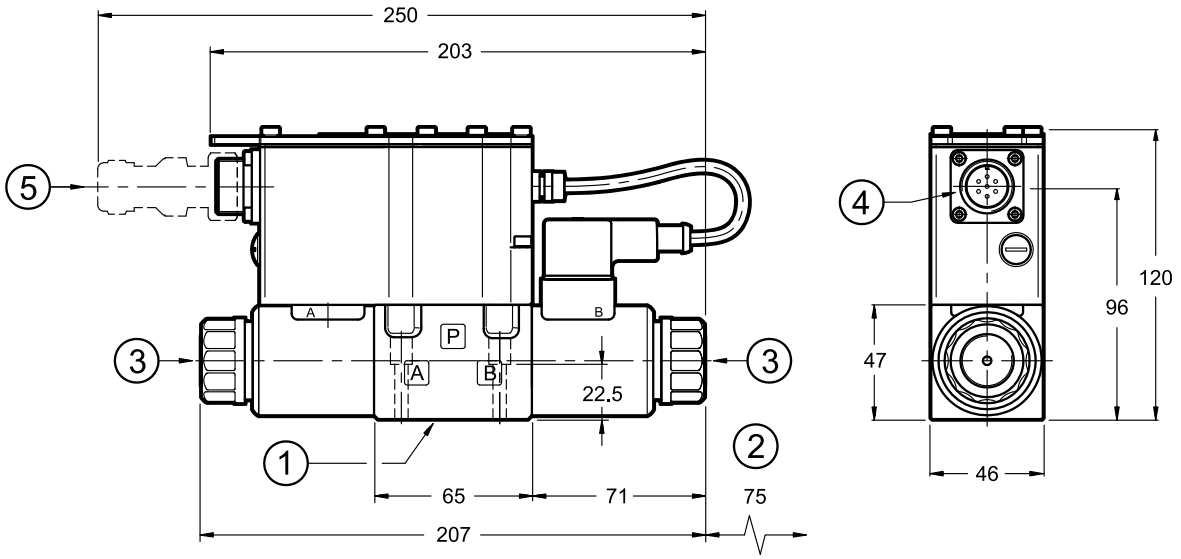
Response times are obtained with an inlet pressure of 100 bar and oil volume of 0,3 litres. The response time is affected both by the flow rate and the oil volume in the pipework.

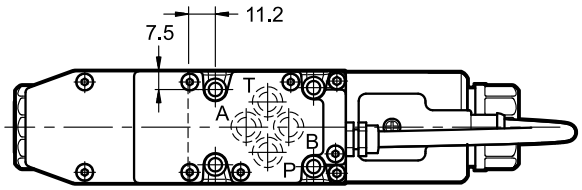


8 - ZDE3G - OVERALL AND MOUNTING DIMENSIONS

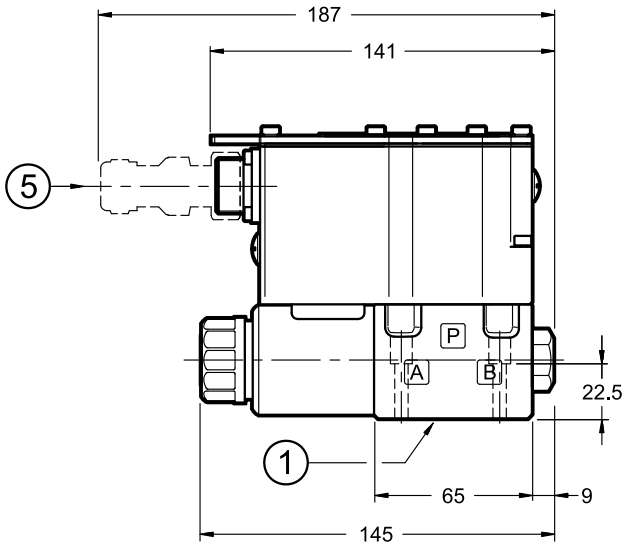
ZDE3G-D/*K11

dimensions in mm





ZDE3G-SB/*K11



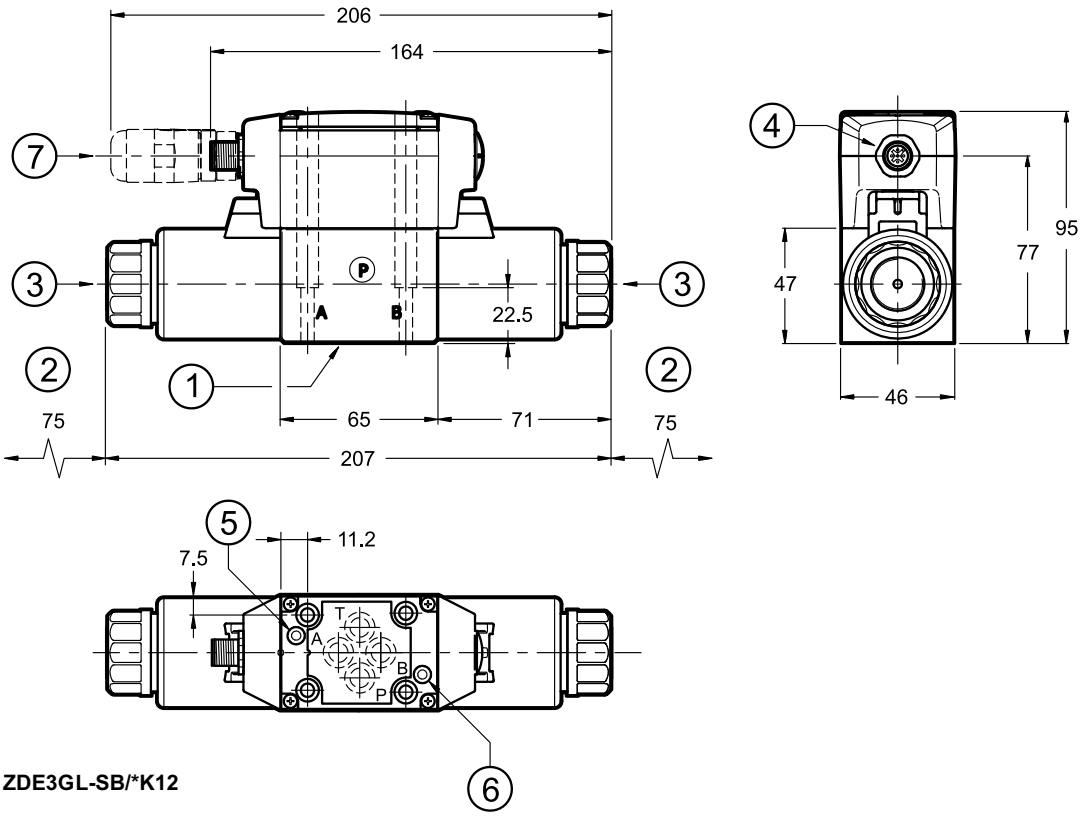
1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Coil removal space (solenoid B only)
3	Standard manual override embedded in the solenoid tube
4	Main connection 6 pin + PE
5	Mating connector 6 poles + PE , female type MIL-5015-G **To be ordered separately.** See catalogue 89 000

Fastening bolts: 4 SHC screws M5x30 - ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

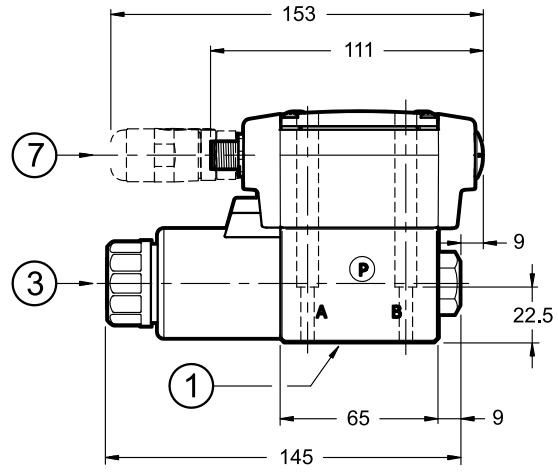
9 - ZDE3GL - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

ZDE3GL-D/*K12



ZDE3GL-SB/*K12



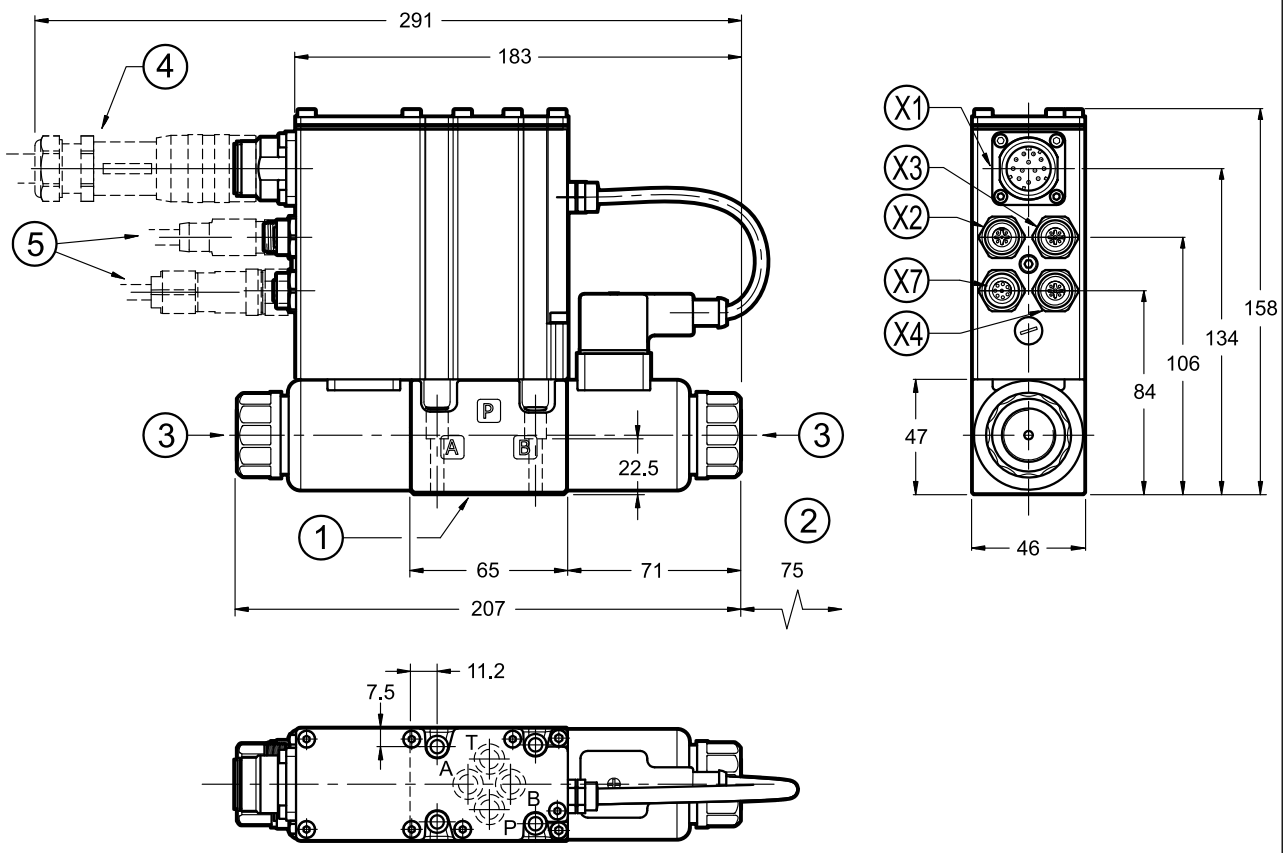
1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Coil removal space
3	Standard manual override embedded in the solenoid tube
4	Connection M12 A 5 pin
5	L1 LED
6	L2 LED
7	Mating connector M12 5 poles - code A, female **To be ordered separately.** See catalogue 89 000

Fastening bolts: 4 SHC screws M5x30- ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

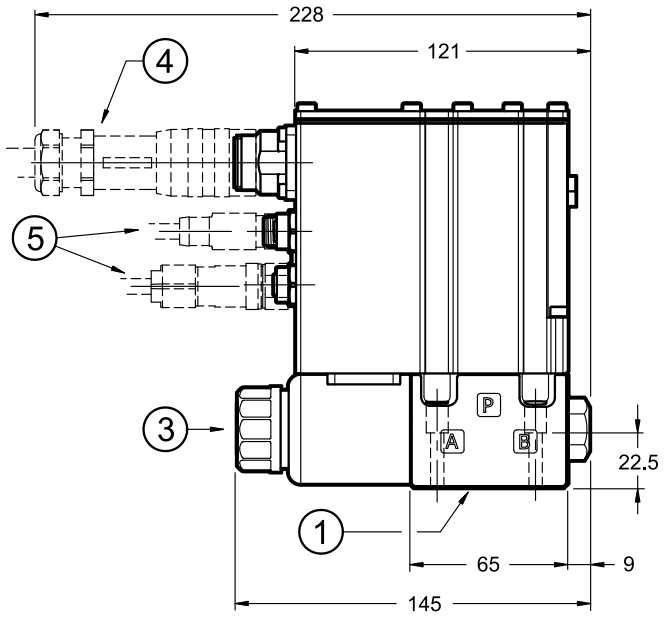
10 - ZDE3GH - OVERALL AND MOUNTING DIMENSIONS

ZDE3GH-D/*K16

dimensions in mm



ZDE3GH-SB/*K16



X1	Main connection 11 pin + PE
X2	Fieldbus communication (IN)
X3	Fieldbus communication (OUT)
X4	X4 connection for analogue transducer
X7	X7 connection for digital transducer

1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Coil removal space (solenoid B only)
3	Manual override by pin integrated in the solenoid tube
4	Mating connector 11 poles + PE **To be ordered separately.** See catalogue 89 000
5	Mating connectors for fieldbus communication and signals **To be ordered separately.** See catalogue 89 000

Fastening bolts: 4 SHCS M5x30 ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

NOTE: Depending on the chosen version, X4 and X7 connections may not be present.
Please refer to section 5 for connection descriptions and pinout.

11 - MANUAL OVERRIDE

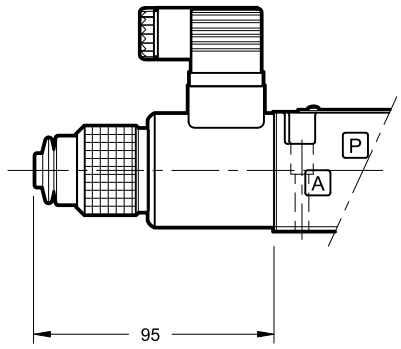
These valves have solenoids whose pin for manual operation is integrated in the tube. Actuate this override by pushing it with a suitable tool, minding not to damage the sliding surface.

Three other types of manual overrides can fit the ZDE3GL valve:

- **CM** version, manual override boot protected
- **CS** version, with metal ring nut provided with a M4 screw and a blocking locknut to allow the continuous mechanical operations.

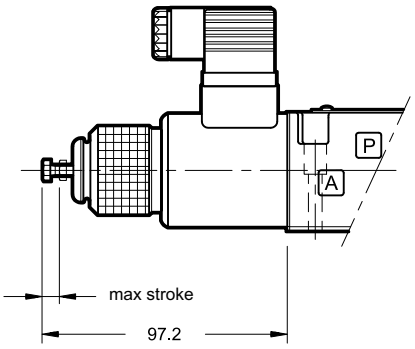
CAUTION!: The manual override use doesn't allow any proportional regulation; indeed using this kind of override, the main stage spool will open completely and the whole inlet pressure will pass through A or B line.

CM Version



Code: 3803210003

CS Version



Code: 3803210004

12 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

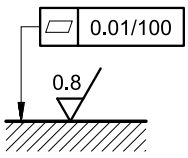
13 - INSTALLATION

ZDE3G* valves can be installed in any position without impairing correct operation. Ensure that there is no air in the hydraulic circuit. Connect the valve T port directly to the tank. Add any backpressure value detected in the T line to the reduced pressure value.

Maximum admissible backpressure in the T line, under operational conditions, is 30 bar.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.

Surface finishing



14 - ACCESSORIES
(to be ordered separately)

14.1 - Mating connectors
Mating connectors must be ordered separately. See catalogue 89 000.

For K11 and K16 versions we recommend the choice of a metal connector to avoid electromagnetic disturbances and to comply with EMC regulations on electromagnetic compatibility. If you opt for a plastic connector, make sure that it guarantees and maintains the IP and EMC protection characteristics of the valve.

14.2 - Mating connectors and caps for fieldbus communication and for sensors.
Duplomatic offers spare parts to be wired and also ready-to-use cord sets. Please refer to cat. 89 000.

14.3 - Connection cable
The optimal wiring provides for 7 isolated conductors, with separate screen for the signal wires (command, monitor) and an overall screen.

Cross section for power supply:
- up to 20 m cable length : 1,0 mm^2
- up to 40 m cable length : 1,5 mm^2 (IO-Link excluded)

Cross section for signals (command, monitor):
- 0,50 mm^2

14.4 - Kit for start-up LINPC-USB
Device for service start-up and diagnostic. See catalogue 89 850.

15 - SUBPLATES
(see catalogue 51 000)

PMMD-AI3G rear ports
PMMD-AL3G side ports
Ports dimensions: P, T, A, B: 3/8” BSP

DUPLOMATIC MOTION SOLUTIONS

DUPLOMATIC MS S.p.A.
via M. Re Depaolini 24 • 20015 PARABIAGO (MI) • ITALY
tel. +39 0331.895.111 • www.duplomatic.com • e-mail: sales.exp@duplomatic.com

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PZME5

PROPORTIONAL PRESSURE REDUCING VALVE, TWO-PORT, PILOT OPERATED

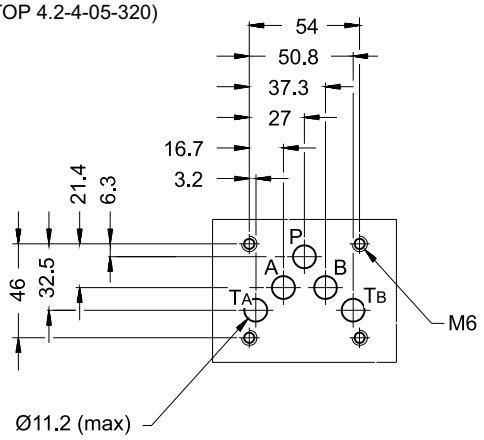
SERIES 10

MODULAR VERSION ISO 4401-05

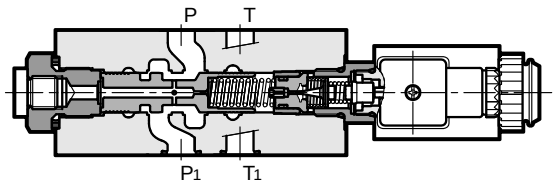
p max **320** bar
Q max **100** l/min

MOUNTING SURFACE

ISO 4401-05-04-0-05
(CETOP 4.2-4-05-320)



OPERATING PRINCIPLE



— PZME5 valves are two-ports pressure reducing valves, pilot operated, with proportional control. They are designed in modular version with mounting interface in compliance with ISO 4401-05 standards.

— These valves reduce pressure in the secondary branches of the circuit thus ensuring stability of controlled pressure in the event of variations in the flow rate through the valve.

— The valve can be controlled directly by a current control supply unit or by an electronic control card, to maximize the valve performance (see point. 10).

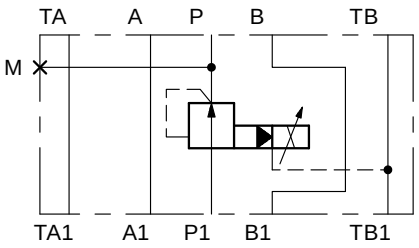
— The PZME5 valve is available in three pressure control ranges of up to 230 bar.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Maximum operating pressure: - P-A-B ports - T port	bar	 320 2
Minimum controlled pressure	see Δp-Q diagram	
Maximum flow in P line Maximum flow on free flow paths Drain flow	l/min	100 100 0,4
Step response	see point 6	
Hysteresis (with PWM 200 Hz)	% of p nom	< 3%
Repeatability	% of p nom	< ±1,5%
Electrical characteristic	see point 5	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass	kg	2.9

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

PZ	M	E	5	-	P		/	10		-			/	

Pressure reducing valve

Modular version

Electrical proportional control

Size: ISO 4401-05

Pressure reduction in P port

Pressure control range
070 = from 7 to 80 bar
150 = from 7 to 165 bar
230 = from 17 to 230 bar

Series No.
(from 10 to 19 sizes and mounting dimensions remain unchanged)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

D12 = Nominal solenoid voltage 12 V DC
D24 = Nominal solenoid voltage 24 V DC

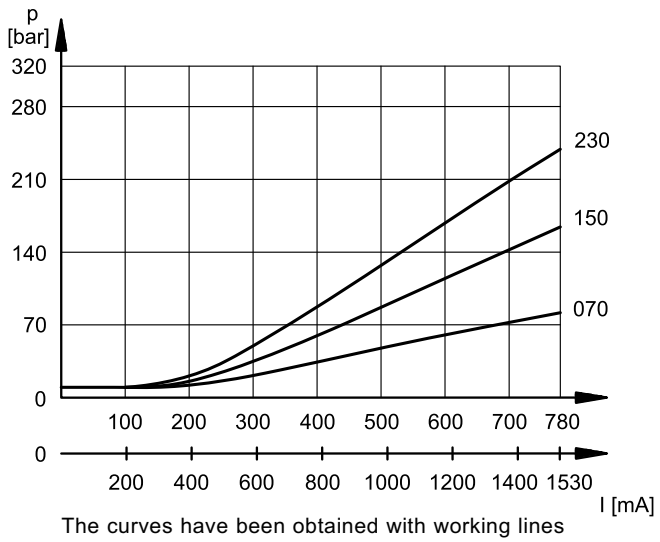
Coil electrical connection:
K1 = plug for connector type EN 175301-803 (ex DIN 43650) (**standard**)
K2 = plug for connector type AMP JUNIOR
K7 = plug for connector type DEUTSCH DT04-2P male

Option: manual override (see point 9)

2 - CHARACTERISTIC CURVES

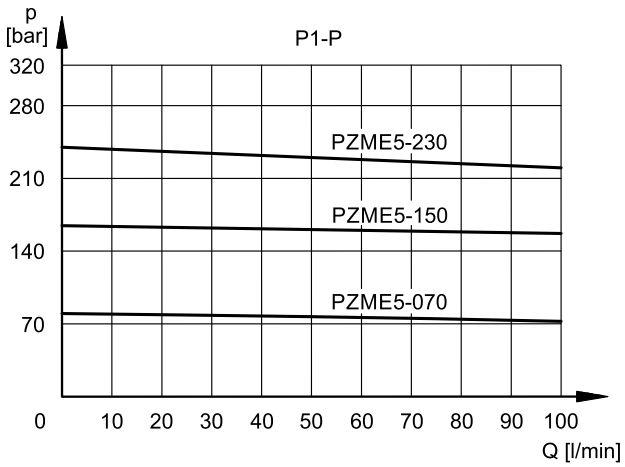
(measured with viscosity 36 cSt at 50 °C)

PRESSURE CONTROL p = f (I)



The curves have been obtained with working lines closed (without flow).

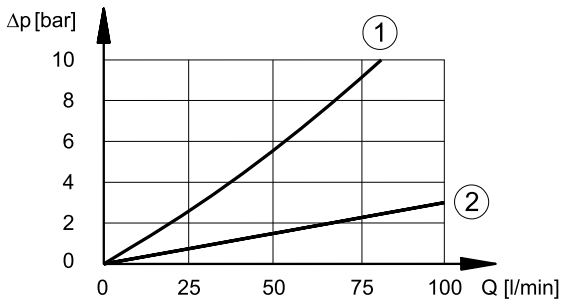
PRESSURE VARIATION p = f(Q)



The curves have been obtained with inlet pressure 50 bar higher than the reduced pressure.

With this Δp > 50 bar the flow rate values reduce considerably.

PRESSURE DROP Δp = f(Q)



1. pressure drops P1→ P
2. pressure drop in passing lines (ex. A ↔ A1)
3. pressure drops T 1→T

3 - MAX PRESSURE VALUES

This valve incorporates a mechanical limit of the maximum pressure, that operates independently of the applied current. This kind of design ensures that the pressure cannot rise over even if the solenoid current exceeds the maximum current ($I > I_{max}$).

Values obtained with oil viscosity of 36 cSt at 50°C. Values obtained with working lines closed (without flow).

		PZME5-070	PZME5-150	PZME5-230
pressure value at 780 mA	bar	80	165	230
max pressure value when $I > I_{max}$	bar	95	180	250

4 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals.

For fluids HFDR type (phosphate esters) use FPM seals (code V).

For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

5 - ELECTRICAL CHARACTERISTICS

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube and is secured by means of a lock nut. It can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20°C)	Ω	4.98	21
NOMINAL CURRENT	A	1.53	0.78
DUTY CYCLE		100%	
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2014/30/EU		
CLASS OF PROTECTION Coil insulation (VDE 0580) Impregnation	class H class F		

Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree correctly connected and installed.

electric connection	electric connection protection	whole valve protection
K1	IP65	IP65
K2	IP65	
K7	IP65/67	

6 - STEP RESPONSE

(obtained with mineral oil with viscosity of 36 cSt at 50 °C and electronic control card)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

The table illustrates typical step response times measured with input flow rate of Q = 20 l/min with closed working lines.

REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms]	40	50

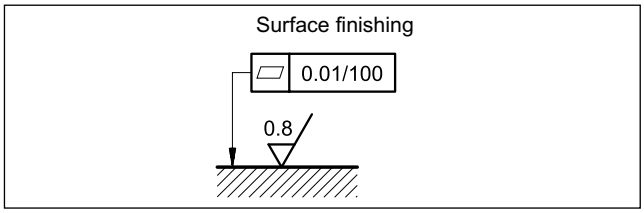
7 - INSTALLATION

These valves can be installed in any position without impairing correct operation if it is ensured that there is no air in the hydraulic circuit. Otherwise, vertical mounting with solenoid downward is preferable. In this case you must consider possible variations of the minimum controlled pressure values reported in point 2.

Connect the valve TB1 port directly to the reservoir.

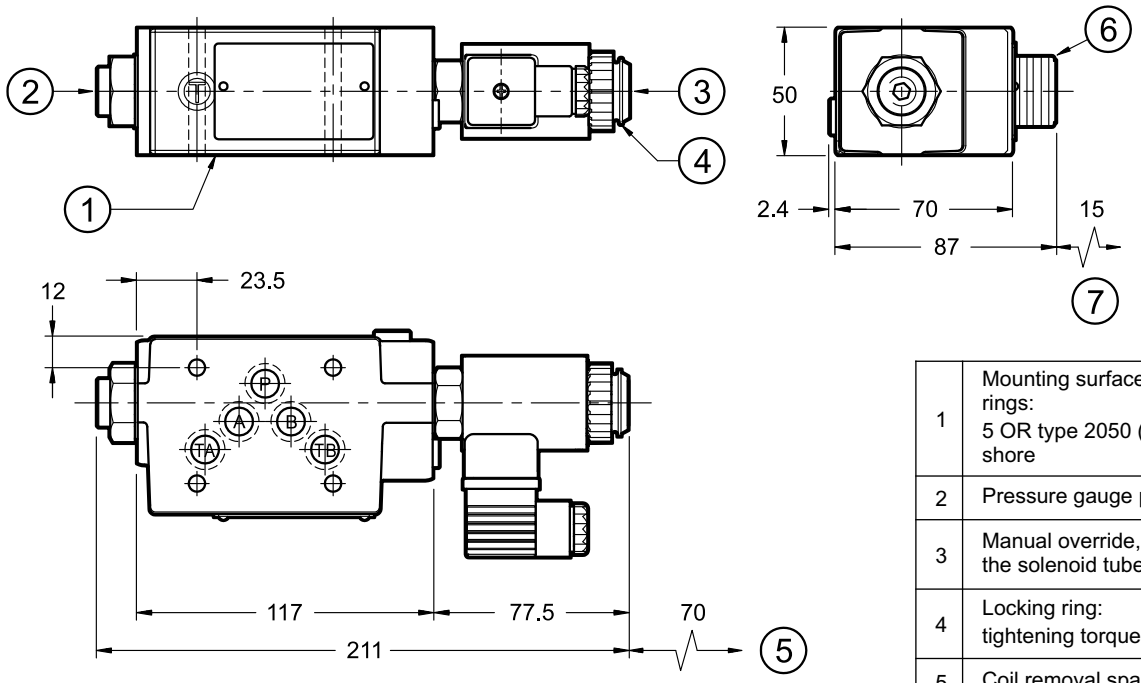
NOTE: Occurring return pressures are to be added up to the value of pressure setting at T port.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed fluid can easily leak between the valve and support surface.



8 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	Mounting surface with sealing rings: 5 OR type 2050 (12.42x1.78) 90 shore
2	Pressure gauge port 1/4” BSP
3	Manual override, integrated in the solenoid tube
4	Locking ring: tightening torque: 5 Nm ± 0,5
5	Coil removal space
6	EN 175301-803 (ex DIN 43650) (included in the delivery)
7	Connector removal space

NOTE: Refer to catalog 81 101 for the dimensions of the K2 and K7 type electrical connections

9 - MANUAL OVERRIDE

These valves have solenoids whose pin for manual operation is integrated in the tube. Actuate this override by pushing it with a suitable tool, minding not to damage the sliding surface. Two different manual override versions are available upon request: **CM** version, manual override boot protected, and **CK1** version, knob to screw.

For more information about these manual overrides, see the catalogue 81 101.

10 - ELECTRONIC CONTROL UNITS

EDM-M102	24V DC solenoids	rail mounting DIN EN 50022	see cat. 89 251
EDM-M163	12V DC solenoids		

DUPLOMATIC MOTION SOLUTIONS

DUPLOMATIC MS S.p.A.
via M. Re Depaolini 24 • 20015 PARABIAGO (MI) • ITALY
tel. +39 0331.895.111 • www.duplomatic.com • e-mail: sales.exp@duplomatic.com

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DZCE*

PRESSURE REDUCING VALVE WITH PROPORTIONAL CONTROL

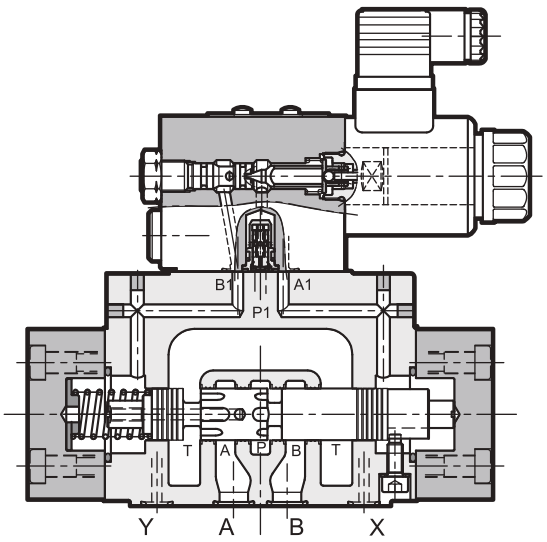
SERIES 11

DZCE5	**CETOP P05**
DZCE5R	**ISO 4401-05** (CETOP R05)
DZCE7	**ISO 4401-07** (CETOP 07)
DZCE8	**ISO 4401-08** (CETOP 08)

p max **350** bar

Q max (see table of performances)

OPERATING PRINCIPLE



— The DZCE* are pressure reducing valves with electric proportional control and mounting interface in compliance with ISO 4401 (CETOP RP121H) standards.

— Those valves, besides reducing the pressure from line P to working line A, allow the flow to return from the line A to the return line T when a pressure greater than the set value is generated in the downstream circuit (flow path A): a typical case of hydraulic counterweight or load balancing.

— The pressure can be modulated continuously in proportion to the current supplied to the solenoid.

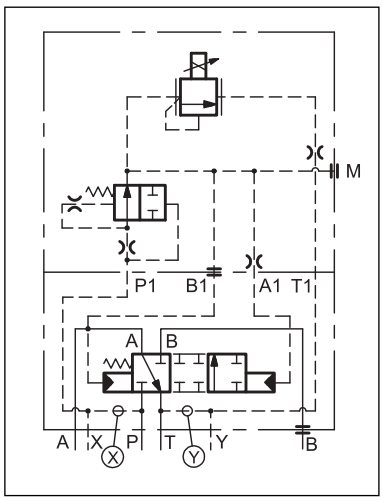
— They can be controlled directly by a current control supply unit or by means of the electronic control units (par. 12) to exploit valve performance to the full .

— They are available in CETOP P05, ISO 4401-05 (CETOP R05), ISO 4401-07 (CETOP 07) and ISO 4401-08 (CETOP 08) sizes.

— Every size can be supplied with several controlled flow rates, up to 500 l/min.

PERFORMANCES (obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control cards)		**DZCE5 DZCE5R**	**DZCE7**	**DZCE8**
Maximum operating pressure	bar	350		
Maximum flow	l/min	150	300	500
Step response		see paragraph 6		
Hysteresis (with PWM 200 Hz)	% of p_{max}	< 4%		
Repeatability	% of p_{max}	< ±2%		
Electrical characteristic		see paragraph 5		
Ambient temperature range	°C	-20 / +60		
Fluid temperature range	°C	-20 / +80		
Fluid viscosity range	cSt	10 ÷ 400		
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13			
Recommended viscosity	cSt	25		
Mass	kg	7	9,2	15,3

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

D	Z	C	E		-		/	11		-			/		K1

Pressure reducing valve

Electric proportional control

Nominal size:
5 = CETOP P05 (**NOTE**)
5R = ISO 4401-05 (CETOP R05)
7 = ISO 4401-07 (CETOP 07)
8 = ISO 4401-08 (CETOP 08)

Pressure control range
070 = 1 ÷ 70 bar
140 = 1 ÷ 140 bar
210 = 1 ÷ 210 bar
300 = 1 ÷ 300 bar

Series N. (the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Piloting: **I** = internal
E = external

Drainage: **I** = internal
E = external

Supply voltage:
D12 = voltage 12V DC
D24 = voltage 24V DC

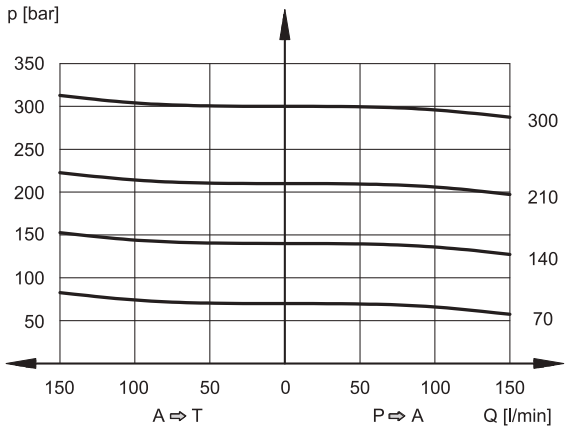
Coil electrical connection:
for connector type
DIN 43650 (**standard**)

NOTE: This version is interchangeable with the model ZCE4 Duplomatic.

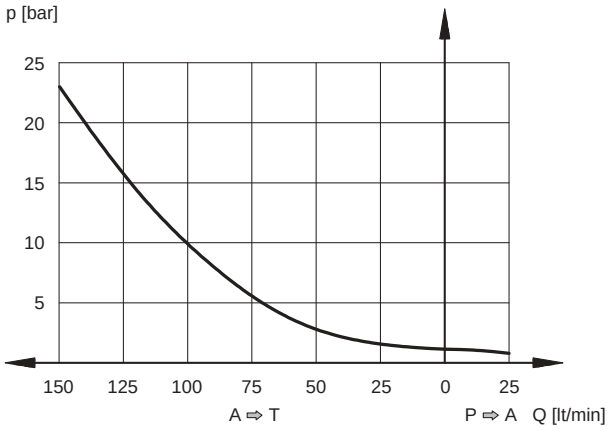
2 - CHARACTERISTIC CURVES (obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control cards)

2.1 - Characteristic curves DZCE5 and DZCE5R

ADJUSTMENT

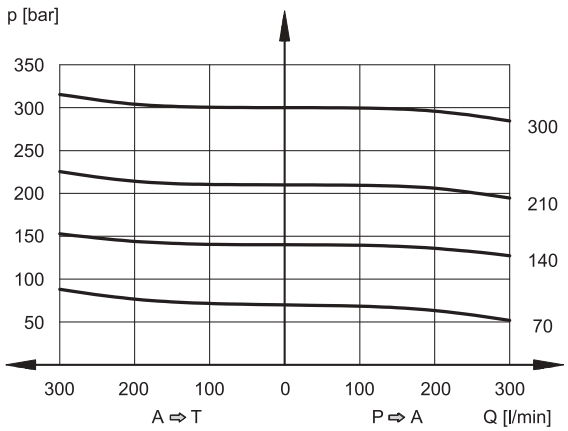


MIN. CONTROLLED PRESSURE p min = f(Q)

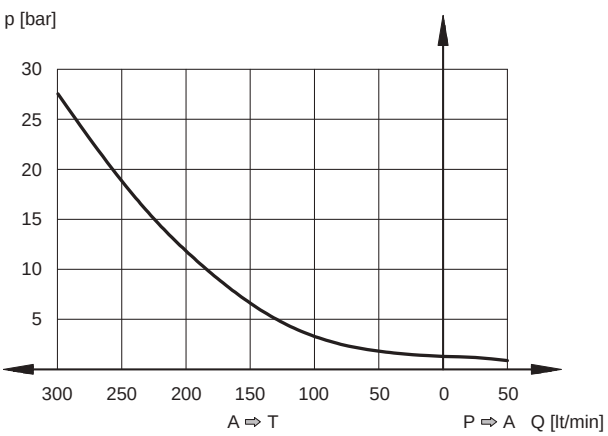


2.2 - Characteristic curves DZCE7

ADJUSTMENT

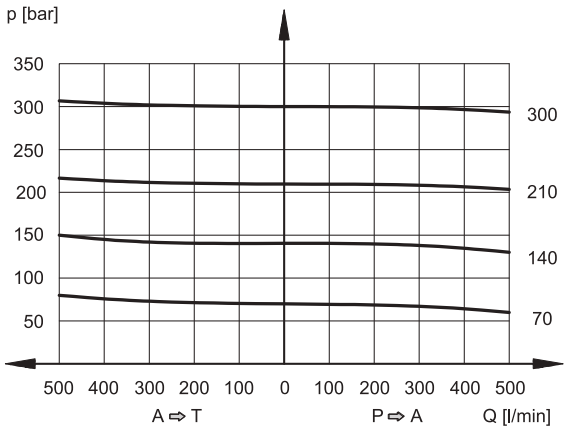


MIN. CONTROLLED PRESSURE p min = f(Q)

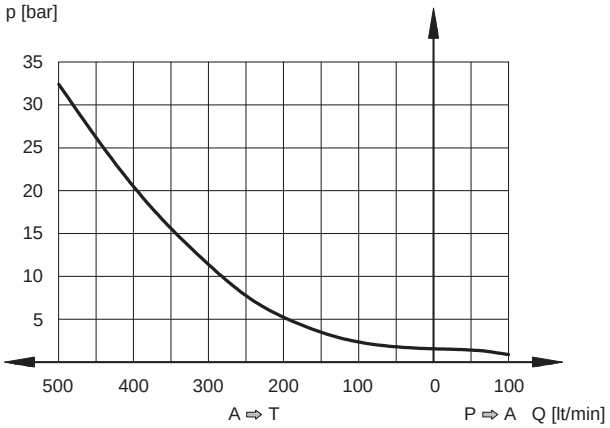


2.3 - Characteristic curves DZCE8

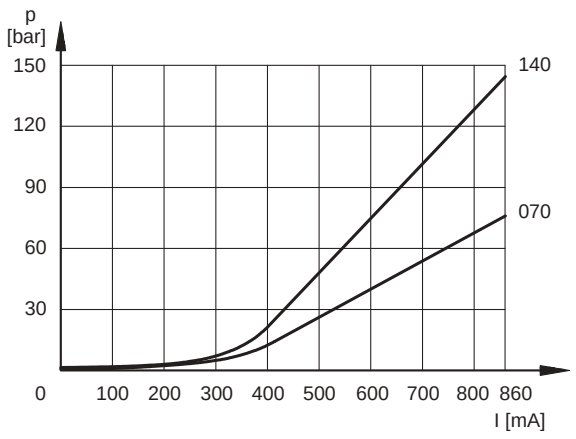
ADJUSTMENT

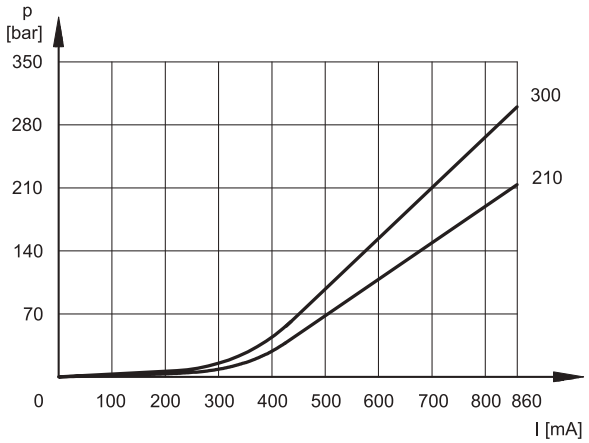


MIN. CONTROLLED PRESSURE p min = f(Q)



2.4 - Pressure control p = f(I) DZCE5, DZCE5R, DZCE7 and DZCE8





3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

6 - PILOTING AND DRAINAGE

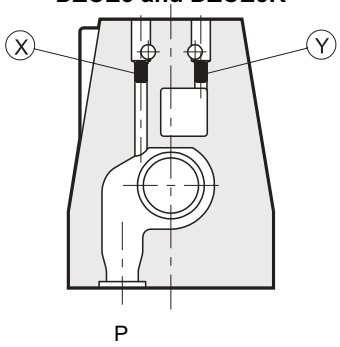
The DZCE* valves are available with piloting and drainage, both internal and external.
We suggest to use the version with external drainage that allows a higher backpressure on the unloading.

VALVE TYPE		Plug assembly	
		X	**Y**
IE	INTERNAL PILOT AND EXTERNAL DRAIN	NO	YES
II	INTERNAL PILOT AND INTERNAL DRAIN	NO	NO
EE	EXTERNAL PILOT AND EXTERNAL DRAIN	YES	YES
EI	EXTERNAL PILOT AND INTERNAL DRAIN	YES	NO

PRESSURES (bar)

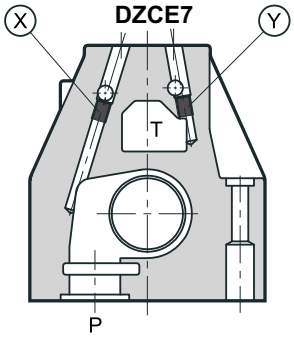
Pressure	MIN	MAX
Piloting pressure on X port	30	350
Pressure on T port with interal drain	–	2
Pressure on T port with external drain	–	250

DZCE5 and DZCE5R



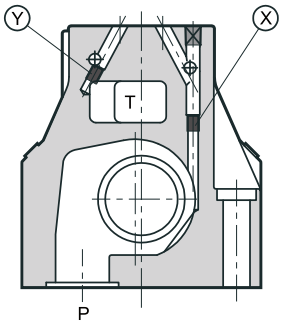
X: M5x6 plug for external pilot
Y: M5x6 plug for external drain

DZCE7



X: M6x8 plug for external pilot
Y: M6x8 plug for external drain

DZCE8



X: M6x8 plug for external pilot
Y: M6x8 plug for external drain

5 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut.
It can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20°C)	Ω	3.66	17.6
NOMINAL CURRENT	A	1.88	0.86
DUTY CYCLE	100%		
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2004/108/CE		
CLASS OF PROTECTION: atmospheric agents (CEI EN 60529) coil insulation (VDE 0580) Impregnation	IP 65 class H class F		

6 - STEP RESPONSE (measured with mineral oil with viscosity of 36 cSt at 50°C with the relative electronic control units)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

REFERENCE SIGNAL STEP	0 →100%	100→0%
response times [ms]		
DZCE5 and DZCE5R	100	70
DZCE7	100	50
DZCE8	100	50

7 - INSTALLATION

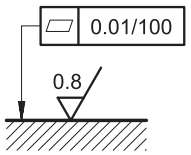
We recommend to install the DZCE* valve either in horizontal position, or vertical position with the solenoid downward. If the valve is installed in vertical position and with the solenoid upward, you must consider possible variations of the minimum controlled pressure, if compared to what is indicated in paragraph 2.

Ensure that there is no air in the hydraulic circuit. In particulars applications,it can be necessary to vent the air entrapped in the solenoid tube, using the special drain screw and then ensure to screwed it correctly.

Connect the valve T port directly to the tank. Add any backpressure value detected in the T line to the controlled pressure value. Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.

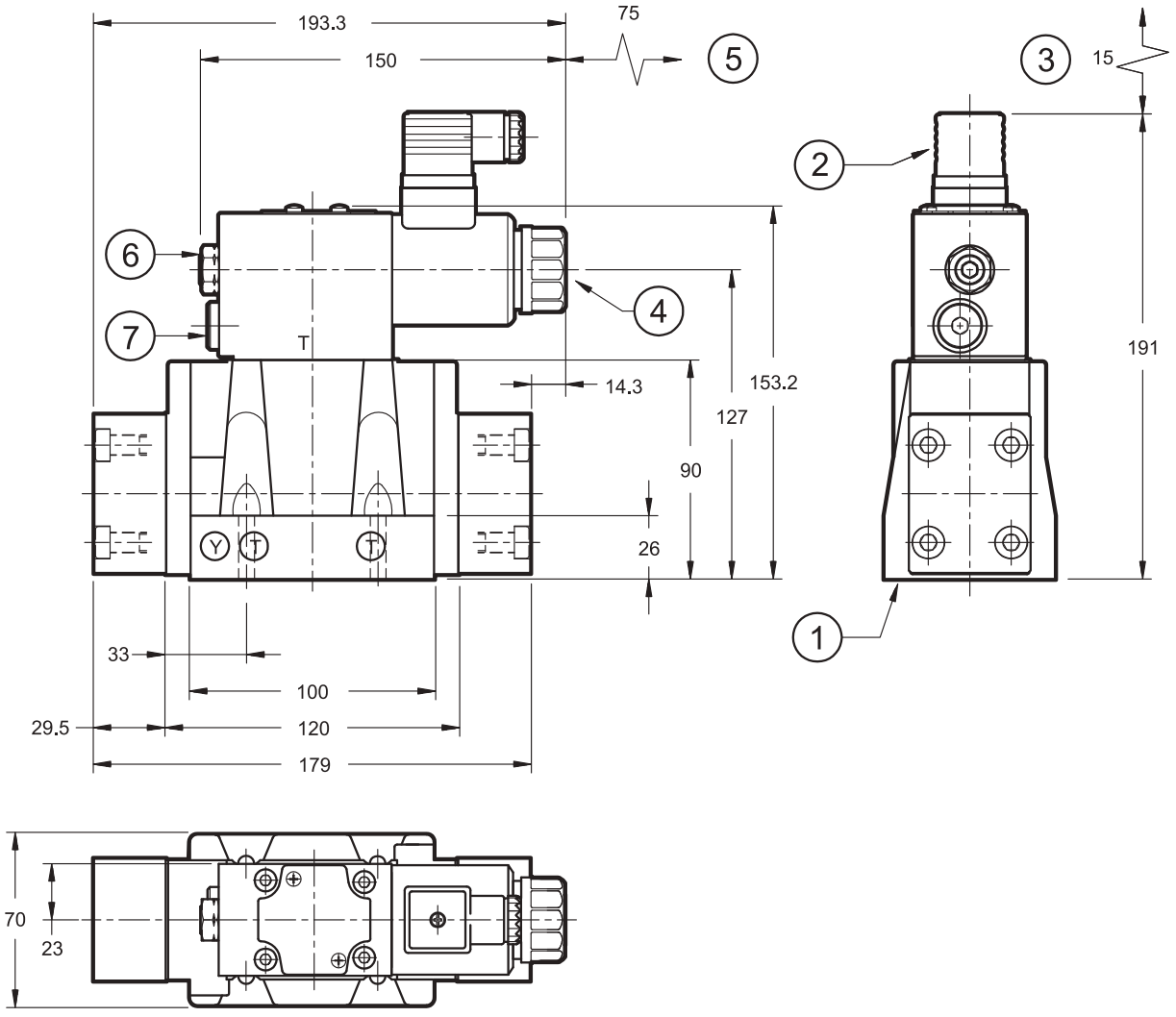
Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.

surface finishing



8 - DZCE5 and DZCE5R OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



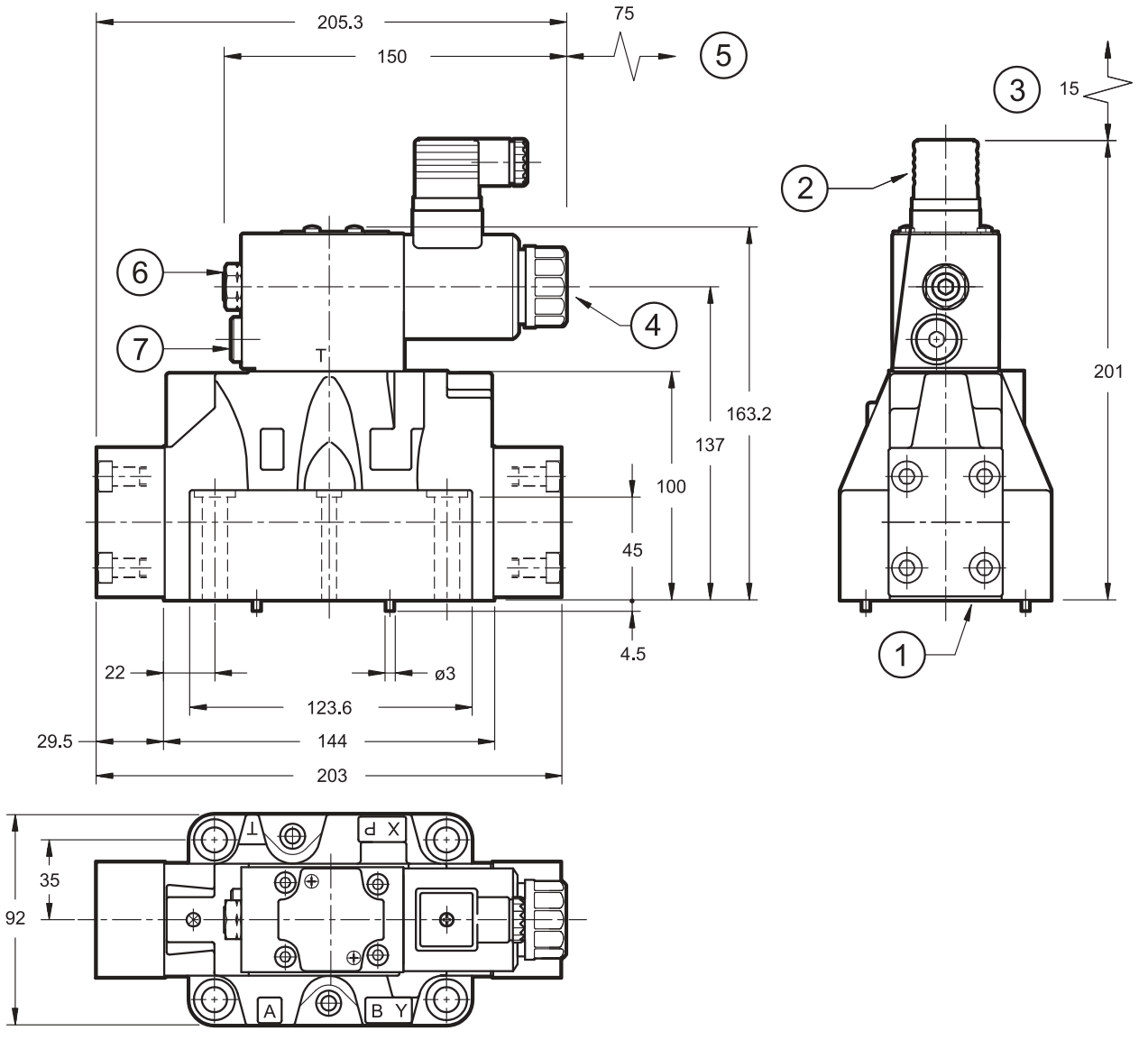
NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (4) placed at the end of the solenoid tube.

Valve fastening: N. 4 bolts SHC M6x35 - ISO 4762
Tightening torque: 8 Nm (A 8.8 bolts)
Thread of mounting holes: M6x10
Sealing rings: N. 5 OR type 2050 (12.42x1.78) - 90 Shore N. 2 OR type 2037 (9.25x1.78) - 90 Shore

1	Mounting surface with sealing rings
2	DIN 43650 electrical connector (included in the supply)
3	Connector removal space
4	Breather (Allen key 4)
5	Coil removal space
6	Adjustment sealing made in factory. Do not unscrew the nut.
7	Pressure gauge port 1/4” BSP

9 - DZCE7 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



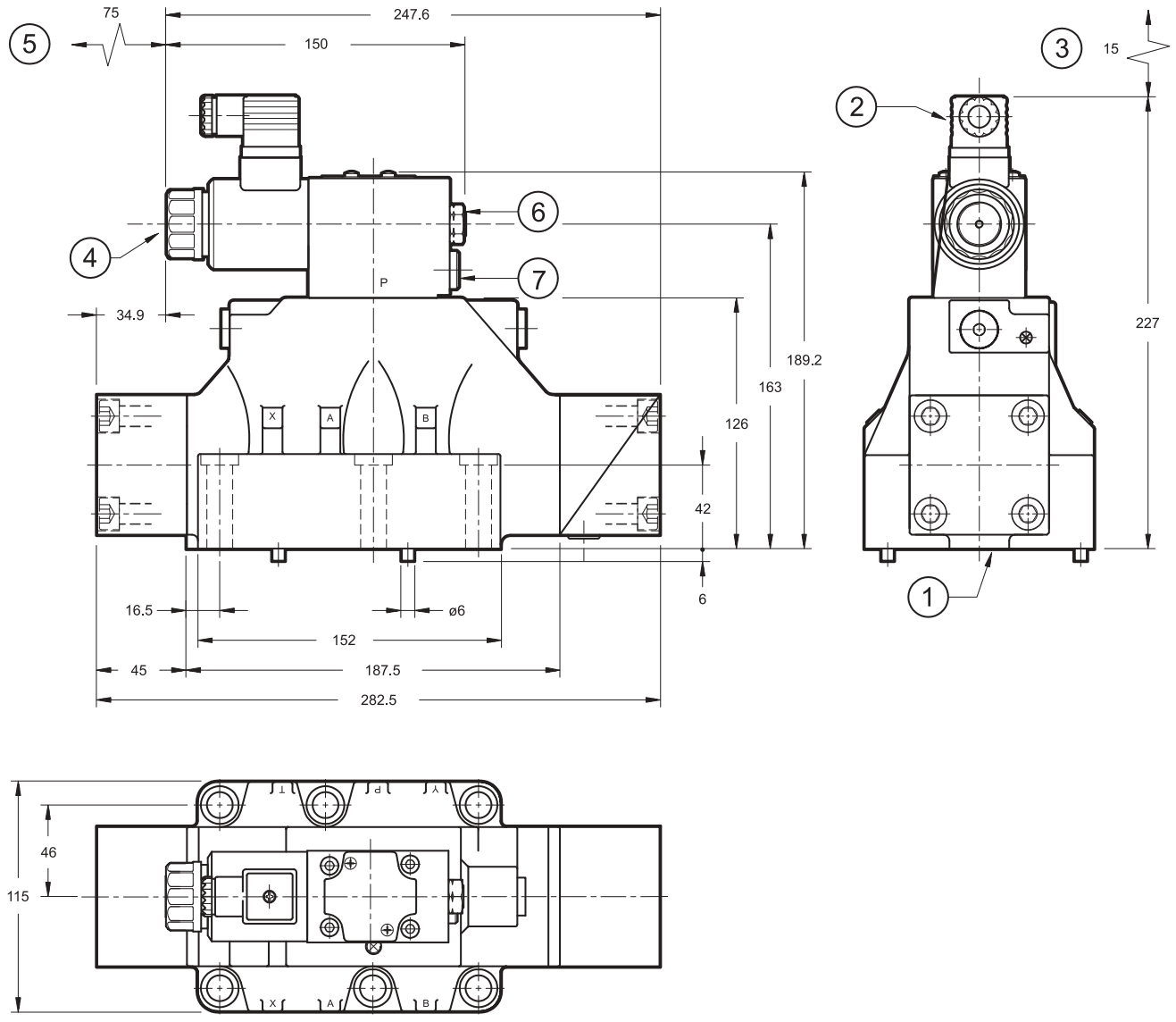
NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (4) placed at the end of the solenoid tube.

Single valve fastening:	N. 4 SHC M10x60 bolts - ISO 4762 N. 2 SHC M6x60 bolts - ISO 4762
Tightening torque M10x60: 40 Nm (A 8.8 bolts) M6x60: 8 Nm (A 8.8 bolts)	
Thread of mounting holes: M6x18; M10x18	
Sealing rings:	N. 4 OR type 130 (22.22x2.62) - 90 Shore N. 2 OR type 2043 (10.82x1.78) - 90 Shore

1	Mounting surface with sealing rings
2	DIN 43650 electrical connector (included in the supply)
3	Connector removal space
4	Breather (Allen key 4)
5	Coil removal space
6	Adjustment sealing made in factory. Do not unscrew the nut.
7	Pressure gauge port 1/4” BSP

10 - DZCE8 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

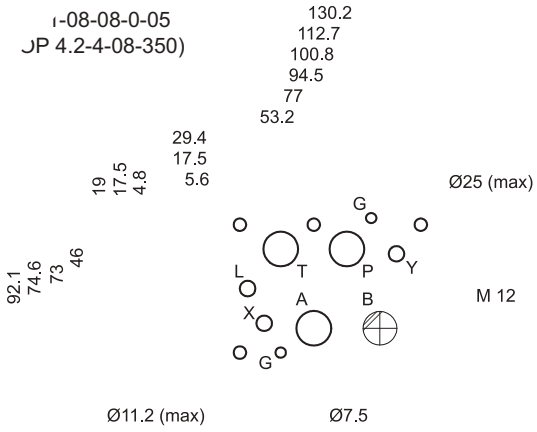


NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (4) placed at the end of the solenoid tube.

Valve fastening: N. 6 SHC M12x60 screws - ISO 4762
Tightening torque: 69 Nm (A 8.8 bolts)
Thread of mounting holes: M12x20
Sealing rings: N. 4 OR type 3118 (29.82x2.62) - 90 Shore N. 2 OR type 3081 (20.24x2.62) - 90 Shore

1	Mounting surface with sealing rings
2	DIN 43650 electrical connector (included in the supply)
3	Connector removal space
4	Breather (Allen key 4)
5	Coil removal space
6	Adjustment sealing made in factory. Do not unscrew the nut.
7	Pressure gauge port 1/4” BSP

11 - MOUNTING SURFACES



12 - ELECTRONIC CONTROL UNITS

EDC-112	for solenoid 24V DC	plug version	see cat.89 120
EDC-142	for solenoid 12V DC		
EDM-M112	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250
EDM-M142	for solenoid 12V DC		
UEIK-11	for solenoid 24V DC	Eurocard type	see cat. 89 300

13 - SUBPLATES (see catalogue 51 000)

		DZCE5	**DZCE7**	**DZCE8**
Model with rear ports		PME4-AI5G	PME07-AI6G	-
Model with side ports		PME4-AL5G	PME07-AL6G	PME5-AL8G
Thread of ports:	P - T - A - B	3/4" BSP	1½" BSP	1" BSP
	X - Y	1/4" BSP	1/4" BSP	1/4" BSP

DUPLOMATIC OLEODINAMICA

DUPLOMATIC OLEODINAMICA S.p.A.
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DUPLOMATIC MOTION SOLUTIONS

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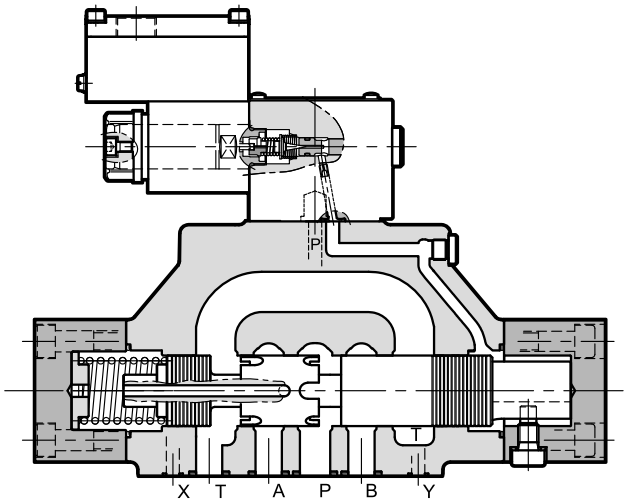
DZCE*K*

EXPLOSION-PROOF PRESSURE REDUCING VALVE WITH PROPORTIONAL CONTROL ATEX, IECEx, PESO

SERIES 30

DZCE5K*	**CETOP P05**
DZCE5RK*	**ISO 4401-05**
DZCE7K*	**ISO 4401-07**
DZCE8K*	**ISO 4401-08**

OPERATING PRINCIPLE



— The DZCE*K* are explosion-proof pressure reducing valves, pilot operated, with proportional control, available with CETOP P05, ISO 4401-05, ISO 4401-07 and ISO 4401-08 mounting surfaces.

— They are compliant with ATEX, IECEx and PESO requirements and are suitable for use in potentially explosive atmospheres, for surface plants or mines.

— A low temperature version (up to -40 °C) is also available.

— They can be controlled directly by a current control supply unit or combined with an external electronic card to maximize the valve performances (see p. 16).

— Upon request, DZCE*K* valves can be supplied with a finishing surface treatment (zinc-nickel) which is suitable to ensure a salt spray resistance up to 600 hours.

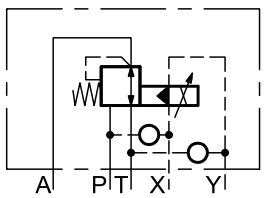
— **Details for classification, operating temperatures and electrical characteristics are in the technical data sheet 02 500 ‘Explosion proof classification’.**

PERFORMANCES

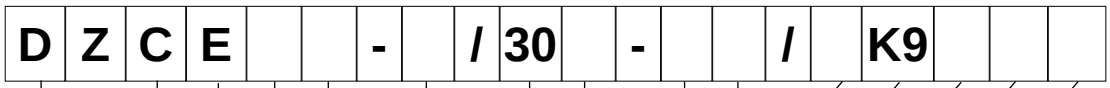
(obtained with mineral oil with viscosity of 36 cSt at 50°C)

		DZCE5K* DZCE5RK*	DZCE7K*	DZCE8K*
Maximum operating pressure	bar	350		
Maximum flow	l/min	150	300	500
Step response		see point 5		
Hysteresis (with PWM 200 Hz)	% of p_{max}	< 6%		
Repeatability	% of p_{max}	< ±2%		
Electrical characteristic		see point 6		
Temperature ranges (ambient and fluid)		see data sheet 02 500		
Fluid viscosity range	cSt	10 ÷ 400		
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13			
Recommended viscosity	cSt	25		
Mass	kg	5.6	8.2	15

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE



Pressure reducing valve

Electric proportional control

Nominal size:
5 = CETOP P05
5R = ISO 4401-05
7 = ISO 4401-07
8 = ISO 4401-08

Explosion-proof certification:
See table 1.1

Pressure adjustment range:
070 = 1 ÷ 70 bar
140 = 1 ÷ 140 bar
210 = 1.2 ÷ 210 bar
320 = 1.8 ÷ 320 bar

Series No. (the overall and mounting dimensions remain unchanged from 30 to 39)

Seals:
For temperature range -20 / +80 °C
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids
For temperature range -40 / +80 °C
NL = seal for low temperatures (for mineral oil)

Option: surface treatment not standard.
Omit if not required
(see **NOTE)**

Option: **/T5**
version in T5 temperature class.
Omit if not required.

Connection type for cable gland
upper connection:
T01 = M20x1.5 - ISO 261
T02 = Gk 1/2 - UNI EN 10226-2
T03 = 1/2" NPT - ANSI B1.20.1 (ex ANSI B2.1)
side connection:
S01 = M20x1.5 - ISO 261
S02 = Gk 1/2 - UNI EN 10226-2
S03 = 1/2" NPT - ANSI B1.20.1 (ex ANSI B2.1)
S04 = M16x1.5 - ISO 261

Coil electrical connection:
junction box

Nominal solenoid voltage:
D12 = 12 V DC
D24 = 24 V DC

Drainage: **I** = internal
E = external

Piloting: **I** = internal
E = external

NOTE: Valves are supplied with standard surface treatment of phosphating black.
Zinc-nickel surface treatment is available upon request. It is suitable to ensure a salt spray resistance up to 600 h (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).
For zinc-nickel surface treatment add the suffix **/W7** at the end of the identification code.

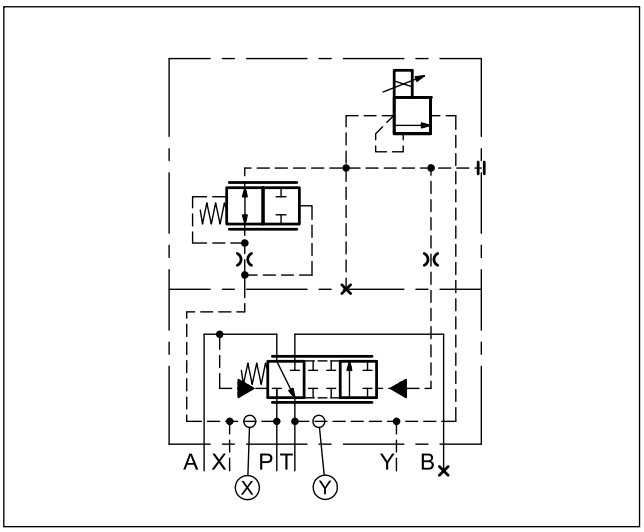
Version with monobloc steel coil
Standard coils are made of zinc-nickel steel, with anodized aluminium junction box on it.
Monobloc coils **MD24K9S01** completely made of steel are available upon request. They have zinc-nickel treatment, power supply voltage D24 and cable gland connection type S01. Other variants for voltage and cable gland connection are available, always on request.

1.1 - Names of valves per certification

	ATEX		IECEx		PESO	
for gases for dusts	**KD2**	II 2GD	**KXD2**	IECEx Gb IECEx Db	**KPD2**	PESO Gb not applicable for dust
for mines	**KDM2**	I M2	**KXDM2**	IECEx Mb	not applicable for mines	

NOTE: Refer to the technical data sheet 02 500 for marking, operating temperatures and available versions.

2 - DETAILED SYMBOL



3 - MAX PRESSURE VALUES

This valve incorporates a mechanical limit of the maximum pressure, that operates independently of the applied current. This kind of design ensures that the pressure cannot rise over even if the solenoid current exceeds the maximum current ($I > I_{max}$).

Values obtained with oil viscosity of 36 cSt at 50°C

		DZCE*K*-070	DZCE*K*-140	DZCE*K*-210	DZCE*K*-320
pressure value at 800 mA	bar	78	140	210	320
max pressure value when $I > I_{max}$	bar	90	150	250	330

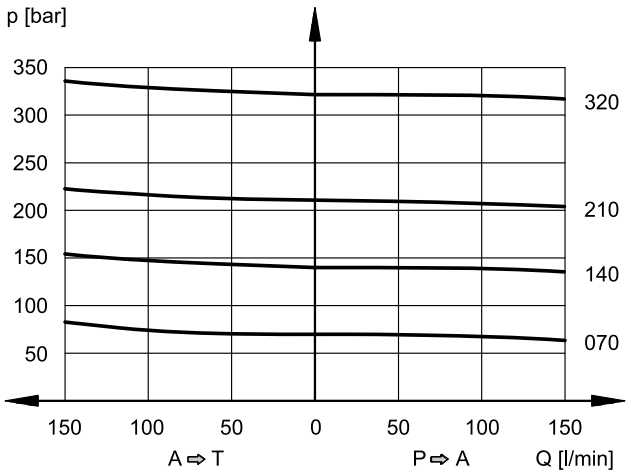
4 - CHARACTERISTIC CURVES

(obtained with mineral oil with viscosity of 36 cSt at 50°C)

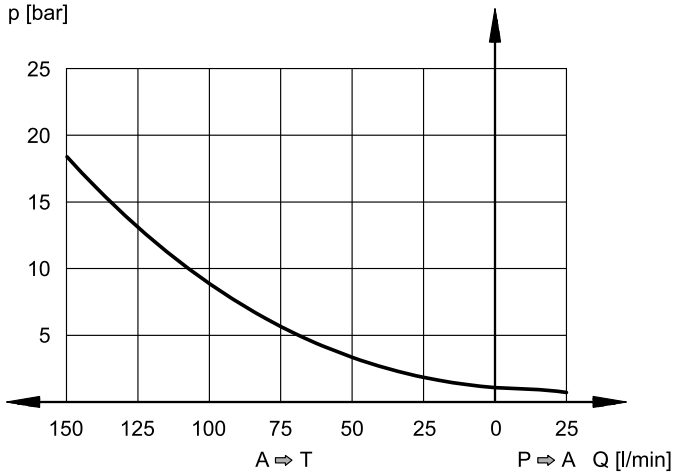
The characteristic curves are measured without hysteresis, linearity compensation and without any backpressure in T.

4.1 - Characteristic curves DZCE5K* and DZCE5RK*

CONTROLLED PRESSURE

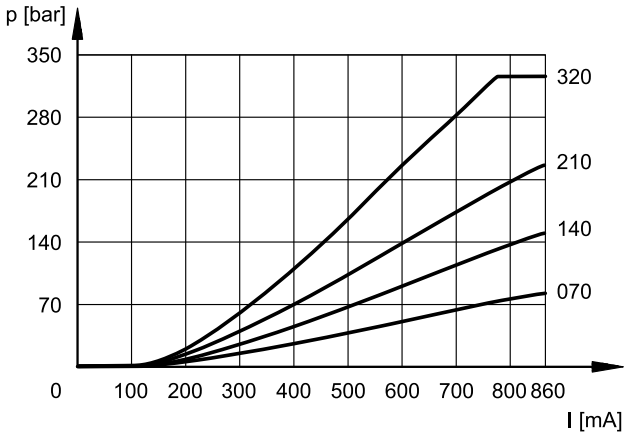


MIN. CONTROLLED PRESSURE p min = f(Q)



Pressure drops A →T as a function of the flow rate, without any backpressure in T and with command signal = 0V

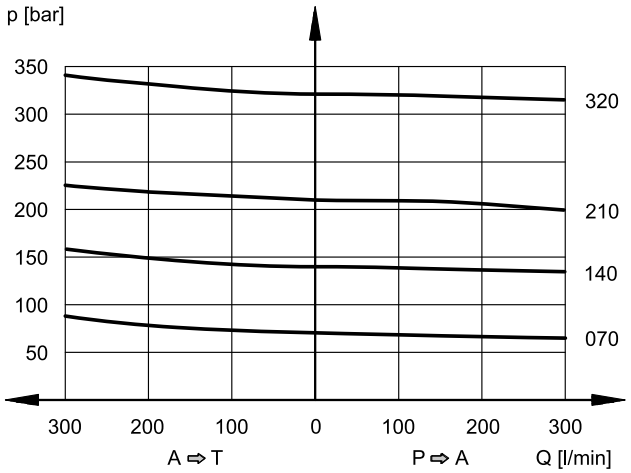
PRESSURE CONTROL p = f(I)



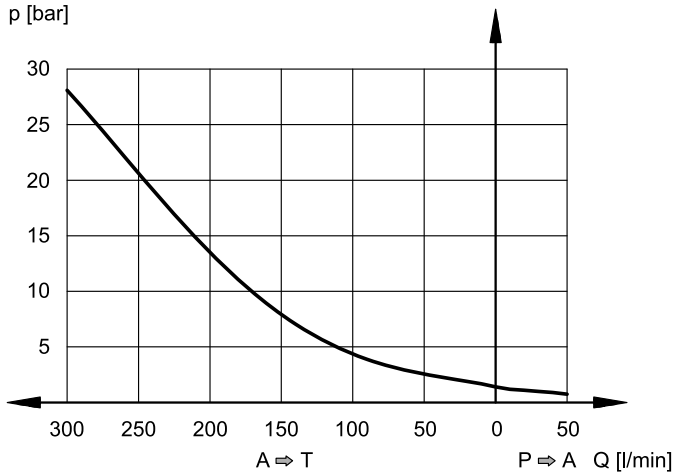
Characteristic curves as a function of the current to the solenoid for the available pressure adjustment ranges, obtained with A port plugged.

4.2 - Characteristic curves DZCE7K*

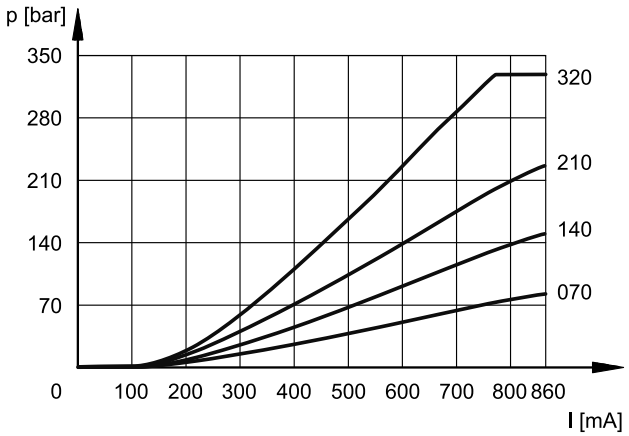
CONTROLLED PRESSURE



MIN. CONTROLLED PRESSURE p min = f(Q)

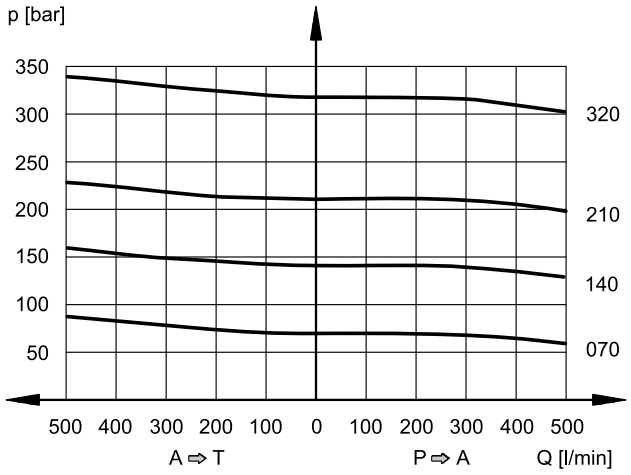


PRESSURE CONTROL p = f(I)

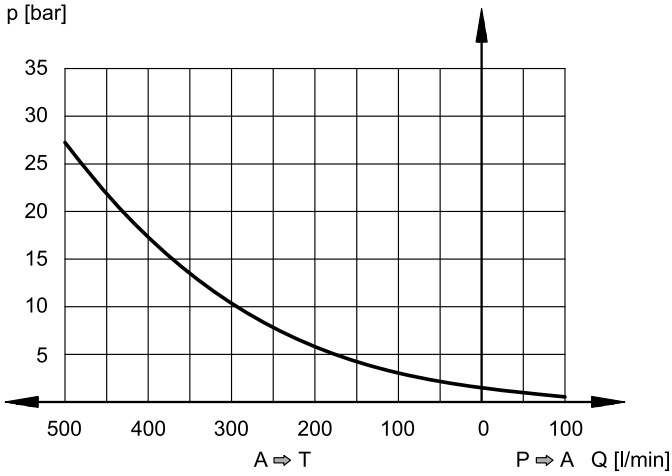


4.3 - Characteristic curves DZCE8K*

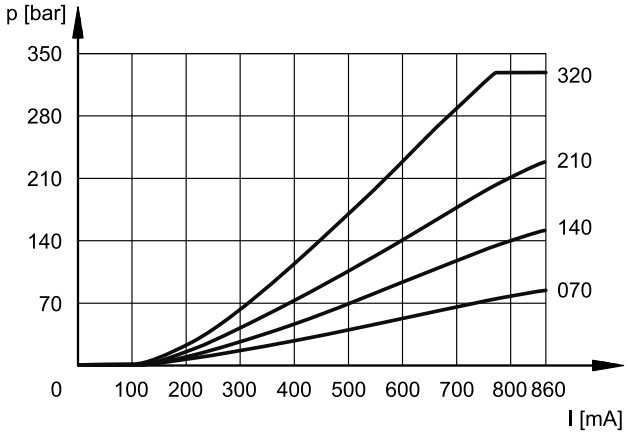
CONTROLLED PRESSURE



MIN. CONTROLLED PRESSURE p min = f(Q)



PRESSURE CONTROL p = f(I)



5 - STEP RESPONSE

(measured with mineral oil with viscosity of 36 cSt at 50°C)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

The values change significantly according to the variation of the available flow rate and to the construction of the circuit.

REFERENCE SIGNAL	0 →100%	100→0%
Response times [ms]		
DZCE5K* and DZCE5RK*	100	50
DZCE7K*	100	50
DZCE8K*	150	70

6 - ELECTRICAL CHARACTERISTICS

(values ± 5%)

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (AT 20°C)	Ω	3.8	15.6
NOMINAL CURRENT	A	1.88	0.86

DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2014/30/EU
CLASS OF PROTECTION: Atmospheric agents Coil insulation (VDE 0580)	 IP66/IP68 class H

6.1 - Wiring

In order to realise the electrical connection of the coil, it is necessary to access the terminal block (1) unscrewing the 4 screws (2) that fasten the cover (3) with the box (4) that contains the terminal block.

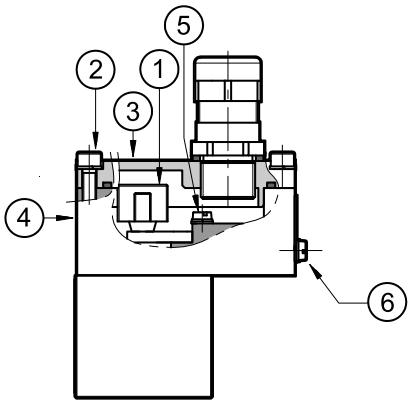
The electrical connection is polarity-independent.

By doing electrical connection it is important to connect also the grounding point (5) in the terminal block box (M4 screws), through suitable conductors with the general grounding line of the system.

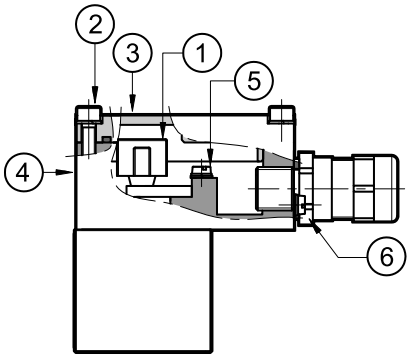
On the external body of the coil, there is a grounding point (6) (M4 screw) that makes it possible to ensure equipotentiality between the valve and the general grounding line of the system; connecting this point, the regulation of the EN 13463-1 standard that requires verifying the equipotentiality of the elements included in a potentially explosive environment (the maximum resistance between the elements must be 100 Ω) is guaranteed.

At the end of the electrical wiring, it is necessary to reassemble the cover (3) on the box (4), checking the correct positioning of the seal located in the cover seat and fastening the 4 M5 screws with a torque of 4.9÷6 Nm.

Electrical wiring must be done in compliance with standards about protection against explosion hazards.



K9T*



K9S*

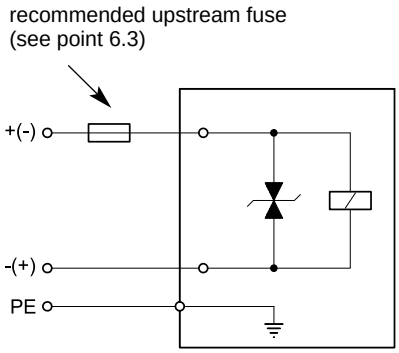
Characteristics of the cables connectable for wiring are indicated in the table below:

Function	Cable section
Operating voltage cables connection	max 2.5 mm²
Connection for internal grounding point	max 2.5 mm²
Connection for external equipotential grounding point	max 6 mm²

Cables for wiring must be non-armoured cables, with external covering sheath and must be suitable for use in environments with temperatures from - 20 °C to +110 °C (for valves either with N or V seals) or from - 40 °C to +110 °C (for valves with NL seals).

Cable glands (which must be ordered separately, see point 15) allow to use cables with external diameter between 8 and 10 mm.

6.2 - Electrical diagram



6.3 - Overcurrent fuse and switch-off voltage peak

Upstream of each valve, an appropriate fuse (max 3 x In according to IEC 60127) or a protective motor switch with short-circuit and thermal instantaneous tripping, as short-circuit protection, must be connected. The cut-off power of the fuse must correspond or exceed the short circuit current of the supply source. The breaking capacity of the fuse link shall be the same as or higher than the maximum short-circuit current expected to occur at the place of installation (normally 1500 A).

The fuse or the protective motor must be placed outside the dangerous area or they must be protected with an explosion-proof covering.

In order to safeguard the electronic device to which the valve is connected, there is a protection circuit in the coil that reduces voltage peaks, which can occur when inductances are switched off.

The table shows the type of fuse recommended according to the nominal voltage of the valve and to the value of the voltage peaks reduction.

Coil type	Nominal voltage [V]	Rated current [A]	**Recommended pre-fuse characteristics medium time-lag according to DIN 41571 [A]**	Maximum voltage value upon switch off [V]	Suppressor circuit
D12	12	1.88	2.5	- 49	Transient voltage suppressor bidirectional
D24	24	0.86	1.25	- 49	

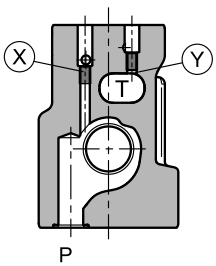
7 - PILOTING AND DRAINAGE

The DZCE*K* valves are available with pilot and drain both internal and external. The version with external drain allows a higher back pressure on the discharge line.

NOTE: The configuration of pilots and drains must be chosen when ordering. Subsequent modifications are allowed only to specialized operators with authorization and in factory.

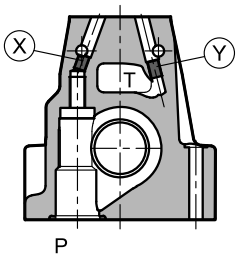
TYPE OF VALVE		Plug assembly	
		X	Y
IE	internal pilot and and external drain	NO	YES
II	internal pilot and internal drain	NO	NO
EE	external pilot and external drain	YES	YES
EI	external pilot and internal drain	YES	NO

DZCE5K* and DZC5RK*

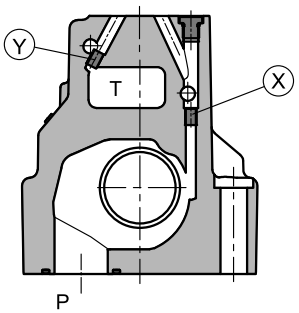


X: M5x6 plug for external pilot
Y: M5x6 plug for external drain

DZCE7K*



DZCE8K*



X: M6x8 plug for external pilot
Y: M6x8 plug for external drain

PRESSURES (bar)

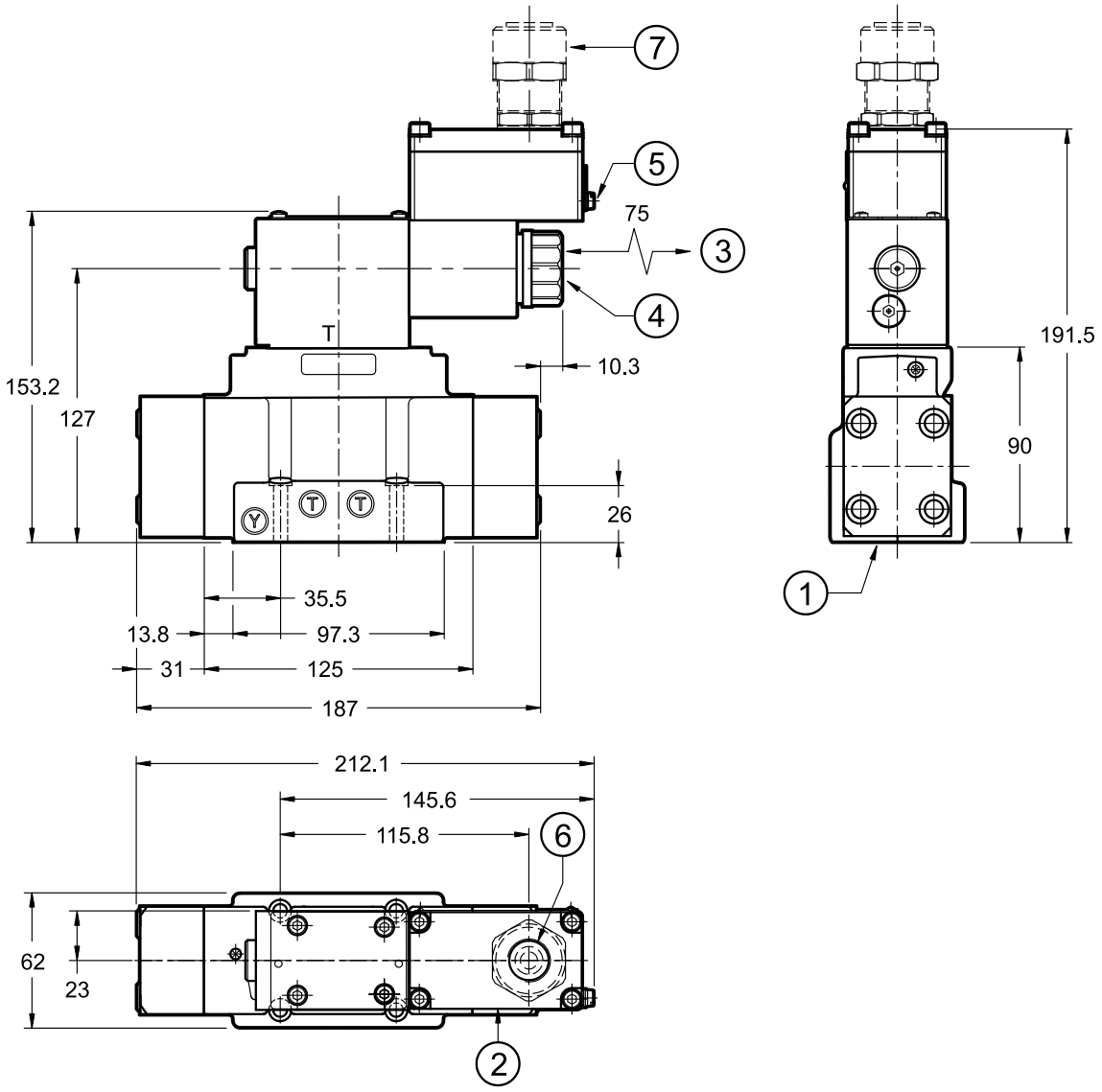
Pressure	MAX
Piloting pressure on external X port	350 (**NOTE**)
Pressure on T port with internal drain	2
Pressure on T port with external drain	250

NOTE: Anyway, the pilot pressure must be 10% higher than the set value for the reduced pressure, in order to let the valve work properly.

8 - DZCE5K* AND DZCE5RK* WITH UPPER CONNECTION - OVERALL AND MOUNTING DIMENSIONS

DZCE5K*-*/30*-*/*K9T*
DZCE5RK*-*/30*-*/*K9T*

dimensions in mm



NOTE 1: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (4) placed at the end of the solenoid tube.

NOTE 2: for side port cable gland see point 11.

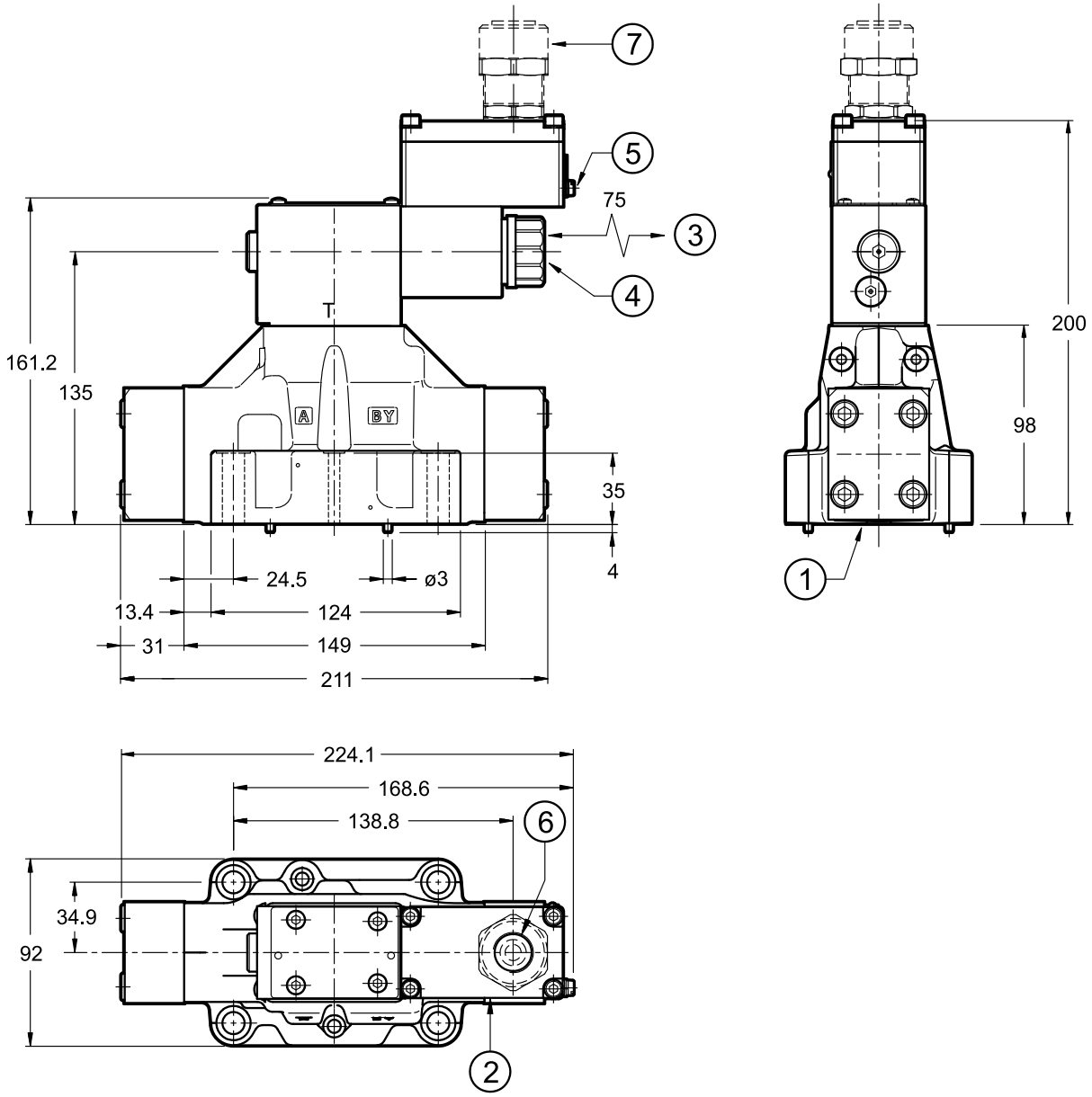
Valve fastening: N. 4 SHC screws M6x35 - ISO 4762
Tightening torque: 8 Nm (A8.8 screws)
Thread of mounting holes: M6x10

1	Mounting surface with sealing rings: N. 5 OR type 2050 (12.42x1.78) - 90 Shore N. 2 OR type 2037 (9.25x1.78) - 90 Shore
2	Explosion-proof coil
3	Minimum clear space required
4	Breather (Allen key 4)
5	Terminal for supplementary earth (GND) connection
6	Upper port for cable gland
7	Cable gland. To be ordered separately, see point 15

9 - DZCE7K* WITH UPPER CONNECTION - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

DZCE7K*-*/30*-*/*K9T*



NOTE 1: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (4) placed at the end of the solenoid tube.

NOTE 2: for side port cable gland see point 11.

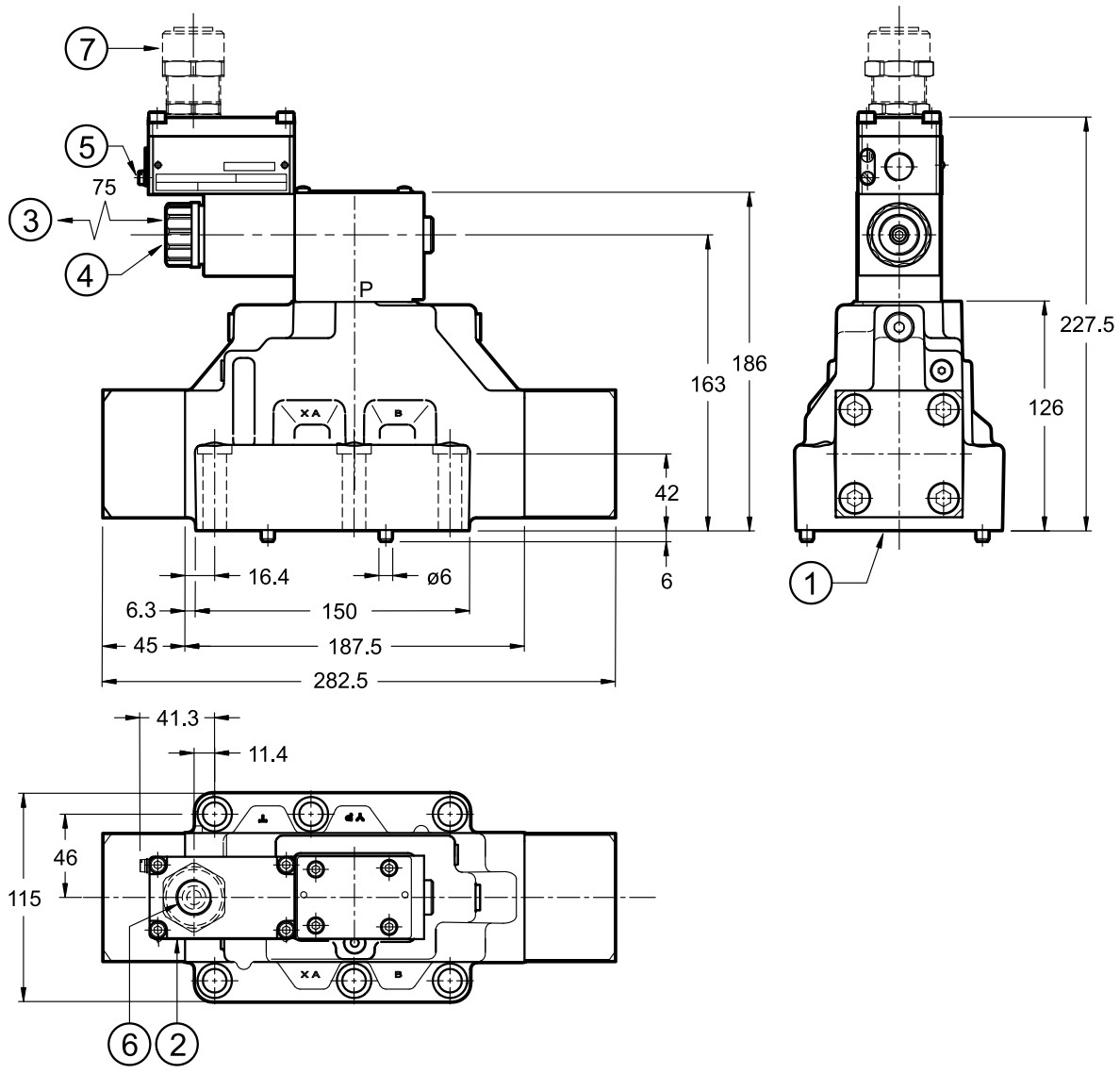
Single valve fastening:	N. 4 SHC screws M10x50 - ISO 4762 N. 2 SHC screws M6x50 - ISO 4762
Tightening torque	M10x50: 40 Nm (A8.8 screws) M6x50: 8 Nm (A8.8 screws)
Thread of mounting holes: M6x18; M10x18	

1	Mounting surface with sealing rings: 4 OR type 130 (22.22x2.62) - 90 Shore 2 OR type 2043 (10.82x1.78) - 90 Shore
2	Explosion-proof coil
3	Minimum clear space required
4	Breather (Allen key 4)
5	Terminal for supplementary earth (GND) connection
6	Upper port for cable gland
7	Cable gland. To be ordered separately, see point 15

10 - DZCE8K* WITH UPPER CONNECTION - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

DZCE8K*-*/30*-*/*K9T*



NOTE 1: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (4) placed at the end of the solenoid tube.

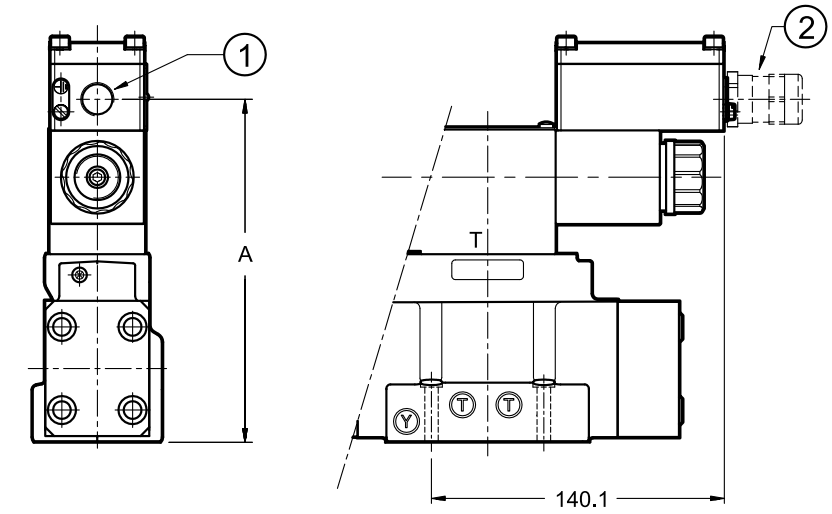
NOTE 2: for side port cable gland see point 11.

Valve fastening: N. 6 SHC screws M12x60 - ISO 4762
Tightening torque: 69 Nm (A8.8 screws)
Thread of mounting holes: M12x20

1	Mounting surface with sealing rings: 4 OR type 3131 (32.99x2.62) - 90 Shore 2 OR type 3087 (21.89x2.62) - 90 Shore
2	Explosion-proof coil
3	Minimum clear space required
4	Breather (Allen key 4)
5	Terminal for supplementary earth (GND) connection
6	Upper port for cable gland
7	Cable gland. To be ordered separately, see point 15

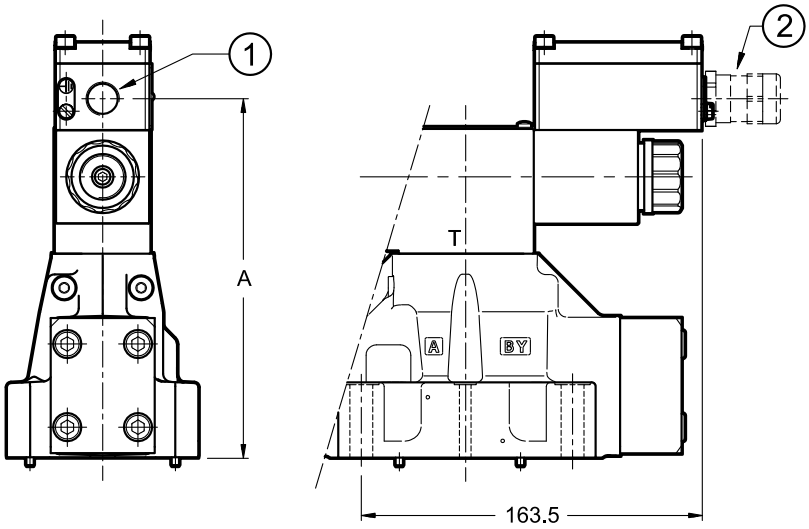
11 - DZCE*K* WITH SIDE CONNECTION - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



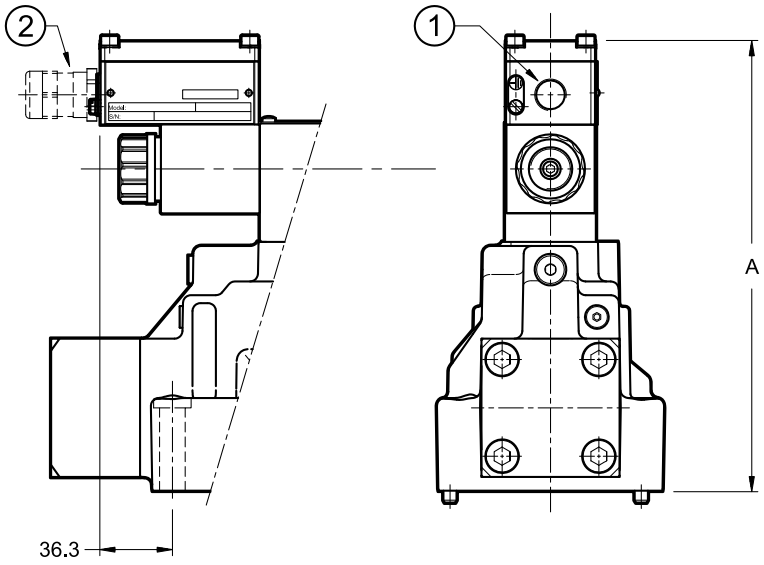
DZCE5K*-*/30*-*/*K9S*
DZCE5RK*-*/30*-*/*K9S*

Side port type	Dimension A
S01, S04	164.5
S02, S03	164



DZCE7K*-*/30*-*/*K9S*

Side port type	Dimension A
S01, S04	172.5
S02, S03	170



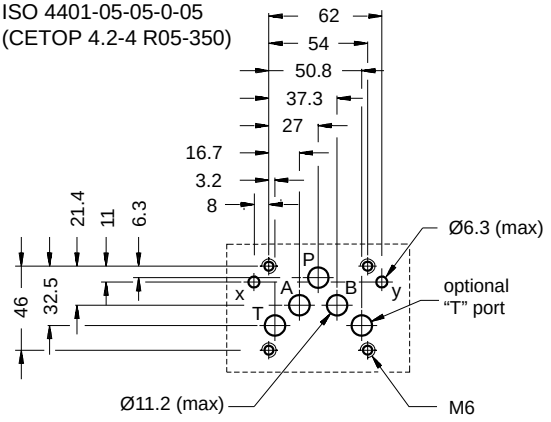
DZCE8K*-*/30*-*/*K9S*

Side port type	Dimension A
S01, S04	227.5
S02, S03	227

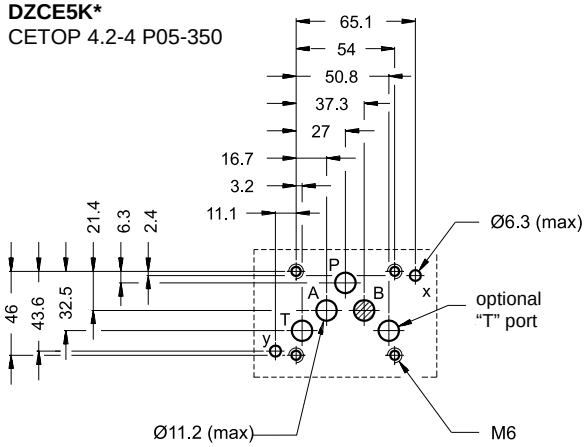
1	Side port for cable gland
2	Cable gland. To be ordered separately, see p. 15

12 - MOUNTING SURFACES

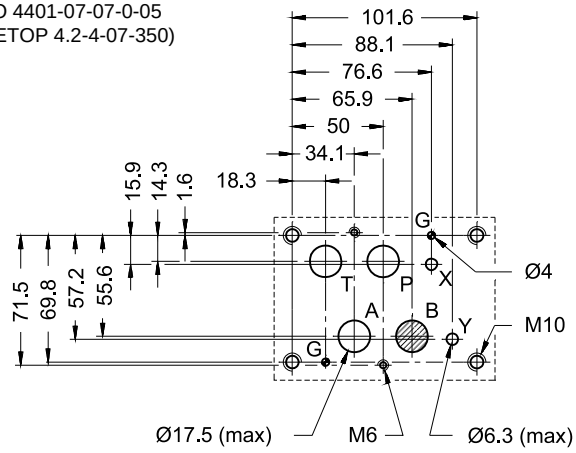
DZCE5RK*
ISO 4401-05-05-0-05
(CETOP 4.2-4 R05-350)



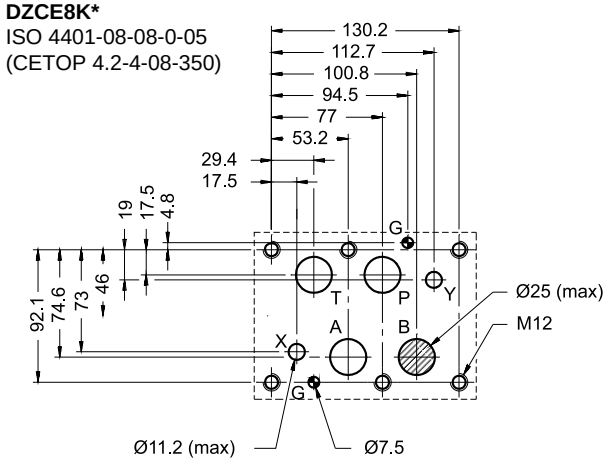
DZCE5K*
CETOP 4.2-4 P05-350



DZCE7K*
ISO 4401-07-07-0-05
(CETOP 4.2-4-07-350)



DZCE8K*
ISO 4401-08-08-0-05
(CETOP 4.2-4-08-350)



13 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

14 - INSTALLATION

Installation must adhere to instructions reported in the Use and Maintenance manual, always attached to the valve. Unauthorized interventions can be harmful to people and goods because of the explosion hazards present in potentially explosive atmospheres.

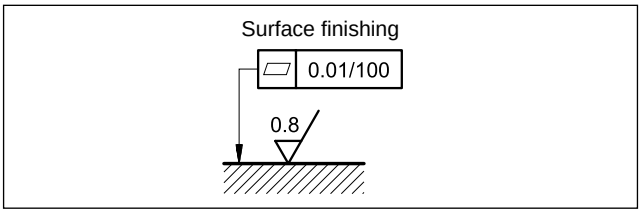
The DZCE*K* valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit. In particular applications, it can be necessary to vent the air entrapped in the solenoid tube, by using the appropriate drain screw in the solenoid tube. So, ensure the solenoid tube is always filled with oil. When finished, make sure you have screwed the screw back in correctly.

Connect the valve T port directly to the tank. Add any backpressure value detected in the T line to the controlled pressure value.

Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.

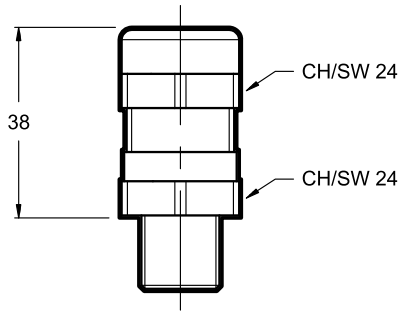
Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.



15 - CABLE GLANDS

Cable glands must be ordered separately; Duplomatic offers some types of cable glands with the following features:

- version for non-armoured cable, external seal on the cable (suitable for Ø 8÷10 mm cables);
- ATEX II 2GD, I M2; IECEx Gb, Db, Mb;
- cable gland material: nickel brass
- inner rubber tip material: silicone
- ambient temperature range: -65 ºC ÷ +220 ºC
- protection degree: IP66/IP68



To order the desired cable glands, specify description, code and quantity.

Description: CGK2/NB-01/10

Code: 3908108001

M20x1.5 - ISO 261 male thread, suitable for coils with T01 and S01 connections. It is supplied equipped with copper washer, that must be assembled between the cable gland and the coil, so as to ensure IP66/IP68 protection degree.

Tightening torque: 45 ÷ 50 Nm

Description: CGK2/NB-02/10

Code: 3908108002

Gk 1/2 - UNI EN 10226-2 male thread, suitable for coils with T02 and S02 connections. The customer must apply LOCTITE® 243™ threadlocker or similar between the cable gland connection thread and the coil in order to ensure IP66/IP68 protection degree.

Tightening torque: 20 ÷ 25 Nm

Description: CGK2/NB-03/10

Code: 3908108003

1/2" NPT - ANSI B1.20.1 (ex ANSI B2.1), suitable for coils with T03 and S03 connections. The customer must apply LOCTITE® 243™ threadlocker or similar between the cable gland connection thread and the coil in order to ensure IP66/IP68 protection degree.

Tightening torque: 20 ÷ 25 Nm

Description: CGK2/NB-04/10

Code: 3908108004

M16x1.5 - ISO 261 male thread, suitable for coils with S04 connection. It is supplied equipped with copper washer, that must be assembled between the cable gland and the coil, so as to ensure IP66/IP68 protection degree.

Tightening torque: 45 ÷ 50 Nm

16 - ELECTRONIC CONTROL UNITS

EDM-M112	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 252
EDM-M142	for solenoid 12V DC		

NOTE: electronic control units offered are not explosion-proof certified; therefore, they must be installed outside classified areas.

17 - SUBPLATES

(see catalogue 51 000)

		DZCE5K*	DZCE7K*	DZCE8K*
Type with rear ports		PME4-AI5G	PME07-AI6G	-
Type with side ports		PME4-AL5G	PME07-AL6G	PME5-AL8G
Thread of ports:	P - T - A - B X - Y	3/4" BSPP 1/4" BSPP	1½" BSPP 1/4" BSPP	1" BSPP 1/4" BSPP

NOTE: Subplates (to be ordered separately) contain neither aluminium nor magnesium at a rate higher than the value allowed by norms according to ATEX directive for category II 2GD and I M2.

The user will bear to do the complete assessment of the ignition risk that can occur from the relative use in potentially explosive environments.

DUPLOMATIC
MOTION SOLUTIONS
a member of DAIKIN group

DUPLOMATIC MS Spa
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EXPLOSION-PROOF CLASSIFICATION for

SOLENOID AND PROPORTIONAL VALVES

ref. catalogues:

pressure control valves

RQM*K*-P	**21 515**
P*E*K*	**81 316**
ZDE3K*	**81 515**
DZCE*K*	**81 606**

flow control valves

QDE3K*	**82 225**

directional valves

D*K*	**41 515**
DT3K*	**42 215**
DS(P)E*K*	**83 510**

GENERAL INFO

This informative technical datasheet displays information about **classification and marking** of Duplomatic explosion-proof valves range.

Duplomatic MS offers valves with the following certifications:

ATEX	**II 2G**	**II 2D**	**I M2**
IECEx	**Gb**	**Db**	**Mb**
PESO	**Gb**		

Instructions for use and maintenance can be found in the related manuals, always supplied toghether with valves.

1 - ATEX CLASSIFICATION AND TEMPERATURES

Duplomatic certificates the combination valve-coil for the valves suitable for application and installation in potentially explosive atmospheres, according to ATEX directive; the supply always includes the declaration of conformity to the directive and the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environments.

Coils assembled on these valves have been separately certified according to ATEX directive and so they are suitable for use in potentially explosive atmospheres.

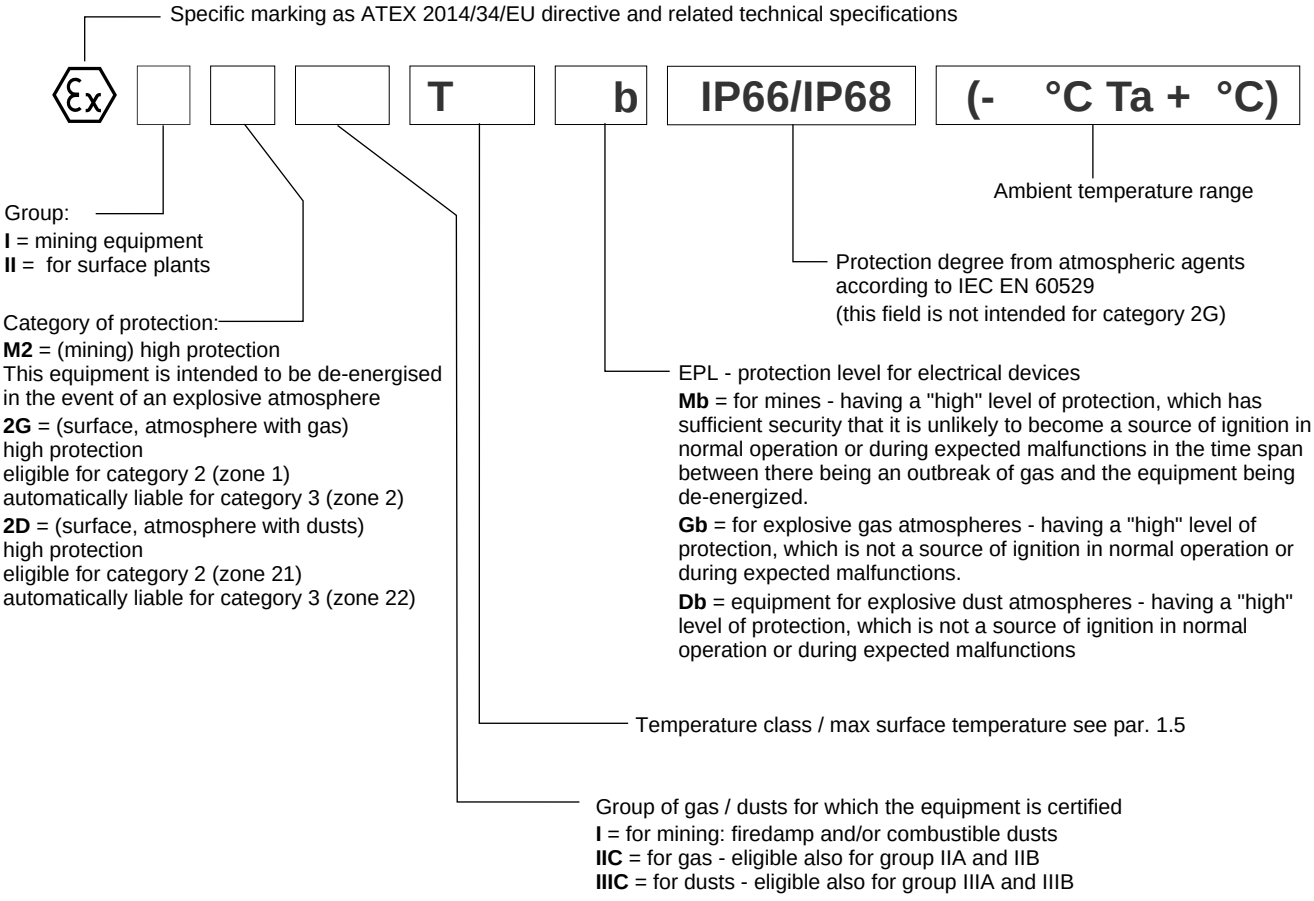
1.1 - ATEX classification for valves

Type examination certificate: AR18ATEX055
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

ATEX II 2G ATEX II 2D	***KD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur occasionally.The means of protection relating to equipment in this category ensure the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account.
ATEX I M2	***KDM2**	equipment intended for use in underground parts of mines as well as those parts of surface installations of such mines likely to be endangered by firedamp and/or combustible dust. This equipment is intended to be de-energised in the event of an explosive atmosphere.

1.2 - ATEX marking for valves

valve code		N and V seals	NL seals
***KD2**	for gas	Ex II 2G IIC T4 Gb (-20°C Ta +80°C)	Ex II 2G IIC T4 Gb (-40°C Ta +80°C)
	for dusts	Ex II 2D IIIC T154°C Db IP66/IP68 (-20°C Ta +80°C)	Ex II 2D IIIC T154°C Db IP66/IP68 (-40°C Ta +80°C)
***KD2 /T5**	for gas	Ex II 2G IIC T5 Gb (-20°C Ta +55°C)	Ex II 2G IIC T5 Gb (-40°C Ta +55°C)
	for dusts	Ex II 2D IIIC T129°C Db IP66/IP68 (-20°C Ta +55°C)	Ex II 2D IIIC T129°C Db IP66/IP68 (-40°C Ta +55°C)
***KDM2**	mining	Ex I M2 I T150°C Mb IP66/68 (-20°C Ta +75°C)	Ex I M2 I T150°C Mb IP66/68 (-40°C Ta +75°C)



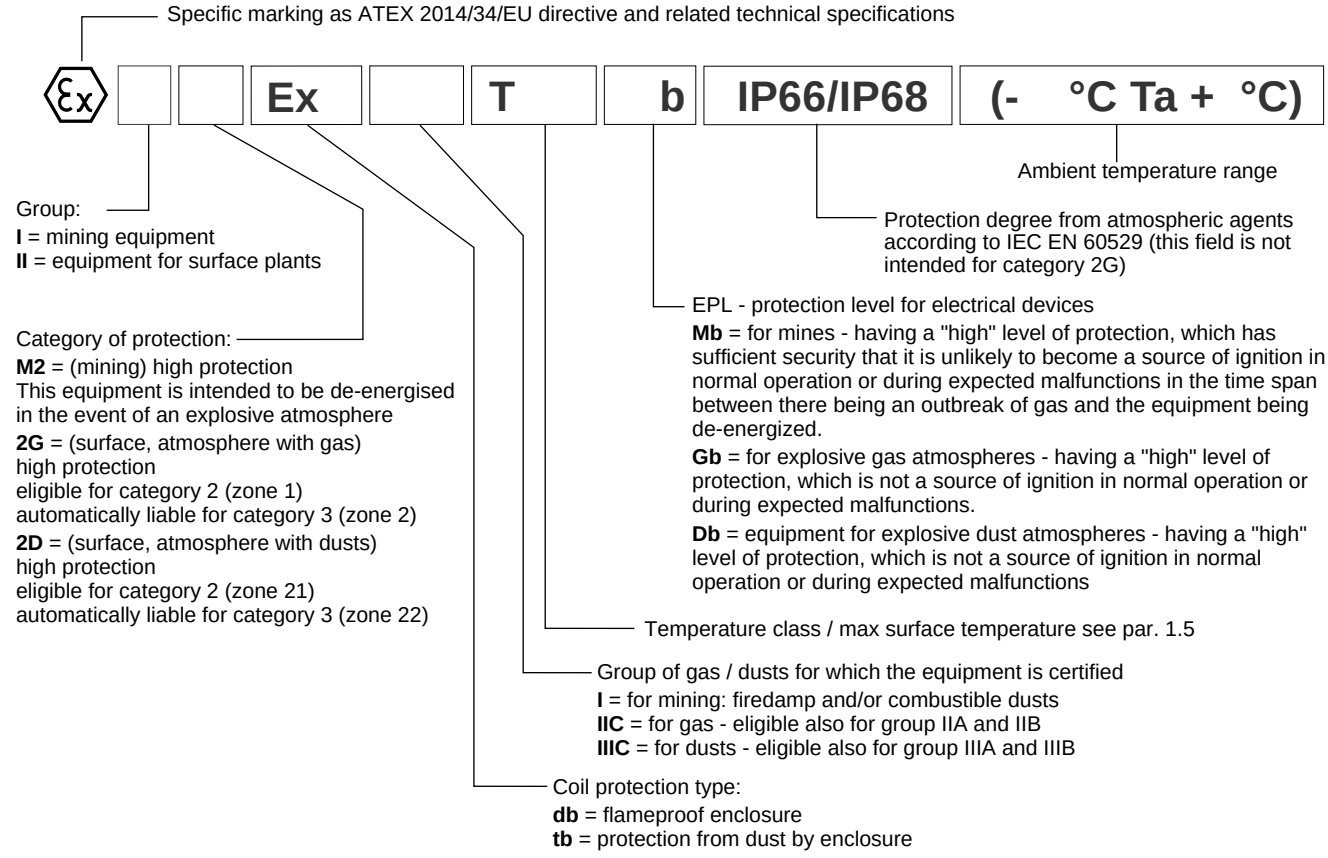
1.3 - ATEX classification of the coils

The coil of the explosion-proof valves is ATEX certified itself and, as such, is identified with its own tag, carries the relative ATEX marking. The mechanical construction of the coil housing is made in order to ensure its resistance to possible internal explosion and to avoid any explosion propagation to the outside environment, matching an “Ex db” type protection (explosion-proof coil).

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

1.4 - ATEX marking on coils

for valve type ***KD2**	for gas	Ex II 2G Ex db IIC T4 Gb (-40°C Ta +80°C)
	for dusts	Ex II 2D Ex tb IIIC T154°C Db IP66/IP68 (-40°C Ta +80°C)
for valve type ***KD2 /T5**	for gas	Ex II 2G Ex db IIC T5 Gb (-40°C Ta +55°C)
	for dusts	Ex II 2D Ex tb IIIC T129°C Db IP66/IP68 (-40°C Ta +55°C)
for valve type ***KDM2**	mining	Ex I M2 Ex db I T150°C Mb IP66/IP68 (-40°C Ta +75°C)



1.5 - Operating temperatures

These valves are classified according to their maximum surface temperature (EN 13463-1), which must be lower than the ignition temperature of the gases, vapors and dusts for which the area in which they will be used is classified.

The valves in group II can also be used for less limiting temperature classes (surface temperature allowed higher).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
ATEX II 2G ATEX II 2D	***KD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas) T154°C (dusts)	T3, T2, T1 T200°C and higher
		of fluid				
	***KD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas) T129°C (dusts)	T4, T3, T2, T1 T135°C and higher
		of fluid	-20 / +60 °C	-40 / +60 °C		
ATEX I M2	***KDM2**	of ambient	-20 / +75 °C	-40 / +75 °C	T150°C	-
		of fluid				

2 - IECEX CLASSIFICATION AND TEMPERATURES

The IECEx certification requires the classification of the electrical equipment only.

Duplomatic supplies valves with IECEx certified coils, suitable for application and installation in potentially explosive atmospheres. The mechanical construction of the coil housing is made in order to ensure its resistance to possible internal explosion and to avoid any explosion propagation to the outside environment, matching an “Ex db” type protection (explosion-proof coil).

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

The supply always includes the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environment.

2.1 - IECEx classification

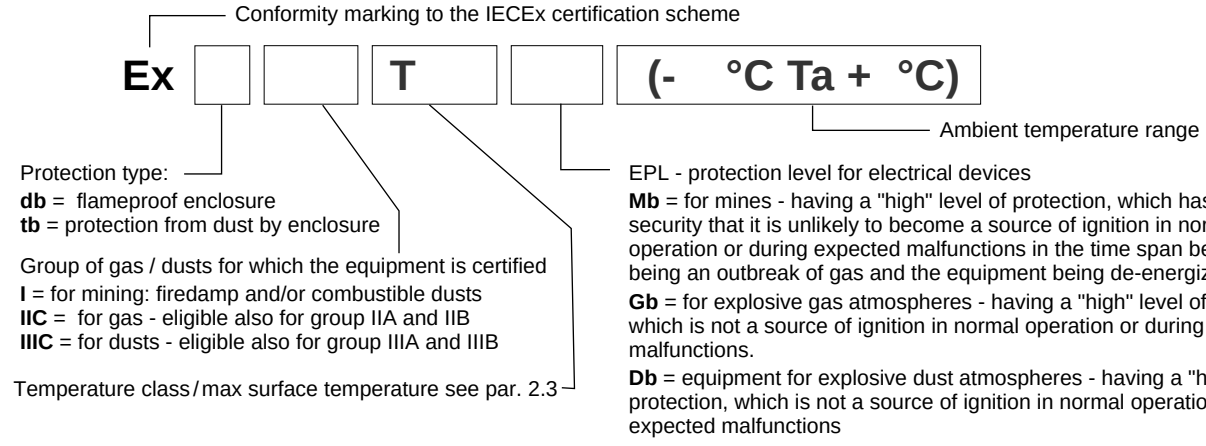
Certificate of conformity (CoC): IECEx TUN 15.0028X
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

IECEx Gb IECEx Db	***KXD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur occasionally.The means of protection relating to equipment in this category ensure the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account.
IECEx Mb	***KXDM2**	equipment intended for use in underground parts of mines as well as those parts of surface installations of such mines likely to be endangered by firedamp and/or combustible dust. This equipment is intended to be de-energised in the event of an explosive atmosphere.

2.2 - IECEx marking

There is a plate with the IECEx mark on each coil.

***KXD2** valves	for gas for dusts	Ex db IIC T4 Gb (-40°C Ta +80°C) Ex tb IIIC T135°C Db (-40°C Ta +80°C)
***KXD2 /T5** valves	for gas for dusts	Ex db IIC T5 Gb (-40°C Ta +55°C) Ex tb IIIC T100°C Db (-40°C Ta +55°C)
***KDM2** valves	mining	Ex db I Mb (-40°C Ta +80°C)



2.3 - Operating temperatures

These valves are classified according to their maximum surface temperature (EN 13463-1), which must be lower than the ignition temperature of the gases, vapors and dusts for which the area in which they will be used is classified.

Valves for surface plants can also be used for less limiting temperature classes (higher surface temperature allowed).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
IECEx Gb IECEx Db	***KXD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas) T135°C (dusts)	T3, T2, T1 T200°C and higher
		of fluid				
	***KXD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas) T100°C (dusts)	T4, T3, T2, T1 T135°C and higher
		of fluid	-20 / +60 °C	-40 / +60 °C		
IECEx Mb	***KXDM2**	of ambient	-20 / +80 °C	-40 / +80 °C	-	-
		of fluid				

2.4 - Protection degree from atmospheric agents (IEC EN 60529)

Protection degree from atmospheric agents according to IEC EN 60529 is IP66/IP68.

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3 - PESO CLASSIFICATION AND TEMPERATURES

The PESO certification requires the classification of the electrical equipment only.

Duplomatic supplies valves with PESO certified coils, suitable for application and installation in potentially explosive atmospheres. The mechanical construction of the coil housing is made in order to ensure its resistance to possible internal explosion and to avoid any explosion propagation to the outside environment, matching an “Ex db” type protection (explosion-proof coil).

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

The supply always includes the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environment.

3.1 - PESO classification

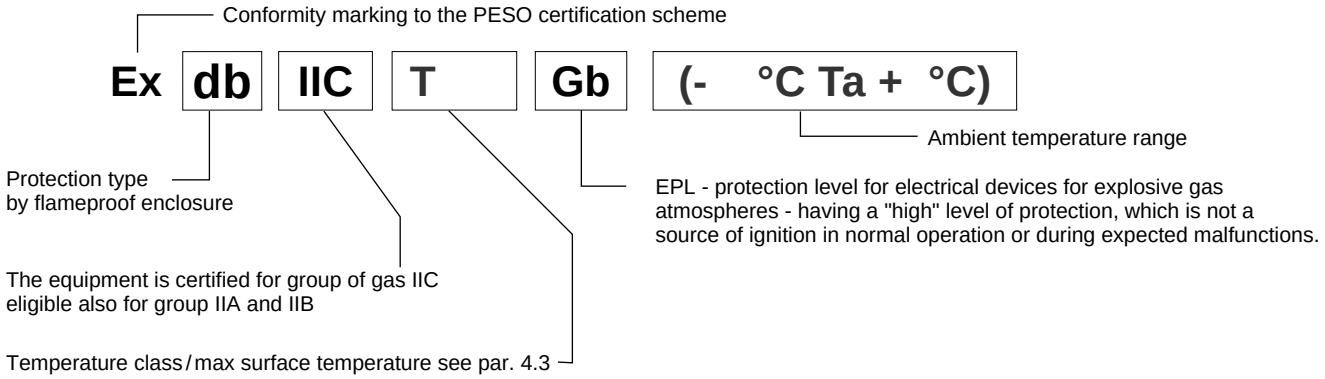
Certificate of conformity: P480801
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

PESO Gb	***KPD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists are likely to occur occasionally.The means of protection relating to equipment in this category ensure the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account.

3.2 - PESO marking

There is a plate with the PESO mark on each coil.

***KPD2** valves	for gas	Ex db IIC T4 Gb (-40°C Ta +80°C)
***KPD2 /T5** valves	for gas	Ex db IIC T5 Gb (-40°C Ta +55°C)



3.3 - Operating temperatures

These valves are classified according to their maximum surface temperature (EN 13463-1), which must be lower than the ignition temperature of the gases, vapors and dusts for which the area in which they will be used is classified.

Valves for surface plants can also be used for less limiting temperature classes (higher surface temperature allowed).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
PESO Gb	***KPD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas)	T3, T2, T1
		of fluid				
	***KPD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas)	T4, T3, T2, T1
		of fluid	-20 / +60 °C	-40 / +60 °C		

3.4 - Protection degree from atmospheric agents (IEC EN 60529)

Protection degree from atmospheric agents according to IEC EN 60529 is IP66/IP68.

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DZCE*G

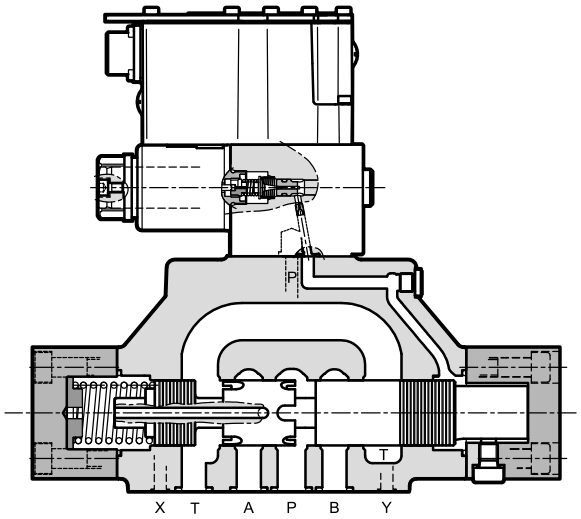
PROPORTIONAL PRESSURE REDUCING VALVES WITH INTEGRATED ELECTRONICS

SERIES 40

DZCE5G	**CETOP P05**
DZCE5RG	**ISO 4401-05**
DZCE7G	**ISO 4401-07**
DZCE8G	**ISO 4401-08**

p max **350** bar
Q max (see performance table)

OPERATING PRINCIPLE



— The DZCE*G are proportional pressure reducing valves with integrated electronics, with mounting interface in compliance with ISO 4401 standards.

— Besides reducing the pressure from line P to working line A, these valves allow the flow to return from the line A to the return line T when a pressure greater than the set value is generated in the downstream circuit (flow path A): a typical case of hydraulic counterweight or load balancing.

— The valves are available with command signal in voltage or current and on-board electronics with internal enable, external enable or 0V monitor on pin C.

— A solenoid current monitoring signal is available.

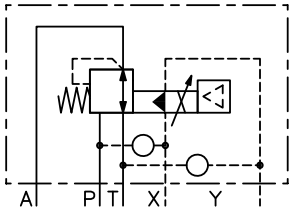
— The valves are easy to install. The driver directly manages digital settings. In the event of special applications, you can customize the settings using the optional kit (see p.15.3).

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C p = 140 bar)

		DZCE5G DZCE5RG	DZCE7G	DZCE8G
Max operating pressure	bar	350		
Maximum flow	l/min	150	300	500
Step response		see point 7		
Hysteresis	% of p_{max}	< 2%		
Repeatability	% of p_{max}	< ±2%		
Electrical characteristics		see point 3		
Ambient temperature range	°C	-20 / +60		
Fluid temperature range	°C	-20 / +80		
Fluid viscosity range	cSt	10 ÷ 400		
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13			
Recommended viscosity	cSt	25		
Mass	kg	7.5	8.5	15.3

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

D	Z	C	E		G	-		/	40		-			/		K11	

Pressure reducing valve

Electric proportional control

Nominal size:
5 = CETOP P05
5R = ISO 4401-05
7 = ISO 4401-07
8 = ISO 4401-08

Integrated electronics for open loop

Pressure control range:
070 = 1 ÷ 70 bar
140 = 1 ÷ 140 bar
210 = 1.2 ÷ 210 bar
300 = 1.8 ÷ 300 bar

Series No.
(the overall and mounting dimensions remain unchanged from 40 to 49)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Piloting: **I** = internal
E = external

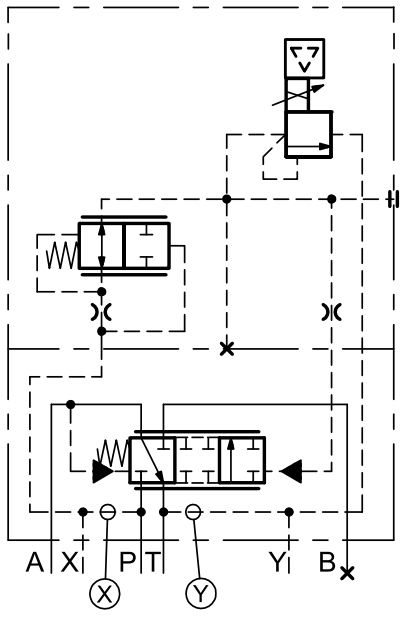
Drainage: **I** = internal
E = external

Reference signal:
E0 = voltage 0÷10 V
E1 = current 4÷20 mA

Main connector 6 pin + PE

Pin C function:
A = external enable
B = internal enable
C = 0V monitor

2 - DETAILED SYMBOL



3 - ELECTRICAL CHARACTERISTICS

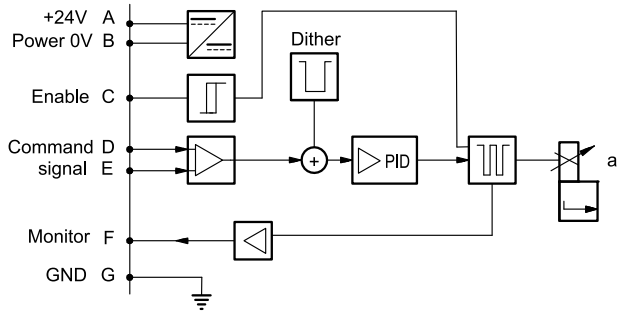
3.1 - Electrical on board electronics

Duty cycle		100% (continuous operation)
Protection class according to IEC 60529		IP65 / IP67 (**NOTE**)
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	25
Maximum solenoid current	A	1.88
Fuse protection, external		2A time lag
Command signals: voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedance Ri > 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm)
Monitor signal (current to solenoid): voltage (E0) current (E1)	 V DC mA	 0 ÷ 10 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
Managed breakdowns		Overload and electronics overheating, cable breakdown, supply voltage failures
Communication		LIN-bus Interface (with the optional kit)
Connection		7 - pin MIL-C-5015-G (DIN-EN 175201-804)
Electromagnetic compatibility (EMC) emissions EN 61000-6-4 immunity EN 61000-6-2		According to 2014/30/EU standards

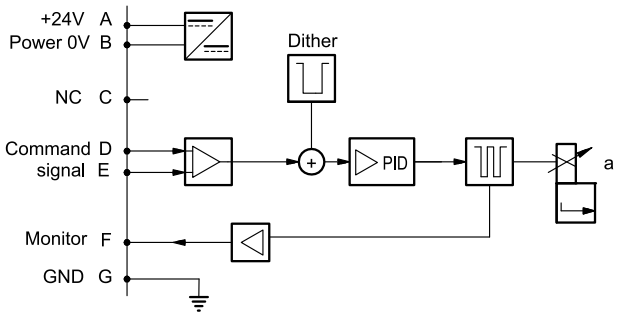
NOTE: The IP degree is guaranteed only with mating connector of equivalent IP degree, installed and tightened correctly.

3.2 - On-board electronics diagrams

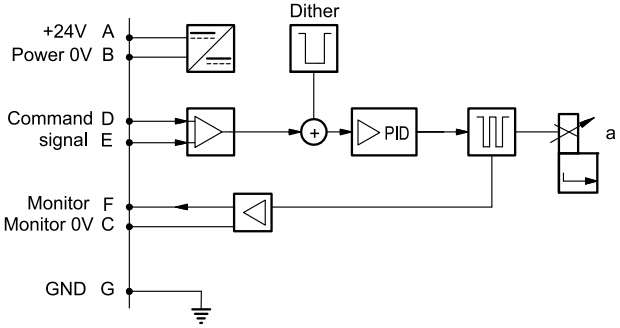
VERSION A - External Enable



VERSION B - Internal Enable

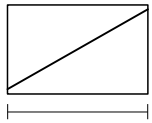


VERSION C - 0V Monitor

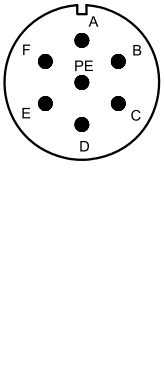


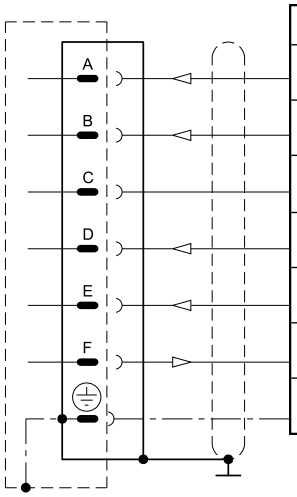
4 - VERSIONS WITH VOLTAGE COMMAND (E0)

The reference signal is between 0 ÷ 10V. The monitor feature of versions B and C becomes available with a delay of 0.5 sec from the power-on of the card.



COMMAND	**0V**	**+10V**
MONITOR	**0V**	**+10V**



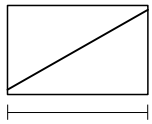


Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	not used -	PIN F reference 0 V
D	0 ÷ 10 V	Command (differential input)		
E	0 V	PIN D reference		
F	0 ÷ 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

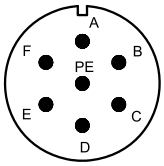
5 - VERSIONS WITH CURRENT COMMAND (E1)

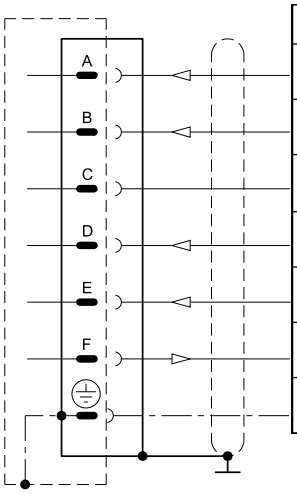
The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower, the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**4 mA**	**20 mA**
MONITOR	**4 mA**	**20 mA**





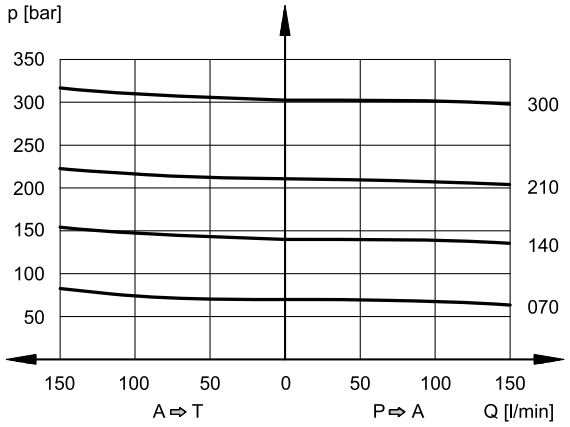
Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	not used -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	PIN D reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

6 - CHARACTERISTIC CURVES

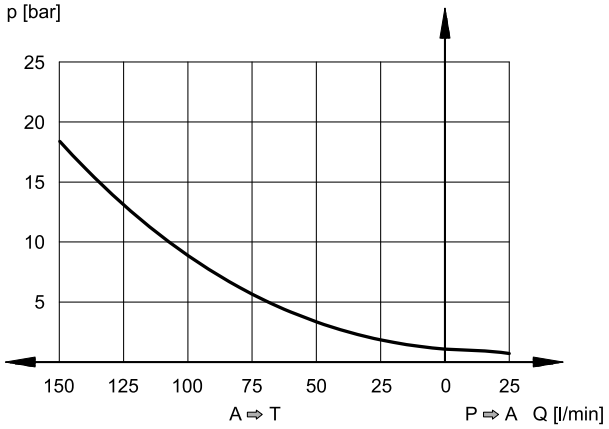
(with mineral oil with viscosity of 36 cSt at 50°C)

6.1 - Characteristic Curves of DZCE5G and DZCE5RG

PRESSURE CONTROL $p_A = f(Q)$

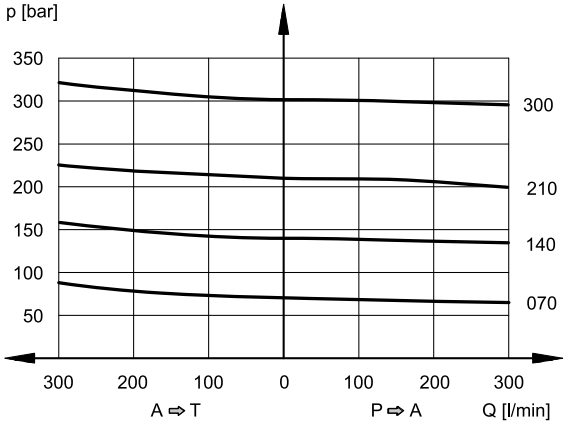


MINIMUM SET PRESSURE p min = f(Q)

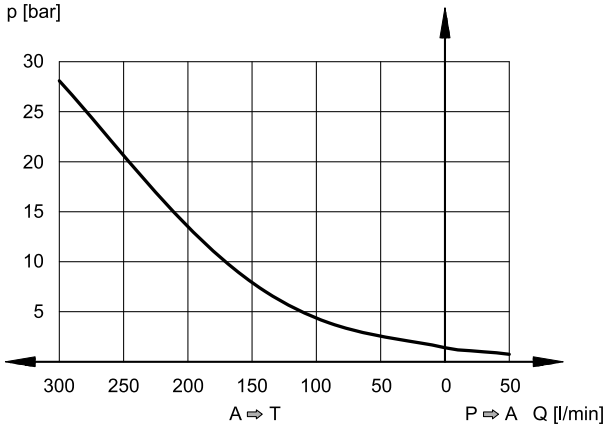


6.2 - Characteristic Curves of DZCE7G

PRESSURE CONTROL $p_A = f(Q)$

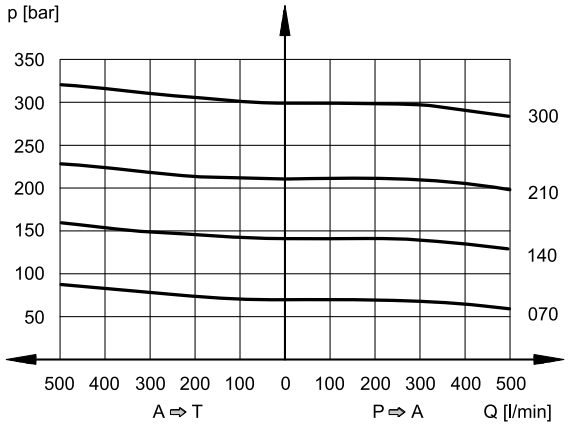


MINIMUM SET PRESSURE p min = f(Q)

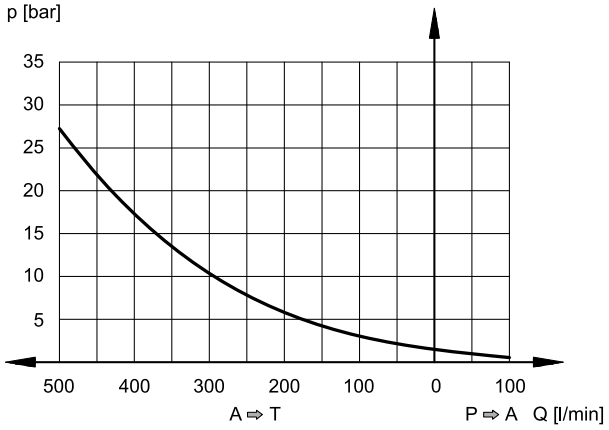


6.3 - Characteristic Curves of DZCE8G

PRESSURE CONTROL $p_A = f(Q)$

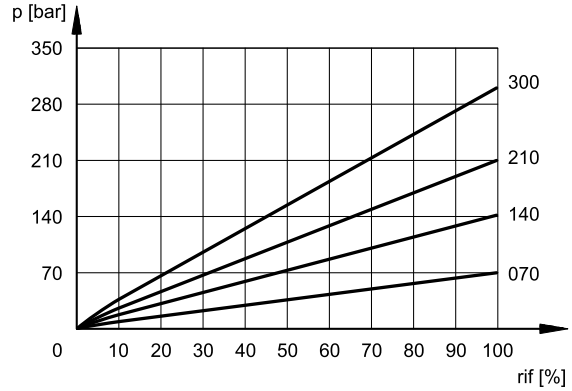


MINIMUM SET PRESSURE p min = f(Q)



6.4 - Pressure in port A depending on the command value p = f(I)

The graph applies to all sizes.



7 - STEP RESPONSE

(measured with mineral oil with viscosity of 36 cSt at 50°C with electronic control card)

The graphs show the typical step response tested with static pressure 100 bar.

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

The values change significantly according to the variation of the available flow rate and to the construction of the circuit.

REFERENCE SIGNAL	0 →100%	100 →0%
Step response [ms]		
DZCE5G and DZCE5RG	100	50
DZCE7G	100	50
DZCE8G	150	70

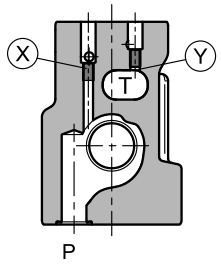
8 - PILOTING AND DRAINAGE

The DZCE*G valves are available with pilot and drain both internal and external. The version with external drain allows a higher back pressure on the discharge line.

NOTE: The configuration of pilots and drains must be chosen when ordering. Subsequent modifications are allowed only to specialized operators with authorization and in factory.

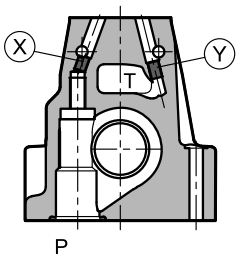
TYPE OF VALVE		Plug assembly	
		X	Y
IE	internal pilot and external drain	NO	YES
II	internal pilot and internal drain	NO	NO
EE	external pilot and external drain	YES	YES
EI	external pilot and internal drain	YES	NO

DZCE5G and DZCE5RG

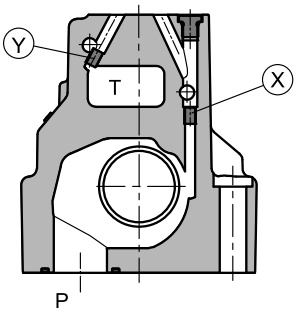


X: M5x6 plug for external pilot
Y: M5x6 plug for external drain

DZCE7G



DZCE8G



X: M6x8 plug for external pilot
Y: M6x8 plug for external drain

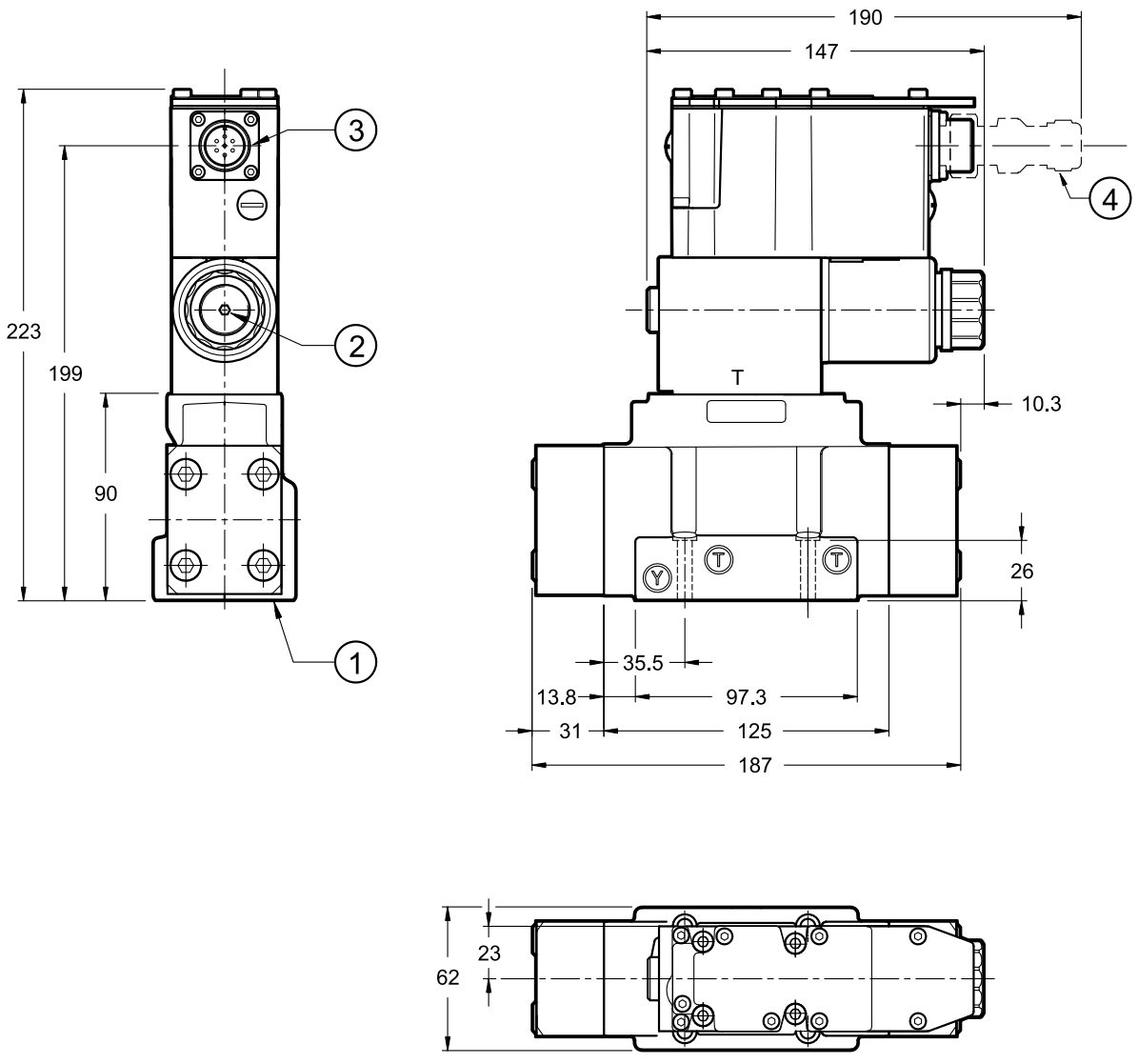
PRESSURES (bar)

Pressure	MAX
Piloting pressure on external X port	350 (**NOTE**)
Pressure on T port with internal drain	2
Pressure on T port with external drain	250

NOTE: The pilot pressure must be 10% higher than the set value for the reduced pressure, in order to let the valve work properly.

9 - OVERALL AND MOUNTING DIMENSIONS DZCE5G AND DZCE5RG

dimensions in mm



NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

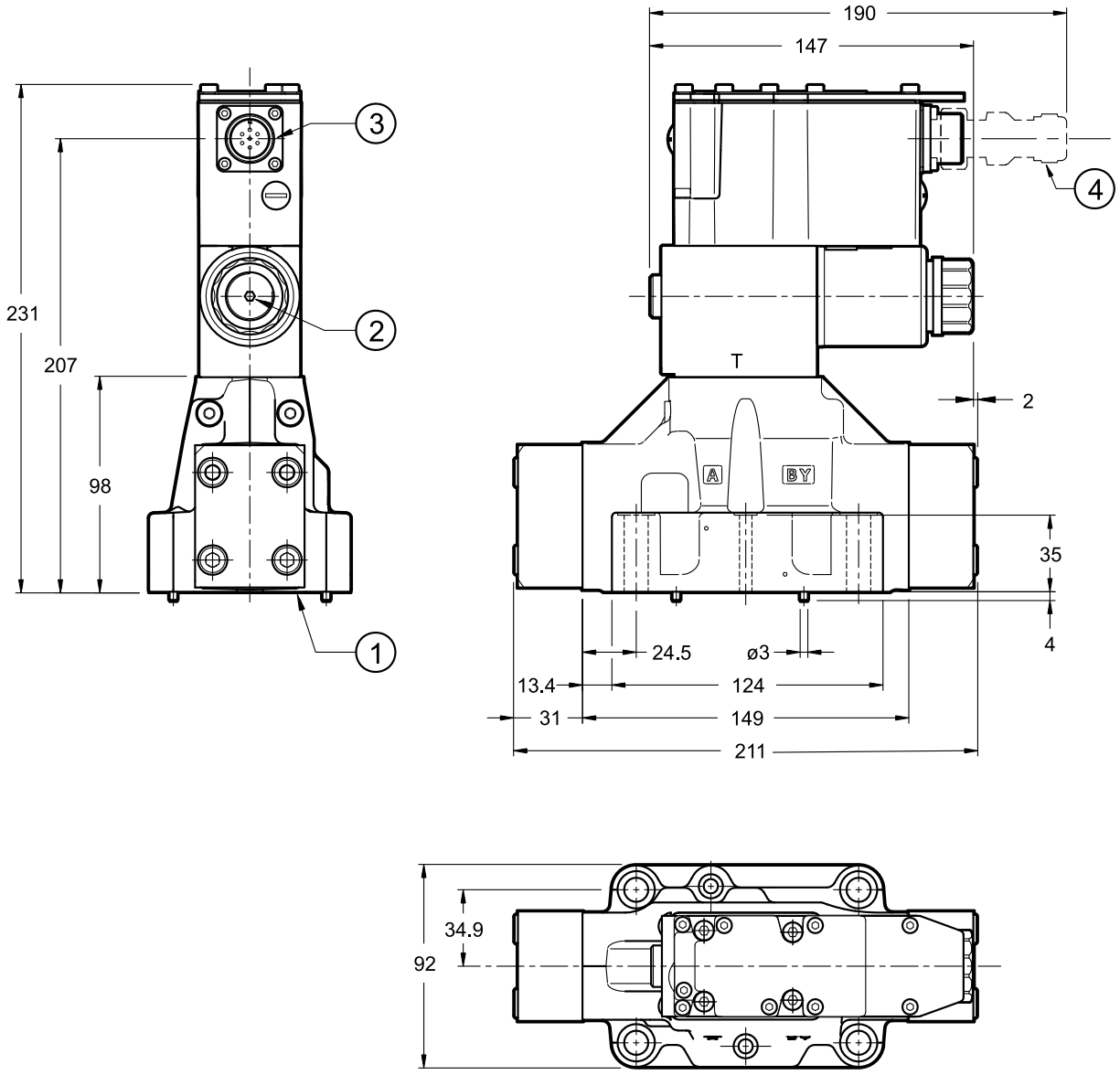
Mounting surface shown at point 12.

Valve fastening: N. 4 bolts SHC M6x35 - ISO 4762
Tightening torque: 8 Nm (bolts A 8.8)
Thread of mounting holes: M6x10

1	Mounting surface with sealing rings: N. 5 OR type 2050 (12.42x1.78) - 90 Shore N. 2 OR type 2037 (9.25x1.78) - 90 Shore
2	Breather (Allen key 4)
3	Main connection 6 pin + PE
4	Mating electrical connector **to be ordered separately.** See at section 15

10 - OVERALL AND MOUNTING DIMENSIONS DZCE7G

dimensions in mm



NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

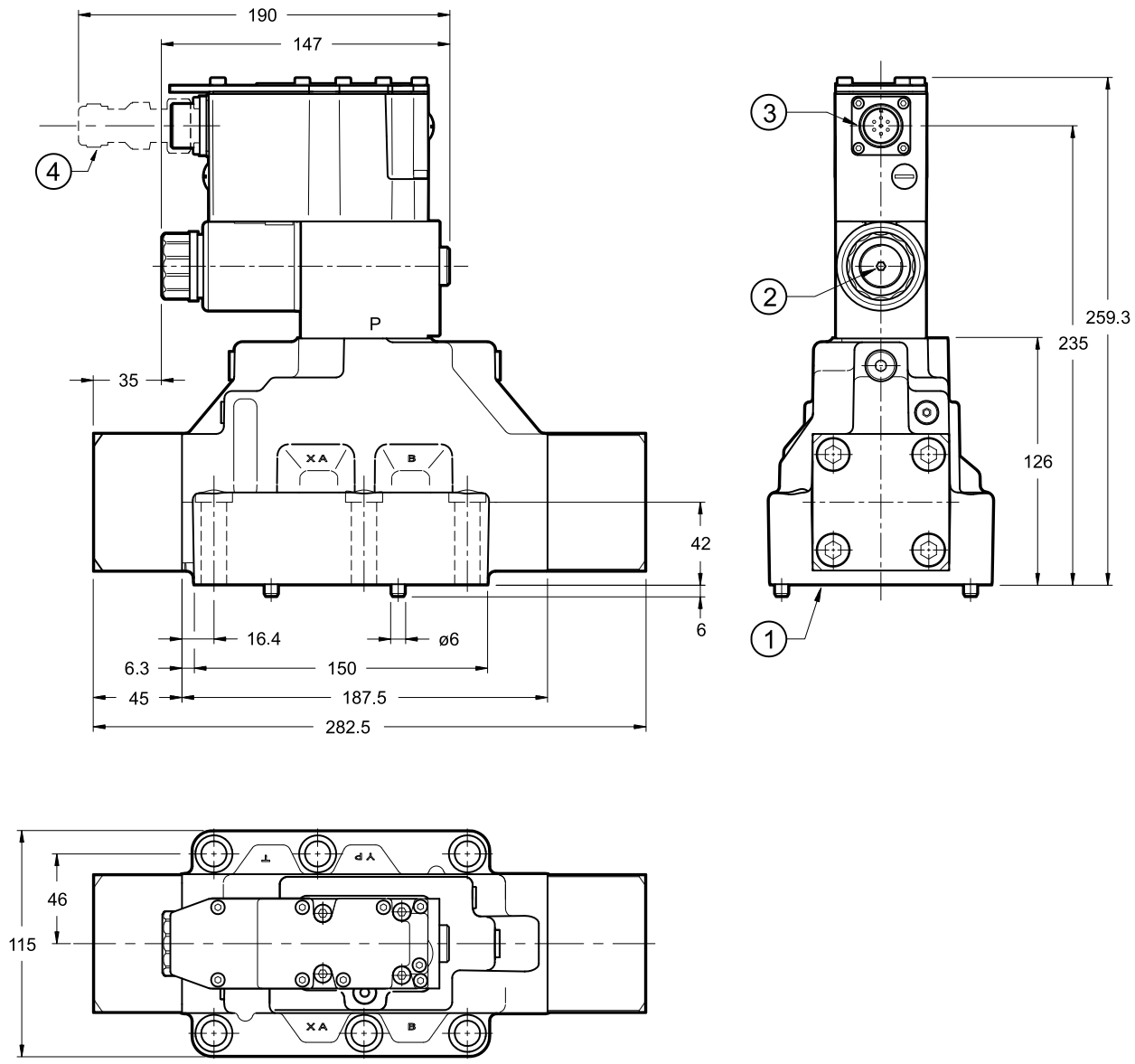
Mounting surface shown at point 12.

Valve fastening:	N. 4 bolts SHC M10x50 - ISO 4762 N. 2 bolts SHC M6x50 - ISO 4762
Tightening torque:	M10x50: 40 Nm (bolts A 8.8) M6x50: 8 Nm (bolts A 8.8)
Thread of mounting holes:	M6x18; M10x18

1	Mounting surface with sealing rings: N. 4 OR type 130 (22.22x2.62) - 90 Shore N. 2 OR type 2043 (10.82x1.78) - 90 Shore
2	Breather (Allen key 4)
3	Main connection 6 pin + PE
4	Mating electrical connector **to be ordered separately.** See at section 15

11 - OVERALL AND MOUNTING DIMENSIONS DZCE8G

dimensions in mm



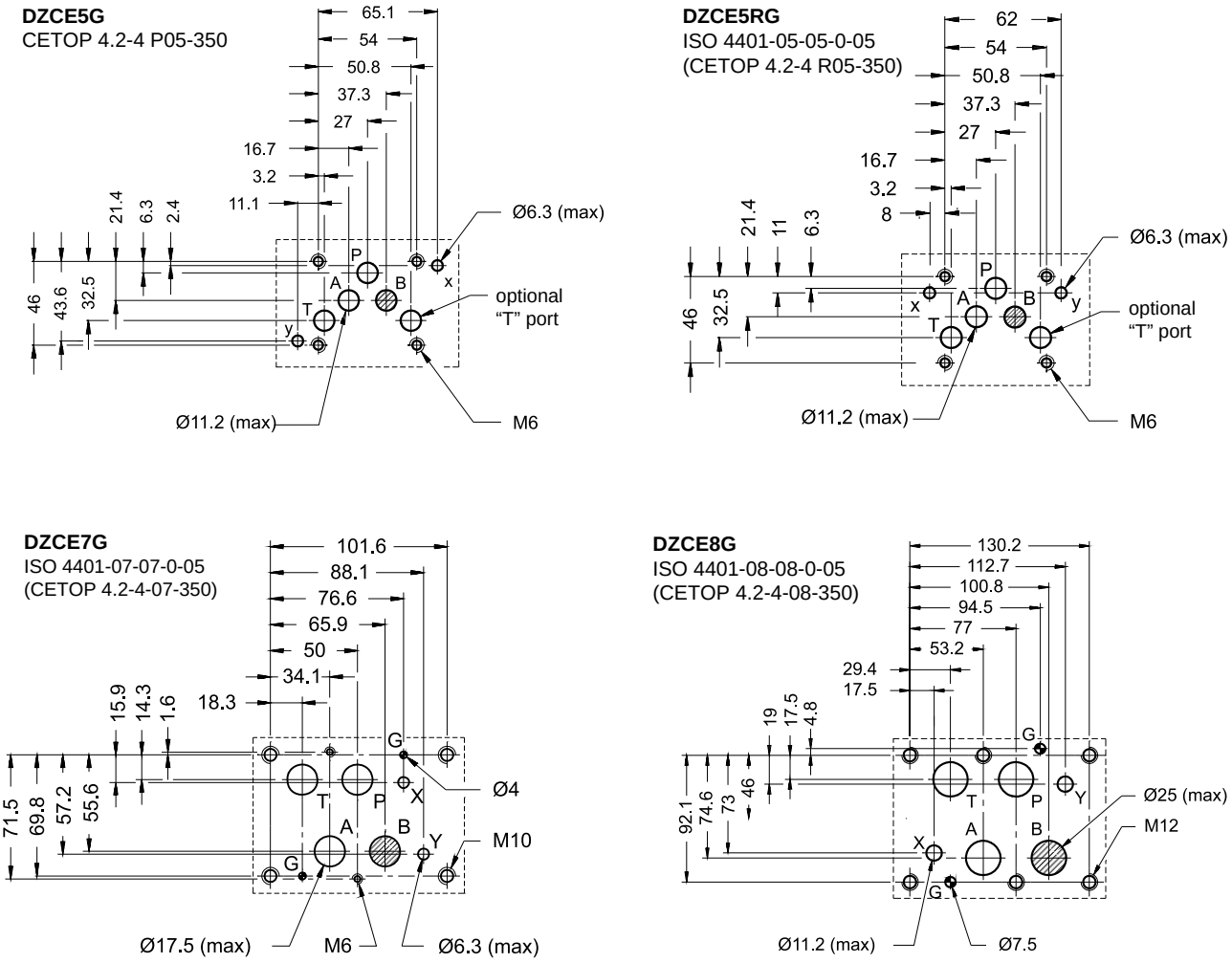
NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

Mounting surface shown at point 12.

Valve fastening: N. 6 bolts SHC M12x60 - ISO 4762
Tightening torque: 69 Nm (bolts A 8.8)
Thread of mounting holes: M12x20

1	Mounting surface with sealing rings: N. 4 OR type 3131 (32.99x2.62) - 90 Shore N. 2 OR type 3087 (21.89x2.62) - 90 Shore
2	Breather (Allen key 4)
3	Main connection 6 pin + PE
4	Mating electrical connector **to be ordered separately.** See at section 15

12 - MOUNTING SURFACES



13 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

14 - INSTALLATION

We recommend to install the valves either in horizontal position, or vertical position with the solenoid downward. If the valve is installed in vertical position and with the solenoid upward, you must consider possible variations of the minimum controlled pressure, if compared to what is indicated in point 6.

Ensure that there is no air in the hydraulic circuit. In particular applications, it can be necessary to vent the air entrapped in the solenoid tube, by using the appropriate drain screw in the solenoid tube.

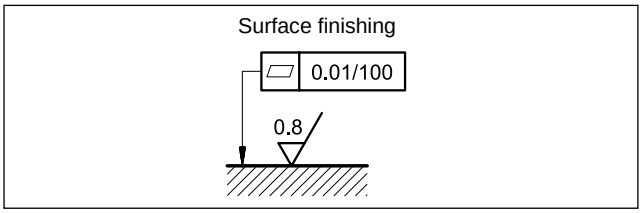
Ensure the solenoid tube is always filled with oil. At the end of the operation, make sure of having correctly replaced the drain screw.

Connect the valve T port directly to the tank. Add any backpressure value detected in the T line to the controlled pressure value.

Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols.

If minimum values are not observed, fluid can easily leak between the valve and support surface.



15 - ACCESSORIES
(to be ordered separately)

15.1 Mating connectors
Mating connectors must be ordered separately. See catalogue 89 000.

We recommend the choice of a metal connector to avoid electromagnetic disturbances and to comply with EMC regulations on electromagnetic compatibility. If you opt for a plastic connector, make sure that it guarantees and maintains the IP and EMC protection characteristics of the valve.

15.2 - Connection cable
The optimal wiring provides for 7 isolated conductors, with separate screen for the signal wires (command, monitor) and an overall screen.

Cross section for power supply:
- up to 20 m cable length: 1,0 mm^2
- up to 40 m cable length: 1,5 mm^2

Cross section for signals (command, monitor):
- 0,50 mm^2

15.3 - Kit for start-up LINPC-USB
Device for service start-up and diagnostic, see catalogue 89 850.

16 - SUBPLATES
(see catalogue 51 000)

No subplates are available for DZCE5RG.

		DZCE5G	DZCE7G	DZCE8G
Type with rear ports		PME4-AI5G	PME07-AI6G	-
Type with side ports		PME4-AL5G	PME07-AL6G	PME5-AL8G
Thread of ports:	P - T - A - B X - Y	3/4” BSP 1/4” BSP	1” BSP 1/4” BSP	1½” BSP 1/4” BSP

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RPCED1

PROPORTIONAL FLOW CONTROL VALVE DIRECT OPERATED

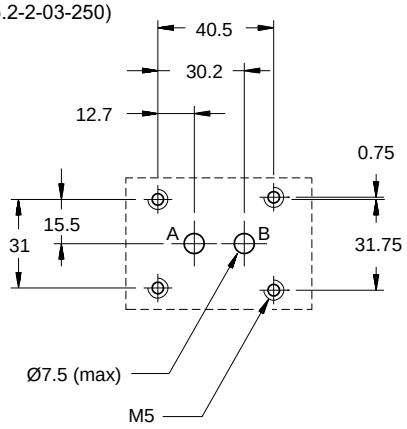
SERIES 54

SUBPLATE MOUNTING
ISO 6263-03

p max **250** bar
Q max (see table of performances)

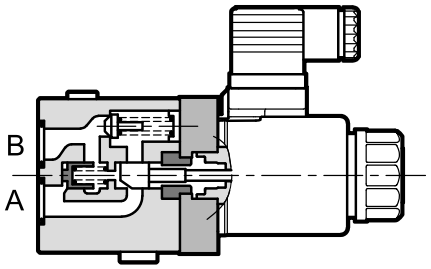
MOUNTING INTERFACE

ISO 6263-03-03-*-97
(CETOP 4.5.2-2-03-250)



NOTE: Ports P and T must never be made. Conversion plates are available.

OPERATING PRINCIPLE



— The RPCED1 valve is a two-port pressure and temperature compensated flow control valve with mounting interface in compliance with ISO 6263 standards.

— It is used for flow rate control in hydraulic circuit branches or for speed control of hydraulic actuators.

— The flow rate can be modulated continuously in proportion to the current supplied to the solenoid.

— The valve can be controlled directly by a current control supply unit or by an external electronic card to maximize the valve performances (see point 10).

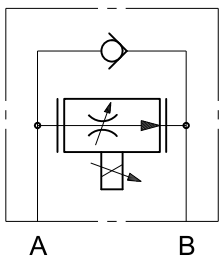
— It is available in five flow rate control ranges up to 25 l/min.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Maximum operating pressure Minimum Δp between A and B port	bar	250 10
Maximum controlled flow Min. controlled flow (for 1 and 4 l/min. reg.) Maximum free-reverse flow	l/min	1,5 - 4 - 8 - 16 - 25 0,025 40
Step response	see point 7	
Hysteresis (with PWM 100 Hz)	% of p nom	< 6%
Repeatability	% of p nom	< ±2,5%
Electrical characteristic	see point 6	
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13 (class 17/15/12 for flows < 0,5 l/min)	
Recommended viscosity	cSt	25
Mass	kg	1,9

HYDRAULIC SYMBOLS



1 - IDENTIFICATION CODE

R	P	C	E	D	1	-		/	C	/	54	-	24	/		

Compensated flow control valve

Electric proportional control

Open loop control

Size: ISO 6263-03

Maximum controlled flow:
1 = 1,5 l/min **8** = 8 l/min **25** = 25 l/min
4 = 4 l/min **16** = 16 l/min

Built-in check valve

Series No.
(from 50 to 59 sizes and mounting dimensions remain unchanged)

Nominal solenoid voltage 24 V DC

Seals:
Omit for mineral oils
V = viton for special fluids

Option:
/ W7 = zinc-nickel surface treatment (see **NOTE**)
Omit if not required.

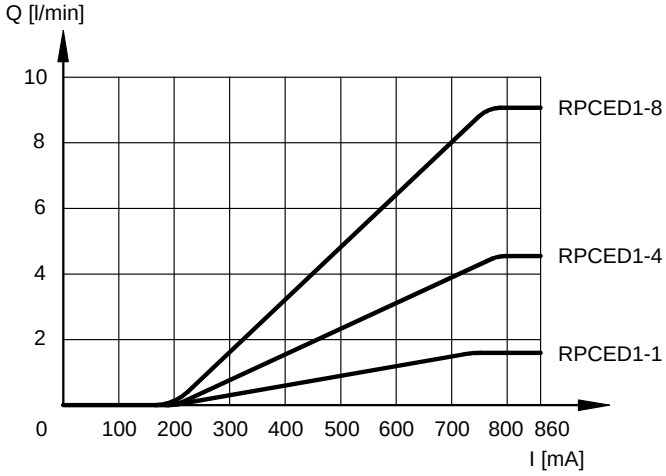
NOTE: The standard valve is supplied with surface treatment of phosphating black. The zinc-nickel finishing on the valve body makes the valve suitable to ensure a salt spray resistance up to 240 hours. (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

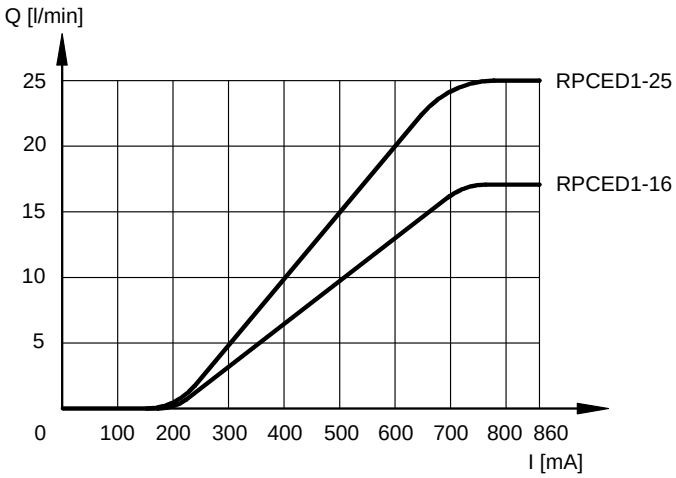
2 - CHARACTERISTIC CURVES

(measured with viscosity of 36 cSt at 50 °C)

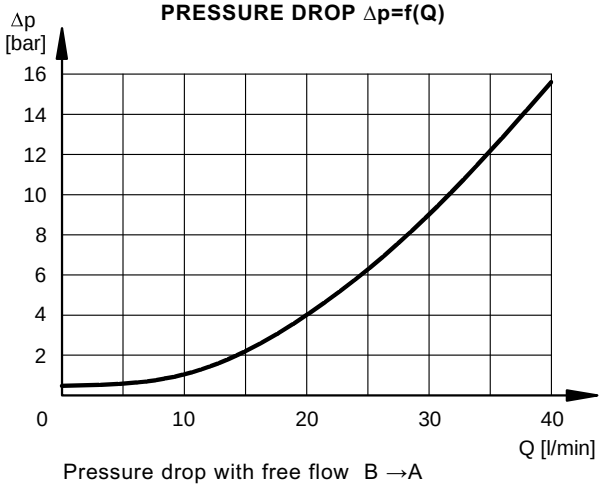
Typical curves for flow rate A→ B according to the current supplied to the solenoid for controlled flow rate of: 1- 4 - 8 - 16 - 25 l/min.

FLOW CONTROL Q=f(I)





PRESSURE DROP Δp=f(Q)



Pressure drop with free flow B →A through the check valve.

3 - PRESSURE COMPENSATION

Two throttles in series are in the valve. The first is controlled by the proportional solenoid; the second throttle assures a constant pressure drop, controlled by the pressure upstream and downstream the first throttle.

In these conditions, the set flow rate value stays constant within a tolerance range of ± 2% of the full scale flow rate for maximum pressure variation between the valve inlet and outlet ports.

4 - THERMAL COMPENSATION

Thermal compensation of the valve is obtained by adopting the principle of restricted fluid passage, so that the fluid is not influenced significantly by variations in oil viscosity.

For controlled flow rates of lower than 0.5 l/min and with a temperature change of 30°C, flow rate varies by 13% of the set value approximatively. For higher flow rates at the same temperature change the flow rate variation is <4% of the set flow rate.

5 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

6 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube, secured by means of a lock nut and can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	24
RESISTANCE (AT 20°C)	Ω	17.6
MAXIMUM CURRENT	A	0.86
DUTY CYCLE		100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2014/30/EU	
CLASS OF PROTECTION Atmospheric agents (IEC EN 60529)	IP65	

7 - STEP RESPONSE

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

The table illustrates typical response times with valve flow rate of 16 l/min and with input pressure of 100 bar.

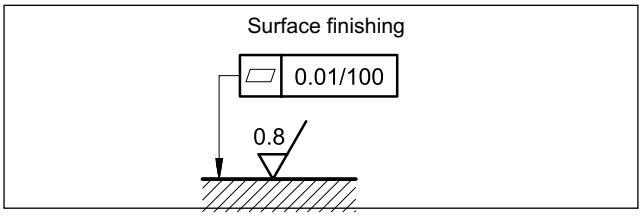
REFERENCE SIGNAL STEP	0 → 100%	100 → 0%	25→75%	75→25%
Step response [ms]	60	80	50	70

8 - INSTALLATION

RPCED1 valves can be installed in any position without impairing correct operation.

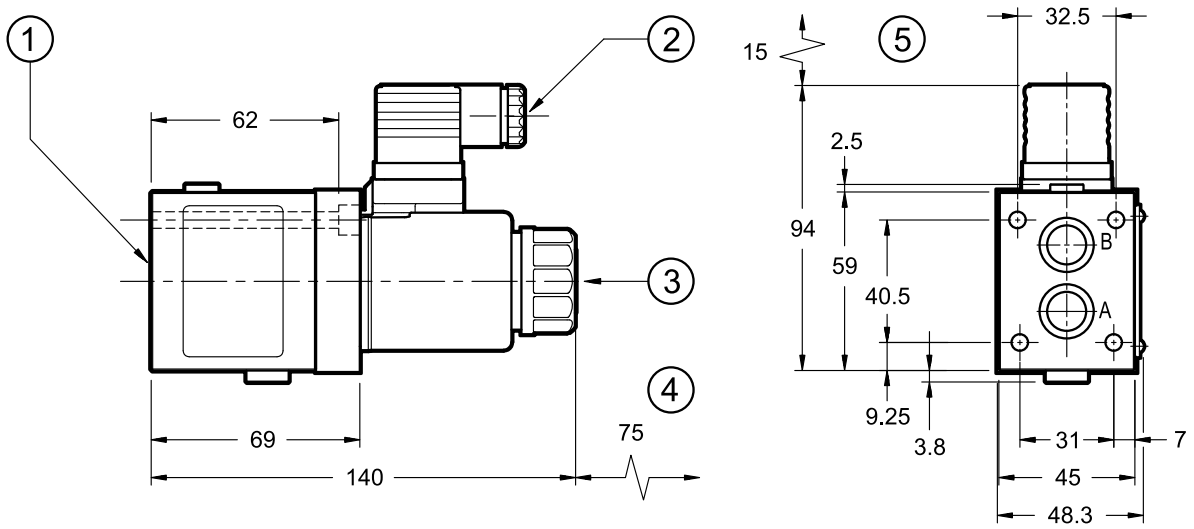
Ensure that there is no air in the hydraulic circuit.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed fluid can easily leak between the valve and support surface.



9 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



Valve fastening: 4 SHC screws ISO 4762 M5x70	
Tightening torque: 5 Nm (A8.8)	
Threads of mounting holes: M5x10	

1	Mounting surface with sealing rings: 2 ORM-0140-20 (14x2) - 70 shore
2	Coil electrical connector EN 175301-803 (ex DIN 43650)
3	Manual override by pin
4	Coil removal space
5	Connector removal space

10 - ELECTRONIC CONTROL UNITS

EDC-111	for solenoid 24V DC	plug version	see cat. 89 120
EDM-M111	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 251

11 - SUBPLATES

(see cat. 51 000)

rear ports 3/8” BSP	side ports 3/8” BSP	ISO 6263 subplate with P e T blind ports
PMRPC1-AI3G	PMRPC1-AL3G	code 0113388 P port to be plug (M4)

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RPCED1-*/T3

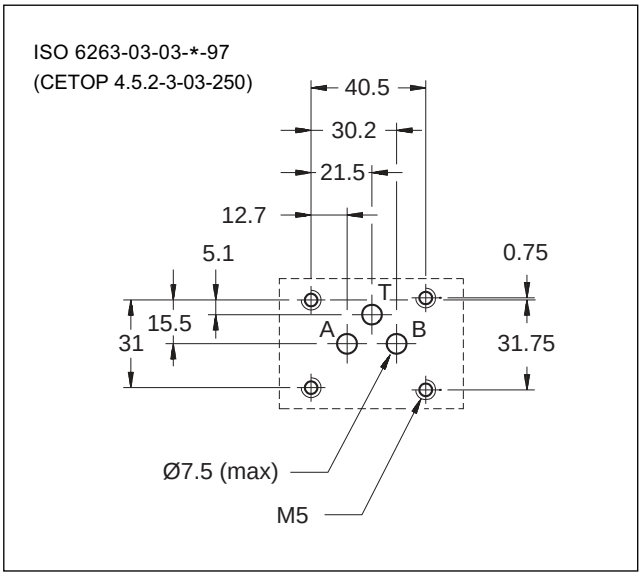
THREE-WAY DIRECT OPERATED FLOW CONTROL VALVE WITH ELECTRIC PROPORTIONAL CONTROL

SERIES 52

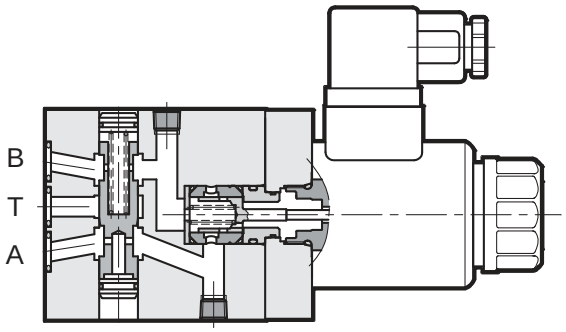
SUBPLATE MOUNTING
ISO 6263-03 (CETOP 03)

p max **250** bar
Q max (see table of performances)

MOUNTING INTERFACE



OPERATING PRINCIPLE



— RPCED1-*/T3 is a three-way flow control valve, pressure and temperature compensated with electric proportional control and mounting interface in compliance with ISO 6263 (CETOP RP121H) standards.

— This valve controls the flow to the circuit, by dumping the exceeding oil flow to the tank.

— Flow rate can be modulated continuously in proportion to the current supplied to the solenoid.

— The valve can be controlled directly by a current control supply unit or by means of the relative electronic control units to exploit valve performance to the full (see par. 10).

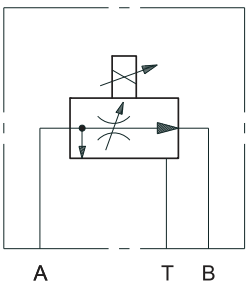
— It is available in five flow rate control ranges up to 25 l/min.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control cards)

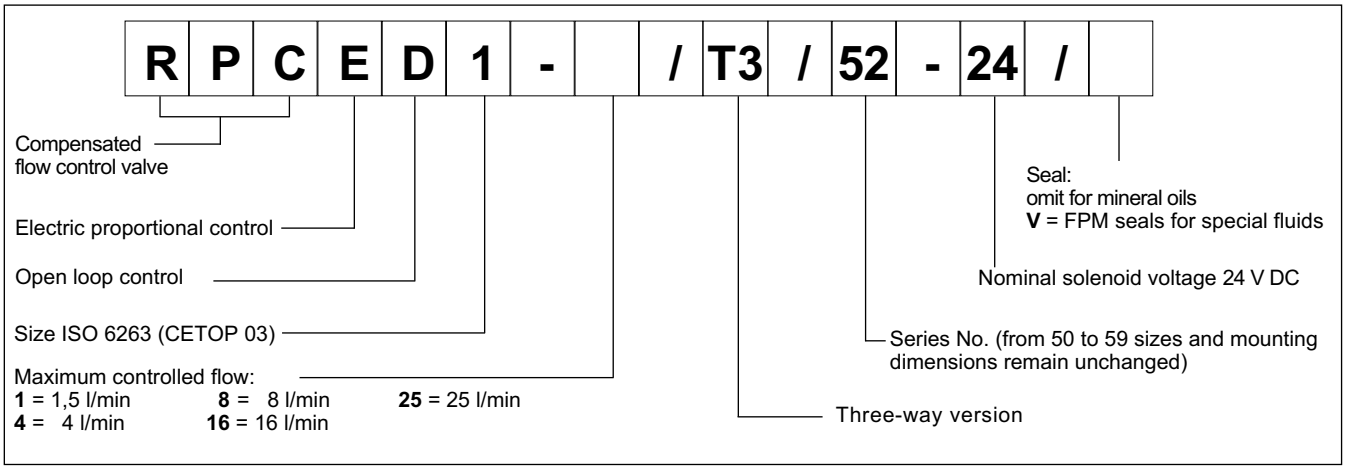
Maximum operating pressure Minimum Δp between A and B port	bar	250 8
Maximum controlled flow Min. controlled flow (for 1 and 4 l/min. reg.)	l/min	1,5 - 4 - 8 - 16 - 25 0,025
Step response	see paragraph 7	
Hysteresis (PWM 100)	% of Q max	< 6%
Repeatability	% of Q max	< ±2,5%
Electrical characteristic	see paragraph 6	
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13 (class 17/15/12 for flows < 0,5 l/min)	
Recommended viscosity	cSt	25
Mass:	kg	1,5

HYDRAULIC SYMBOLS



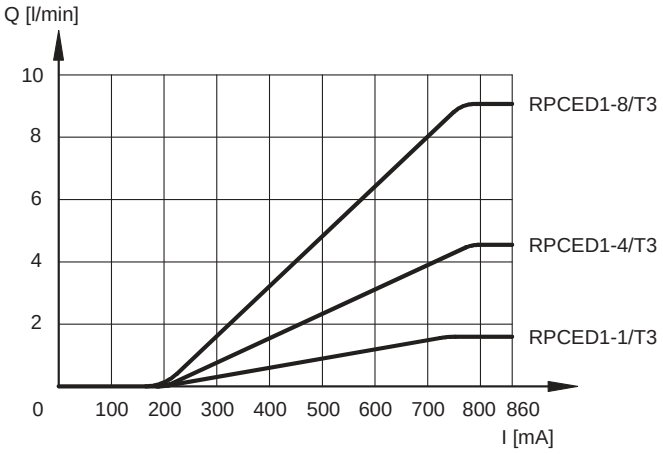
RPCED1-*/T3
SERIES 52

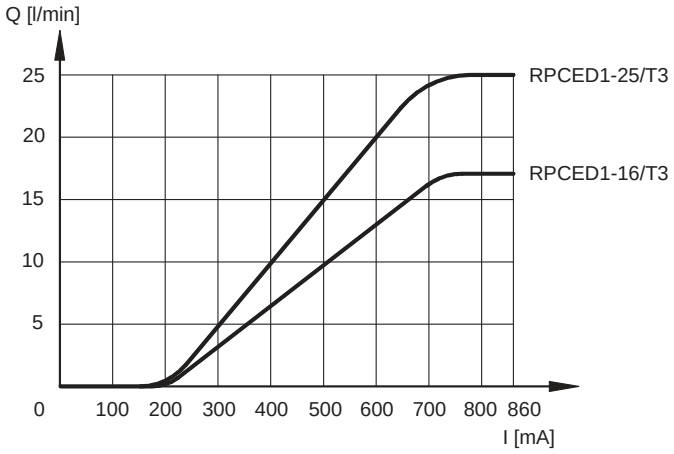
1 - IDENTIFICATION CODE



2 - CHARACTERISTIC CURVES (measured with viscosity of 36 cSt at 50°C)

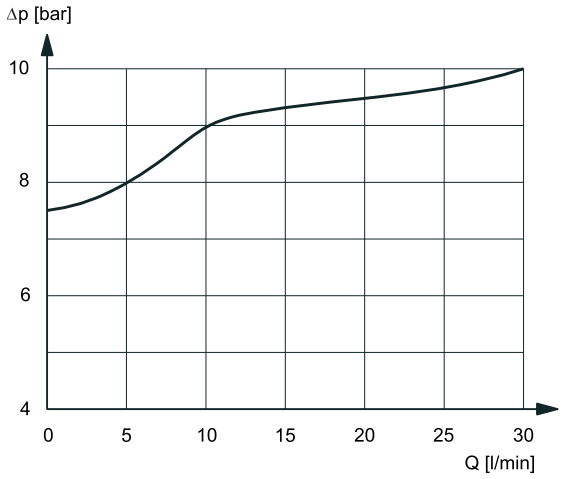
FLOW CONTROL Q=f(I)





Typical curves for flow rate A→B according to the current supplied to the solenoid for controlled flow rate of: 1 - 4 - 8 - 16 - 25 l/min.

PRESSURE DROP Δp=f(Q)



Pressure drop with flow A →T through the compensator.

3 - PRESSURE COMPENSATION

The valves are equipped with two restrictors. The first is an opening which can be adjusted by the proportional solenoid; the second, controlled by the pressure upstream and downstream of the first restrictor ensures constant pressure drop across the adjustable restrictor. In these conditions, the set flow rate value is maintained constant within a tolerance limit of ± 2% of the set flow rate for maximum pressure variation between the valve inlet and outlet chambers.

4 - THERMAL COMPENSATION

Thermal compensation of the valve is obtained by adopting the principle of restricted fluid passage, so that the fluid is not influenced significantly by variations in oil viscosity.
For controlled flow rates of lower than 0.5 l/min and with a temperature change of 30°C, flow rate varies by approx. 13% of the set value.
For higher flow rates and with the same temperature change the flow rate variation is <4% of the set flow rate.

5 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

6 - ELECTRICAL CHARACTERISTICS

6.1 - Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut and can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**24**
RESISTANCE (at 20°C)	Ω	17.6
MAXIMUM CURRENT	A	0.86
DUTY CYCLE		100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2004/108/CE	
CLASS OF PROTECTION: Atmospheric agents (CEI EN 60529)	IP 65	

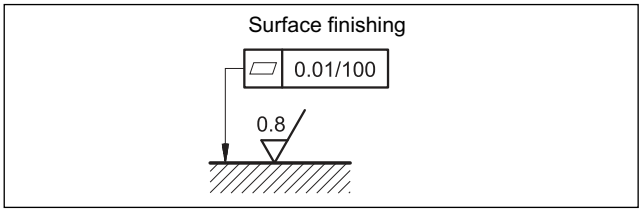
7 - STEP RESPONSE (obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control cards)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.
The table illustrates typical response times with valve flow rate of 16 l/min and with input pressure of 100 bar.

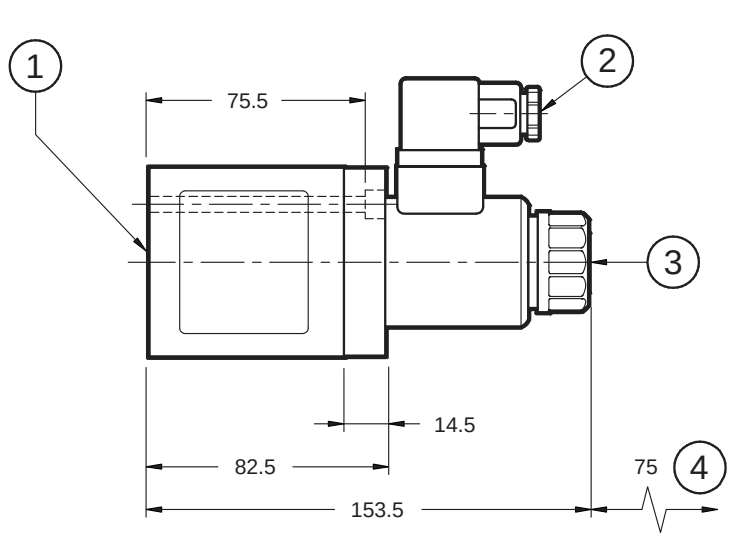
REFERENCE SIGNAL STEP	0 → 100%	100 → 0%	25→75%	75→25%
Step response [ms]	60	80	50	70

8 - INSTALLATION

RPCED1-*/T3 valves can be installed in any position without impairing correct operation.
Ensure that there is no air in the hydraulic circuit.
Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed fluid can easily leak between the valve and support surface.



9 - OVERALL AND MOUNTING DIMENSIONS



dimensions in mm

1	Mounting surface with sealing rings: 3 OR type 2037 (9.25x1.78) - 90 Shore
2	Coil electrical connector DIN 43650
3	Manual emergency control
4	Coil removal space
5	Connector removal space

Fastening bolts: 4 bolts M5x85
Torque: 5 Nm

10 - ELECTRONIC CONTROL UNITS

EDC-112	for solenoid 24V DC	plug version	see cat.89 120
EDM-M111	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250

11 - SUBPLATES (see cat. 51 000)

Type	PMMD-AI3G rear ports with user P plugged PMMD-AL3G side ports with user P plugged
Port dimensions	3/8” BSP

DUPLOMATIC OLEODINAMICA

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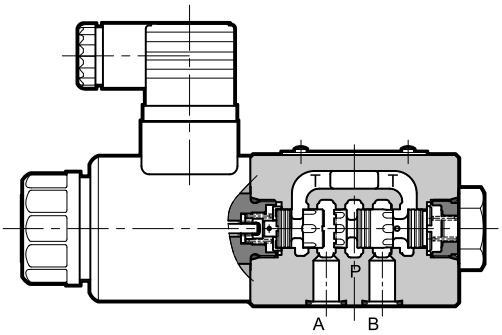
QDE*
PROPORTIONAL COMPENSATED FLOW CONTROL VALVE

SERIES 11

SUBPLATE MOUNTING
ISO 6263-03
ISO 4401-05

p max **250** bar
Q max **80** l/min

OPERATING PRINCIPLE



— QDE* are proportional pressure-compensated flow control valves, with mounting surface according to ISO 6263-03 and ISO 4401-05. They operate as 2- or 3-port flow control valves, depending on the existence of the port P in the mounting surface.

— These valves are used for the flow control in branches of a hydraulic circuit or for the speed control of hydraulic cylinders.

— The valve can be controlled directly by a current control supply unit or by means of an electronic control unit, to exploit valve performance to the full (see point 13).

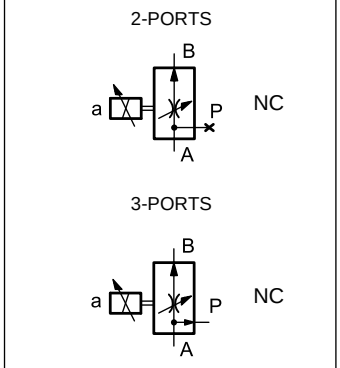
— QDE* valves are available in two sizes, for five flow adjustment ranges of up to 80 l/min.

— The valve body is zinc-nickel coated.

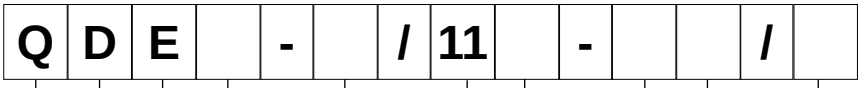
PERFORMANCES
(values measured with viscosity of 36 cSt at 50°C with electronic control unit)

		QDE3				QDE5
Maximum operating pressure	bar	250				250
Controlled flow (Q_B)	l/min	14	20	30	40	80
Max input flow (Q_A) (3-port)	l/min	40	50	40	50	90
Spring setting in pressure compensator	bar	4	8	4	8	8
Minimum pressure drop A > B	bar	10	22	10	22	22
Hysteresis	% of Q_{max}	< 6 %				
Repeatability	% of Q_{max}	< ± 1,5 %				< ±2 %
Electrical characteristics	see point 5					
Ambient temperature range	°C	-20 / +60				
Fluid temperature range	°C	-20 / +80				
Fluid viscosity range	cSt	10 ÷ 400				
Fluid contamination degree	according to ISO 4406:1999 class 18/16/13					
Recommended viscosity	cSt	25				
Mass	kg	1,4				4,4

HYDRAULIC SYMBOLS



1 - IDENTIFICATION CODE



Flow control valve direct operated

Electric proportional control

Size:
3 = ISO 6263-03
5 = ISO 4401-05

Controlled flow:

QDE3
14 = 14 l/min
20 = 20 l/min
30 = 30 l/min
40 = 40 l/min

QDE5
80 = 80 l/min

Series no. (from 10 to 19 sizes and mounting dimensions remains unchanged)

Seals:
N = NBR seals (**standard**)
V = FPM seals for special fluids

D12 = Nominal solenoid voltage 12V DC
D24 = Nominal solenoid voltage 24V DC

Coil electrical connection:
K1 = plug for connector type EN 175301-803 (ex DIN 43650) (**standard**)
K7 = plug for connector type DEUTSCH DT04-2P male

Option: manual override (see at point 10)

NOTE: The zinc-nickel finishing on the valve body makes the valve suitable to ensure a salt spray resistance up to **240** hours. (test operated according to EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

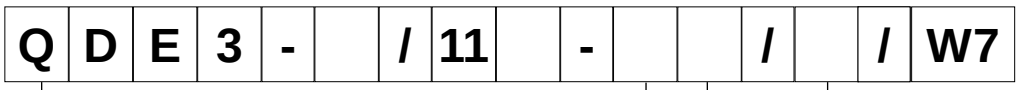
For a salt spray resistance up to 600 hours order the high corrosion resistance version.

1.1 - QDE3: high corrosion resistance version

This version features the zinc-nickel coating on all exposed metal parts of the valve, making it resistant to exposure to the salt spray for **600** hours (test performed according to UNI EN ISO 9227 and assessment test performed according to UNI EN ISO 10289).

The coil are specific for this version, featuring a zinc-nickel surface treatment. The boot manual override (CM) is installed as standard in order to protect the solenoid tube.

Follow the identification code below to order it:



Choices as in standard identification code

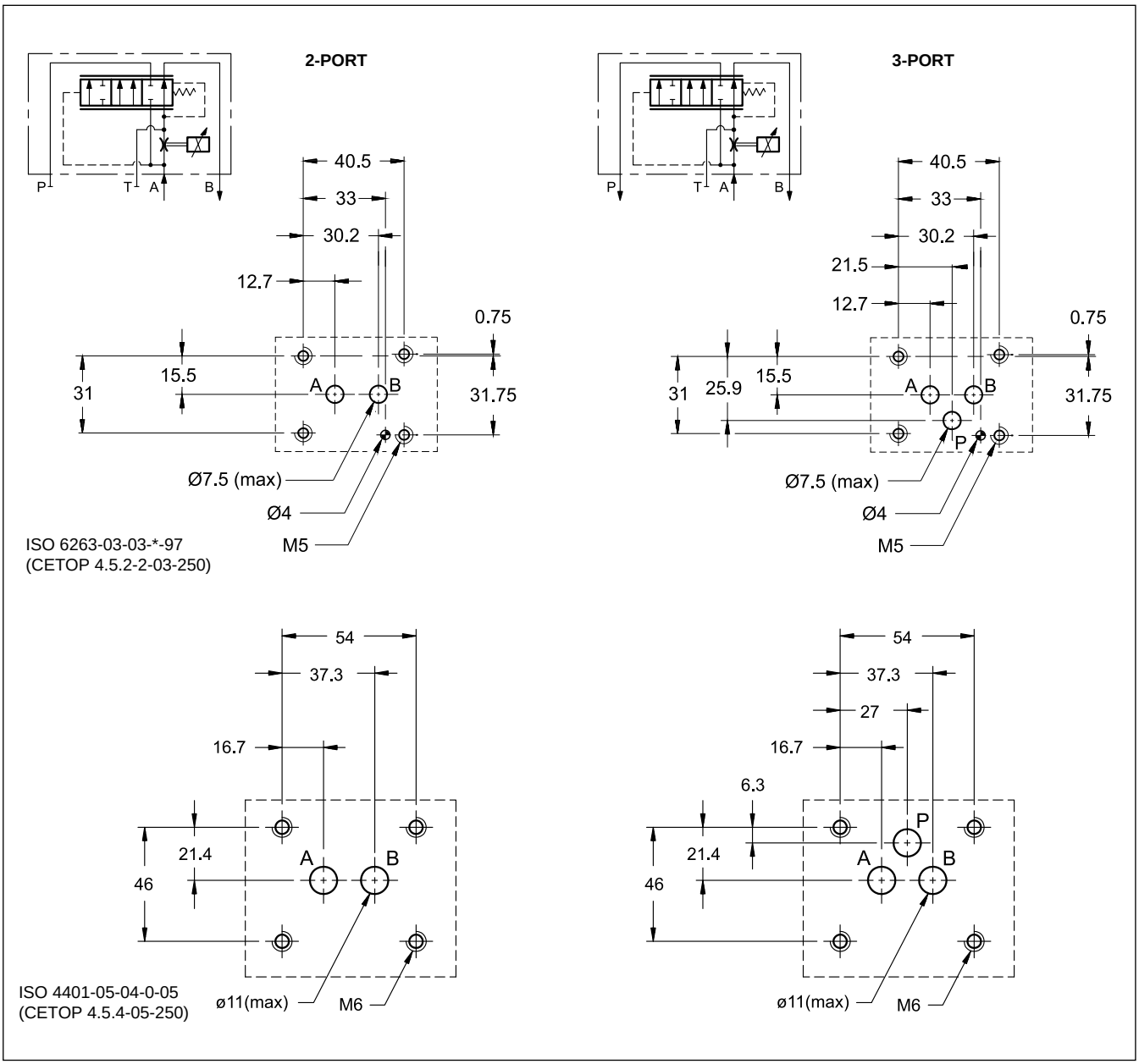
Coil electrical connection
WK1 = plug for connector type EN 175301-803 (ex DIN 43650)
WK7 = plug DEUTSCH DT04-2P, for male connector type DEUTSCH DT06-2S.

Manual override:
(see at point 10)
CM = manual override, boot protected (**standard**)
CK1 = knob manual override

2 - CONFIGURATIONS AND MOUNTING INTERFACE

The function of two- or three- port valve is obtained by realizing the mounting interface with holes according to ISO 6263-03 for QDE3 and with holes according to ISO 4401-05 for QDE5, without ever making the path T to reservoir, and making the path P only for three- port configuration.

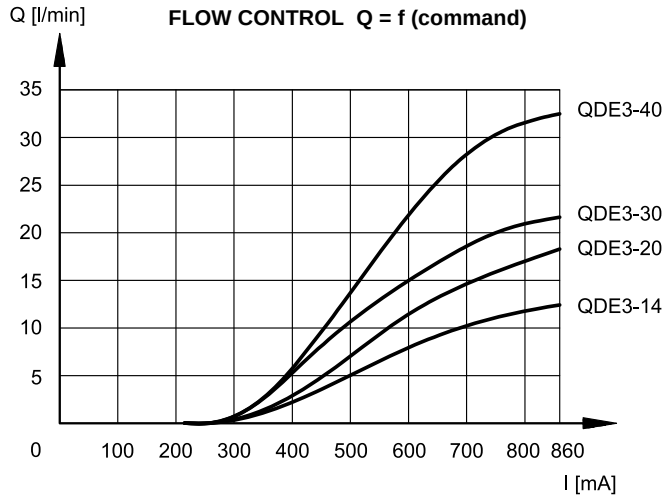
To use the QDE3 as two- port valve it is also possible to interpose an adapter plate with plug (code 0113388 and 0530384), to be ordered separately.

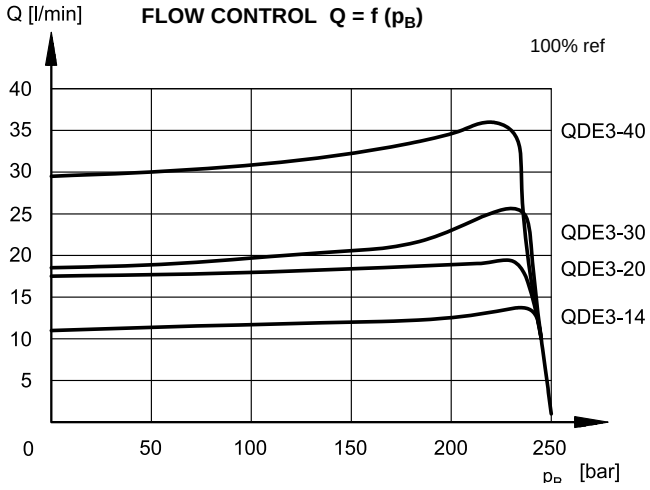


3 - CHARACTERISTIC CURVES QDE3

(obtained with viscosity of 36 cSt a 50°C)

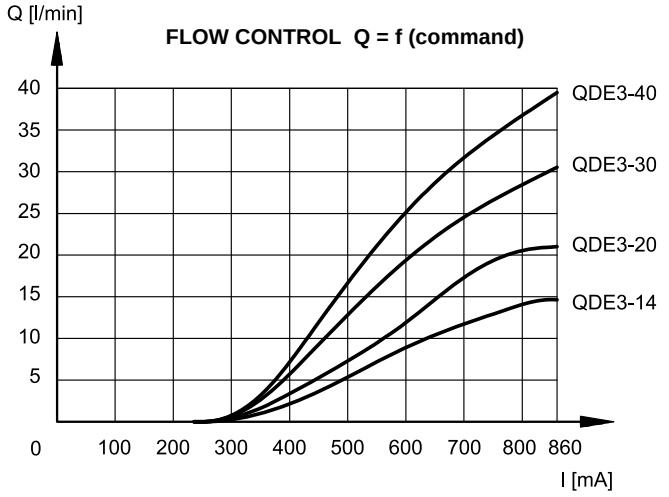
3.1 - Two-port

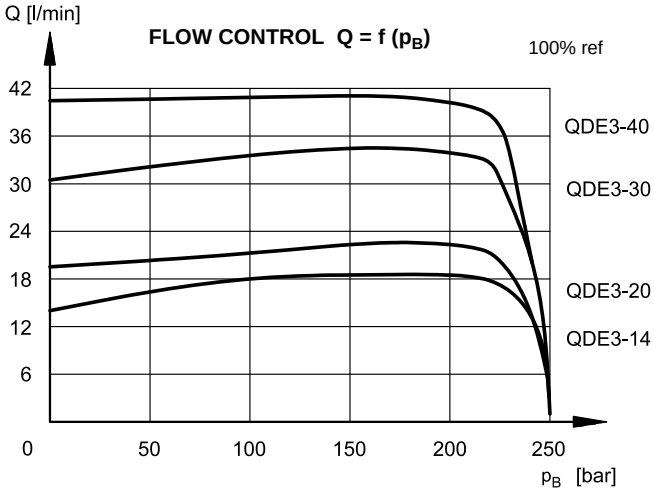




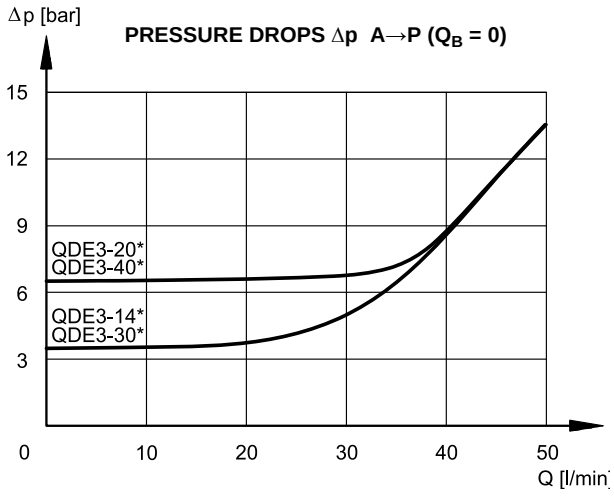
Typical flow rate characteristics A → B for controlled flow rate:
14 - 20 - 30 - 40 l/min in function of the current supplied to the solenoid (D24 version, maximum current 860 mA, PWM 100 Hz)

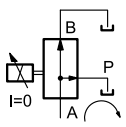
3.2 - Three-port





Typical flow rate characteristics A → B for controlled flow rate:
14 - 20 - 30 - 40 l/min in function of the current supplied to the solenoid (D24 version, maximum current 860 mA, PWM 100 Hz)



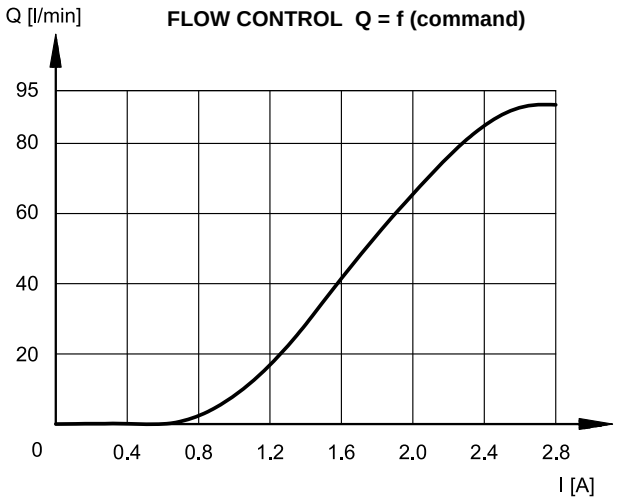


Pressure drops with flow A→P.
Obtained with Q_B = 0 (no current)

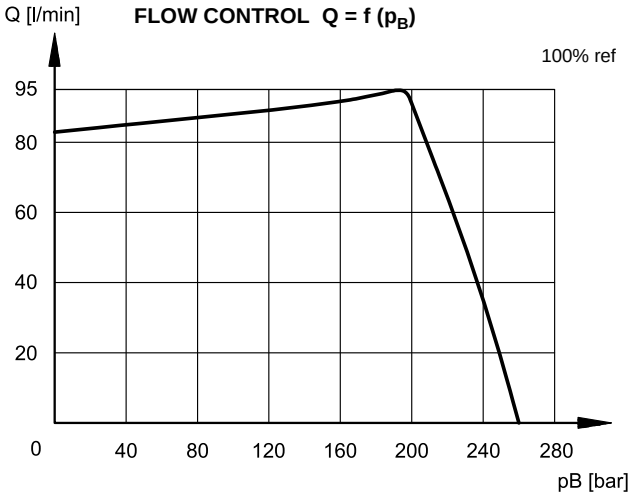
4 - CHARACTERISTIC CURVES QDE5

(obtained with viscosity of 36 cSt a 50°C)

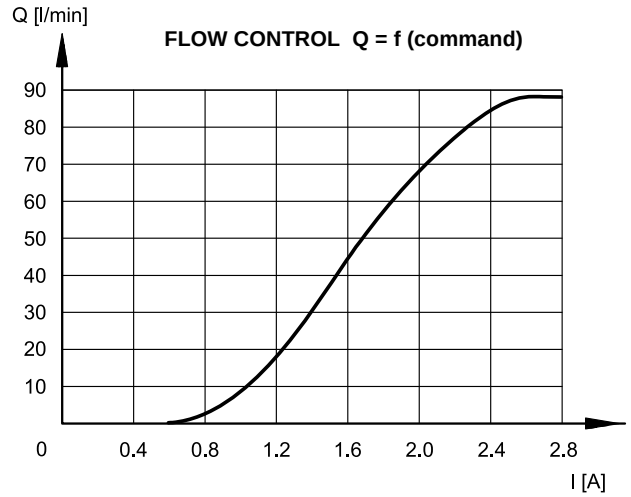
4.1 - Two-port



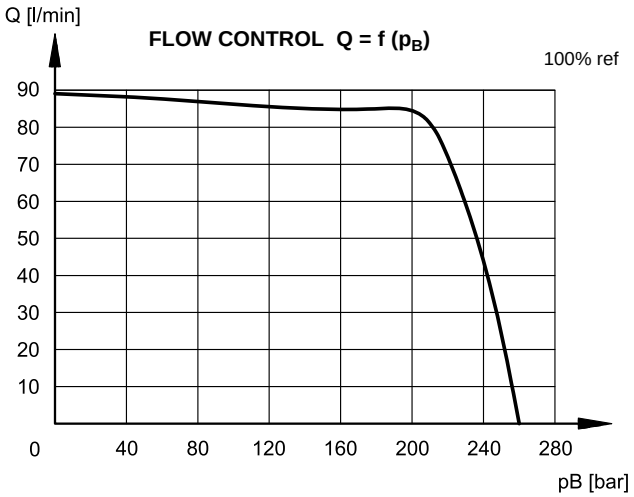
Typical flow rate characteristics A→B in function of the current supplied to the solenoid (D12 version, max current 2.8 A, PWM 100 Hz).

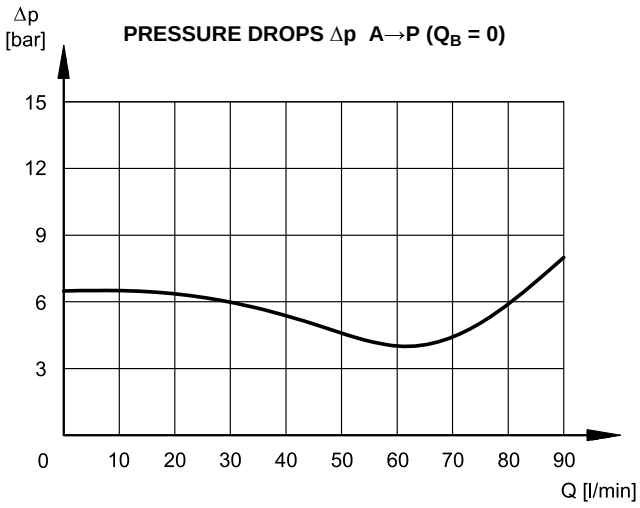


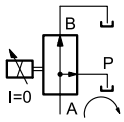
4.2 - Three-port



Typical flow rate characteristics A→B in function of the current supplied to the solenoid (D12 version, max current 2.8 A, PWM 100 Hz).







Pressure drops with flow A→P.
Obtained with Q_B = 0 (no current)

5 - ELECTRICAL CHARACTERISTIC

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut and can be rotated through 360° depending on installation clearances.

DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2014/30/EU
CLASS OF PROTECTION: coil insulation (VDE 0580) Impregnation	 class H class F

		QDE3		QDE5	
NOMINAL VOLTAGE	VDC	12	24	12	24
RESISTANCE (at 20°C)	ohm	4,4	18,6	3	12
NOMINAL CURRENT	A	1,88	0,86	2,8	1,6
PWM FREQUENCY	Hz	100		100	

Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP grade correctly connected and installed.

electric connection	electric connection protection	whole valve protection
QDE3		
K1 EN 175301-803	IP65	IP65
K7 DEUTSCH DT04 male	IP65/IP67	
WK1 EN 175301-803	IP66	IP66
WK7 DEUTSCH DT04 male	IP66/IP68/IP69 IP69K*	IP66/IP68/IP69 IP69K*

QDE5		
K1 EN 175301-803	IP65	IP65
K7 DEUTSCH DT04 male	IP65/IP67	

6 - STEP RESPONSE

(values measured with viscosity of 36 cSt at 50°C with electronic control unit)

Step response is the time taken for the valve to reach 90% of the set flow value following a step change of reference signal.

The table illustrates typical response times with Δp = 8 bar.

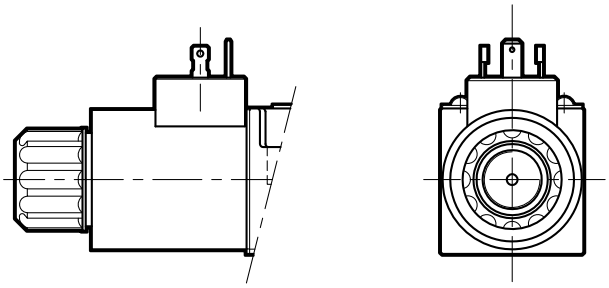
REFERENCE SIGNAL STEP	0 →100%
Step response [ms]	< 70

7 - ELECTRIC CONNECTIONS

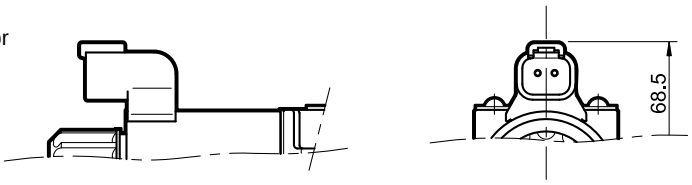
Connectors for K1 and WK1 connections are always delivered together with the valve.

7.1 - QDE3

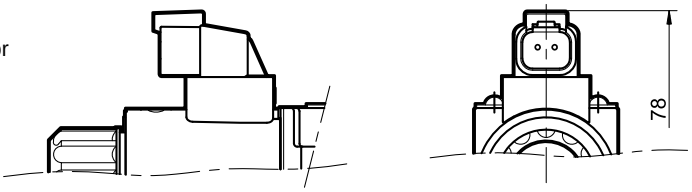
connection for EN 175301-803
(ex DIN 43650) connector
code **K1** (**standard**)
code **WK1** (W7 version)



connection for
DEUTSCH DT06-2S male connector
code **K7**

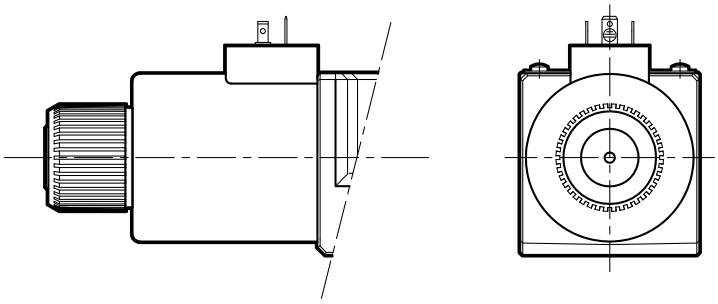


connection for
DEUTSCH DT06-2S male connector
code **WK7 (**W7 version)

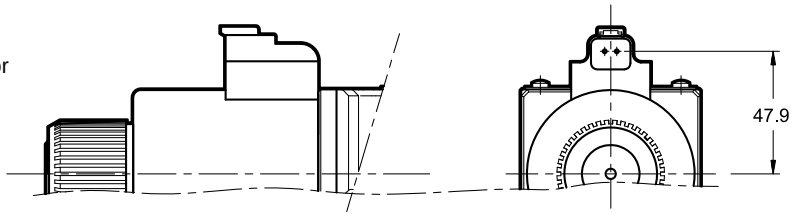


7.2 - QDE5

connection for EN 175301-803
(ex DIN 43650) connector
code **K1** (**standard**)

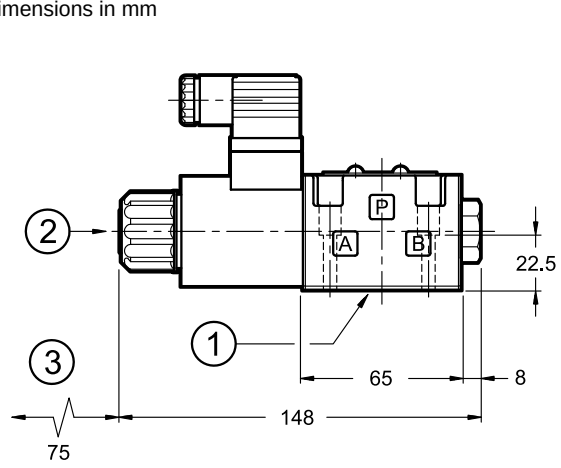


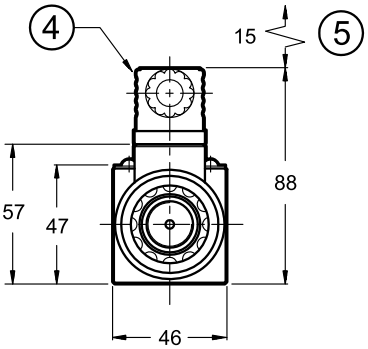
connection for
DEUTSCH DT06-2S male connector
code **K7**

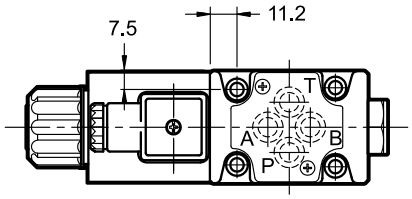


8 - QDE3 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm





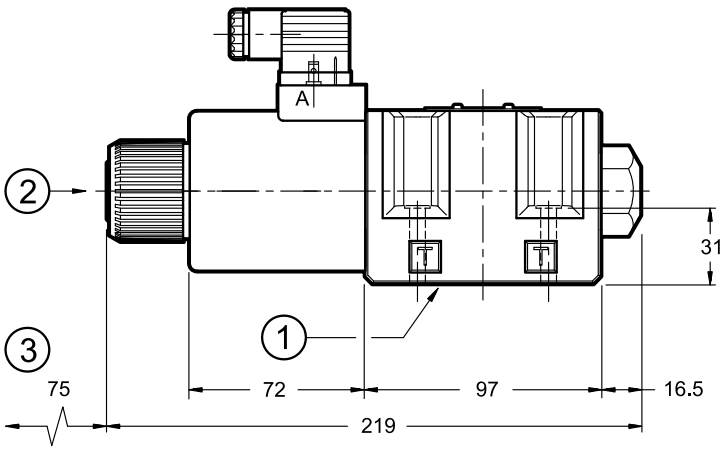


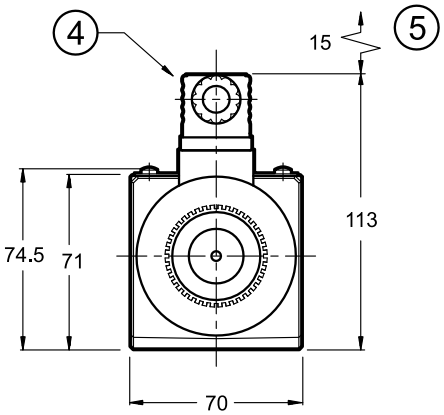
Fastening bolts: 4 bolts M5x30 - ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

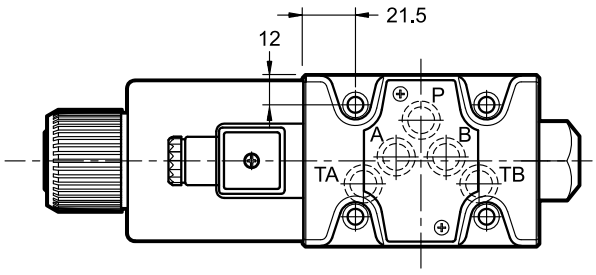
1	Mounting surface with sealing rings: 4 OR type 2037 (9.25 x 1.78) - 90 shore
2	Standard manual override, integrated in the solenoid tube
3	Coil removal space
4	Electric connector type EN 175301-803 (ex DIN 43650)
5	Connector removal space

9 - QDE5 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm







Fastening bolts: 4 bolts M6x40 - ISO 4762
Torque: 8 Nm (A8.8)
Threads of mounting holes: M6x10

1	Mounting surface with sealing rings: N. 5 OR type 2050 (12.42x1.78) - 90 Shore
2	Standard manual override, integrated in the solenoid tube
3	Coil removal space
4	Electric connector type EN 175301-803 (ex DIN 43650)
5	Connector removal space

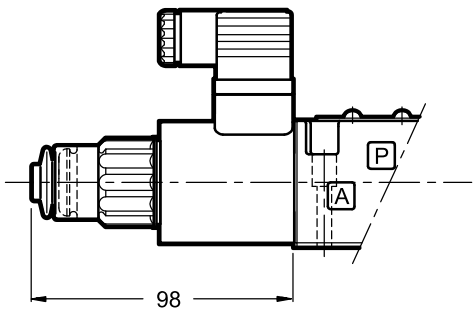
10 - MANUAL OVERRIDE

Standard valves have the pin for the manual operation integrated in the solenoid tube. The operation of this override must be executed with a suitable tool, minding not to damage the sliding surface.

For QDE3 are available:

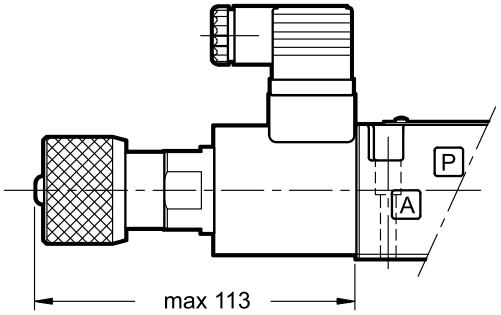
- **CM**: manual override boot protected (mandatory for WK1 coils).
- **CK1** version, knob.

CM Version



Code: 3401150006

CK1 Version

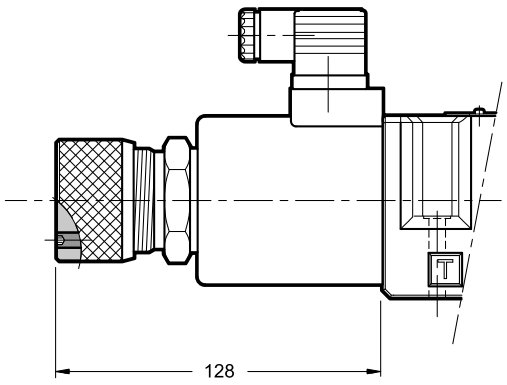


Code: 3401150031

For QDE5 only available:

- **CK** version, knob. When the set screw is screwed and its point is aligned with the edge of the knob, tighten the knob till it touches the spool: in this position the override is not engaged and the valve is de-energized. After adjusting the override, tighten the set screw in order to avoid the knob loosing.

CK Version



Spanner for set screw: 3 mm

Code: 3803260003

11 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

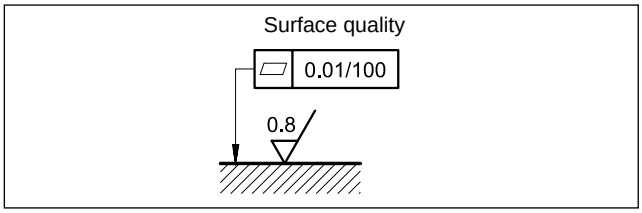
The fluid must be preserved in its physical and chemical characteristics.

12 - INSTALLATION

QDE* valves can be installed in any position without impairing correct operation. Ensure that there is no air in the hydraulic circuit.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols.

If minimum values are not observed fluid can easily leak between the valve and support surface.



13 - ELECTRONIC CONTROL UNITS

QDE3

EDM-M111	24V DC solenoids	rail mounting DIN EN 50022	see catalogue 89 252
EDM-M141	12V DC solenoids		
EWM-A-PV	12V / 24V DC software config.		see catalogue 89 620

QDE5

EDM-M131	24V DC solenoids	rail mounting DIN EN 50022	see catalogue 89 252
EDM-M151	12V DC solenoids		
EWM-A-PV	12V / 24V DC software config.		see catalogue 89 620

DUPLOMATIC MOTION SOLUTIONS
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duplomaticmotionsolutions.com

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QDE3K*

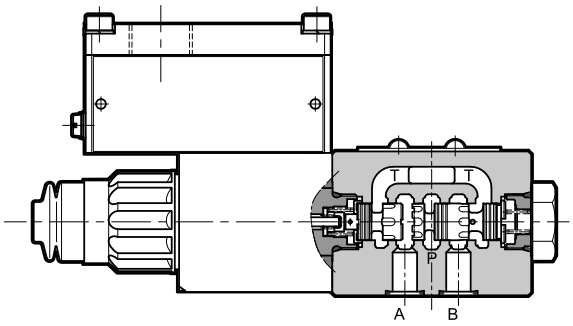
EXPLOSION-PROOF PROPORTIONAL FLOW CONTROL VALVE WITH COMPENSATION ATEX, IECEx, PESO

SERIES 10

SUBPLATE MOUNTING ISO 6263-03

p max **250** bar
Q max **40** l/min

OPERATING PRINCIPLE



— QDE3K* are compensated flow control valves with pressure compensation and proportional electric control, with mounting surface according to ISO 6263-03, supplied with 2 or 3 way design, depending on the use of port P.

— These valves are used for the flow control, in branches of a hydraulic circuit or for the speed control of hydraulic cylinders.

— They are compliant with ATEX, IECEx or PESO requirements and are suitable for use in potentially explosive atmospheres, for surface plants or mines.

— A low temperature version (up to -40 °C) is also available.

— The valve body is zinc-nickel coated.

— **Details for classification, operating temperatures and electrical characteristics are in the technical data sheet 02 500 'Explosion proof classification'.**

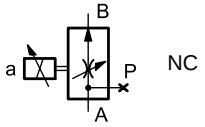
PERFORMANCES

(values measured with viscosity of 36 cSt at 50°C with electronic control unit)

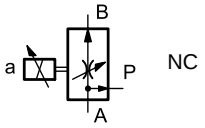
Maximum operating pressure	bar	250					
Controlled flow (Q_B)	l/min	6	8,5	14	20	30	40
Max input flow (Q_A) (3-way)	l/min	40	50	40	50	40	50
Spring setting in pressure compensator	bar	4	8	4	8	4	8
Minimum pressure drop A > B	bar	10	22	10	22	10	22
Hysteresis	% of Q_{max}	< 6 %					
Repeatability	% of Q_{max}	< ± 1,5 %					
Electrical characteristics	see point 5						
Operating temperatures (ambient and fluid)	see data sheet 02 500						
Fluid viscosity range	cSt	10 ÷ 400					
Fluid contamination degree	according to ISO 4406:1999 class 18/16/13						
Recommended viscosity	cSt	25					
Mass	kg	1,9					

HYDRAULIC SYMBOLS

TWO WAYS



THREE WAYS



1 - IDENTIFICATION CODE

Q	D	E	3		-		/	10		-		K9		/		

Flow control valve direct operated

Electric proportional control

Size ISO 6263-03

Explosion-proof certification:
See table 1.1

Controlled flow:
06 = 6 l/min
08 = 8,5 l/min
14 = 14 l/min
20 = 20 l/min
30 = 30 l/min
40 = 40 l/min

Series no. (from 10 to 19 sizes and mounting dimensions remains unchanged)

Seals:
For temperature range -20 / +80 °C
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids
For temperature range - 40 / +80 °C
NL = seal for low temperatures (for mineral oil)

Nominal solenoid voltage:
D12 = 12V DC
D24 = 24V DC

Coil electrical connection: junction box

Connection type for cable gland
upper connection:
T01 = M20x1.5 - ISO 261
T02 = Gk 1/2 - UNI EN 10226-2
T03 = 1/2" NPT - ANSI B1.20.1 (ex ANSI B2.1)
side connection:
S01 = M20x1.5 - ISO 261
S02 = Gk 1/2 - UNI EN 10226-2
S03 = 1/2" NPT - ANSI B1.20.1 (ex ANSI B2.1)
S04 = M16x1.5 - ISO 261

Manual override:
CM = boot protected
standard for both N and V seals
not available for NL seals
CB = blind ring nut
standard for NL seals
available upon request for both N and V seals
CK1 = turning knob override
CK2 = push and twist knob override
CS = screw manual override

Option: **/T5**
version in T5 temperature class.
Omit if not required.

NOTE: Valves are supplied with zinc-nickel surface treatment, that is suitable to ensure a salt spray resistance up to 600 h (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

Version with monobloc steel coil

Standard coils are made of zinc-nickel steel, with anodized aluminium junction box on it.

Monobloc coils **MD24K9S01** completely made of steel are available upon request. They have zinc-nickel treatment, power supply voltage D24 and cable gland connection type S01. Other variants for voltage and cable gland connection are available, always on request.

1.1 - Names of valves per certification

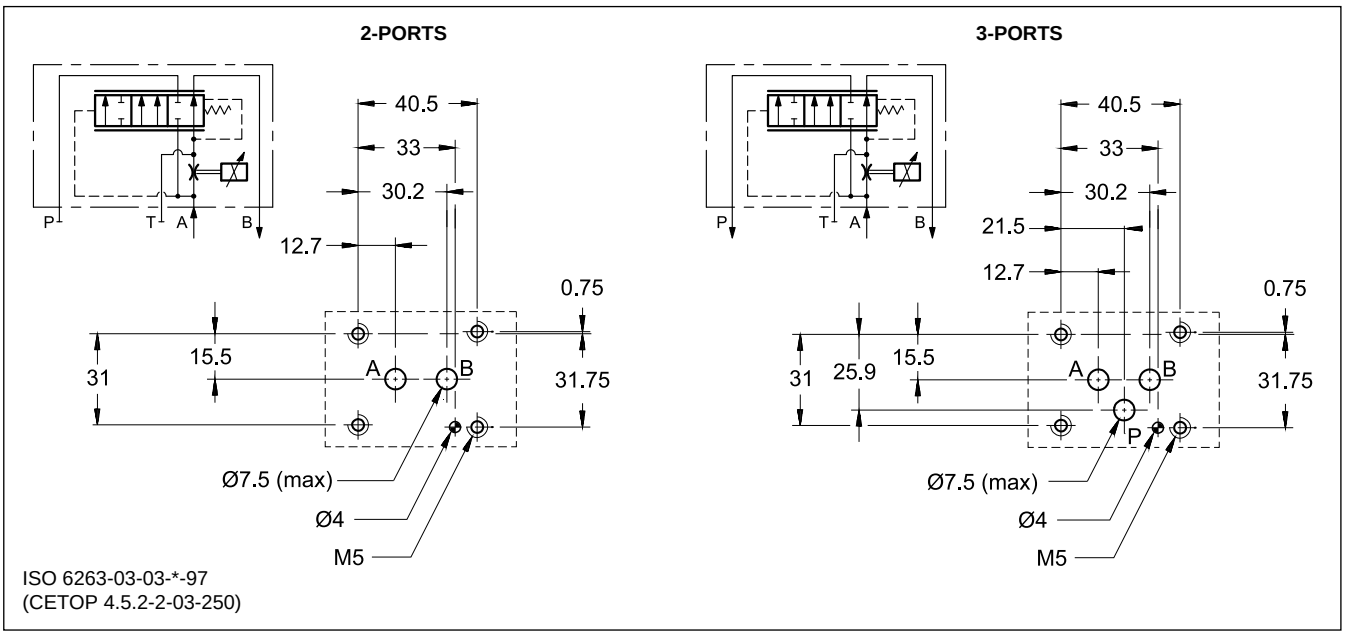
	ATEX		IECEx		PESO	
for gases for dusts	**KD2**	II 2GD	**KXD2**	IECEx Gb IECEx Db	**KPD2**	PESO Gb not applicable for dust
for mines	**KDM2**	I M2	**KXDM2**	IECEx Mb	not applicable for mines	

NOTE: Refer to the technical data sheet 02 500 for marking, operating temperatures and available versions.

2 - CONFIGURATIONS AND MOUNTING INTERFACE

The function of two or three ways is obtained realizing the mounting interface according to ISO 6263-03, using the port P for three-ways configuration only. The port T will never be used.

To use the valve in two-ways mode is also possible interposing a subplate with plug (code 0113388 and 0530384), to be ordered separately.

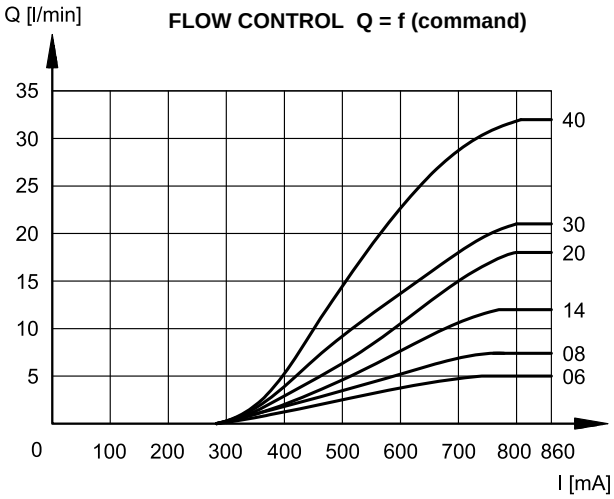


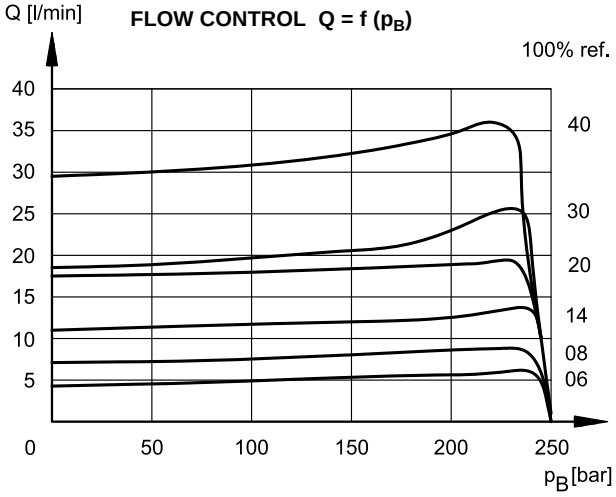
ISO 6263-03-03-*-97
(CETOP 4.5.2-2-03-250)

3 - CHARACTERISTIC CURVES

(obtained with viscosity of 36 cSt a 50°C)

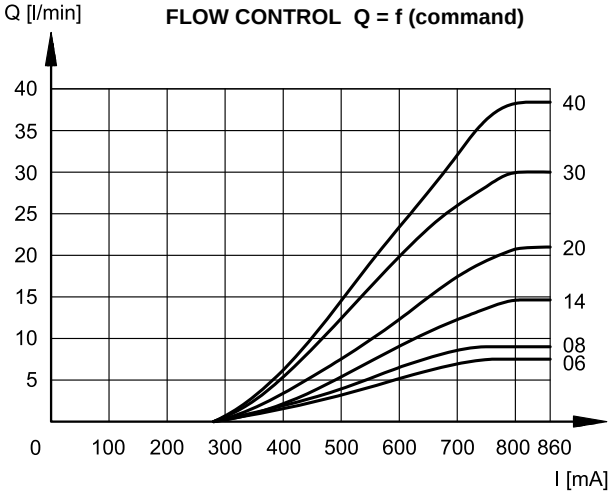
3.1 - Two ways

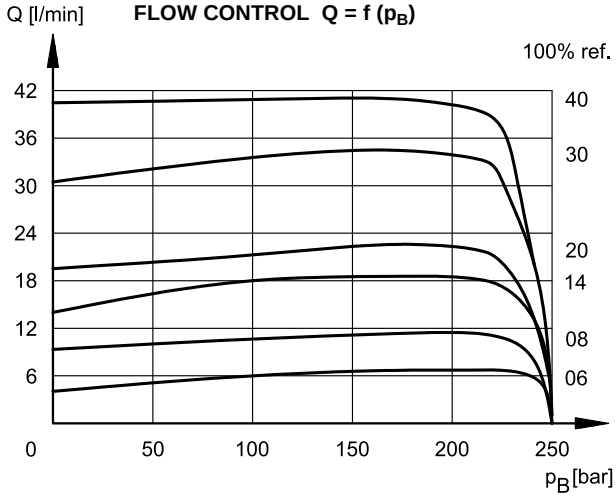




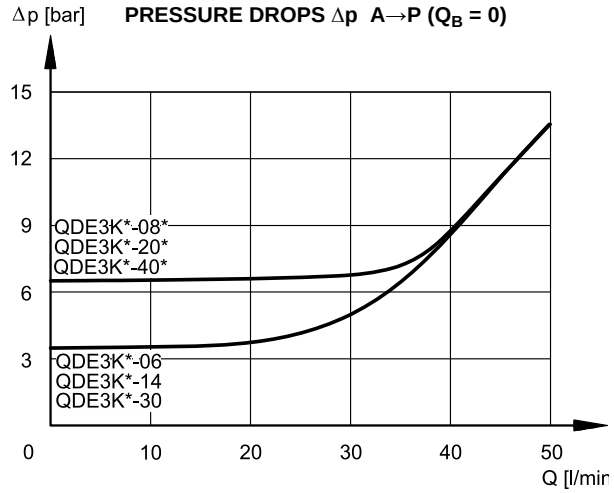
Typical flow rate characteristics A → B for controlled flow rate: 14 - 20 - 30 - 40 l/min in function of the current supplied to the solenoid (D24 version, maximum current 860 mA, PWM 100 Hz)

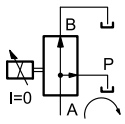
3.2 - Three ways





Typical flow rate characteristics A → B for controlled flow rate: 14 - 20 - 30 - 40 l/min in function of the current supplied to the solenoid (D24 version, maximum current 860 mA, PWM 100 Hz)





Pressure drops with flow A→P.
Obtained with Q_B = 0 (no current)

4 - STEP RESPONSE

(values measured with viscosity of 36 cSt at 50°C with electronic control unit)

Step response is the time taken for the valve to reach 90% of the set flow value following a step change of reference signal.

The table illustrates typical response times with Δp = 8 bar.

REFERENCE SIGNAL STEP	0 →100%
Step response [ms]	< 70

5 - ELECTRICAL CHARACTERISTICS

(values ± 5%)

NOMINAL VOLTAGE	V DC	12	24
RESISTANCE (AT 20°C)	Ω	3,8	15,6
NOMINAL CURRENT	A	1,88	0,86

DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2014/30/EU
CLASS OF PROTECTION: Atmospheric agents Coil insulation (VDE 0580)	 IP66/IP68 class H

5.1 - Wiring

In order to realise the electrical connection of the coil, it is necessary to access the terminal block (1) unscrewing the 4 screws (2) that fasten the cover (3) with the box (4) that contains the terminal block.

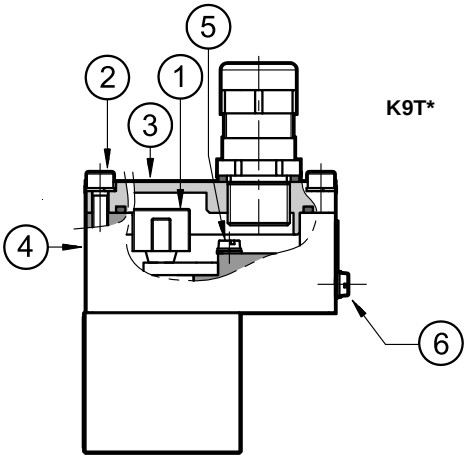
The electrical connection is polarity-independent.

By doing electrical connection it is important to connect also the grounding point (5) in the terminal block box (M4 screws), through suitable conductors with the general grounding line of the system.

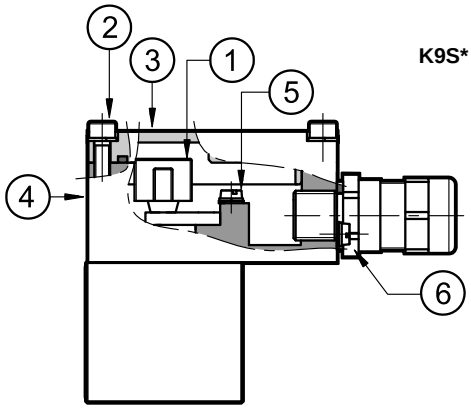
On the external body of the coil there is a grounding point (6) (M4 screw) that allow to ensure equipotentiality between the valve and the general grounding line of the system; connecting this point the regulation of the EN 13463-1 standard, that impose to verify the equipotentiality of the elements included in a potentially explosive environment (the maximum resistance between the elements must be 100 Ω), is guaranteed.

At the end of the electrical wiring, it is necessary to reassemble the cover (3) on the box (4), checking the correct positioning of the seal located in the cover seat and fastening the 4 M5 screws with a torque of 4.9÷6 Nm.

Electrical wiring must be done following in compliance with standards about protection against explosion hazards



K9T*



K9S*

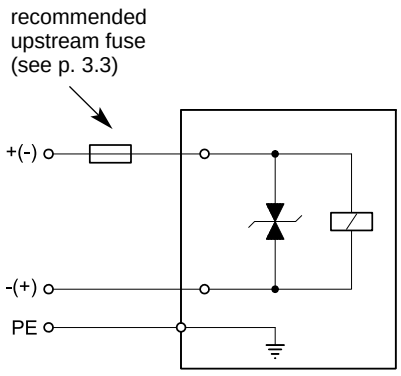
Characteristics of the cables connectable for wiring are indicated in the table below:

Function	Cable section
Operating voltage cables connection	max 2.5 mm²
Connection for internal grounding point	max 2.5 mm²
Connection for external equipotential grounding point	max 6 mm²

Cables for wiring must be non-armoured cables, with external covering sheath and must be suitable for use in environments with temperatures from - 20 °C to +110 °C (for valves either with N or V seals) or from - 40 °C to +110 °C (for valves with NL seals).

Cable glands (which must be ordered separately, see point 19) allow to use cables with external diameter between 8 and 10 mm.

5.2 - Electrical diagrams



5.3 - Overcurrent fuse and switch-off voltage peak

Upstream of each valve, an appropriate fuse (max 3 x In according to IEC 60127) or a protective motor switch with short-circuit and thermal instantaneous tripping, as short-circuit protection, must be connected. The cut-off power of the fuse must correspond or exceed the short circuit current of the supply source. The breaking capacity of the fuse link shall be the same as or higher than the maximum short-circuit current expected to occur at the place of installation (normally 1500 A).

The fuse or the protective motor must be placed outside the dangerous area or they must be protected with an explosion-proof covering.

In order to safeguard the electronic device to which the valve is connected, there is a protection circuit in the coil, that reduces voltage peaks, which can occur when inductances are switched off.

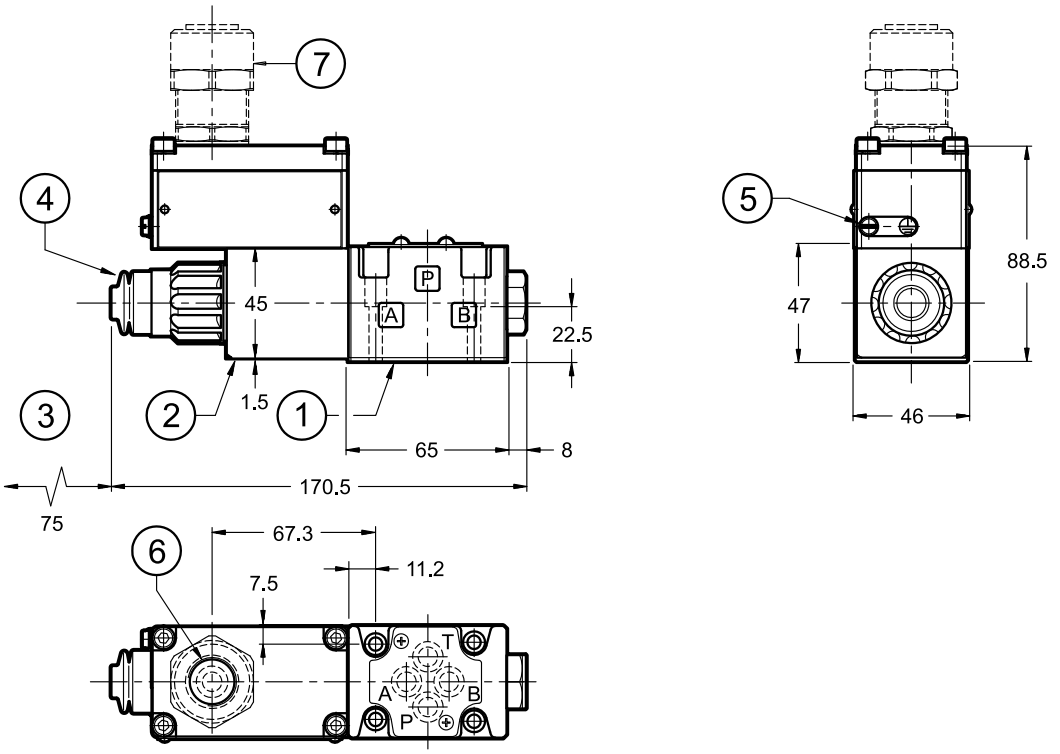
The table shows the type of fuse recommended according to the nominal voltage of the valve and to the value of the voltage peaks reduction.

Coil type	Nominal voltage [V]	Rated current [A]	**Recommended pre-fuse characteristics medium time-lag according to DIN 41571 [A]**	Maximum voltage value upon switch off [V]	Suppressor circuit
D12	12	1,88	2,5	- 49	Transient voltage suppressor bidirectional
D24	24	0,86	1,25	- 49	

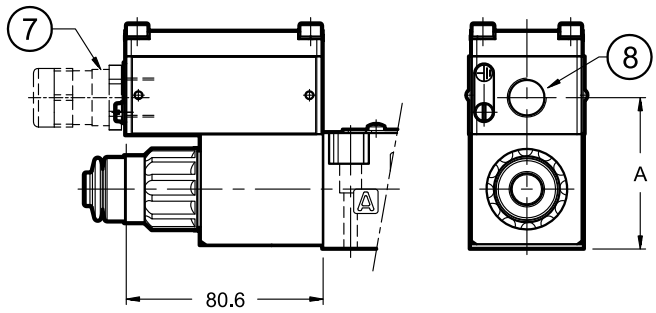
6 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

QDE3K*-*/10*-*K9T*/CM



QDE3K*-*/10*-*K9S*/CM



Side port type	Dimension A
S01, S04	60.5
S02, S03	60

Valve fastening: 4 SHC screws ISO 4762 M5x30	
Tightening torque: 5 Nm (A8.8 screws)	
Threads of mounting holes: M5x10	

1	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) - 90 Shore
2	Explosion-proof coil
3	Minimum clear space required
4	Manual override, boot protected (**standard for both N and V seals**) for blind ring nut dimensions (standard for NL seals) see p. 9
5	Terminal for supplementary GND connection
6	Upper port for cable gland
7	Cable gland. To be ordered separately, see p. 10
8	Side port for cable gland

7 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

8 - INSTALLATION

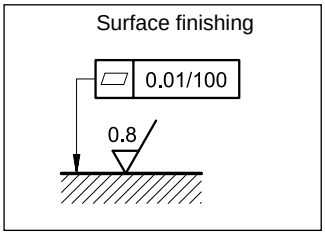
Installation must adheres to instructions reported in the *Use and Maintenance manual*, always attached to the valve. Unauthorized interventions can be harmful to people and goods because of the explosion hazards present in potentially explosive atmospheres.

The valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

Valve fastening takes place by means of screws or tie rods, laying the valve on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing.

If the minimum values of planarity or smoothness are not met, fluid leakages between valve and mounting surface can easily occur.



9 - MANUAL OVERRIDES

9.1 - CB - Blind ring nut

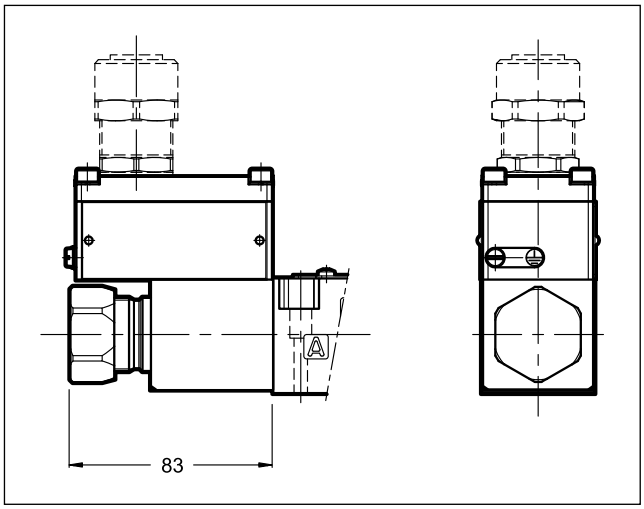
The metal ring nut protects the solenoid tube from atmospheric agents and isolates the manual override from accidental operations. The ring nut is tightened on a threaded fastener that keeps the coil in its position even without the ring nut.

To access the manual override, loosen the ring nut and remove it; then reassemble hand tightening, until it stops.

Activate the manual override always and only with non-sparking tools suitable for use in potentially explosive atmospheres.

More information on safe use of explosion-proof components are provided in the instruction manual, always supplied with the valve.

CAUTION!: The manual override use doesn't allow any proportional regulation.

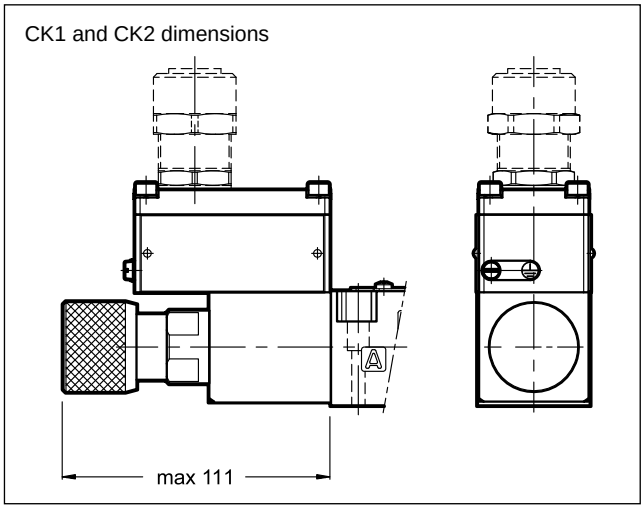


9.2 - CK1 - Knob manual override

Screwing the knob activates this manual override.

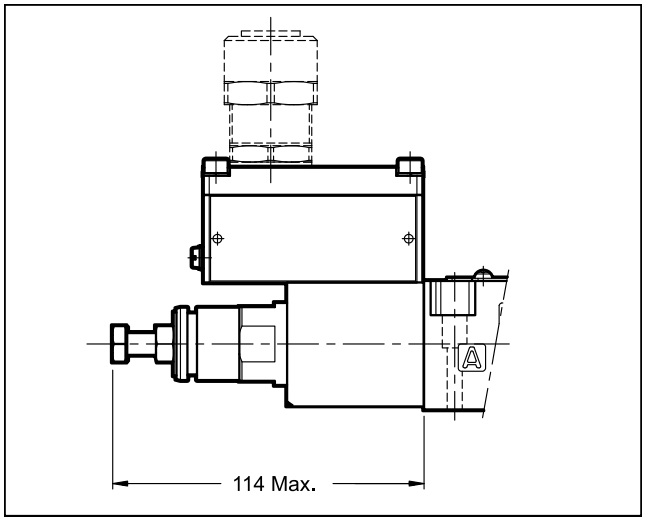
9.3 - CK2 - Push and twist manual override

Pressing and turning the knob activates this manual override.



9.3 - CS - Screw manual override

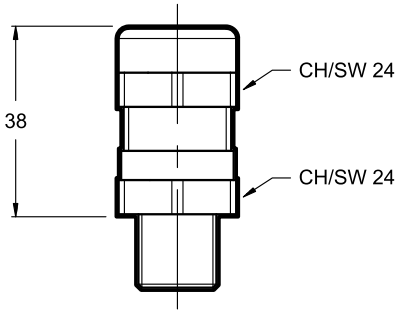
Metal ring nut provided with a M8 screw and a blocking locknut to allow the continuous mechanical operations.



10 - CABLE GLANDS

Cable glands must be ordered separately; Duplomatic offers some types of cable glands with the following features:

- version for non-armoured cable, external seal on the cable (suitable for Ø 8÷10 mm cables);
- ATEX II 2GD, I M2; IECEx Gb, Db, Mb;
- cable gland material: nickel brass
- inner rubber tip material: silicone
- ambient temperature range: -65 ºC ÷ +220 ºC
- protection degree: IP66/IP68



To order the desired cable glands, specify description, code and quantity.

Description: CGK2/NB-01/10

Code: 3908108001

M20x1.5 - ISO 261 male thread, suitable for coils with T01 and S01 connections. It is supplied equipped with copper washer, that must be assembled between the cable gland and the coil, so as to ensure IP66/IP68 protection degree.

Tightening torque: 45 ÷ 50 Nm

Description: CGK2/NB-02/10

Code: 3908108002

Gk 1/2 - UNI EN 10226-2 male thread, suitable for coils with T02 and S02 connections. The customer must apply LOCTITE® 243™ threadlocker or similar between the cable gland connection thread and the coil in order to ensure IP66/IP68 protection degree.

Tightening torque: 20 ÷ 25 Nm

Description: CGK2/NB-03/10

Code: 3908108003

1/2” NPT - ANSI B1.20.1 (ex ANSI B2.1), suitable for coils with T03 and S03 connections. The customer must apply LOCTITE® 243™ threadlocker or similar between the cable gland connection thread and the coil in order to ensure IP66/IP68 protection degree.

Tightening torque: 20 ÷ 25 Nm

Description: CGK2/NB-04/10

Code: 3908108004

M16x1.5 - ISO 261 male thread, suitable for coils with S04 connection. It is supplied equipped with copper washer, that must be assembled between the cable gland and the coil, so as to ensure IP66/IP68 protection degree.

Tightening torque: 45 ÷ 50 Nm

11 - ELECTRONIC CONTROL UNITS

EDM-M111	24V DC solenoids	rail mounting DIN EN 50022	see catalogue 89 251
EDM-M141	12V DC solenoids		
EWM-A-PV	12V / 24V DC software config.		see catalogue 89 620

NOTE: electronic control units offered are not explosion proof certified; therefore, they must be installed outside the classified area.

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duplomaticmotionsolutions.com

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EXPLOSION-PROOF CLASSIFICATION for

SOLENOID AND PROPORTIONAL VALVES

ref. catalogues:

pressure control valves

RQM*K*-P	**21 515**
P*E*K*	**81 316**
ZDE3K*	**81 515**
DZCE*K*	**81 606**

flow control valves

QDE3K*	**82 225**

directional valves

D*K*	**41 515**
DT3K*	**42 215**
DS(P)E*K*	**83 510**

GENERAL INFO

This informative technical datasheet displays information about **classification and marking** of Duplomatic explosion-proof valves range.

Duplomatic MS offers valves with the following certifications:

ATEX	**II 2G**	**II 2D**	**I M2**
IECEx	**Gb**	**Db**	**Mb**
PESO	**Gb**		

Instructions for use and maintenance can be found in the related manuals, always supplied toghether with valves.

1 - ATEX CLASSIFICATION AND TEMPERATURES

Duplomatic valves are suitable for application and installation in potentially explosive atmospheres, according to ATEX directive; the supply always includes the declaration of conformity to the directive and the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environments.

Coils assembled on these valves have been separately certified according to ATEX directive and so they are suitable for use in potentially explosive atmospheres.

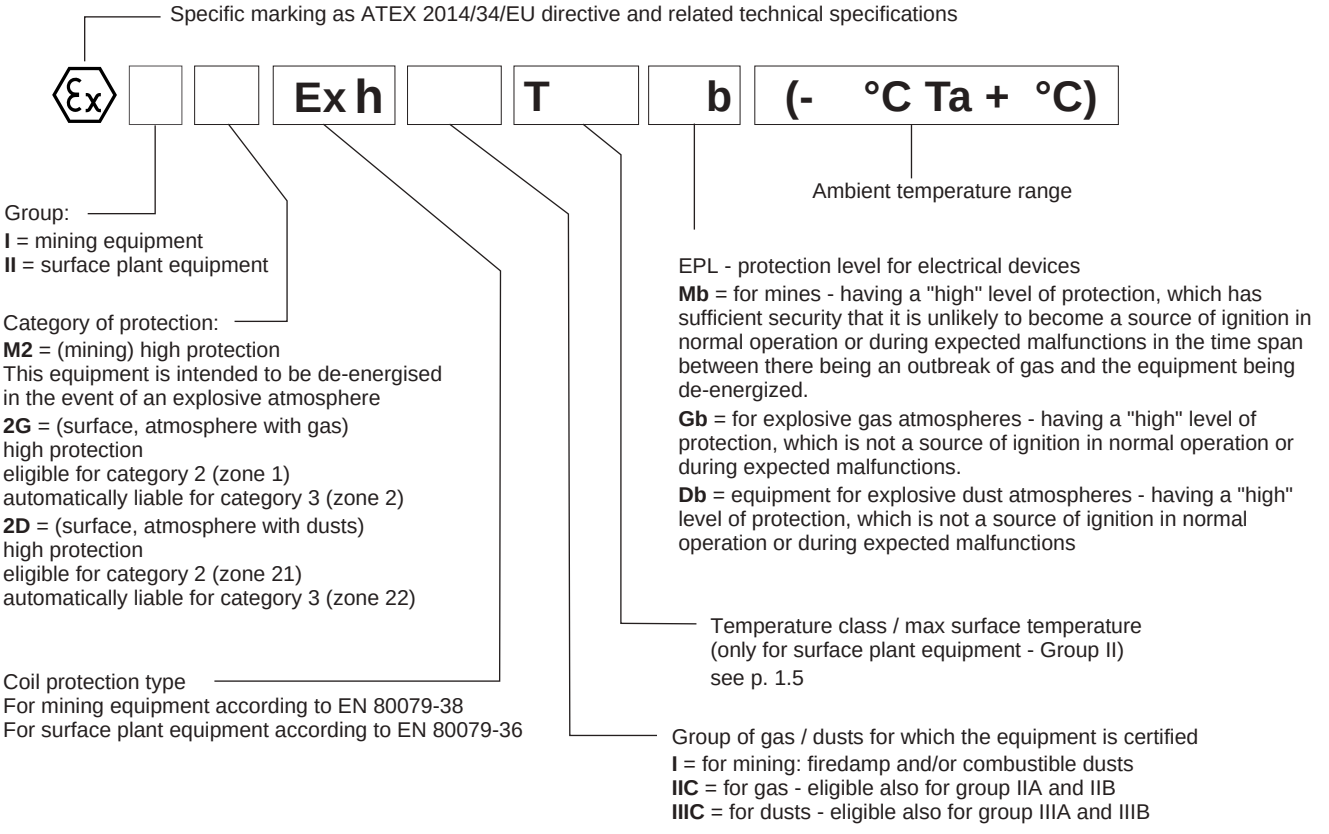
1.1 - ATEX classification for valves

The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

ATEX II 2G ATEX II 2D	***KD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur occasionally.The means of protection relating to equipment in this category ensure the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account.
ATEX I M2	***KDM2**	equipment intended for use in underground parts of mines as well as those parts of surface installations of such mines likely to be endangered by firedamp and/or combustible dust. This equipment is intended to be de-energised in the event of an explosive atmosphere.

1.2 - ATEX marking for valves

valve code		N and V seals	NL seals
***KD2**	for gas	Ⓔx II 2G Ex h IIC T4 Gb (-20°C Ta +80°C)	Ⓔx II 2G Ex h IIC T4 Gb (-40°C Ta +80°C)
	for dusts	Ⓔx II 2D Ex h IIIC T135°C Db (-20°C Ta +80°C)	Ⓔx II 2D Ex h IIIC T135°C Db (-40°C Ta +80°C)
***KD2 /T5**	for gas	Ⓔx II 2G Ex h IIC T5 Gb (-20°C Ta +55°C)	Ⓔx II 2G Ex h IIC T5 Gb (-40°C Ta +55°C)
	for dusts	Ⓔx II 2D Ex h IIIC T100°C Db (-20°C Ta +55°C)	Ⓔx II 2D Ex h IIIC T100°C Db (-40°C Ta +55°C)
***KDM2**	mining	Ⓔx I M2 Ex h I Mb (-20°C Ta +80°C)	Ⓔx I M2 Ex h I Mb (-40°C Ta +80°C)



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1.3 - ATEX classification of the coils

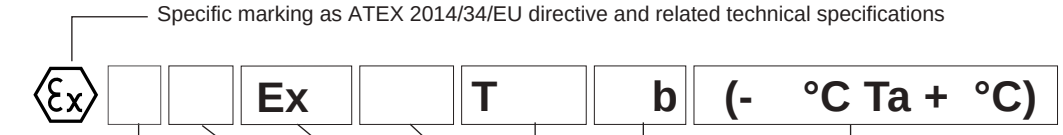
The coil of the explosion-proof valves is ATEX certified and, as such, is identified with its own tag, carries the relative ATEX marking. The mechanical construction of the coil housing is made in order to ensure its resistance to possible internal explosion and to avoid any explosion propagation to the outside environment, matching an “Ex db” type protection (explosion-proof coil).

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

1.4 - ATEX marking on coils

EU-type examination certificate: TÜV 25 ATEX 410149 X

for valve type ***KD2**	for gas	Ex II 2G Ex db IIC T4 Gb (-40°C Ta +80°C)
	for dusts	Ex II 2D Ex tb IIIC T135°C Db (-40°C Ta +80°C)
for valve type ***KD2 /T5**	for gas	Ex II 2G Ex db IIC T5 Gb (-40°C Ta +55°C)
	for dusts	Ex II 2D Ex tb IIIC T100°C Db (-40°C Ta +55°C)
for valve type ***KDM2**	mining	Ex I M2 Ex db I Mb (-40°C Ta +80°C)



Group:
I = mining equipment
II = surface plant equipment

Category of protection:
M2 = (mining) high protection
This equipment is intended to be de-energised in the event of an explosive atmosphere
2G = (surface, atmosphere with gas)
high protection
eligible for category 2 (zone 1)
automatically liable for category 3 (zone 2)
2D = (surface, atmosphere with dusts)
high protection
eligible for category 2 (zone 21)
automatically liable for category 3 (zone 22)

Coil protection type:
db = flameproof enclosure
tb = protection from dust by enclosure

EPL - protection level for electrical devices
Mb = for mines - having a "high" level of protection, which has sufficient security that it is unlikely to become a source of ignition in normal operation or during expected malfunctions in the time span between there being an outbreak of gas and the equipment being de-energized.
Gb = for explosive gas atmospheres - having a "high" level of protection, which is not a source of ignition in normal operation or during expected malfunctions.
Db = equipment for explosive dust atmospheres - having a "high" level of protection, which is not a source of ignition in normal operation or during expected malfunctions

Temperature class / max surface temperature
(only for surface plant equipment - Group II)
see p. 1.5

Group of gas / dusts for which the equipment is certified
I = for mining: firedamp and/or combustible dusts
IIC = for gas - eligible also for group IIA and IIB
IIIC = for dusts - eligible also for group IIIA and IIIB

1.5 - Operating temperatures

These valves are classified according to their maximum surface temperature (EN 13463-1), which must be lower than the ignition temperature of the gases, vapors and dusts for which the area in which they will be used is classified.

The valves in group II can also be used for less limiting temperature classes (surface temperature allowed higher).

		temperature range	N and V seals	NL seals	Temperature class	eligible also for
ATEX II 2G ATEX II 2D	***KD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas) T135°C (dusts)	T3, T2, T1 T200°C and higher
		of fluid				
	***KD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas) T100°C (dusts)	T4, T3, T2, T1 T135°C and higher
		of fluid	-20 / +60 °C	-40 / +60 °C		
ATEX I M2	***KDM2**	of ambient	-20 / +80 °C	-40 / +80 °C	-	-
		of fluid				

1.6 - Protection degree from atmospheric agents (EN 60529)

Protection degree from atmospheric agents according to EN 60529 is IP66/IP68.

2 - IECEX CLASSIFICATION AND TEMPERATURES

The IECEx certification requires the classification of the electrical equipment only.

Duplomatic supplies valves with IECEx certified coils, suitable for application and installation in potentially explosive atmospheres. The mechanical construction of the coil housing is made in order to ensure its resistance to possible internal explosion and to avoid any explosion propagation to the outside environment, matching an “Ex db” type protection (explosion-proof coil).

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

The supply always includes the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environment.

2.1 - IECEx classification

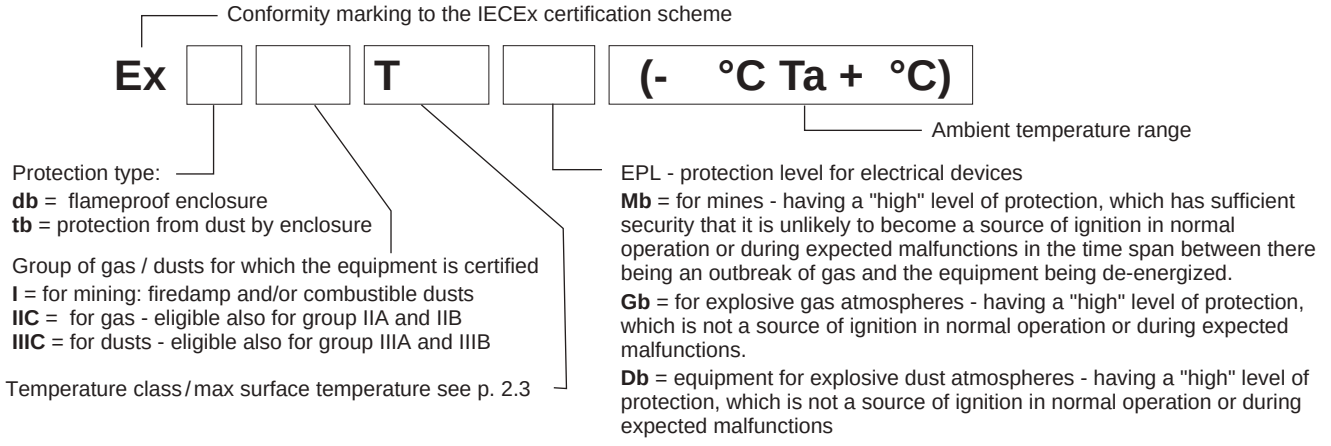
Certificate of conformity (CoC): IECEx TUN 15.0028X
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

IECEx Gb IECEx Db	***KXD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur occasionally.The means of protection relating to equipment in this category ensure the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account.
IECEx Mb	***KXDM2**	equipment intended for use in underground parts of mines as well as those parts of surface installations of such mines likely to be endangered by firedamp and/or combustible dust. This equipment is intended to be de-energised in the event of an explosive atmosphere.

2.2 - IECEx marking

There is a plate with the IECEx mark on each coil.

***KXD2** valves	for gas	Ex db IIC T4 Gb (-40°C Ta +80°C)
	for dusts	Ex tb IIIC T135°C Db (-40°C Ta +80°C)
***KXD2 /T5** valves	for gas	Ex db IIC T5 Gb (-40°C Ta +55°C)
	for dusts	Ex tb IIIC T100°C Db (-40°C Ta +55°C)
***KDM2** valves	mining	Ex db I Mb (-40°C Ta +80°C)



2.3 - Operating temperatures

These valves are classified according to their maximum surface temperature (EN 13463-1), which must be lower than the ignition temperature of the gases, vapors and dusts for which the area in which they will be used is classified.

Valves for surface plants can also be used for less limiting temperature classes (higher surface temperature allowed).

		temperature range	N and V seals	NL seals	Temperature class	eligible also for
IECEx Gb IECEx Db	***KXD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas) T135°C (dusts)	T3, T2, T1 T200°C and higher
		of fluid				
	***KXD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas) T100°C (dusts)	T4, T3, T2, T1 T135°C and higher
		of fluid	-20 / +60 °C	-40 / +60 °C		
IECEx Mb	***KXDM2**	of ambient	-20 / +80 °C	-40 / +80 °C	-	-
		of fluid				

2.4 - Protection degree from atmospheric agents (IEC EN 60529)

Protection degree from atmospheric agents according to IEC EN 60529 is IP66/IP68.

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3 - PESO CLASSIFICATION AND TEMPERATURES

The PESO certification requires the classification of the electrical equipment only.

Duplomatic supplies valves with PESO certified coils, suitable for application and installation in potentially explosive atmospheres. The mechanical construction of the coil housing is made in order to ensure its resistance to possible internal explosion and to avoid any explosion propagation to the outside environment, matching an “Ex db” type protection (explosion-proof coil).

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

The supply always includes the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environment.

3.1 - PESO classification

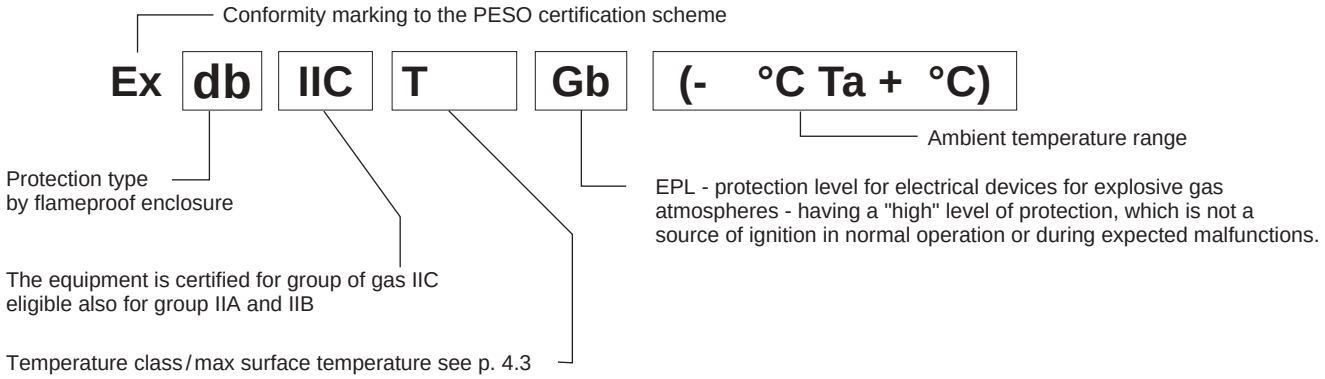
Certificate of conformity: P636522
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

PESO Gb	***KPD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists are likely to occur occasionally.The means of protection relating to equipment in this category ensure the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account.

3.2 - PESO marking

There is a plate with the PESO mark on each coil.

***KPD2** valves	for gas	Ex db IIC T4 Gb (-40°C Ta +80°C)
***KPD2 /T5** valves	for gas	Ex db IIC T5 Gb (-40°C Ta +55°C)



3.3 - Operating temperatures

These valves are classified according to their maximum surface temperature (EN 13463-1), which must be lower than the ignition temperature of the gases, vapors and dusts for which the area in which they will be used is classified.

Valves for surface plants can also be used for less limiting temperature classes (higher surface temperature allowed).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
PESO Gb	***KPD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas)	T3, T2, T1
		of fluid				
	***KPD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas)	T4, T3, T2, T1
		of fluid	-20 / +60 °C	-40 / +60 °C		

3.4 - Protection degree from atmospheric agents (IEC EN 60529)

Protection degree from atmospheric agents according to IEC EN 60529 is IP66/IP68.

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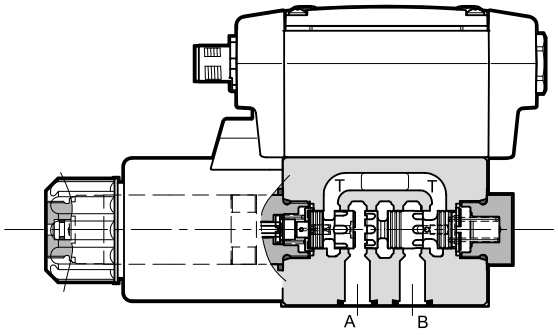
QDE3GL

PROPORTIONAL COMPENSATED FLOW CONTROL VALVE WITH INTEGRATED ELECTRONICS

SUBPLATE MOUNTING ISO 6263-03

p max **250** bar
Q max **40** l/min

OPERATING PRINCIPLE



— QDE3GL are proportional pressure-compensated flow control valves with on-board electronics and mounting surface according to ISO 6263-03. Depending on the presence of the P port in the mounting surface, they can operate as either 2- or 3-port flow control valves.

— These valves are suitable for controlling flow in sub-systems of a hydraulic circuit or for controlling the speed of a hydraulic cylinder.

— These valves are equipped with compact integrated electronics, with analogue or fieldbus (IO-Link or CAN Open) interface.

— QDE3GL valves are available in four flow adjustment ranges of up to 40 l/min.

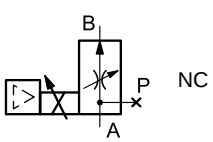
PERFORMANCES

(values measured with viscosity of 36 cSt at 50 °C with electronic control unit)

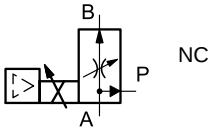
Maximum operating pressure	bar	250			
Controlled flow (Q_B)	l/min	14	20	30	40
Max inlet flow (Q_A) (3-port)	l/min	40	50	40	50
Spring setting in pressure compensator	bar	4	8	4	8
Minimum pressure drop A > B	bar	10	22	10	22
Hysteresis	% of Q_{max}	< 6 %			
Repeatability	% of Q_{max}	< ± 1,5 %			
Electrical characteristics	see point 4				
Ambient temperature range	°C	-20 / +60			
Fluid temperature range	°C	-20 / +80			
Fluid viscosity range	cSt	10 ÷ 400			
Fluid contamination degree	according to ISO 4406:1999 class 18/16/13				
Recommended viscosity	cSt	25			
Mass	kg	1,6			

HYDRAULIC SYMBOLS

2-PORTS



3-PORTS



1 - IDENTIFICATION CODE

Q	D	E	3	GL	-		/			-		K12	/	

Compensated flow control valve, direct operated

Proportional control

Size ISO 6263-03

Digital integrated electronics for open loop - compact version

Controlled flow
14 = 14 l/min
20 = 20 l/min
30 = 30 l/min
40 = 40 l/min

Series No. (the overall and mounting dimensions remain unchanged from 10 to 19):
10 = versions with E0, E1 and CA interfaces
12 = version with IOL interface

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Interfaces:
E0 = analogue, voltage 0 ÷ 10 V
E1 = analogue, current 4 ÷ 20 mA
IOL = IO-Link interface
CA = CAN Open

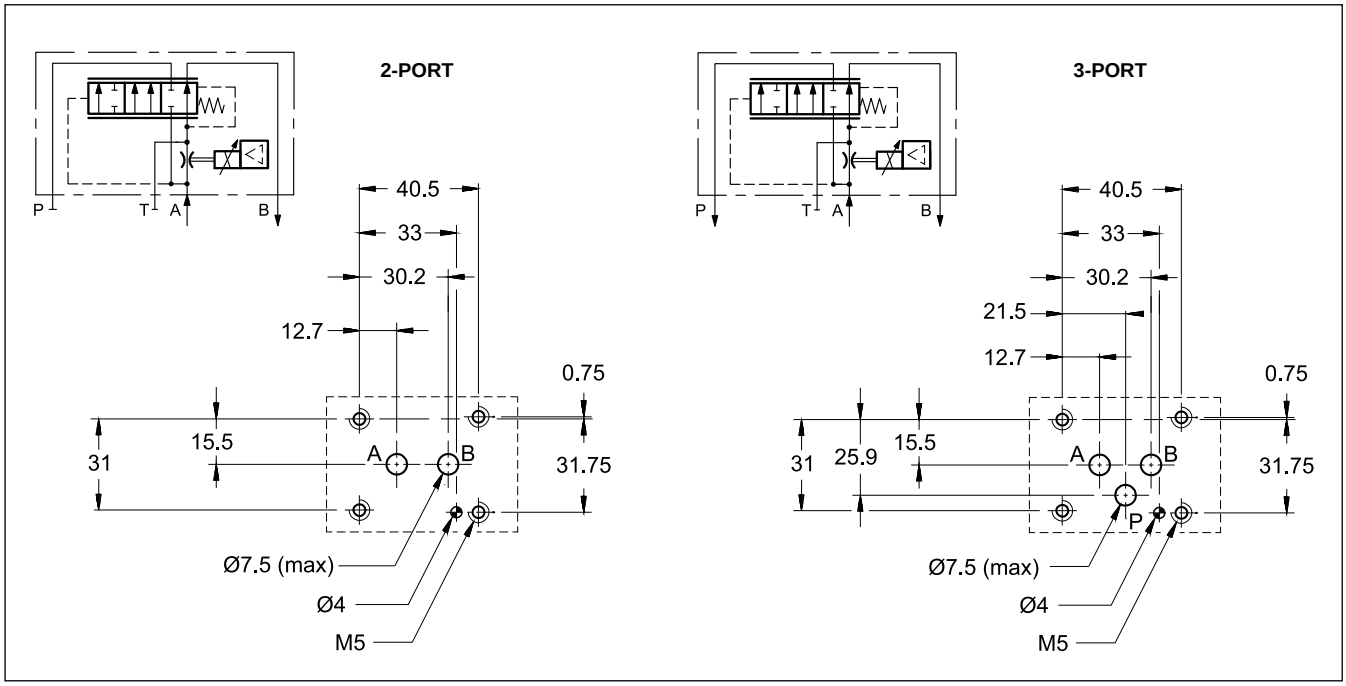
Connection 5 pin M12

Option:
Manual override
Omit if not required
(see at point 6)

2 - CONFIGURATIONS AND MOUNTING INTERFACE

The two- or three-port function is achieved by drilling the mounting interface with holes according to ISO 6263-03. The T path to the reservoir is not created, and the P path is created in the case of a three- ports configuration only.

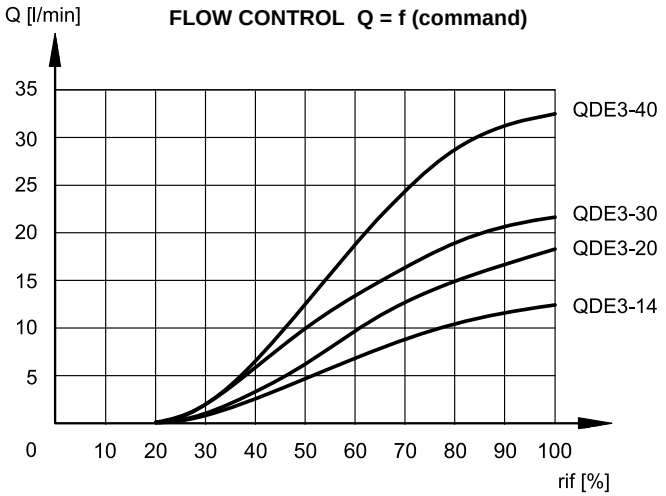
Alternatively, in order to use the QDE3GL valve in the two-ports configuration, it is possible to interpose an adapter plate with plug (codes 0113388 and 0530384 respectively), which must be ordered separately.

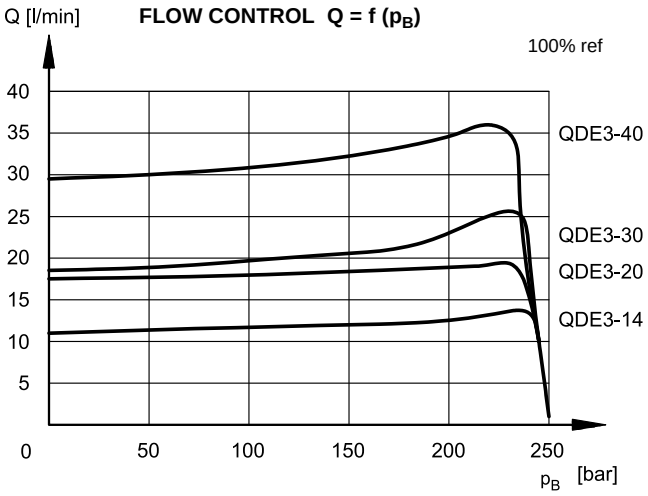


3 - CHARACTERISTIC CURVES

(obtained with viscosity of 36 cSt a 50 °C)

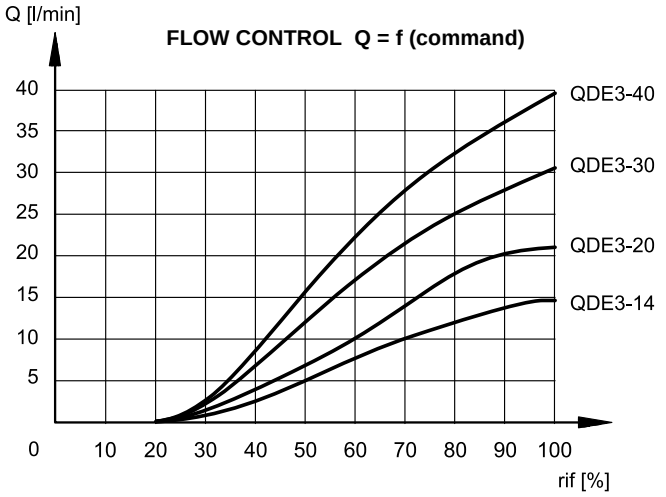
3.1 - Two-port

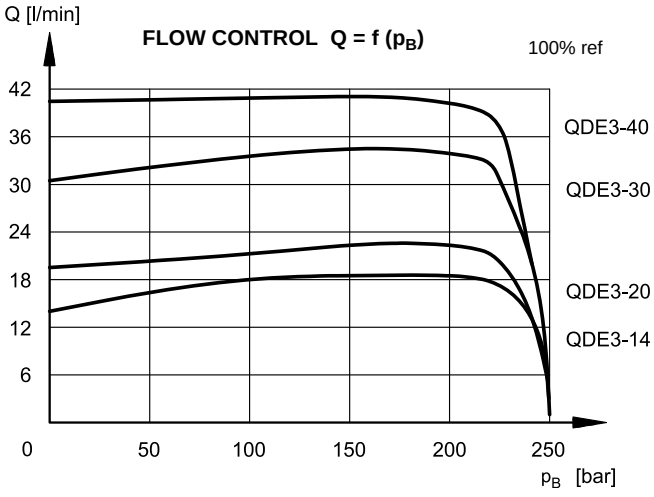




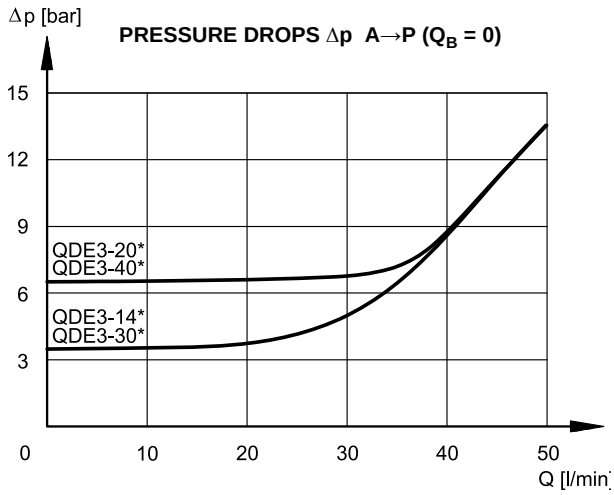
Typical flow rate characteristics A → B for sizes
14 - 20 - 30 - 40 l/min as function of the command signal.

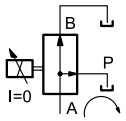
3.2 - Three-port





Typical flow rate characteristics A → B for sizes
14 - 20 - 30 - 40 l/min as function of the command signal.





Pressure drops with flow A→P.
Obtained with Q_B = 0 (no current)

4 - ELECTRICAL CHARACTERISTICS

Duty cycle		100% (continuous operation)
Protection class according to EN 60529		IP65 / IP67 (**NOTE**)
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	25
Maximum solenoid current	A	1.88
Fuse protection, external	A	2A time lag
Managed breakdowns		overload and electronics overheating, cable breakdown, supply voltage failures
Electromagnetic compatibility (EMC) emissions EN 61000-6-4, immunity EN 61000-6-2		according to 2014/30/EU standards
Command signal: voltage (E0) current (E1)	V DC mA	0 ÷ 10 (impedance Ri > 11 kOhm) 4 ÷ 20 (impedance Ri = 58 Ohm)
Monitor signal (current to solenoid): voltage (E0) current (E1)	 V DC mA	 0 ÷ 5 (impedance Ro > 1 kOhm) 4 ÷ 20 (impedance Ro = 500 Ohm)
IO-Link communication (IOL): Data rate	 kBaud	IO-Link Port Class B 38.4
Can Open communication (CA): Data rate	kbit	 10 ÷ 1000
Data register (IOL and CA versions only)		card voltage supply, solenoid faults (shortcircuit, bad configuration), box temperature.
Connection		5-pin M12 code A (IEC 61076-2-101)

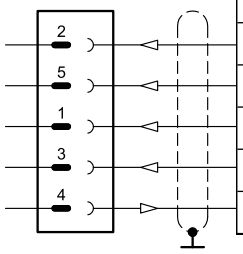
NOTE: The IP degree is guaranteed only with mating connector of equivalent IP degree, installed and tightened correctly.

In IO-Link networks, the length of the connecting cables is limited to 20 metres. In CA versions, pin 3 and pin 5 are galvanic isolated up to 100 V to avoid earth loops.

4.1 - Pin tables

‘E0’ connection

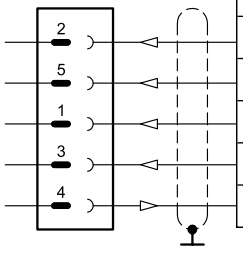




Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	0 ÷ 10 V	Command
3	0 V	Command reference
4	0 ÷ 5 V	Monitor (0V reference: pin 5)

’E1’ connection

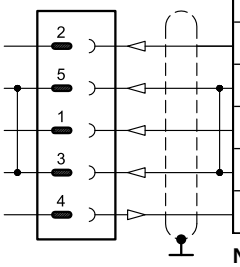




Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	4 ÷ 20 mA	Command
3	0V	Command reference
4	4 ÷ 20 mA	Monitor (0V reference: pin 5)

'IOL' connection



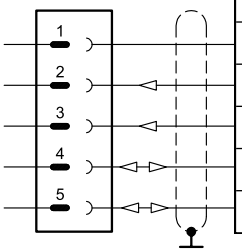


Pin	Values	Function
2	2L+ 24 V DC	Solenoid supply voltage
5	2L- 0 V (GND)	
1	1L+ +24 V DC	Logic and IO-Link supply voltage
3	1L- 0V (GND)	
4	C/Q	IO-Link Communication

NOTE: Pin 3 and pin 5 are linked with each other in the valve electronics. The reference potentials 1L- and 2L- of the two supply voltages must also be linked with each other on the customer side.

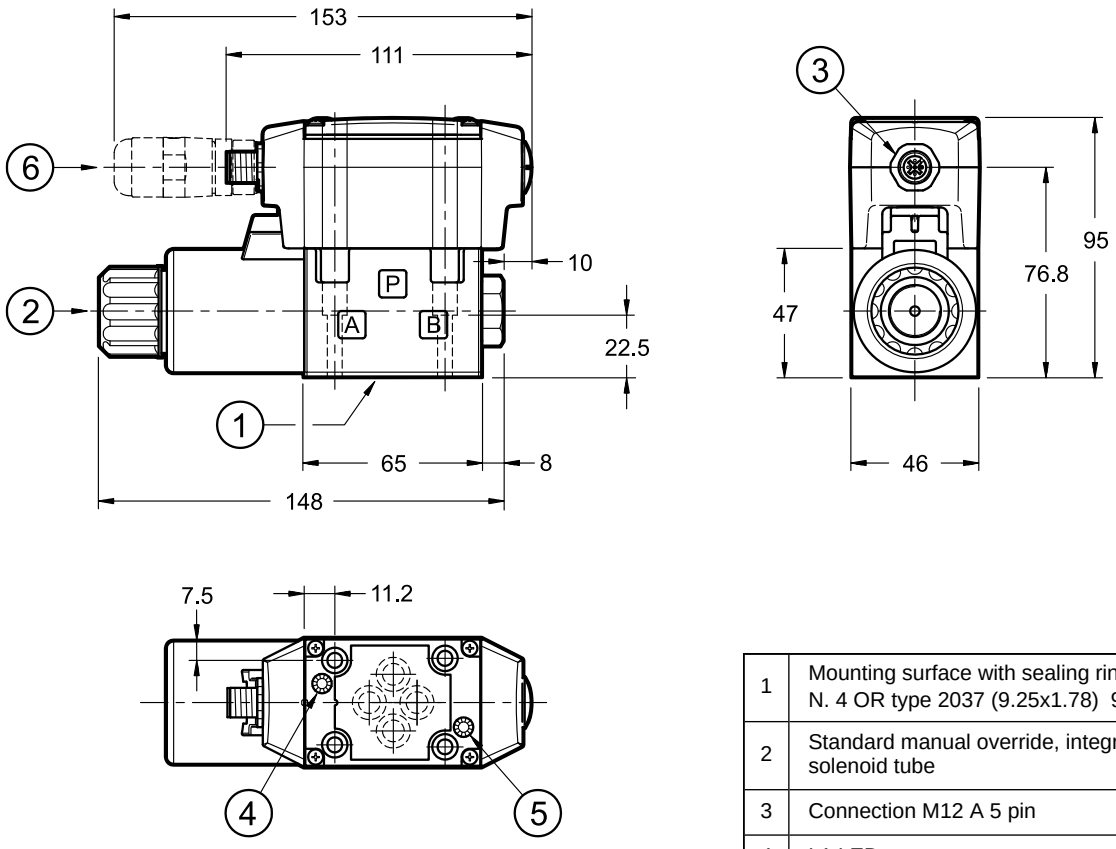
'CA' connection





Pin	Values	Function
1	CAN_SH	Shield
2	24 V DC	Supply voltage
3	0 V (GND)	
4	CAN H	Bus line (high)
5	CAN_L	Bus line (low)

5 - OVERALL AND MOUNTING DIMENSIONS



1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Standard manual override, integrated in the solenoid tube
3	Connection M12 A 5 pin
4	L1 LED
5	L2 LED
6	Mating connector M12 5 poles, code A, female **To be ordered separately.** See catalogue 89 000

Fastening bolts: 4 SHCS M5x30- ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

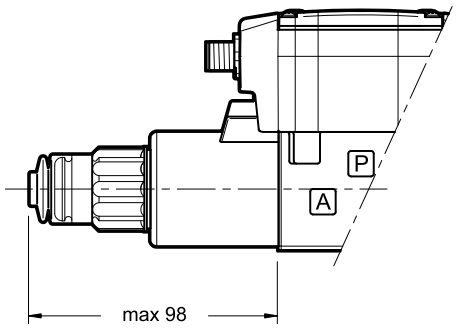
6 - MANUAL OVERRIDE

Standard valves have the pin for the manual operation integrated in the solenoid tube. The operation of this override must be executed with a suitable tool, minding not to damage the sliding surface.

Available manual overrides are:

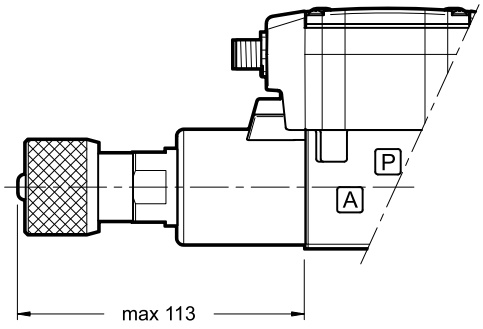
- **CM**: manual override boot protected.
- **CK1** version, knob.

CM Version



Code: 3401150006

CK1 Version



Code: 3401150031

7 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

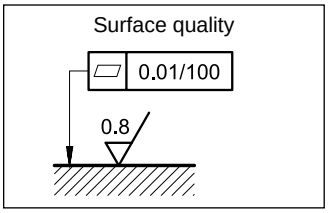
The fluid must be preserved in its physical and chemical characteristics.

8 - INSTALLATION

The QDE3GL valves can be installed in any position without impairing correct operation. Ensure that there is no air in the hydraulic circuit.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols.

If minimum values are not observed fluid can easily leak between the valve and support surface.



9 - ACCESSORIES

(to be ordered separately)

9.1 - Mating connectors

Mating connectors must be ordered separately. See catalogue 89 000.

9.2 - Mating connectors and caps for fieldbus communication and for sensors.

Duplomatic offers spare parts to be wired and also ready-to-use cord sets. Please refer to cat. 89 000.

9.3 - Connection cable

The optimal wiring provides for 7 isolated conductors, with separate screen for the signal wires (command, monitor) and an overall screen.

Cross section for power supply:
- up to 20 m cable length : 1,0 mm²
- up to 40 m cable length : 1,5 mm² (IO-Link excluded)

Cross section for signals (command, monitor):
- 0,50 mm²

9.4 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic. See catalogue 89 850.

DUPLOMATIC MOTION SOLUTIONS
a member of DAIKIN group

DUPLOMATIC MS Spa
via Mario Re Depaolini, 24 | 20015 Parabiago (MI) | Italy
T +39 0331 895111 | E vendite.ita@duplomatic.com | sales.exp@duplomatic.com
duplomaticmotionsolutions.com

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RPCER1

DIRECT OPERATED FLOW CONTROL VALVE WITH ELECTRIC PROPORTIONAL CONTROL AND POSITION FEEDBACK

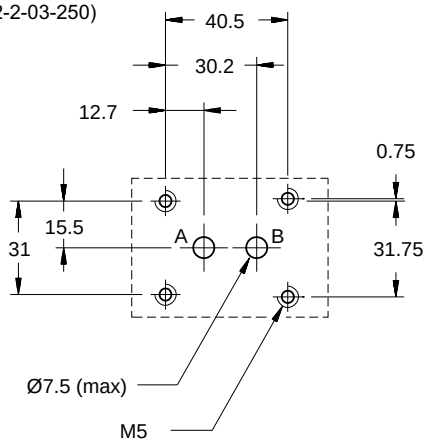
SERIES 54

SUBPLATE MOUNTING
ISO 6263-03

p max **250** bar
Q max (see performances table)

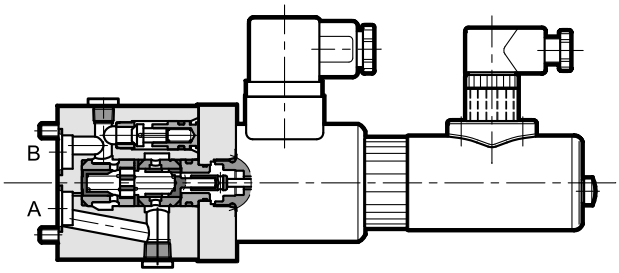
MOUNTING INTERFACE

ISO 6263-03-03-0-97
(CETOP 4.5.2-2-03-250)



NOTE: the RPCER1 mounting interface, with holes according to ISO 6263-03, must not have P and T ports

OPERATING PRINCIPLE



— RPCER1 is a pressure and temperature compensated two-way flow control valve, with electric proportional control and mounting interface according to ISO 6263 standards.

— The position feedback of the flow rate controlling throttle gives regulation conditions featuring highly reduced hysteresis and high repeatability.

— This valve controls the flow rate in a branch of the hydraulic circuit or the speed of hydraulic actuators.

— The flow rate can be modulated continuously in proportion to the reference signal coming from the electronic control unit.

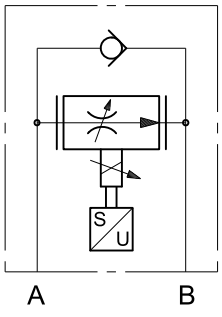
— It is available in five flow rate control ranges up to 25 l/min.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Maximum operating pressure Minimum Δp between A and B port	bar	250 10
Maximum controlled flow Min. controlled flow (for 1 and 4 l/min. reg.) Maximum free-reverse flow	l/min	1,5 - 4 - 8 - 16 - 25 0,025 40
Step response	see point 7	
Hysteresis	% of Q max	< 2,5%
Repeatability	% of Q max	< ±1%
Electrical characteristic	see point 6	
Ambient temperature range	°C	-10 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13 (class 17/15/12 for flows < 0,5 l/min)	
Recommended viscosity	cSt	25
Mass	kg	2,2

HYDRAULIC SYMBOLS



1 - IDENTIFICATION CODE

R	P	C	E	R	1	-		/	C	/	54	-	24	/	

Compensated flow control valve

Electric proportional control

Position feedback

ISO 6263-03 size

Maximum controlled flow:
1 = 1.5 l/min **16** = 16 l/min
4 = 4 l/min **25** = 25 l/min
8 = 8 l/min

Built-in check valve

Series No. (from 50 to 59 sizes and mounting dimensions remain unchanged)

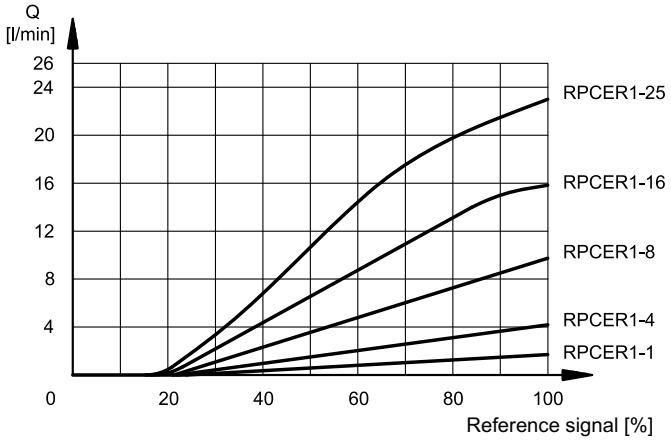
Nominal solenoid voltage 24 V DC

Seal: omit for mineral oils
V = FPM seals for special fluids

2 - CHARACTERISTIC CURVES

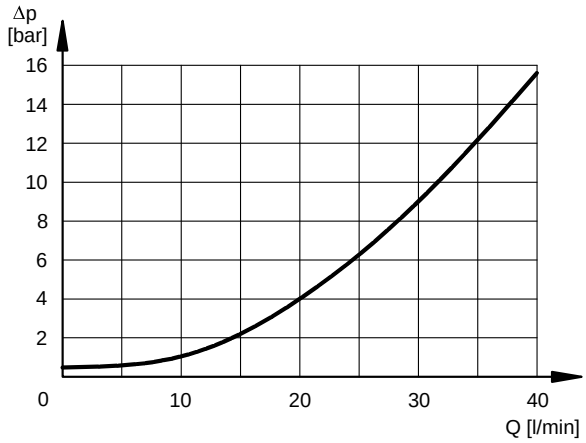
(measured with viscosity of 36 cSt at 50°C and UEIK-11RSQ/52-24 card)

FLOW CONTROL Q = f (ref)



Typical curves for flow rate A →B according to the reference signal sent to the electronic control unit.

PRESSURE DROP Δp = f (Q)



Pressure drop with free flow B→A through check valve.

3 - PRESSURE COMPENSATION

The valves are equipped with two restrictors in series. The first is an opening which can be adjusted by the proportional solenoid; the second, controlled by the pressure upstream and downstream of the first restrictor ensures constant pressure drop across the adjustable restrictor.

In these conditions, the set flow rate value is maintained constant within a tolerance limit of ± 2% of the full scale flow rate for maximum pressure variation between the valve inlet and outlet chambers.

4 - THERMAL COMPENSATION

Thermal compensation of the valve is obtained by adopting the principle of restricted fluid passage, so that the fluid is not influenced significantly by variations in oil viscosity.

For controlled flow rates of lower than 0.5 l/min and with a temperature change of 30°C, flow rate varies by approx. 13% of the set value.

For higher flow rates and with the same temperature change the flow rate variation is <4% of the set flow rate.

5 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4.

For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

6 - ELECTRICAL CHARACTERISTICS

6.1 - Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to reduce friction to a minimum thereby reducing hysteresis.

The armature connected to the LVDT transducer core sends the position status to the electronic card.

NOMINAL VOLTAGE	V DC	**24**
RESISTANCE (at 20°C)	Ω	17.6
MAXIMUM CURRENT	A	0.86
DUTY CYCLE	100%	
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2014/30/EU	
CLASS OF PROTECTION Atmospheric agents (IEC EN 60529)	IP65	

6.2 - Position transducer

The RPCER1 valve has an LVDT type position transducer with amplified signal. This type of transducer allows a precise control of the restrictor and of the set flow rate, thus improving repeatability and hysteresis characteristics.

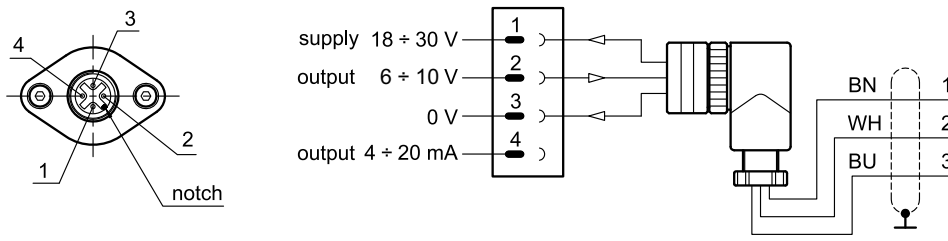
The transducer is fitted coaxially on the proportional solenoid and the connector features 360° positioning. The field-wireable mating connector is always included.

Use a screened cable to avoid interferences.

Technical specifications and connections are indicated here below.

The transducer is protected against polarity inversion on the power line.

transducer ouput at closed valve 6 V, at open valve 10 V



pin on control card	
UEIK-11RSQ	EDM-J1*/RPCER1
8c	13
24a	10
22c	15 (**NOTE**)

NOTE: with jumper on pin 11

7 - STEP RESPONSE

(measured with mineral oil with viscosity of 36 cSt at 50°C with UEIK-11RSQ/52-24 card)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

The table illustrates typical response times with valve flow rate of 16 l/min and with input pressure of 100 bar.

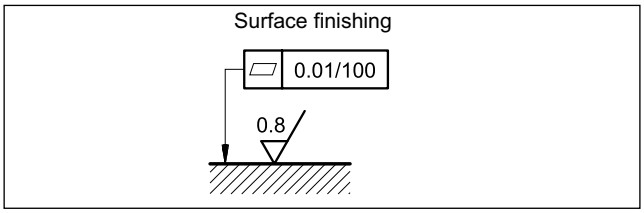
REFERENCE SIGNAL	0 → 100%	100 → 0%	25→100%	100→25%
Step response [ms]	180	150	150	120

8 - INSTALLATION

RPCER1 valves can be installed in any position without impairing correct operation.

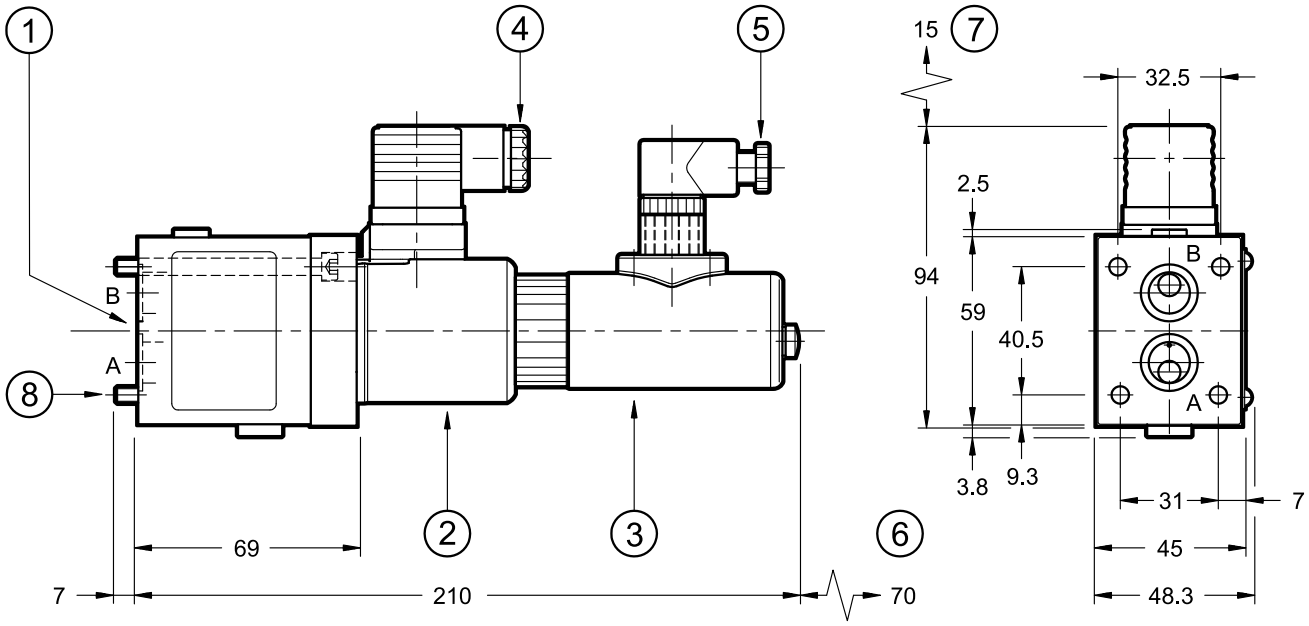
Ensure that there is no air in the hydraulic circuit.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed fluid can easily leak between the valve and mounting surface.



9 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	Mounting surface with sealing rings: 2 ORM-0140-20 (14x2)
2	Proportional solenoid
3	Position transducer
4	EN 175301-803 (ex DIN 43650) electrical connector for proportional solenoid
5	Electrical connector 4 pin M12 - IP67 PG7 for position transducer
6	Position transducer removal space
7	Connector removal space
8	4 SHCS M5x65 included in the supply. Torque: 5 Nm

10 - ELECTRONIC CONTROL UNIT

EDM-J1/*RPCER1	DIN EN 50022 rail mounting	see cat. 89 255
UEIK-11RSQ	Eurocard	see cat. 89 315

The card holder for Eurocard electronics is available.

See catalogue 89 900

11 - SUBPLATES (see cat. 51 000)

PMRPC1-AI3G rear ports
PMRPC1-AL3G side ports
Port dimensions: 3/8” BSP

DUPLOMATIC MOTION SOLUTIONS

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RPCE2-*

PROPORTIONAL FLOW CONTROL VALVE, PILOT OPERATED

SERIES 52

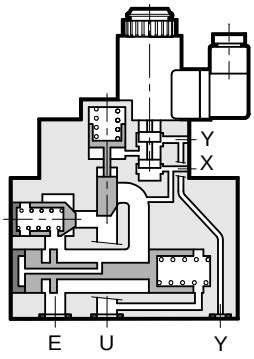
RPCE2-∗/C two-port
RPCE2-70-T3 three-port

SUBPLATE MOUNTING ISO 6263-06

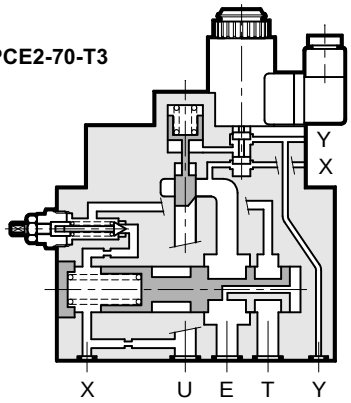
p max **250** bar
Q max (see performances table)

OPERATING PRINCIPLE

RPCE2-*/C



RPCE2-70-T3



— RPCE2 valves are proportional flow control valves pressure- and temperature-compensated, with two-ports or three-ports, with mounting interface in compliance with ISO 6263 standards.

— These valves are employed for flow rate control in hydraulic circuit branches and for speed control of hydraulic actuators.

— Flow rate can be modulated continuously in proportion to the current supplied to the solenoid.

— The valve can be controlled directly by a current control supply unit or combined with an external electronic card to maximize the valve performances (see par. 10).

— The valves are available in three flow control ranges: two with progressive gain up to 72 l/min and the third with differential gain of 30 l/min.

— The minimum pilot flow rate required to operate correctly is 2 l/min, with a minimum pressure of 20 bar.

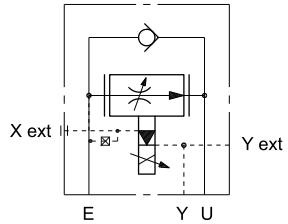
— Pilot signal can be internal, flowing through port E in the mounting surface, or coming from an external pilot line with 1/4" BSP connection to the X port placed on valve side. If internal pilot is chosen this X port comes plugged.

— Drainage is always external and must be connected directly to the tank without backpressure flowing from Y port in the mounting surface (OR Ø35) or from Y port on valve side by a drain line (1/4"BSP connection).

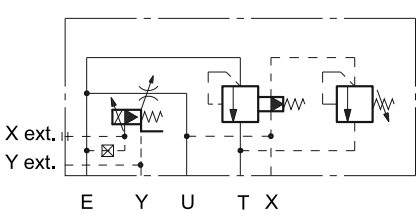
— The three-port version RPCE2-70-T3 allows controlled flow in working line U, dumping the residual flow to the tank. The maximum pressure from the circuit is limited by means of an adjustable relief valve which operates on the compensator pilot.

HYDRAULIC SYMBOLS

RPCE2-*/C

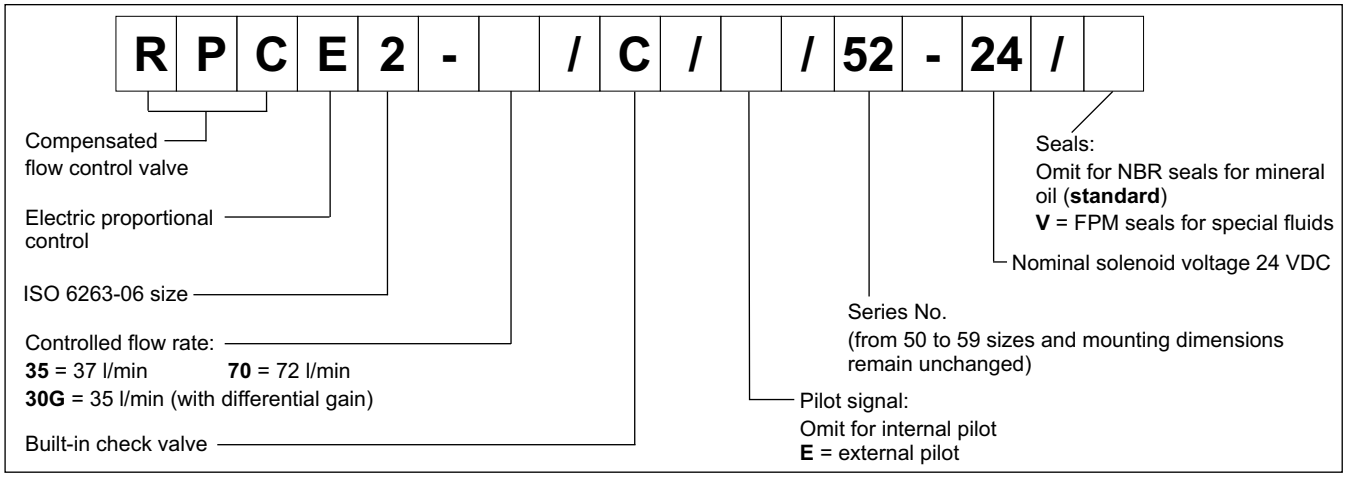


RPCE2-70-T3

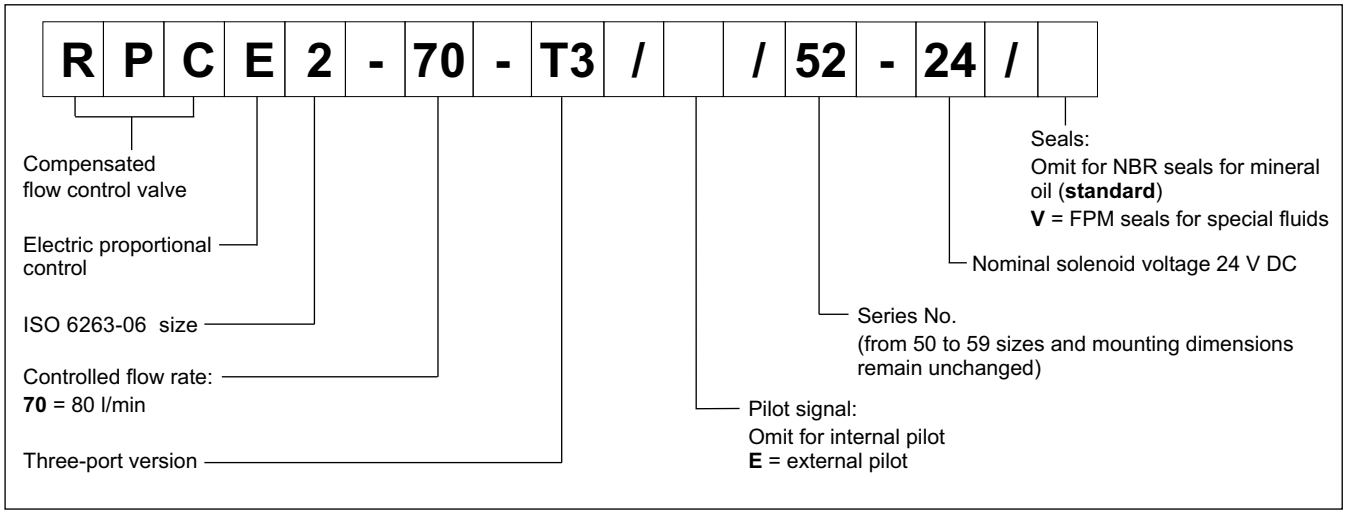


1 - IDENTIFICATION CODES

1.1 - Identification code for two-port valve: RPCE2-*/C



1.2 - Identification code for three-port valve: RPCE2-70-T3



2 - PERFORMANCES (obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Maximum working pressure Minimum Δp across E and U ports Piloting pressures: min max	bar	250 10 20 160 (**NOTE 1**)
Maximum controlled flow E→U (RPCE2-*/C) Maximum controlled flow (RPCE2-70-T3) Minimum controlled flow with P=100 bar (versions 35 and 70) (version 30G) Maximum free reverse flow U→E	l/min	30 - 37 - 72 80 0,5 0,2 60 (**NOTE 2**)
Step response	see paragraph 8	
Hysteresis (with PWM 100 Hz)	% of Q_{max}	< 8%
Repeatability	% of Q_{max}	< ±3%
Electrical features	see paragraph 7	
Ambient temperature range	°C	-10 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass: RPCE2-*/C RPCE2-70-T3	kg	6 6,8

NOTE 1: Pilot signal must be external pressure line is over 160 bar.

NOTE 2: Maximum recommended flow U→E through the check valve (only for two-port version).

3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

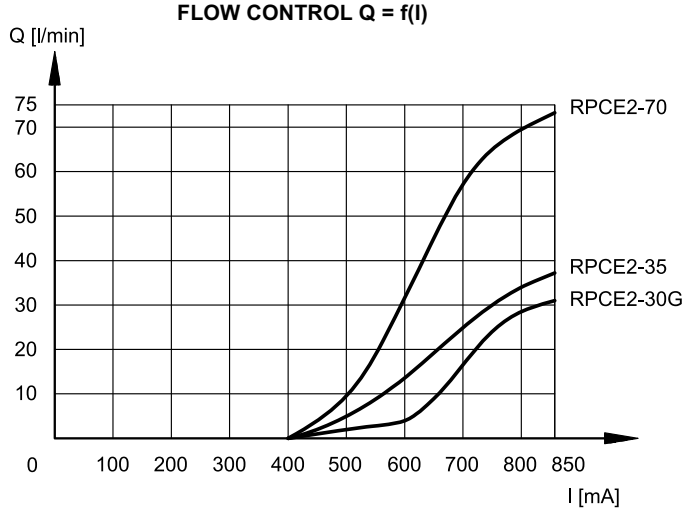
The fluid must be preserved in its physical and chemical characteristics.

4 - CHARACTERISTIC CURVES

(measured with viscosity of 36 cSt at 50°C)

4.1 - 2-way valve

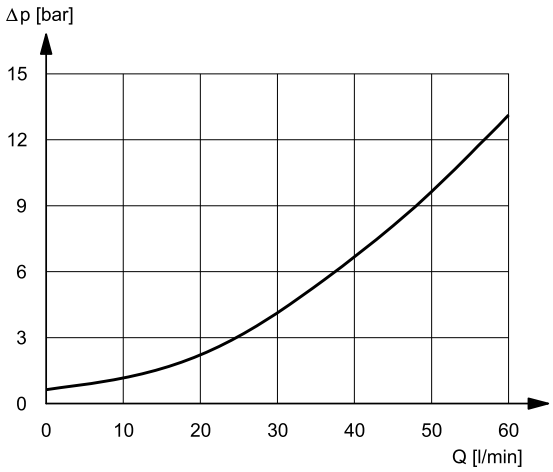
FLOW CONTROL Q = f(I)



Typical flow control curves for flow rate E→U according to the current supplied to the solenoid.

The RPCE2-G version, featuring differential gain control, is particularly suitable for “FAST-SLOW” flow rate control as it ensures high sensitivity at low flow rates while enabling high flow rates for rapid actuator movement.

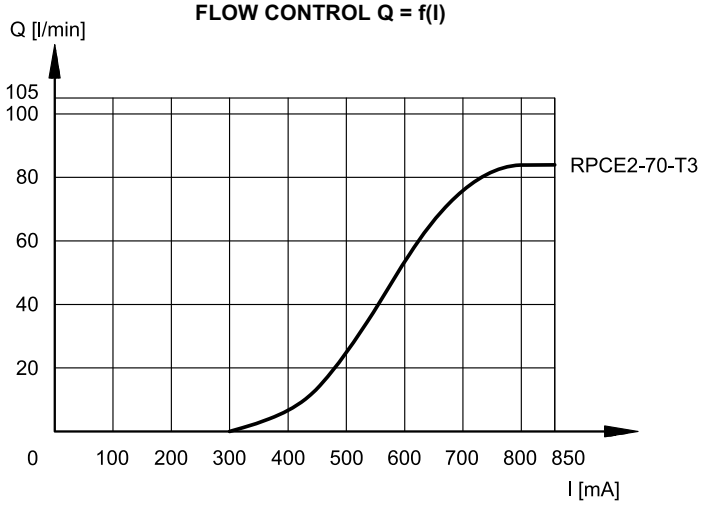
PRESSURE DROPS Δp = f(Q)



Pressure drops with free flow U → E through check valve.

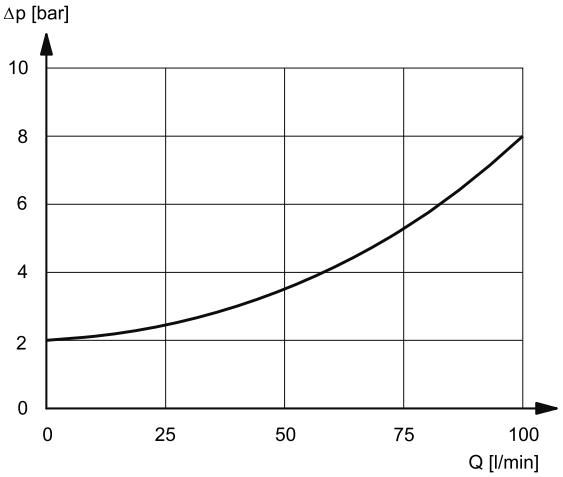
4.2 - 3-way valve

FLOW CONTROL Q = f(I)



Typical flow control curves for flow rate E→T, according to the current supplied to the solenoid.

PRESSURE DROPS Δp = f(Q)



Pressure drops E→T
Curve obtained with unloading electrical control

5 - PRESSURE COMPENSATION

The valves are equipped with two restrictors. The first is an opening which can be adjusted by the proportional solenoid; the second, controlled by the pressure upstream and downstream of the first restrictor ensures constant pressure drop across the adjustable restrictor. In these conditions, the set flow rate value is maintained constant within a tolerance range of ±3% of the set flow rate for maximum pressure variation between the valve inlet and outlet ports.

6 - THERMAL COMPENSATION

A temperature-sensitive device installed on the flow control element corrects the position and maintains the set flow rate virtually unchanged, also in the case of fluid viscosity variation.

Flow rate variation remains within 2,5% of the set flow rate, for a fluid temperature variation of 10°C.

7 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut and can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**24**
RESISTANCE (at 20°C)	Ω	16.6
MAXIMUM CURRENT	A	0.85
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2014/30 EU	
CLASS OF PROTECTION Atmospheric agents (IEC EN 60529) Coil insulation (VDE 0580) Impregnation	IP 65 class H class F	

8 - STEP RESPONSE

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

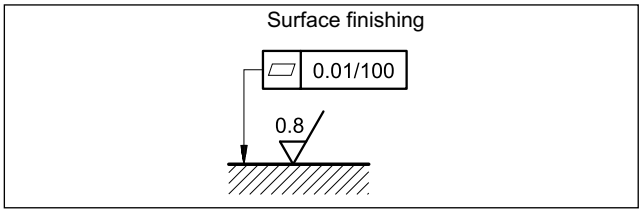
REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms]	250	120

9 - INSTALLATION

RPCE2-* valves, both two-port or three-port versions, can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed fluid can easily leak between the valve and support surface.

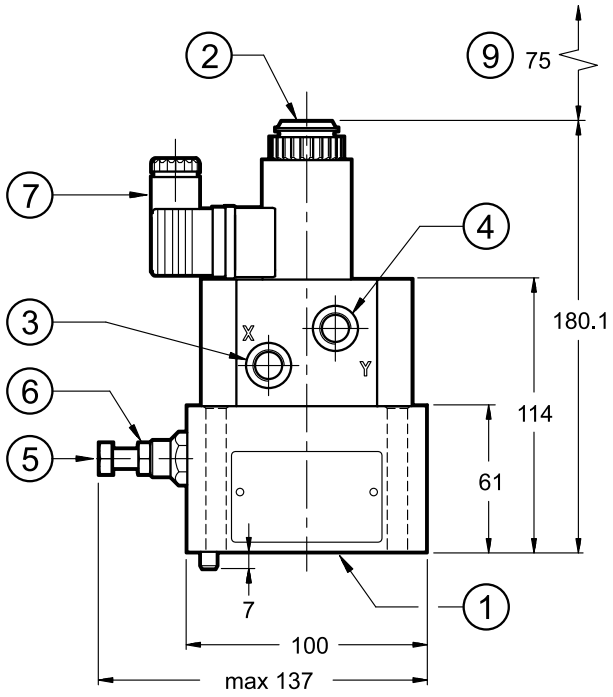


10 - ELECTRONIC CONTROL UNITS

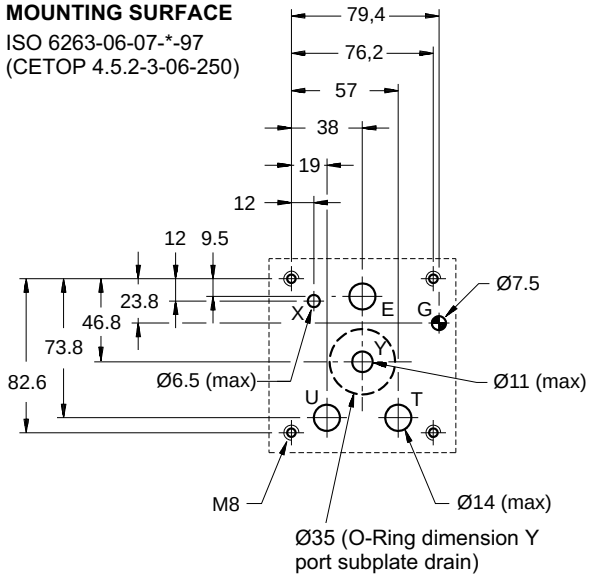
EDC-111	plug version	see cat. 89 120
EDM-M111	DIN EN 50022 rail mounting	see cat. 89 251

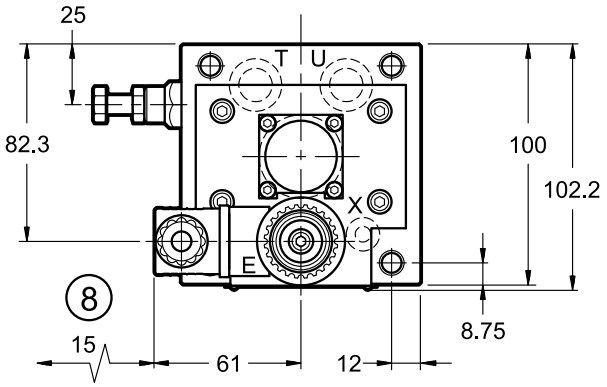
11 - RPCE2-70-T3 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



MOUNTING SURFACE
ISO 6263-06-07-*-97
(CETOP 4.5.2-3-06-250)



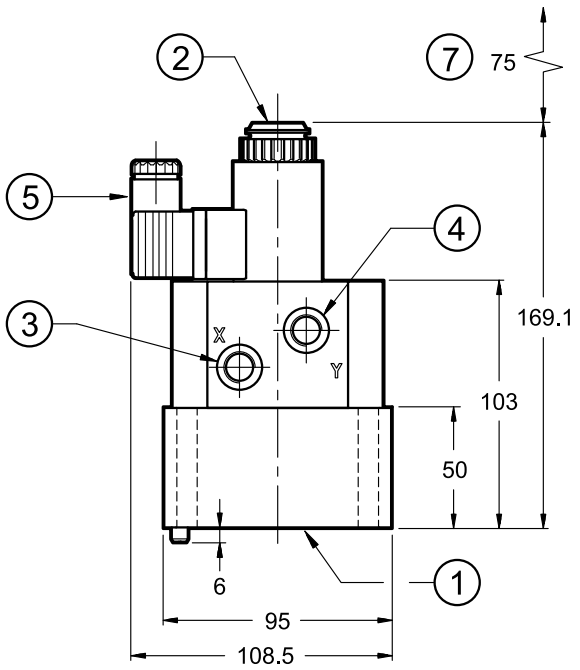


1	Mounting surface with sealing rings: 3 OR type 3068 (17.13x2.62) 1 OR type 2125 (31.47x1.78) 1 OR type 109 (9.13x2.62)
2	Breather (Allen key 4)
3	External pilot port X: 1/4” BSP. (plugged if internal pilot is chosen)
4	Drain port Y: 1/4” BSP if port Y in mounting surface is not used
5	Pressure relief valve: Adjustment screw: spanner 13 Turn clockwise to increase pressure. P max 210 bar
6	Locking ring: spanner 13
7	EN 175301-803 (ex DIN 43650) electric connector
8	Connector removal space
9	Coil removal space

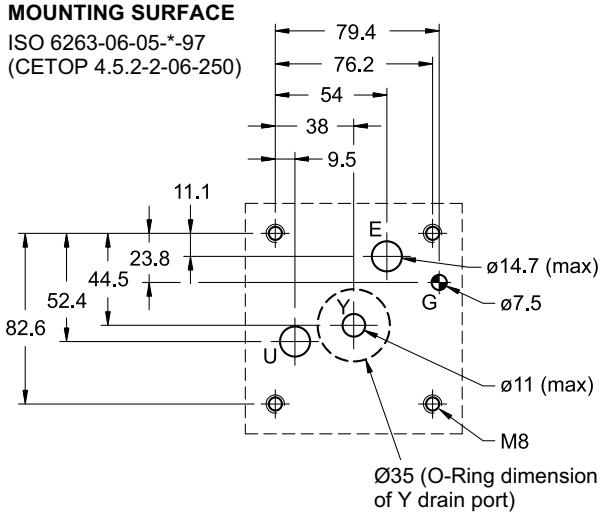
Valve fastening: 4 SHC screws ISO 4762 M8x75
Tightening torque: 20 Nm (A8.8)
Threads of mounting holes: M8x15

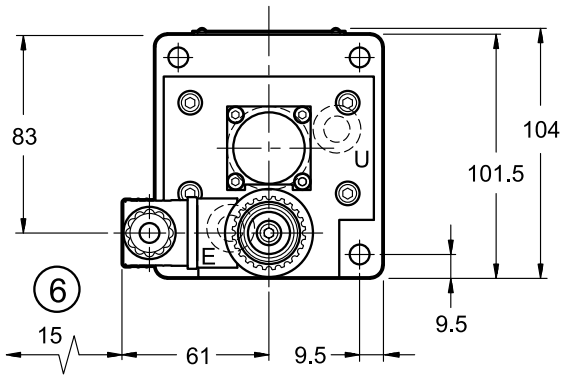
12 - OVERALL AND MOUNTING DIMENSION TWO-PORT VALVE RPCE2-*/C

dimensions in mm



MOUNTING SURFACE
ISO 6263-06-05-*-97
(CETOP 4.5.2-2-06-250)





1	Mounting surface with sealing rings: 2 OR type 119 (15.08x2.62) 1 OR type 2125 (31.47x1.78)
2	Breather (Allen key 4)
3	External pilot port X: 1/4” BSP. (plugged if internal pilot is chosen)
4	Drain port Y: 1/4” BSP if port Y in mounting surface is not used
5	EN 175301-803 (ex DIN 43650) electric connector
6	Connector removal space
7	Coil removal space

Valve fastening: 4 SHC screws ISO 4762 M8x60
Tightening torque: 20 Nm (A8.8)
Threads of mounting holes: M8x10

13 - SUBPLATES

(see catalogue 51 000)

Subplates listed below are suitable only for valves with Y drain with external pipe.

	RPCE2-*/C two-port version	**RPCE2-70-T3** three-port version
Type	PMRPC2-AI4G rear ports	PMRPCQ2-AI4G rear ports
E, U, T ports threading	1/2” BSP	1/2” BSP
X port threading	-	1/4” BSP

DUPLOMATIC MOTION SOLUTIONS

DUPLOMATIC MS S.p.A.
via M. Re Depaolini 24 • 20015 PARABIAGO (MI) • ITALY
tel. +39 0331.895.111 • www.duplomatic.com • e-mail: sales.exp@duplomatic.com

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RPCE3-*

PROPORTIONAL FLOW CONTROL VALVE, PILOT OPERATED

SERIES 52

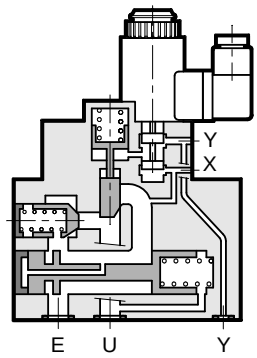
RPCE3-*/C **two-port**
RPCE3-100-T3 **three-port**

SUBPLATE MOUNTING ISO 6263-07

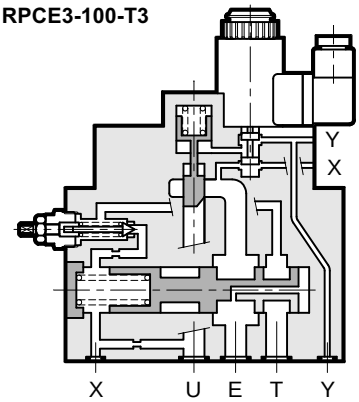
p max **250** bar
Q max (see performances table)

OPERATING PRINCIPLE

RPCE3-*/C



RPCE3-100-T3



— RPCE3 valves are proportional flow control valves pressure- and temperature-compensated, with two-ports or three-ports, with mounting interface in compliance with ISO 6263 standards.

— These valves are employed for flow rate control in hydraulic circuit branches and for speed control of hydraulic actuators.

— Flow rate can be modulated continuously in proportion to the current supplied to the solenoid.

— The valve can be controlled directly by a current control supply unit or combined with an external electronic card to maximize the valve performances (see par. 10).

— The valves are available in three flow control ranges: two with progressive gain up to 72 l/min and the third with differential gain of 30 l/min.

— The minimum pilot flow rate required to operate correctly is 2 l/min, with a minimum pressure of 20 bar.

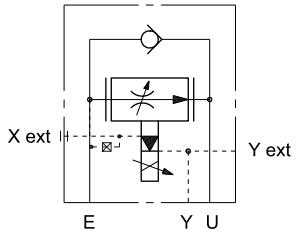
— Pilot signal can be internal, flowing through port E in the mounting surface, or coming from an external pilot line with 1/4" BSP connection to the X port placed on valve side. If internal pilot is chosen this X port comes plugged.

— Drainage is always external and must be connected directly to the tank without backpressure flowing from Y port in the mounting surface (OR Ø32) or from Y port on valve side by a drain line (1/4" BSP connection).

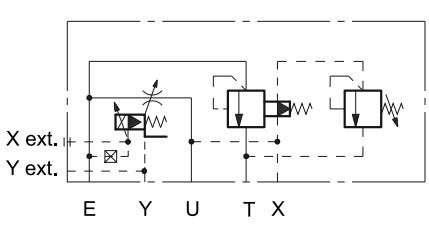
— The three-port version RPCE3-100-T3 allows controlled flow in working line U, dumping the residual flow to the tank. The maximum pressure from the circuit is limited by means of an adjustable relief valve which operates on the compensator pilot.

HYDRAULIC SYMBOLS

RPCE3-*/C

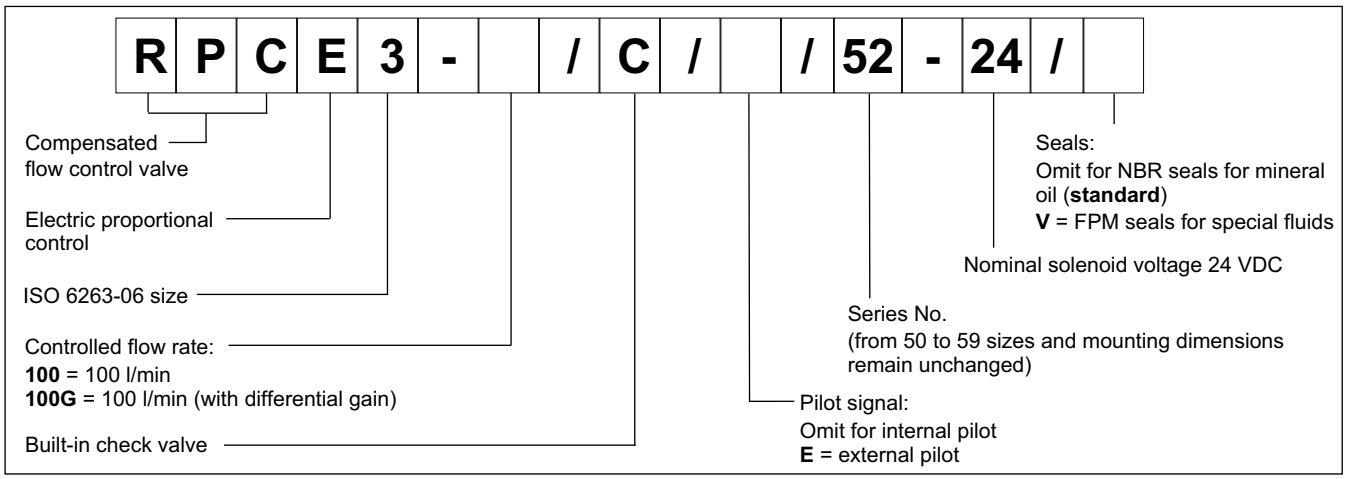


RPCE3-100-T3

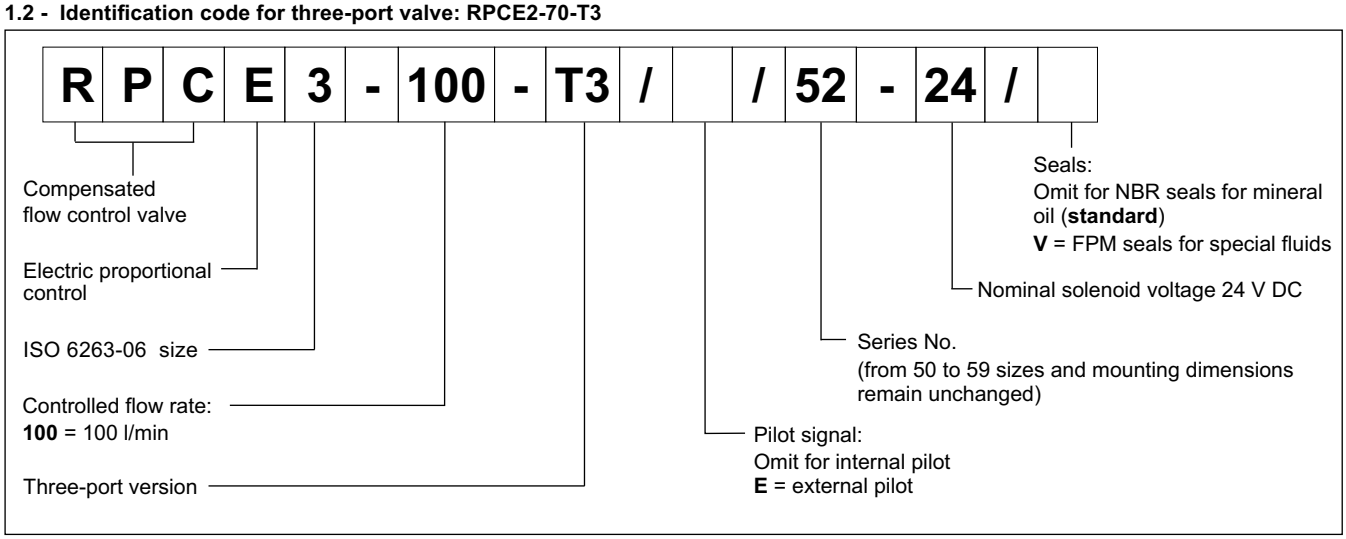


1 - IDENTIFICATION CODES

1.1 - Identification code for two-port valve: RPCE3-*/C



1.2 - Identification code for three-port valve: RPCE2-70-T3



2 - PERFORMANCES (obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Maximum working pressure Minimum Δp across E and U ports Piloting pressures: min max	bar	250 10 20 160 (**NOTE 1**)
Maximum controlled flow E→U (RPCE3-*) Minimum controlled flow with P=100 bar (version 100) (version 100G) Maximum free reverse flow U→E	l/min	100 1,5 0,5 150 (**NOTE 2**)
Step response	see paragraph 8	
Hysteresis (with PWM 100 Hz)	% of Q_{max}	< 8%
Repeatability	% of Q_{max}	< ±3%
Electrical features	see paragraph 7	
Ambient temperature range	°C	-10 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass	kg	10,3

NOTE 1: Pilot must be external if the valve had to operate with pressure line over 160 bar.

NOTE 2: Maximum recommended flow U→E through the check valve (only for two-port version).

3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

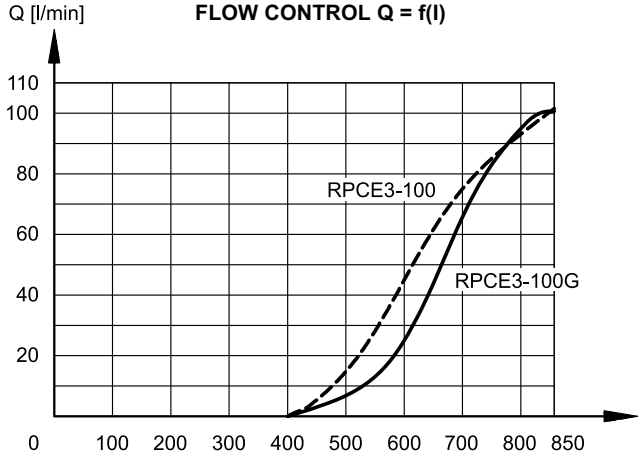
The fluid must be preserved in its physical and chemical characteristics.

4 - CHARACTERISTIC CURVES

(measured with viscosity of 36 cSt at 50°C)

4.1 - 2-way valve

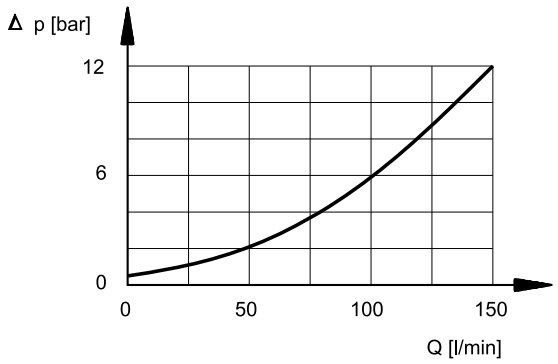
FLOW CONTROL Q = f(I)



Typical flow control curves for flow rate E→U, according to the current supplied to the solenoid.

The RPCE3-100G version, featuring differential gain control, is particularly suitable for “FAST-SLOW” flow rate control as it ensures high sensitivity at low flow rates while enabling high flow rates for rapid actuator movement.

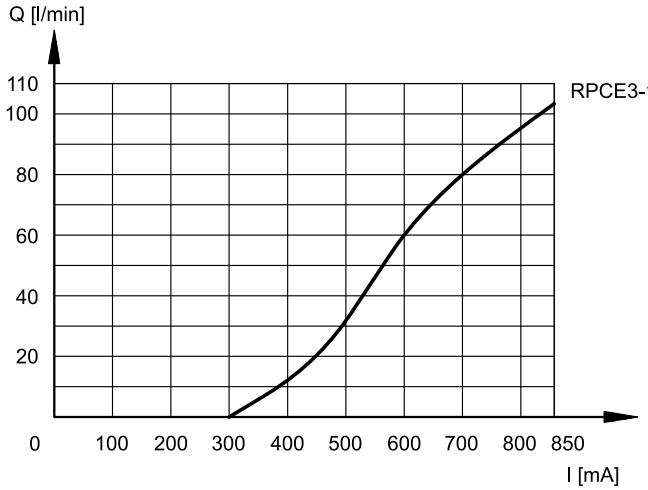
PRESSURE DROPS Δp = f(Q)



Pressure drops with free flow U→E through the check valve.

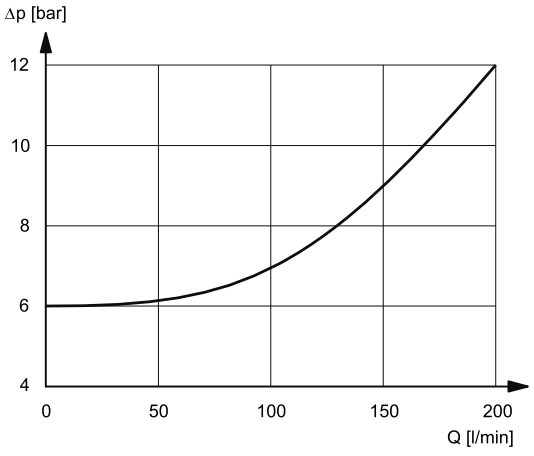
4.1 - 3-way valve

FLOW CONTROL Q = f(I)



Typical flow control curves for flow rate E→U, according to the current supplied to the solenoid.

PRESSURE DROPS Δp = f(Q)



Pressure drops E→T

5 - PRESSURE COMPENSATION

The valves are equipped with two restrictors. The first is an opening which can be adjusted by the proportional solenoid; the second, controlled by the pressure upstream and downstream of the first restrictor ensures constant pressure drop across the adjustable restrictor.

In these conditions, the set flow rate value is maintained constant within a tolerance range of ±3% of the set flow rate for maximum pressure variation between the valve inlet and outlet chambers.

6 - THERMAL COMPENSATION

A temperature-sensitive device installed on the flow control element corrects the position and maintains the set flow rate virtually unchanged, also in the case of fluid viscosity variation.

Flow rate variation remains within 2,5% of the set flow rate, for a fluid temperature variation of 10°C.

7 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut and can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**24**
RESISTANCE (AT 20°C)	Ω	16.6
MAXIMUM CURRENT	A	0.85
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2014/30/EU	
CLASS OF PROTECTION Atmospheric agents (IEC EN 60529)	IP 65	

8 - STEP RESPONSE

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

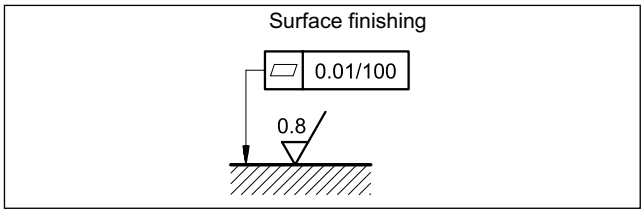
Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms]	250	120

9 - INSTALLATION

The RPCE3 valves, both two-port or three-port versions, can be installed in any position without impairing correct operation. Ensure that there is no air in the hydraulic circuit.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed fluid can easily leak between the valve and support surface.

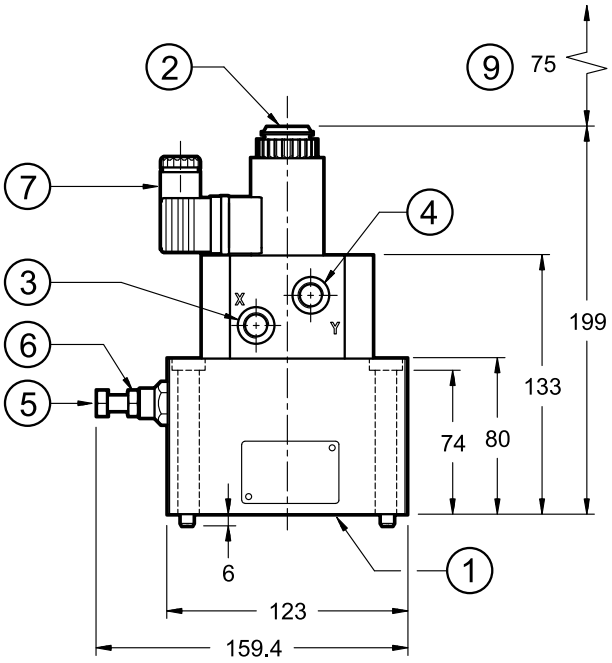


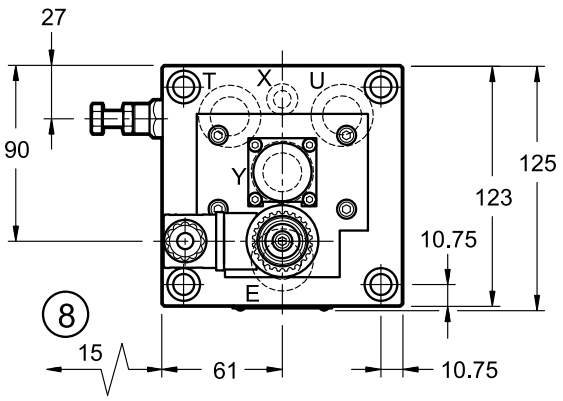
10 - ELECTRONIC CONTROL UNITS

EDC-111	plug version	see cat. 89 120
EDM-M111	DIN EN 50022 rail mounting	see cat. 89 251

11 - RPCE3-100-T3 - OVERALL AND MOUNTING DIMENSIONS

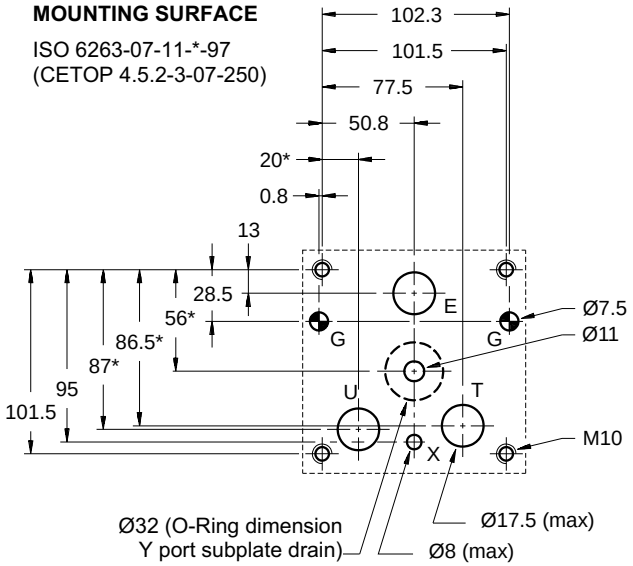
dimensions in mm





MOUNTING SURFACE

ISO 6263-07-11-*-97
(CETOP 4.5.2-3-07-250)



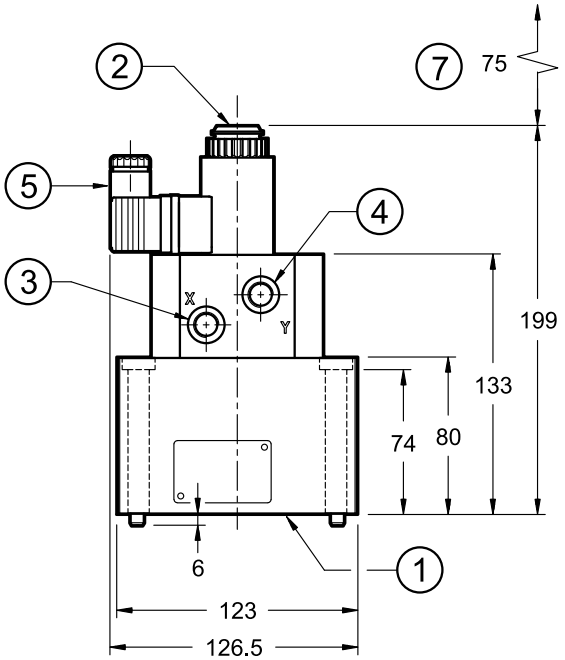
NOTE: Dimensions with the asterisk * deviate from ISO standard.

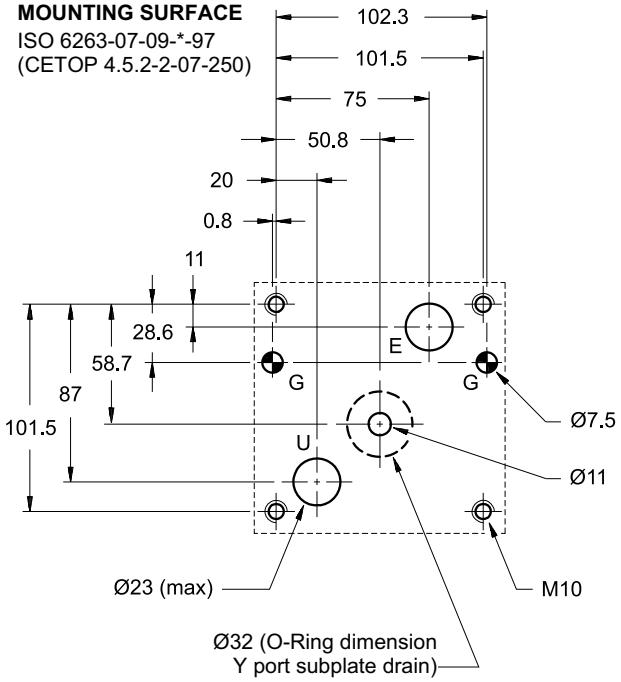
Valve fastening: 4 SHC screws ISO 4762 M10x90
Tightening torque: 40 Nm (A8.8)
Threads of mounting holes: M10x15

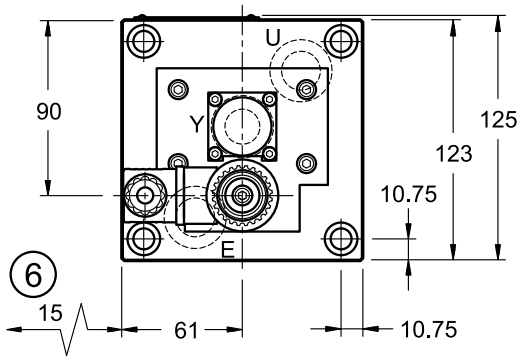
1	Mounting surface with sealing rings: N. 3 OR type 3106 (26.65x2.62) N. 1 OR type 2112 (28.30x1.78) N. 1 OR type 3043 (10.78x2.62)
2	Breather (Allen key 4)
3	External pilot port X: 1/4” BSP. (plugged if internal pilot is chosen)
4	Drain port Y: 1/4” BSP if port Y in mounting surface is not used
5	Pressure relief valve: Adjustment screw: spanner 13 Turn clockwise to increase pressure. P max 210 bar
6	Locking ring: spanner 13
7	EN 175301-803 (ex DIN 43650) electric connector
8	Connector removal space
9	Coil removal space

12 - OVERALL AND MOUNTING DIMENSIONS TWO-PORT VALVE RPCE3-*/C

dimensions in mm







Valve fastening: 4 SHC screws ISO 4762 M10x90
Tightening torque: 40 Nm (A8.8)
Threads of mounting holes: M10x15

1	Mounting surface with sealing rings: N. 2 OR type 3106 (26.65x2.62) N. 1 OR type 2112 (28.30x1.78)
2	Breather (Allen key 4)
3	External pilot port X: 1/4” BSP. (plugged if internal pilot is chosen)
4	Drain port Y: 1/4” BSP if port Y in mounting surface is not used
5	EN 175301-803 (ex DIN 43650) electric connector
6	Connector removal space
7	Coil removal space

13 - SUBPLATES

(see catalogue 51 000)

Subplates listed below are suitable only for valves with Y drain with external pipe.

	RPCE3-*/C two way version	**RPCE3-*-T3** three way version
Type	PMRPC3-AI6G rear ports	PMRPCQ3-AI6G rear ports
E, U, T ports threading	1” BSP	1” BSP
X port threading	-	1/4” BSP

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DSE2

PROPORTIONAL DIRECTIONAL VALVE

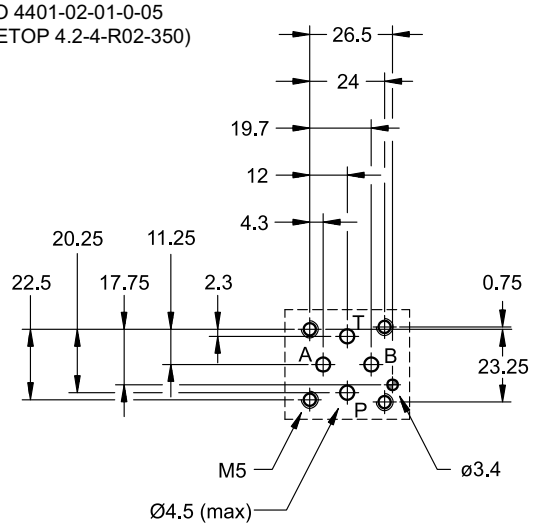
SERIES 10

SUBPLATE MOUNTING ISO 4401-02

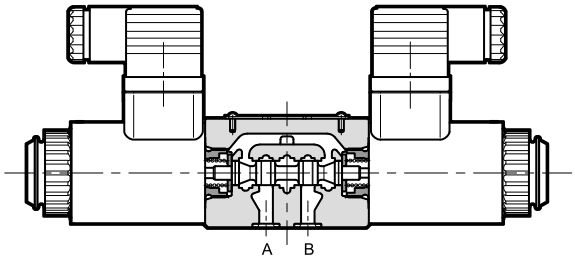
p max **350** bar
Q max **20** l/min

MOUNTING SURFACE

ISO 4401-02-01-0-05
(CETOP 4.2-4-R02-350)



OPERATING PRINCIPLE



— The DSE2 valve is a proportional directional valve, direct operated, with ports in compliance with ISO 4401-02 standards.

— It is suitable for directional and speed control of hydraulic actuators.

— Valve opening and hence flow rate can be modulated continuously in proportion to the current supplied to the solenoid.

— The valve can be controlled directly by a current control supply unit or combined with an external electronic card to maximize the valve performances (see point 11).

— Boot and knob manual overrides are available.

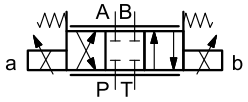
PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

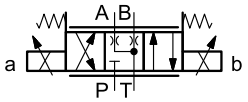
Max operating pressure: P - A - B ports T port	bar	 350 250
Nominal flowrate with Δp 10 bar P-T	l/min	1 - 3 - 8
Step response		see point 5
Hysteresis (with PWM 200 Hz)	% Q_{max}	< 6%
Repeatability	% Q_{max}	< ± 1,5%
Electrical characteristics		see point 4
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass: single solenoid valve double solenoid valve	kg	0.9 1.3

HYDRAULIC SYMBOLS (typical)

DSE2-C*



DSE2-A*



1 - IDENTIFICATION CODE

D	S	E	2	-				/	10		-			/		

Direct operated directional control valve

Electric proportional control

Size ISO 4401-02

Spool type:
C = closed centres
A = open centres

Spool nominal flow. See point 2

Solenoid position (Omit for configuration with two solenoids):
SA = 1 solenoid on A side
SB = 1 solenoid on B side

Series No.
(from 10 to 19 sizes and mounting dimensions remain unchanged)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

D12 = Nominal solenoid voltage 12V DC
D24 = Nominal solenoid voltage 24V DC

Coil electrical connection:
K1 = plug for connector type EN 175301-803 (ex DIN 43650) (**standard**)
K2 = plug for connector type AMP JUNIOR
K7 = plug for connector type DEUTSCH DT04-2P male

Option: manual override (see at point 8)

Option:
/ W7 = Zinc-nickel surface treatment (see **NOTE**)
Omit if not required

NOTE: The standard valve is supplied with surface treatment of phosphating black.
The zinc-nickel finishing on the valve body makes the valve suitable to ensure a salt spray resistance up to **240** hours. (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

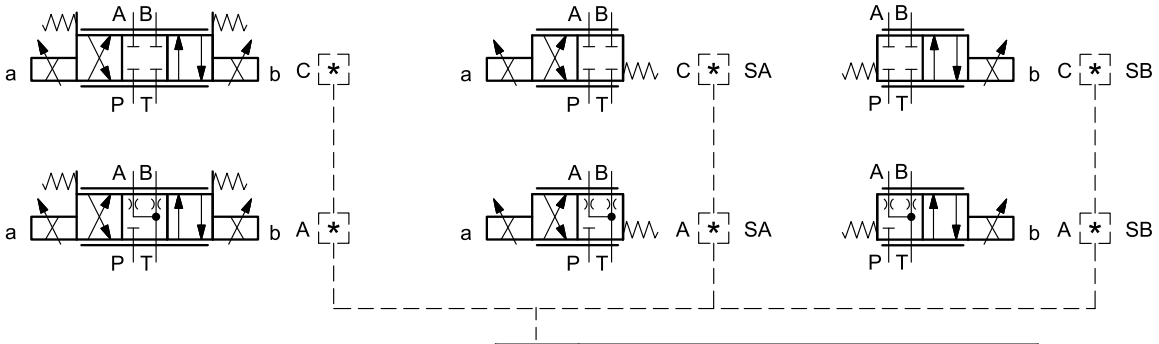
2 - CONFIGURATIONS

Valve configuration depends on the combination of the following elements:
number of proportional solenoids, spool type, nominal flow rate.

2 solenoids configuration:
3 positions with spring centreing

"**SA**" configuration: 1 solenoid on side A.
2 positions (central + external) with spring centreing

"**SB**" configuration: 1 solenoid on side B.
2 positions (central + external) with spring centreing

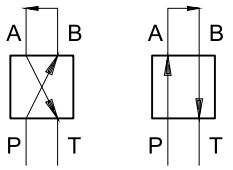


*	Nominal flow with Δp 10 bar P→T
01	1.4 l/min (available for spool type A only)
03	3 l/min
08	8 l/min

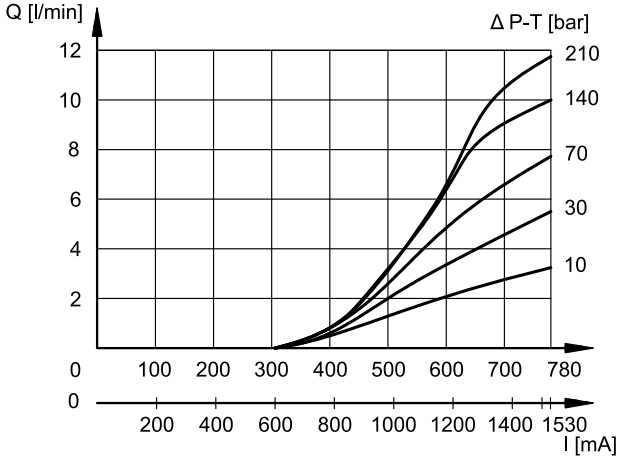
3 - CHARACTERISTIC CURVES

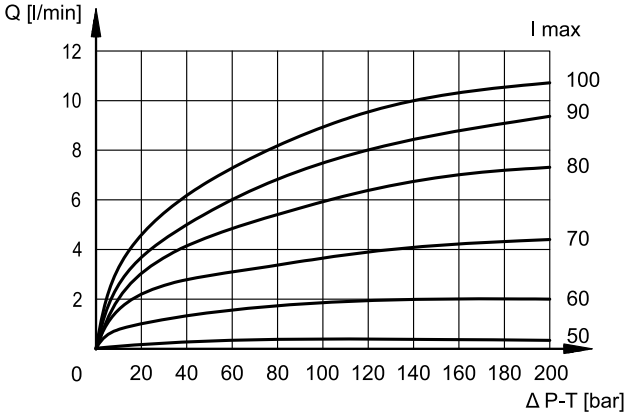
(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Typical flow rate control curves according to the current supply to solenoid. The reference Δp values are measured between ports P and T of the valve.

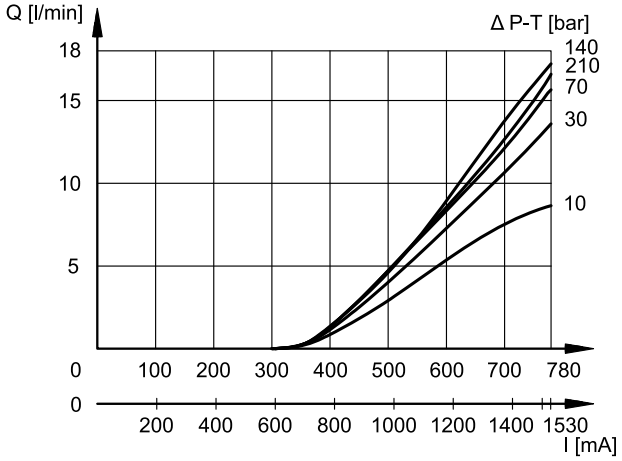


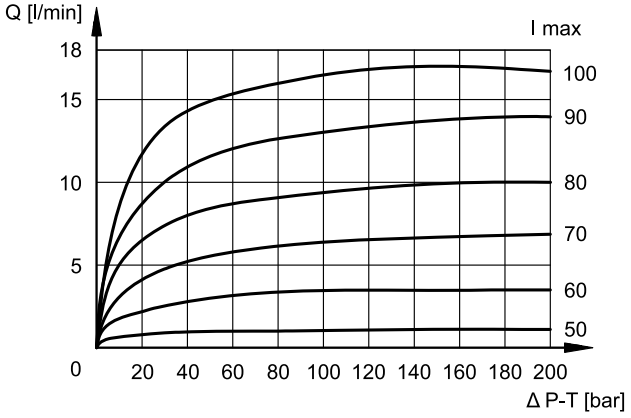
C03



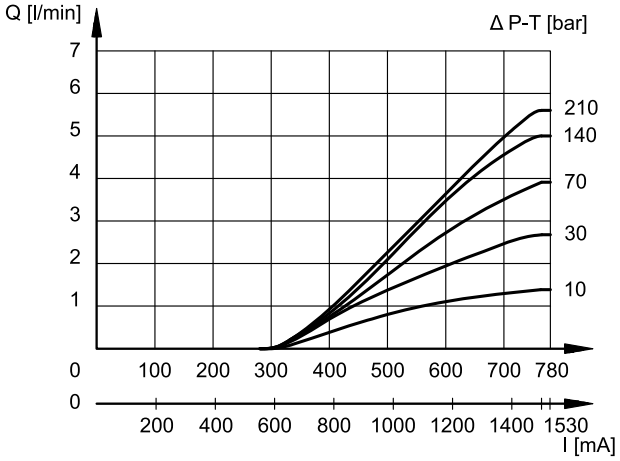


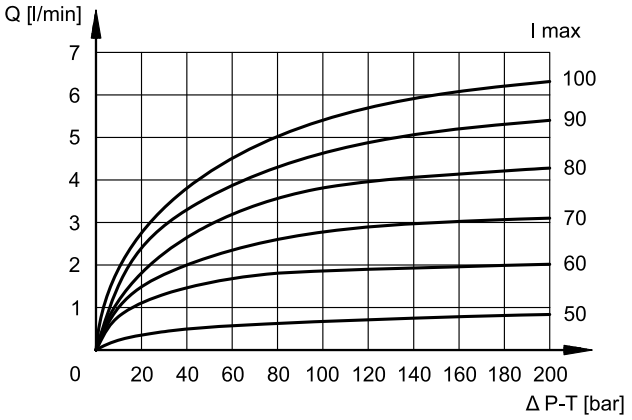
C08



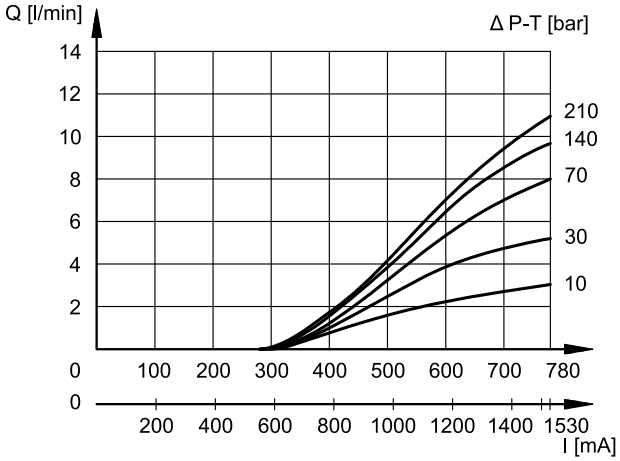


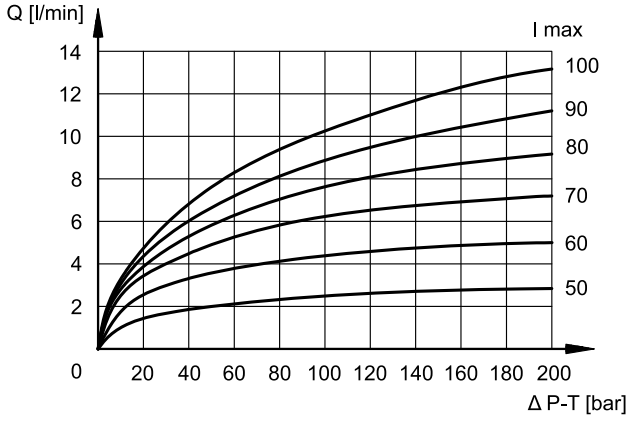
A01


Q [l/min]
Δ P-T [bar]
7
6
5
4
3
2
1
0
210
140
70
30
10
0
100 200 300 400 500 600 700 780
200 400 600 800 1000 1200 1400 1530
I [mA]

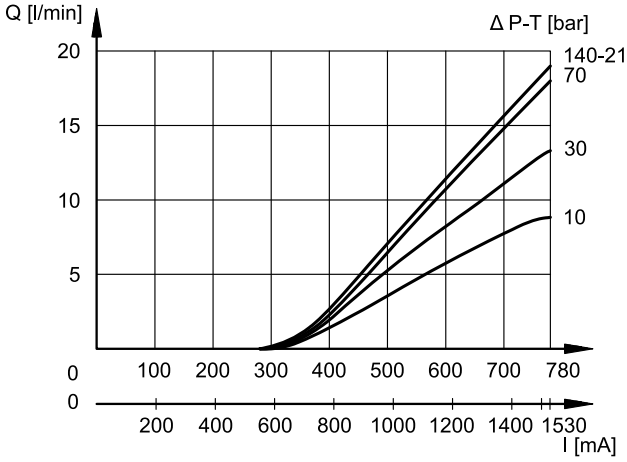

Q [l/min]
I max
7
6
5
4
3
2
1
0
100
90
80
70
60
50
0 20 40 60 80 100 120 140 160 180 200
Δ P-T [bar]

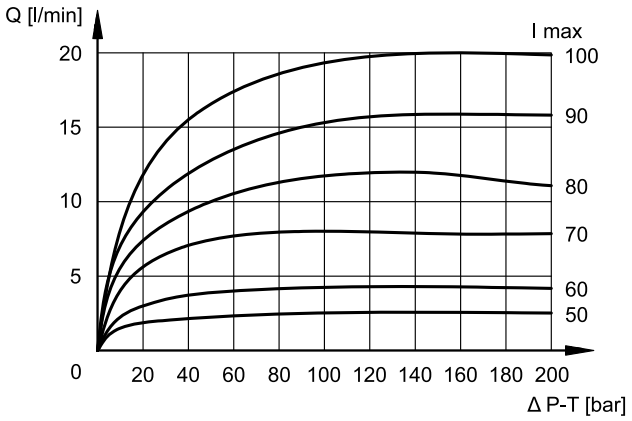
A03


Q [l/min]
Δ P-T [bar]
14
12
10
8
6
4
2
0
210
140
70
30
10
0
100 200 300 400 500 600 700 780
200 400 600 800 1000 1200 1400 1530
I [mA]


Q [l/min]
I max
14
12
10
8
6
4
2
0
100
90
80
70
60
50
0 20 40 60 80 100 120 140 160 180 200
Δ P-T [bar]

A08


Q [l/min]
Δ P-T [bar]
20
15
10
5
0
140-210
70
30
10
0
100 200 300 400 500 600 700 780
200 400 600 800 1000 1200 1400 1530
I [mA]


Q [l/min]
I max
20
15
10
5
0
100
90
80
70
60
50
0 20 40 60 80 100 120 140 160 180 200
Δ P-T [bar]

4 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut.

It can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20°C)	Ω	4.98	21
NOMINAL CURRENT	A	1.53	0.78
DUTY CYCLE		100%	
ELECTROMAGNETIC COMPATIBILITY (EMC)		According to 2014/30/EU	
CLASS OF PROTECTION Coil insulation (VDE 0580) Impregnation		class H class F	

Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree correctly connected and installed.

electric connection	electric connection protection	whole valve protection
K1	IP65	IP65
K2	IP65	
K7	IP65/67	

5 - STEP RESPONSE

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

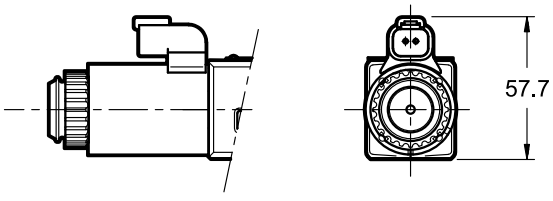
Step response is the time taken for the valve to reach 90% of the setted positioning value, following a step change of reference signal. The table shows typical response times tested with spool type A03 and Δp = 30 bar P-T.

REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms]	60	60

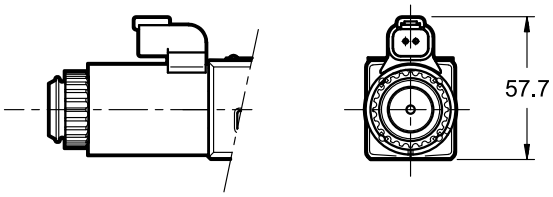
6 - ELECTRIC CONNECTIONS

Refer to the overall and mouting dimension for K1 connection. Connectors for K1 connection are always delivered together with the valve.

connection for AMP JUNIOR
connector type
code **K2**



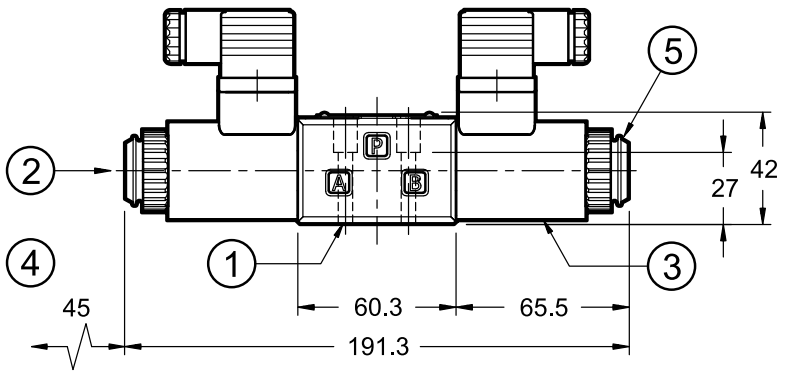
connection for
DEUTSCH DT06-2S male connector
code **K7**

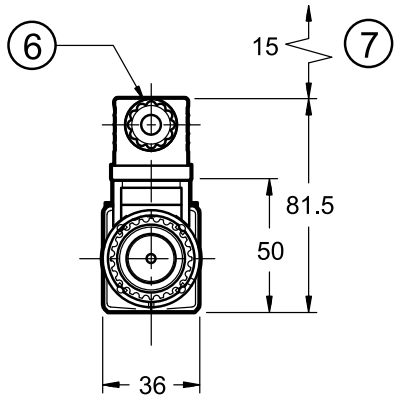


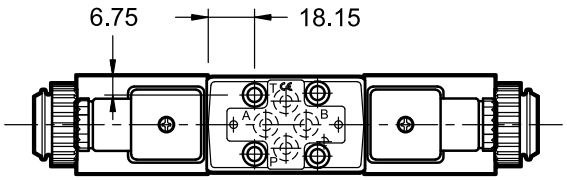
7 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

DSE2-C*
DSE2-A*

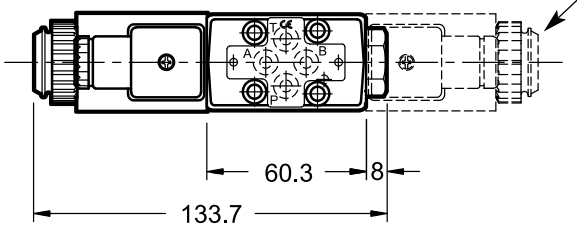






DSE2-C*SA
DSE2-A*SA

solenoid position for *SB configurations



1	Mounting surface with sealing rings: 4 OR type 106 (6.75x1.78) - 90 shore
2	Standard manual override, integrated in the solenoid tube
3	Coil (360° revolving)
4	Coil removal space
5	Locking ring: tightening torque: 5 Nm ± 0,5
6	Electric connector type EN 175301-803 (ex DIN 43650)
7	Connector removal space

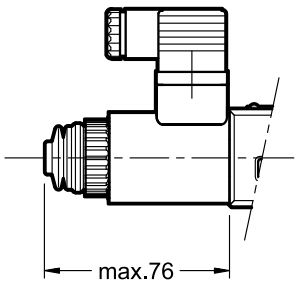
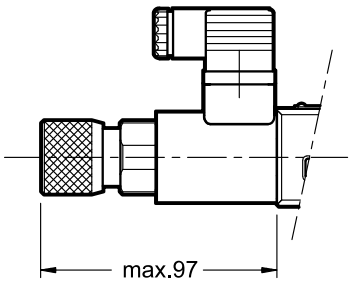
Fastening bolts: 4 bolts M5x35 - ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

8 - MANUAL OVERRIDES

These valves have solenoids whose pin for manual operation is integrated in the tube. Actuate this override by pushing it with a suitable tool, minding not to damage the sliding surface.

Two different manual override versions are available upon request:

- **CM** version, manual override boot protected.
- **CK1** version, knob to screw

CM Version	CK1 Version
	
Code: 3404100043	Code: 3404100041

9 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids like HL or HM type, according to ISO 6743-4. With this kind of fluids, use NBR seals type (code N). For HFDR fluids type (phosphate esters) use FPM seals (code V). For use with other kind of fluids such as HFA, HFB, HFC please consult our technical department.

Operation with fluid temperature exceeding 80°C causes premature deterioration of the quality of the fluid and seals. The physical and chemical properties of the fluid must be maintained.

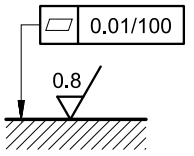
10 - INSTALLATION

These valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed fluid can easily leak between the valve and support surface.

Surface finishing



11 - ELECTRONIC CONTROL UNITS

DSE2 - **SA (SB)

EDM-M101	24V DC solenoids	rail mounting DIN EN 50022	see cat. 89 251
EDM-M162	12V DC solenoids		

DSE2 - A* DSE2 - C*

EDM-M201	24V DC solenoids	rail mounting DIN EN 50022	see cat. 89 251
EDM-M262	12V DC solenoids		

12 - SUBPLATES

(see catalogue 51 000)

Type PMMD-AI3G rear ports (port thread 3/8” BSP)
Type PMMD-AL3G side ports (port thread 3/8” BSP)

DUPLOMATIC MOTION SOLUTIONS

DUPLOMATIC MS S.p.A.
via M. Re Depaolini 24 • 20015 PARABIAGO (MI) • ITALY
tel. +39 0331.895.111 • www.duplomatic.com • e-mail: sales.exp@duplomatic.com

REPRODUCTION IS FORBIDDEN. THE COMPANY RESERVES THE RIGHT TO APPLY ANY MODIFICATIONS.



DSE3

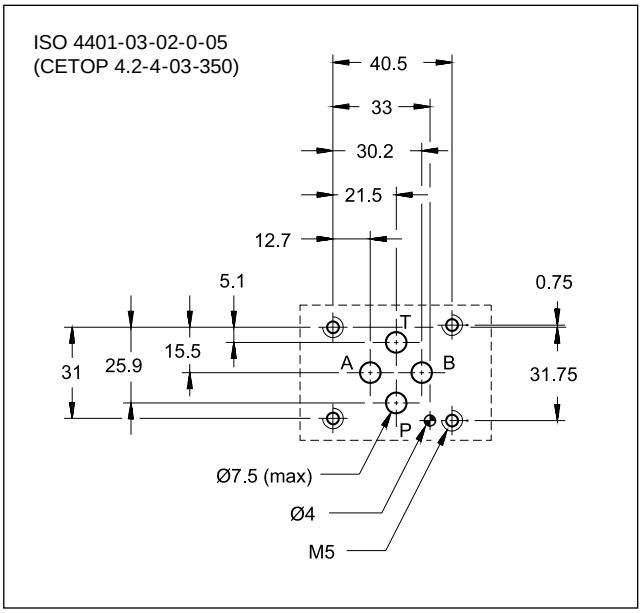
PROPORTIONAL DIRECTIONAL VALVE

SERIES 11

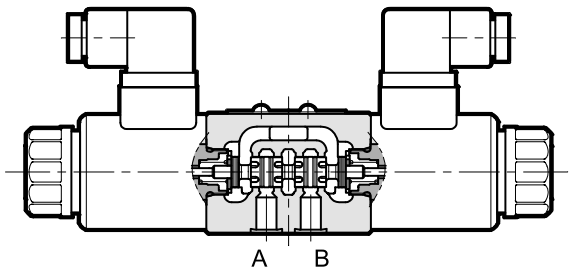
SUBPLATE MOUNTING ISO 4401-03

p max **350** bar
Q max **40** l/min

MOUNTING SURFACE



OPERATING PRINCIPLE



— The DSE3 valve is a proportional directional valve, direct operated, with ports in compliance with ISO 4401-03 standards.

— It is suitable for directional and speed control of hydraulic actuators.

— Valve opening and hence flow rate can be modulated continuously in proportion to the current supplied to the solenoid.

— The valve can be controlled directly by a current control supply unit or combined with an external electronic card to maximize the valve performances (see par. 12).

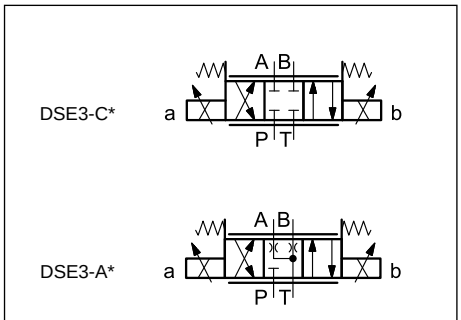
— Several manual overrides are available.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Max operating pressure: P - A - B ports T port	bar	 350 210
Maximum flow with Δp 10 bar P-T	l/min	1 - 4 - 8 - 16 - 26
Step response		see par. 5
Hysteresis (with PWM 200 Hz)	% Q_{max}	< 6%
Repeatability	% Q_{max}	< ± 1,5%
Electrical characteristics		see par. 4
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass: single solenoid valve double solenoid valve	kg	1.5 2.0

HYDRAULIC SYMBOLS (typical)



1 - IDENTIFICATION CODE

D	S	E	3	-				/	11		-			/		

Direct operated directional control valve

Electric proportional control

Size ISO 4401-03

Spool type:
C = closed centre
A = open centre

Spool nominal flow. See par. 2

Solenoid position (omit for configuration with two solenoids):
SA = 1 solenoid on A side
SB = 1 solenoid on B side

Series No.
(from 10 to 19 sizes and mounting dimensions remain unchanged)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

D12 = Nominal solenoid voltage 12V DC
D24 = Nominal solenoid voltage 24V DC

Coil electrical connection:
K1 = plug for connector type EN 175301-803 (ex DIN 43650) (**standard**)
K7 = plug for connector type DEUTSCH DT04-2P male

Option: manual override (see at par. 8)

Option:
/ W7 = Zinc-nickel surface treatment (see **NOTE**)
Omit if not required

NOTE: The standard valve is supplied with surface treatment of phosphating black. The zinc-nickel finishing on the valve body makes the valve suitable to ensure a salt spray resistance up to **240** hours. For a salt spray resistance up to **600** hours refer to **paragraph 9**.
(test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

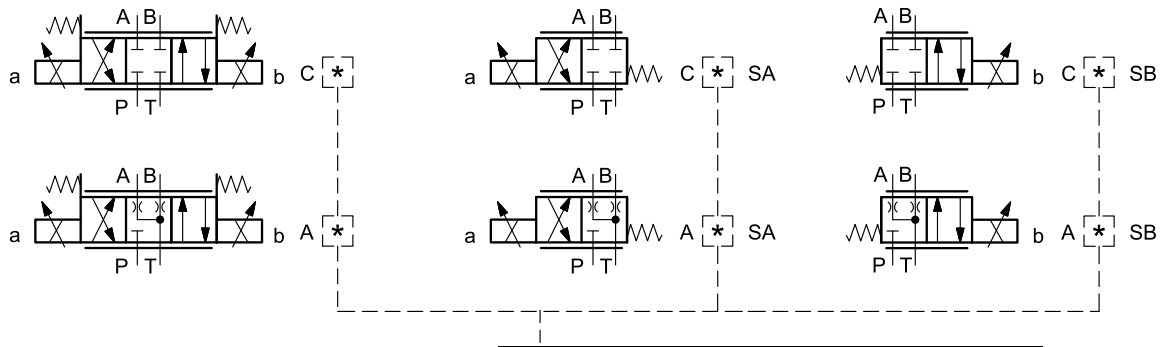
2 - CONFIGURATIONS

Valve configuration depends on the combination of the following elements:
number of proportional solenoids, spool type, nominal flow rate.

2 solenoids configuration:
3 positions with spring centreing

"**SA**" configuration: 1 solenoid on side A.
2 positions (central + external) with return spring

"**SB**" configuration: 1 solenoid on side B.
2 positions (central + external) with return spring

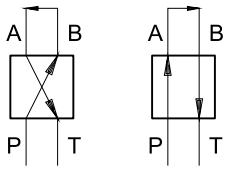


*	Nominal flow with Δp 10 bar P→T
01	1 l/min
04	4 l/min
08	8 l/min
16	16 l/min
16/08	16 (P→A) / 08 (B→T) l/min
26	26 l/min
26/13	26 (P→A) / 13 (B→T) l/min

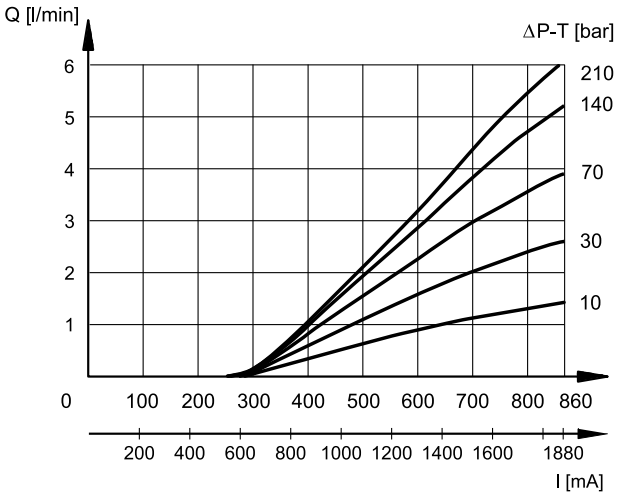
3 - CHARACTERISTIC CURVES

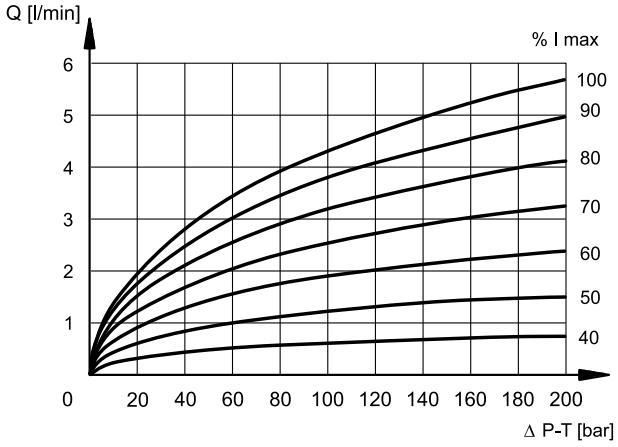
(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Typical flow rate control curves according to the current supply to solenoid. The reference Δp values are measured between ports P and T on the valve.

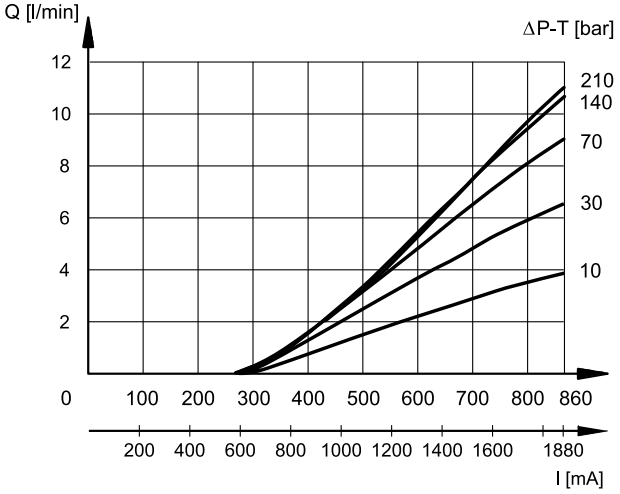


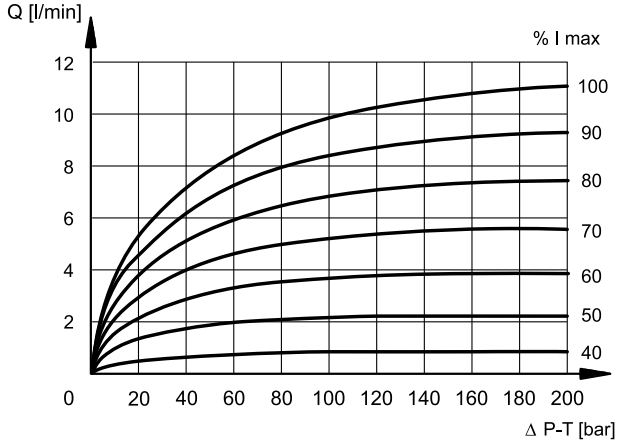
C01 / A01



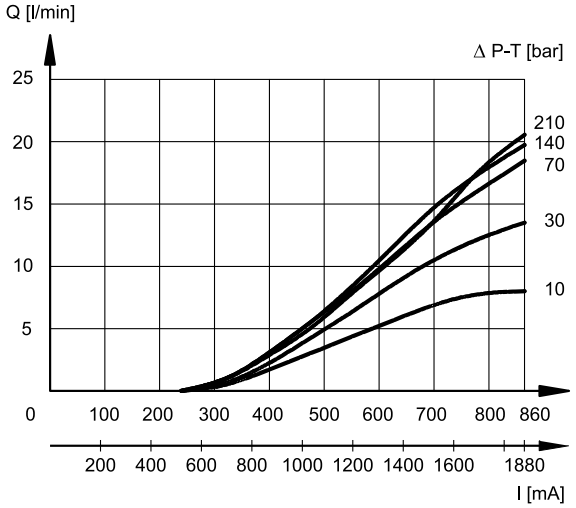


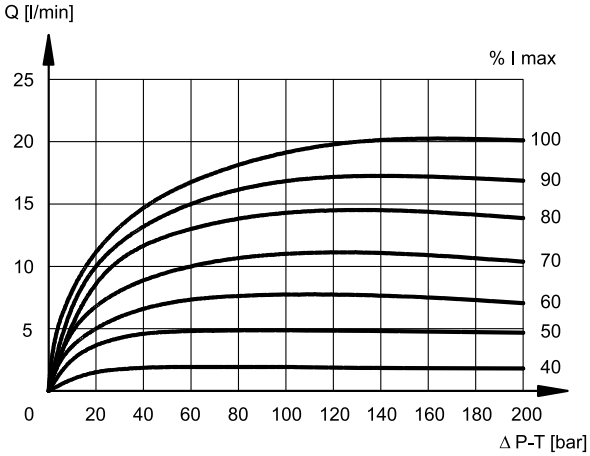
C04 / A04



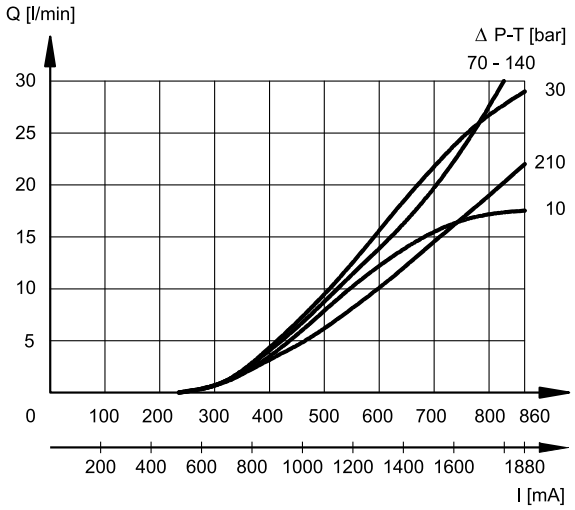


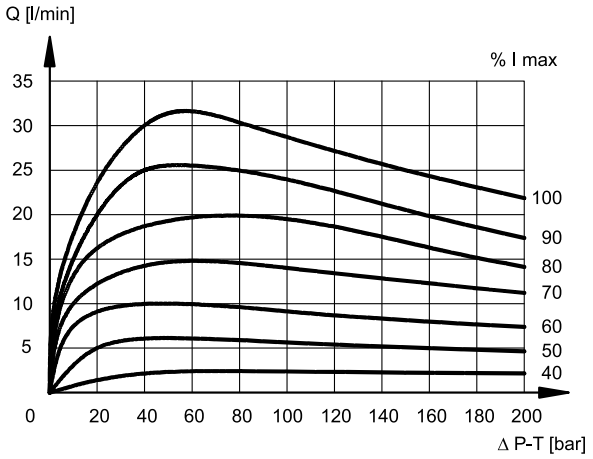
C08 / A08



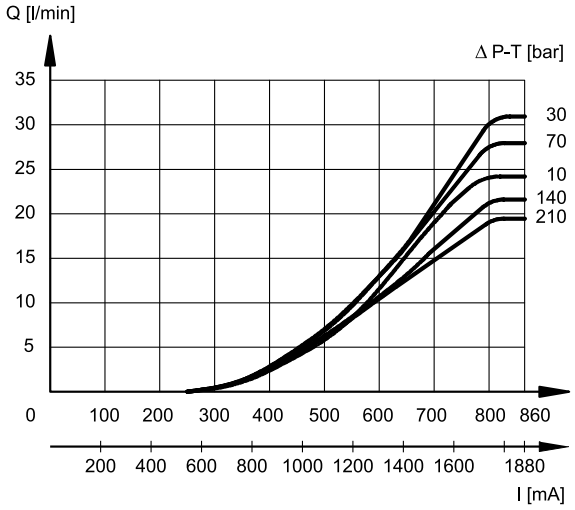


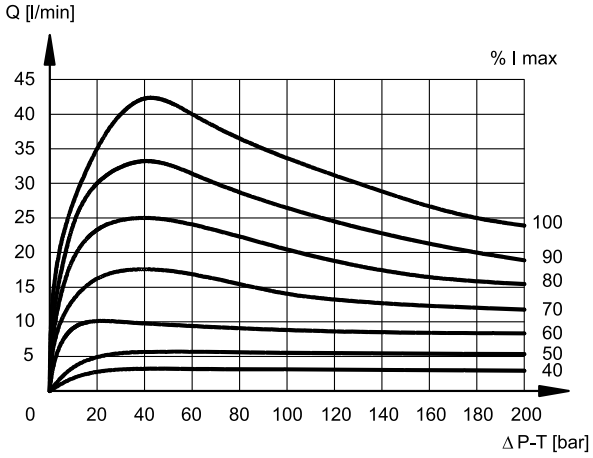
C16 / A16





C26 / A26





4 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut.

It can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20°C) K1 coil K7, WK1, WK7 coil	Ω	 3.66 4.4	 17.6 18.6
NOMINAL CURRENT	A	1.88	0.86
DUTY CYCLE		100%	
ELECTROMAGNETIC COMPATIBILITY (EMC)		According to 2014/30/EU	
CLASS OF PROTECTION : Coil insulation (VDE 0580) Impregnation		 class H class F	

Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree correctly connected and installed.

electric connection	electric connection protection	whole valve protection
K1 EN 175301-803 (ex DIN 43650)	IP65	IP65
K7 DEUTSCH DT04 male	IP65/67	

5 - STEP RESPONSE

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

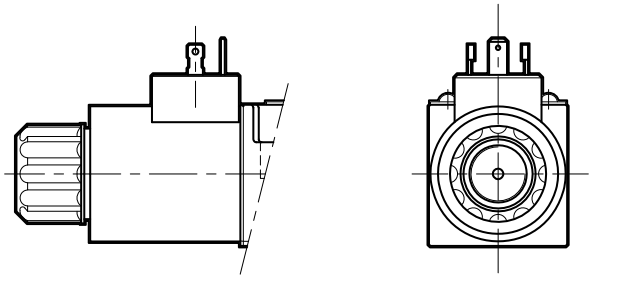
Step response is the time taken for the valve to reach 90% of the setted positioning value, following a step change of reference signal. The table shows typical response times tested with spool type C16 and Δp = 30 bar P-T.

REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms]	50	40

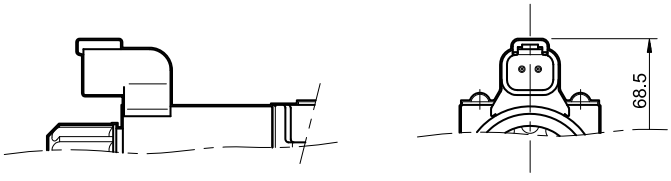
6 - ELECTRIC CONNECTIONS

Connectors for K1 connection are always delivered together with the valve.

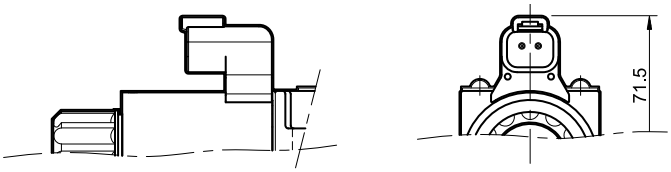
connection for EN 175301-803
(ex DIN 43650) connector
code **K1** (**standard**)
code **WK1** (W7 version only)



connection for
DEUTSCH DT06-2S male connector
code **K7**



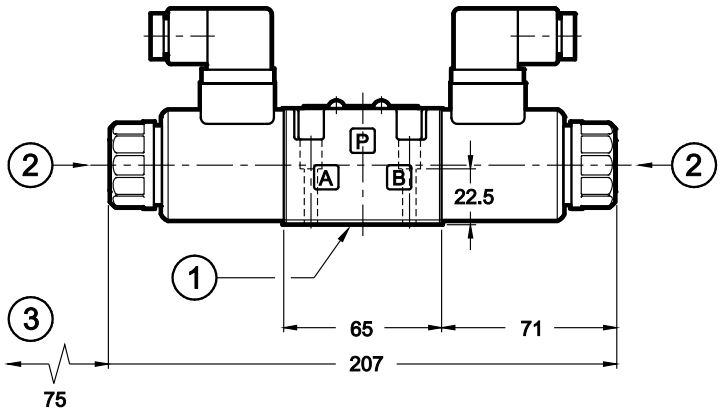
connection for
DEUTSCH DT06-2S male connector
code **WK7** (W7 version only)

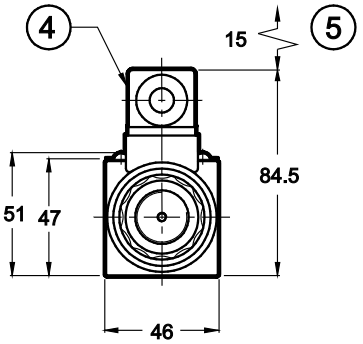


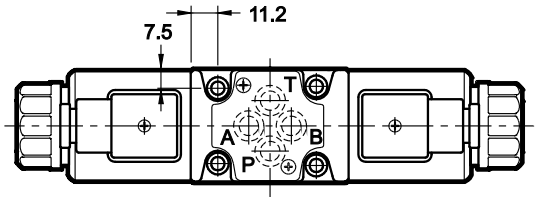
7 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

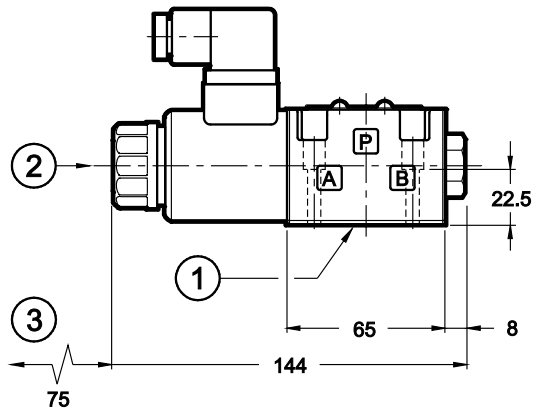
DSE3-**

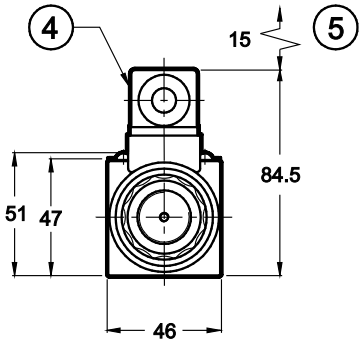


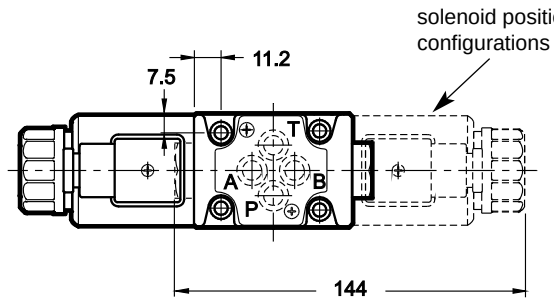




DSE3-*SA







1	Mounting surface with sealing rings: 4 OR type 2037 (9.25 x 1.78) - 90 shore
2	Standard manual override, integrated in the solenoid tube
3	Coil removal space
4	Electric connector type EN 175301-803 (ex DIN 43650)
5	Connector removal space

Fastening bolts: 4 bolts M5x30 - ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

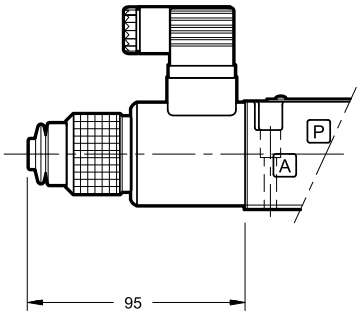
8 - MANUAL OVERRIDE

These valves have solenoids whose pin for manual operation is integrated in the tube. Actuate this override by pushing it with a suitable tool, minding not to damage the sliding surface.

Four different manual override versions are available upon request:

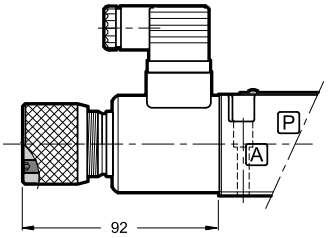
- **CM** version, manual override boot protected.
- **CK** version, knob. When the set screw is screwed and its point is aligned with the edge of the knob, tighten the knob till it touches the spool: in this position the override is not engaged and the valve is de-energized. After adjusting the override, tighten the set screw in order to avoid the knob loosing.
- **CS** version, with metal ring nut provided with a M4 screw and a locknut.
- **CH** version, lever manual override. The lever device is always placed at the A side of the valve.

CM Version



Code: 3803210003

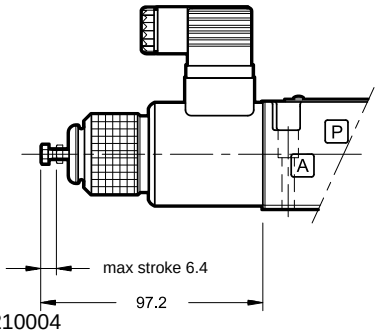
CK Version



Allen key for set screw: 3 mm

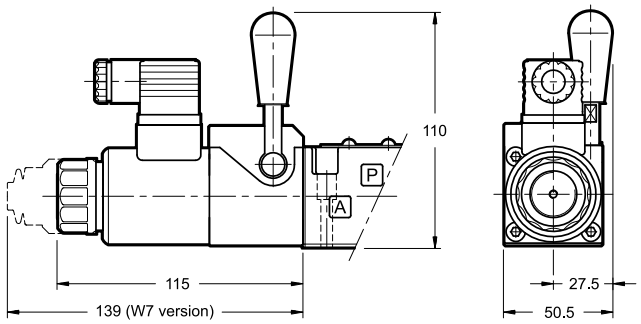
Code: 3803210005

CS Version

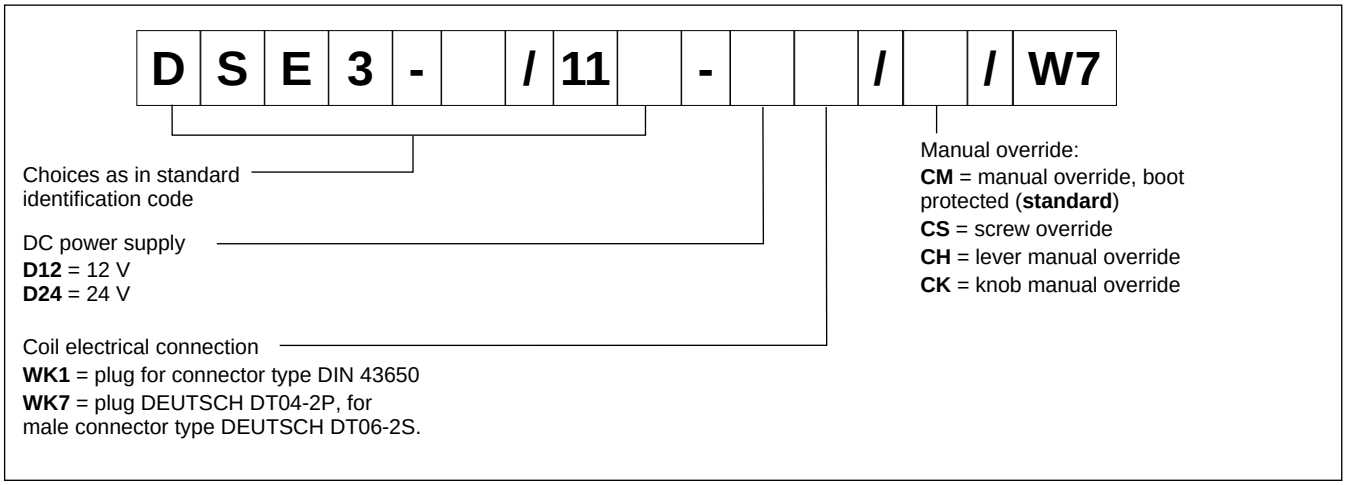


Code: 3803210004

CH Version



9 - HIGH IP AND CORROSION RESISTANCE VERSION



9.1 - Corrosion resistance

This version features the zinc-nickel coating on all exposed metal parts of the valve, making it resistant to exposure to the salt spray for **600** hours (test performed according to UNI EN ISO 9227 and assessment test performed according to UNI EN ISO 10289).

The boot protected manual override is fitted as standard in order to protect the solenoid tube. See the dimensions of the CM manual override in par. 8.

9.2 - Coils

The coils feature a zinc-nickel surface treatment. The electrical characteristics do not change compared to the standard version: see table in par. 4.

9.3 - Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree correctly connected and installed.

electric connection	electric connection protection	whole valve protection
WK1 EN 175301-803 (ex DIN 43650)	IP66	IP66
WK7 DEUTSCH DT04 male	IP66/IP68/IP69 IP69K*	IP66/IP68/IP69 IP69K*

(*****) The IP69K protection degree is not taken into account in IEC 60529 but it is included in ISO 20653.

NOTE: As regards the liquid ingress protection (second digit), there are three means of protection.

Codes from 1 to 6 are related to water jets.

Rates 7 and 8 are related to immersion.

Rate 9 is reserved for high pressure and temperature water jets.

This means that IPX6 covers all the lower steps, rate IPX8 covers IPX7 but not IPX6 and lower, instead IPX9 does not cover any of them.

Whether a device meets two types of protection requirements it must be indicated by listing both the tests separated by a slash.

(E.g. a marking of an equipment covered both by temporary immersion and water jets is IP66/IP68).

10 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids like HL or HM type, according to ISO 6743-4. With this kind of fluids, use NBR seals type (code N). For HFDR fluids type (phosphate esters) use FPM seals (code V). For use with other kind of fluids such as HFA, HFB, HFC please consult our technical department.

Operation with fluid temperature exceeding 80°C causes premature deterioration of the quality of the fluid and seals. The physical and chemical properties of the fluid must be maintained.

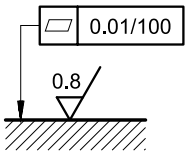
11 - INSTALLATION

DSE3 valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed fluid can easily leak between the valve and support surface.

Surface finishing



12 - ELECTRONIC CONTROL UNITS

DSE3 - * * SA (SB)

EDC-112	for solenoid 24V DC	plug version	see cat.89 120
EDC-142	for solenoid 12V DC		
EDM-M112	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 252
EDM-M142	for solenoid 12V DC		

DSE3 - A* DSE3 - C*

EDM-M212	24V DC solenoids	rail mounting DIN EN 50022	see cat. 89 252
EDM-M242	12V DC solenoids		

12 - SUBPLATES

(see catalogue 51 000)

Type PMMD-AI3G ports on rear
Type PMMD-AL3G side ports
P, T, A, B port threading: 3/8” BSP

DUPLOMATIC
MOTION SOLUTIONS
a member of DAIKIN group

DUPLOMATIC MS Spa
via Mario Re Depaolini, 24 | 20015 Parabiago (MI) | Italy
T +39 0331 895111 | E vendite.ita@duplomatic.com | sales.exp@duplomatic.com
duplomaticmotionsolutions.com

REPRODUCTION IS FORBIDDEN. THE COMPANY RESERVES THE RIGHT TO APPLY ANY MODIFICATIONS.



DSE3B

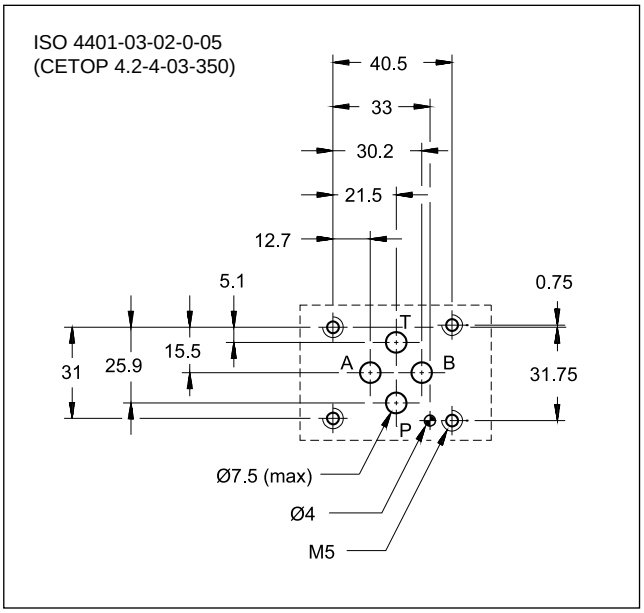
DIRECTIONAL VALVE WITH PROPORTIONAL CONTROL

SERIES 10

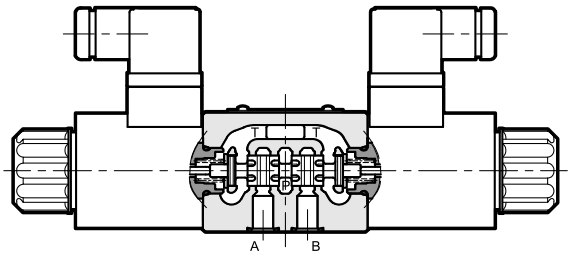
SUBPLATE MOUNTING ISO 4401-03

p max **350** bar
Q max **40** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



— The DSE3B valve is a direct operated directional valve with electric proportional control, with ports in compliance with ISO 4401-03 standards.

— It is suitable for directional and speed control of hydraulic actuators.

— Valve opening and hence flow rate can be modulated continuously in proportion to the current supplied to the solenoid.

— The valve can be controlled directly by a current control supply unit or combined with an external electronic card to exploit valve performance to the full (see point 12).

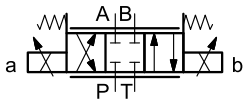
PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

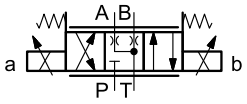
Max operating pressure: P - A - B ports T port	bar	 350 160
Nominal flow with Δp 10 bar P-T	l/min	1 - 4 - 8 - 16 - 26
Step response		see point 5
Hysteresis (with PWM 200 Hz)	% Q max	< 6%
Repeatability	% Q max	< ± 2%
Electrical characteristics		see point 4
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass: single solenoid valve double solenoid valve	kg	1.6 2.0

HYDRAULIC SYMBOLS (typical)

DSE3B-C*



DSE3B-A*



1 - IDENTIFICATION CODE

D	S	E	3	B	-				/	10		-			/		

Direct operated directional valve

Electric proportional control

Size ISO 4401-03

Spool type:
C = closed centres
A = open centres

Spool nominal flow (see point 2)

Solenoid position (omit for configuration with two solenoids):
SA = 1 solenoid on side A
SB = 1 solenoid on side B

Series No.
(from 10 to 19 sizes and mounting dimensions remain unchanged)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

D12 = Nominal solenoid voltage 12V DC
D24 = Nominal solenoid voltage 24V DC

Coil electrical connection:
K1 = plug for connector type EN 175301-803 (ex DIN 43650) (**standard**)
K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S

Option: manual override (see at point 8)

Option:
/ W7 = Zinc-nickel surface treatment (see **NOTE**)
Omit if not required

NOTE: The standard valve is supplied with surface treatment of phosphating black. The zinc-nickel finishing on the valve body makes the valve suitable to ensure a salt spray resistance up to **240** hours. For a salt spray resistance up to **600** hours refer to **point 9**.
(test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

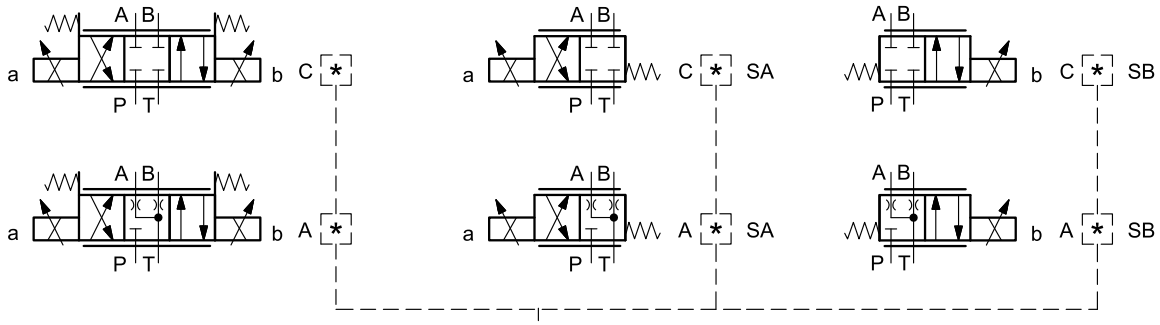
2 - CONFIGURATIONS

Valve configuration depends on the combination of the following elements:
number of proportional solenoids, spool type, nominal flow rate.

2 solenoids configuration:
3 positions with spring centreing

"**SA**" configuration: 1 solenoid on side A.
2 positions (central + external)
with spring return

"**SB**" configuration: 1 solenoid on side B.
2 positions (central + external)
with spring return



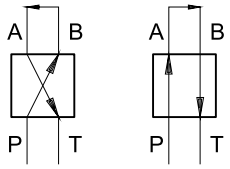
*	Controlled flow with Δp 10 bar P-T
01	1 l/min
04	4 l/min
08	8 l/min
16	16 l/min
26	26 l/min

3 - CHARACTERISTIC CURVES

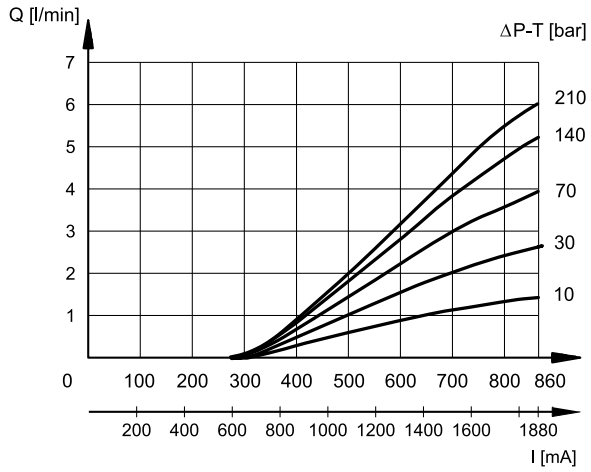
(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

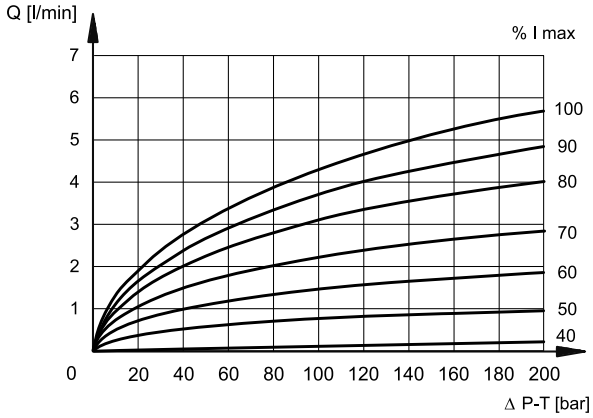
Typical constant flow rate control curves at Δp according to current supply to solenoid (D24 version, maximum current 860 mA), measured for the various spool types available.

The reference Δp values are measured between ports P and T on the valve.

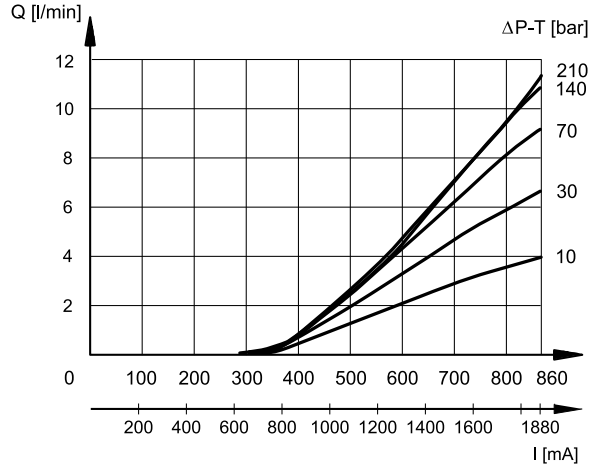


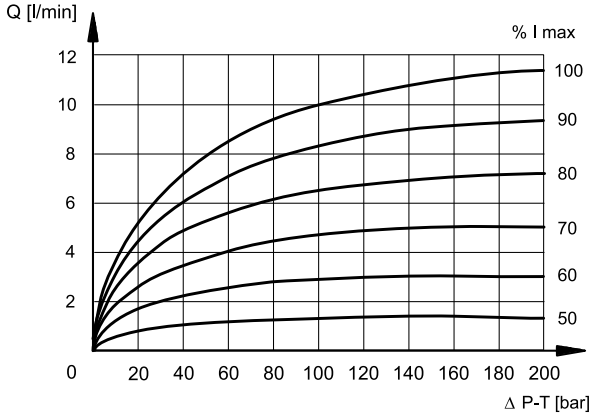
C01/A01



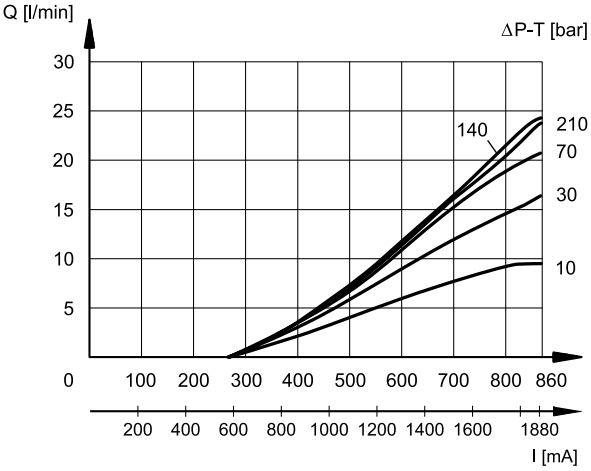


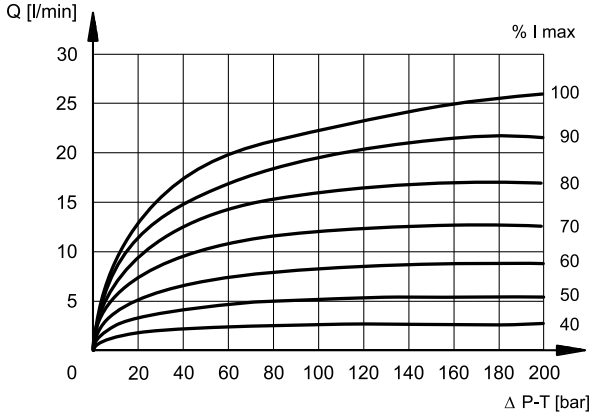
C04/A04



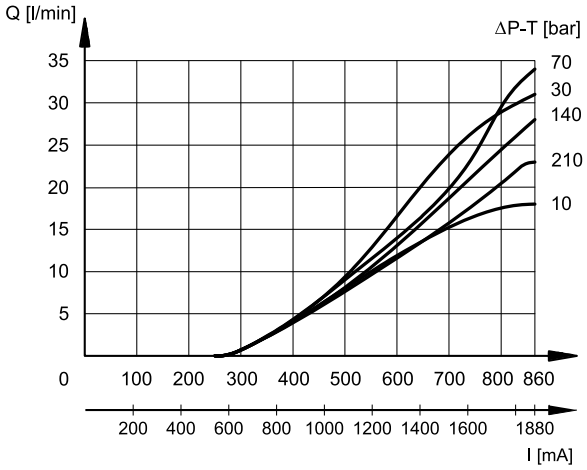


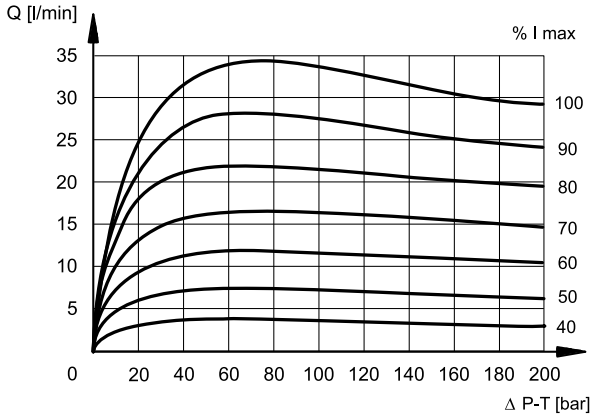
C08/A08



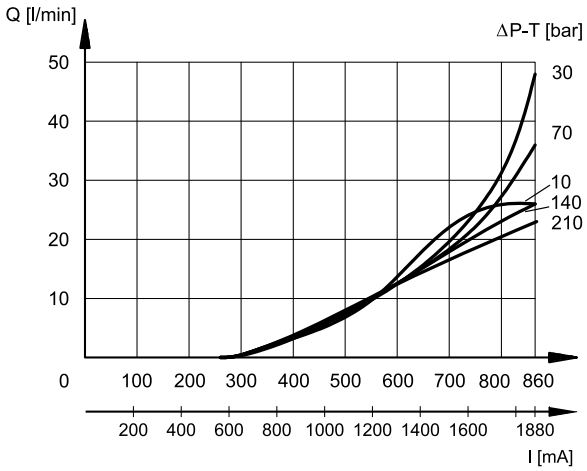


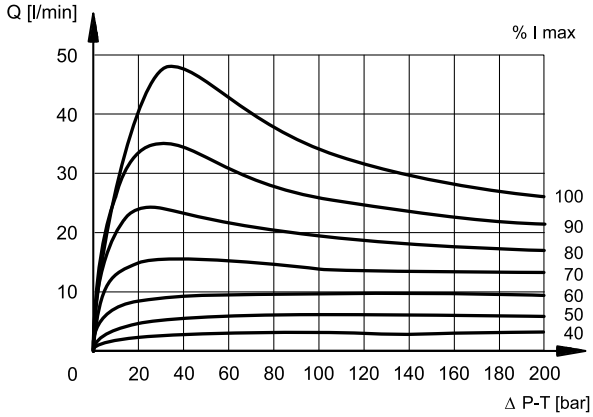
C16/A16





C26/A26





4 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil. The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube, secured by means of a lock nut. It can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20°C)	Ω	4,4	18,6
MAXIMUM CURRENT	A	1,88	0,86
DUTY CYCLE	100%		
ELECTROMAGNETIC COMPATIBILITY (EMC)	according to 2014/30/EU		
CLASS OF PROTECTION coil insulation (VDE 0580) impregnation	class H class F		

Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree correctly connected and installed.

electric connection	electric connection protection	whole valve protection
K1 EN 175301-803 (ex DIN 43650)	IP65	IP65
K7 DEUTSCH DT04 male	IP65/67	

5 - STEP RESPONSE

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Step response is the time taken for the valve to reach 90% of the setted positioning value, following a step change of reference signal.

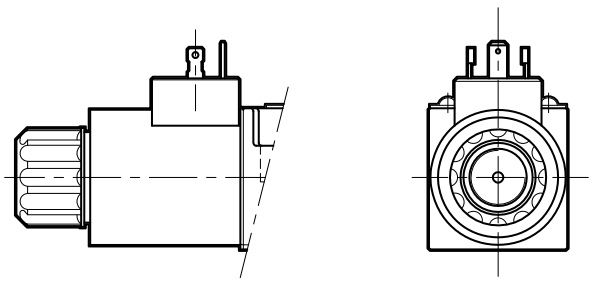
The table shows typical response times tested with spool type C16 and Δp = 30 bar P-T.

REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms]	50	40

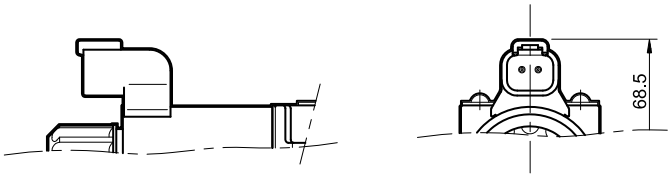
6 - ELECTRIC CONNECTIONS

Connectors for K1 and WK1 connections are always delivered together with the valve.

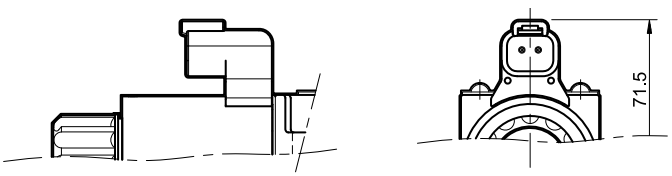
connection for EN 175301-803 connector
code **K1** (**standard**)
code **WK1** (W7 version only)



connection for
DEUTSCH DT06-2S male connector
code **K7**



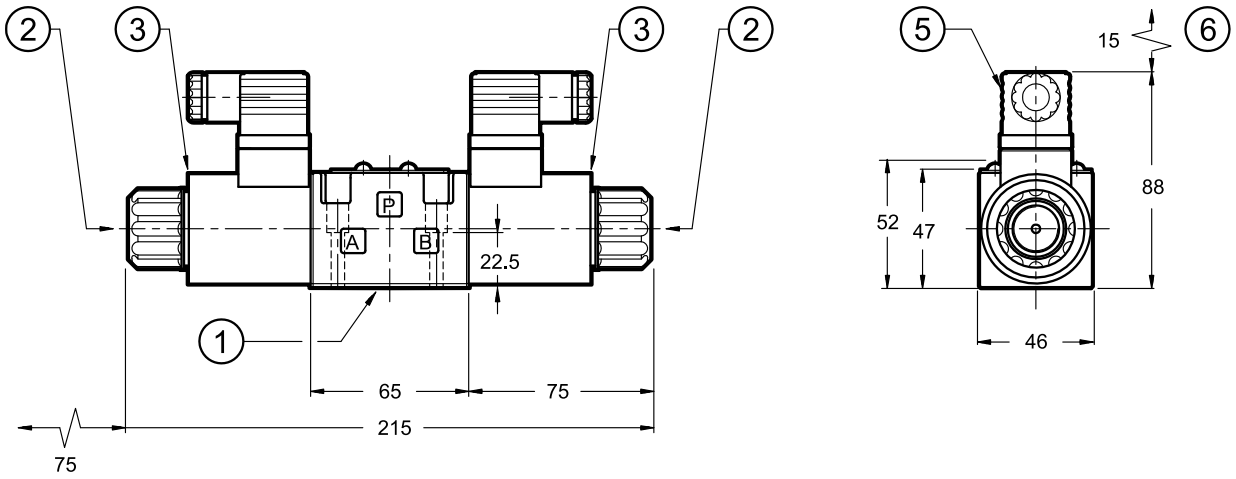
connection for
DEUTSCH DT06-2S male connector
code **WK7** (W7 version only)

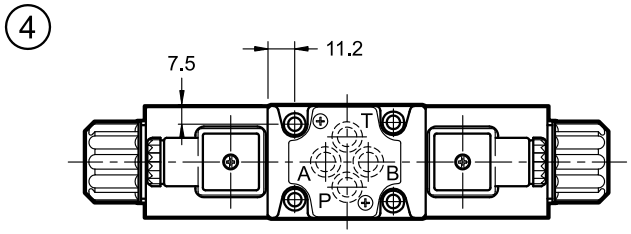


7 - OVERALL AND MOUNTING DIMENSIONS

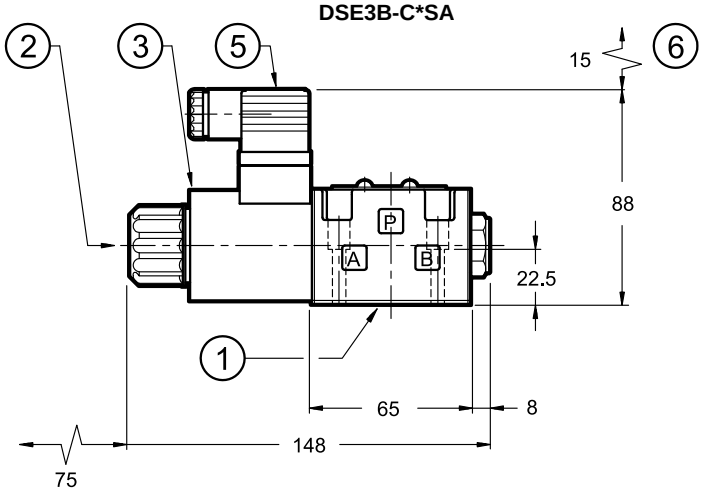
dimensions in mm

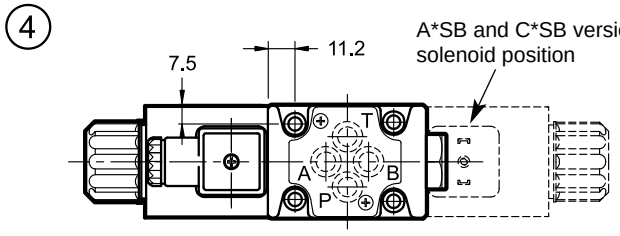
DSE3B-A*
DSEB3-C*





DSE3B-A*SA
DSE3B-C*SA





Fastening bolts: 4 SHCS M5x30 - ISO 4762
Torque: 5 Nm (A 8.8)
Threads of mounting holes : M5x10
Locking ring tightening torque: 5 ± 0.5 Nm

1	Mounting surface with sealing rings: 4 OR type 2037 (9.25 x 1.78) - 90 shore
2	Standard manual override integrated in the solenoid tube **NOTE**: The valve version with high IP and high corrosion resistance fits the CM manual override as standard See the CM dimensions in point 8
3	Coil (360° revolving)
4	Coil removal space
5	EN 175301-803 (ex DIN 43650) electric coil connector
6	Connector removal space

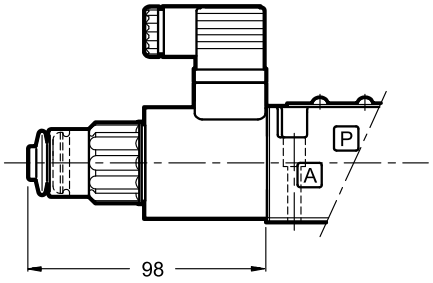
8 - MANUAL OVERRIDE

These valves have solenoids whose pin for manual operation is integrated in the tube. Actuate this override by pushing it with a suitable tool, minding not to damage the sliding surface.

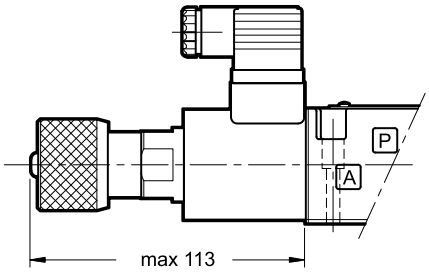
Three different manual override version are available upon request:

- **CM** version, manual override boot protected.
- **CK1** version, turning knob override.
- **CS** version, with metal ring nut provided with a M8 screw and a blocking locknut.

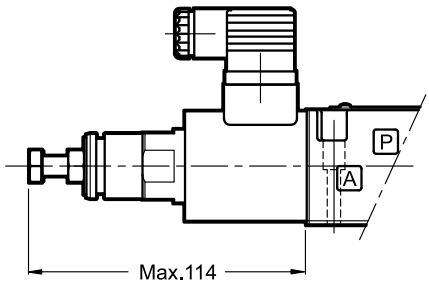
CM Version - Code: 3401150006



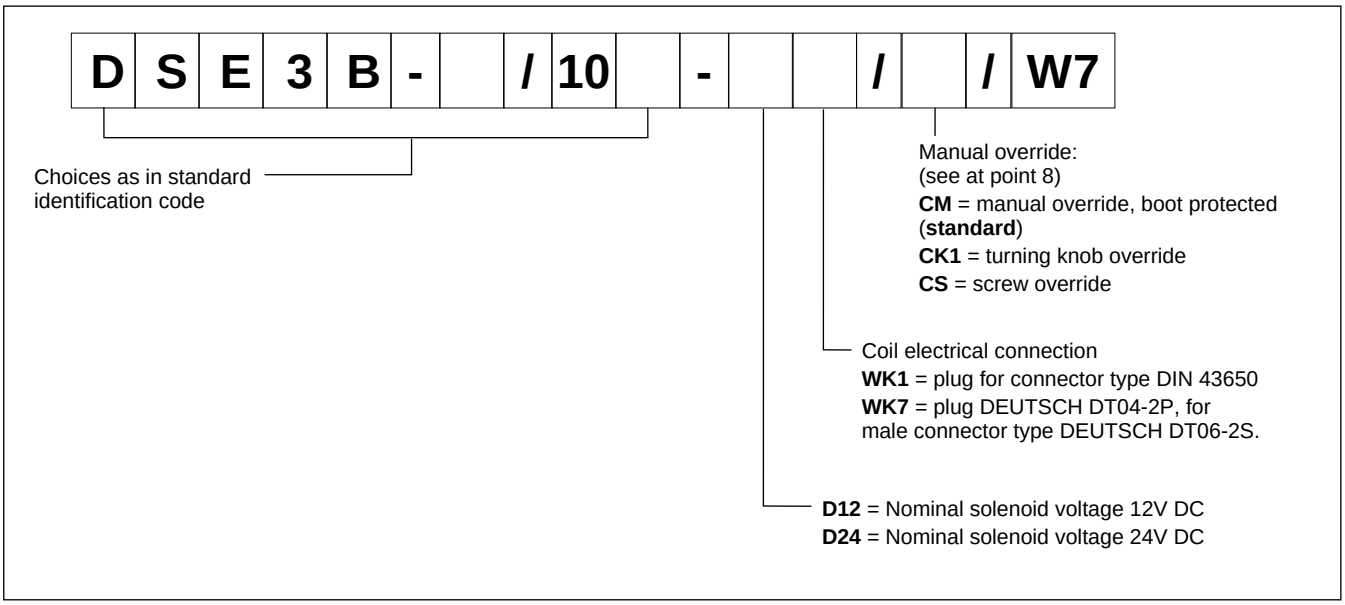
CK1 Version - Code: 3401150031



CS Version - Code: 3803210006



9 - HIGH IP DEGREE AND CORROSION RESISTANCE VERSION



9.1 - Corrosion resistance

This version features the zinc-nickel coating on all exposed metal parts of the valve, making it resistant to exposure to the salt spray for **600** hours (test performed according to UNI EN ISO 9227 and assessment test performed according to UNI EN ISO 10289).

The boot protected manual override is fitted as standard in order to protect the solenoid tube. See the dimensions of the CM manual override in point 8.

9.2 - Coils

The coils feature a zinc-nickel surface treatment. The electrical characteristics do not change compared to the standard version: see table in point 4

9.3 - Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree correctly connected and installed.

electric connection	electric connection protection	whole valve protection
WK1 EN 175301-803 (ex DIN 43650)	IP66	IP66
WK7 DEUTSCH DT04 male	IP66/IP68/IP69 IP69K*	IP66/IP68/IP69 IP69K*

(*****) The IP69K protection degree is not taken into account in IEC 60529 but it is included in ISO 20653.

NOTE: As regards the liquid ingress protection (second digit), there are three means of protection.

Codes from 1 to 6 are related to water jets.

Rates 7 and 8 are related to immersion.

Rate 9 is reserved for high pressure and temperature water jets.

This means that IPX6 covers all the lower steps, rate IPX8 covers IPX7 but not IPX6 and lower, instead IPX9 does not cover any of them.

Whether a device meets two types of protection requirements it must be indicated by listing both the tests separated by a slash.

(E.g. a marking of an equipment covered both by temporary immersion and water jets is IP66/IP68).

10 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids like HL or HM type, according to ISO 6743-4. With this kind of fluids, use NBR seals type (code N). For HFDR fluids type (phosphate esters) use FPM seals (code V). For use with other kind of fluids such as HFA, HFB, HFC please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

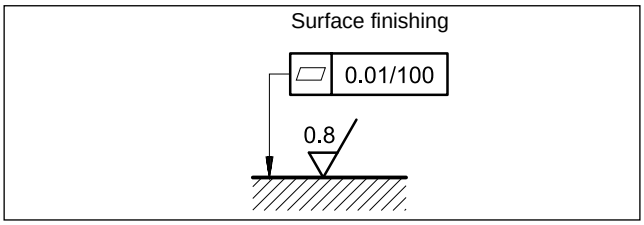
11 - INSTALLATION

DSE3B valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

Valves are fixed by means of screws or tie rods on a lapped surface with planarity and roughness equal to or better than those indicated in the symbol.

If minimum values of planarity or smoothness are not observed, fluid leakages between valve and mounting surface can easily occur.



12 - ELECTRONIC CONTROL UNITS

DSE3B - **SA (SB)

EDC-112	for solenoid 24V DC	plug version	see cat. 89 120
EDC-142	for solenoid 12V DC		
EDM-M112	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 252
EDM-M142	for solenoid 12V DC		

DSE3B - A* **DSE3B - C***

EDM-M212	for solenoids 24V DC	rail mounting DIN EN 50022	see cat. 89 252
EDM-M242	for solenoids 12V DC		

13 - SUBPLATES

(see catalogue 51 000)

Type PMMD-AI3G ports on rear (3/8” BSP threaded)
Type PMMD-AL3G side ports (3/8” BSP threaded)

DUPLOMATIC MOTION SOLUTIONS

DUPLOMATIC MS Spa
via Mario Re Depaolini, 24 | 20015 Parabiago (MI) | Italy
T +39 0331 895111 | E vendite.ita@duplomatic.com | sales.exp@duplomatic.com
duplomaticmotionsolutions.com

REPRODUCTION IS FORBIDDEN. THE COMPANY RESERVES THE RIGHT TO APPLY ANY MODIFICATIONS.



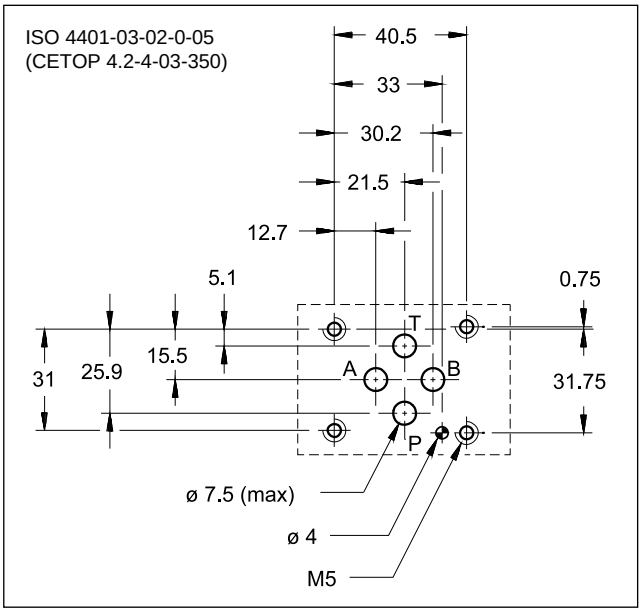
DSE3G*

PROPORTIONAL DIRECTIONAL VALVE WITH DIGITAL INTEGRATED ELECTRONICS

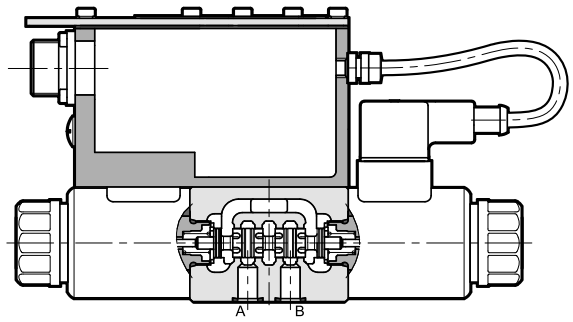
SUBPLATE MOUNTING
ISO 4401-03

p max **350** bar
Q max **40** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



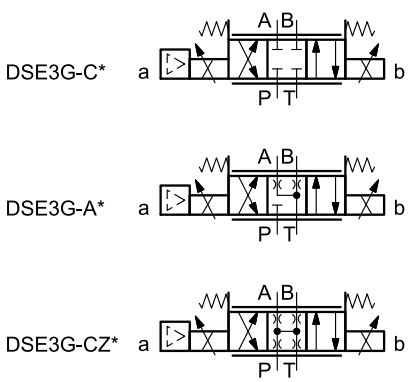
— The DSE3G* are proportional directional valves, direct operated, with digital integrated electronics and with mounting interface according to ISO 4401-03 standards.
— They control the positioning and the speed of hydraulic actuators.
— They are available with different types of electronics, with analogue or fieldbus interfaces.
— The valves are easy to install. The driver manages digital settings directly.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

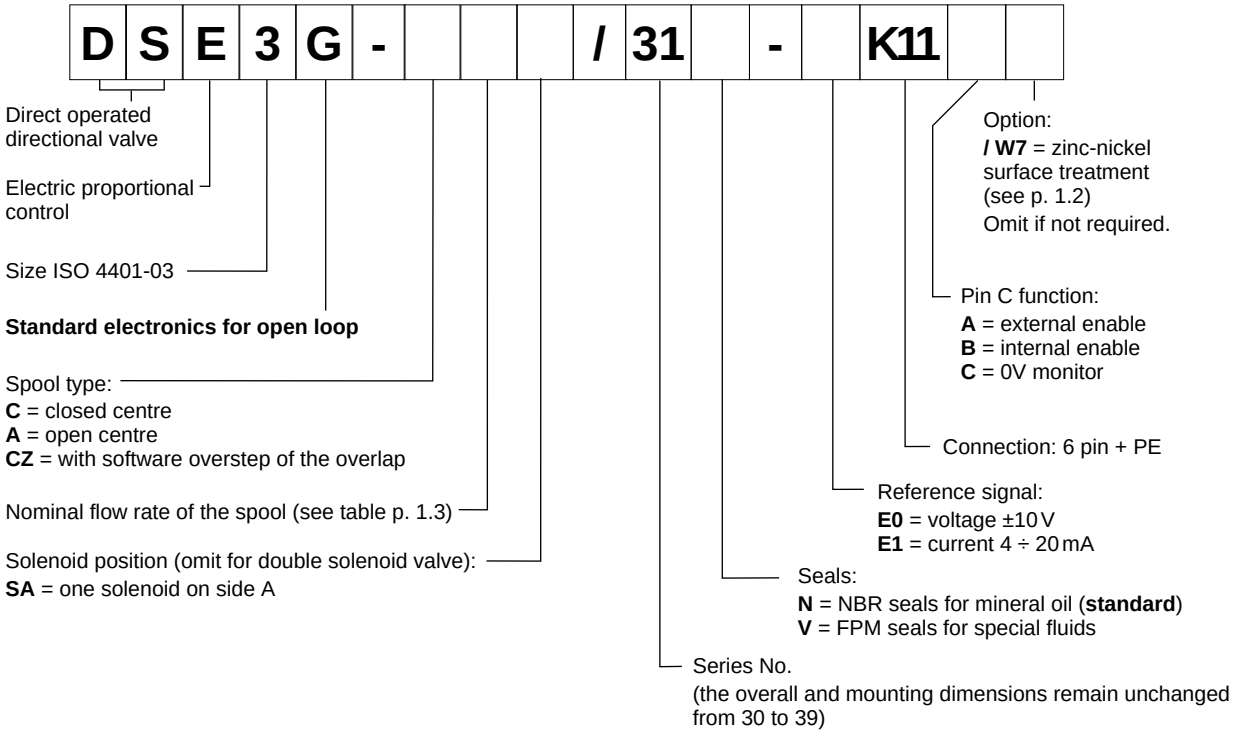
Max operating pressure: - P - A - B ports - T port	bar	 350 210
Nominal flow with Δp 10 bar P-T	l/min	1 - 4 - 8 - 16 - 26
Response times	see point 6	
Hysteresis	% of Q max	< 3%
Repeatability	% of Q max	< ±1%
Electrical characteristics	see points 3 and 4	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	according to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass: single solenoid valve double solenoid valve	kg	1.9 2.4

HYDRAULIC SYMBOLS (typical)



1 - IDENTIFICATION CODES AND CONFIGURATION

1.1 - Standard electronics



1.2 - Surface treatments

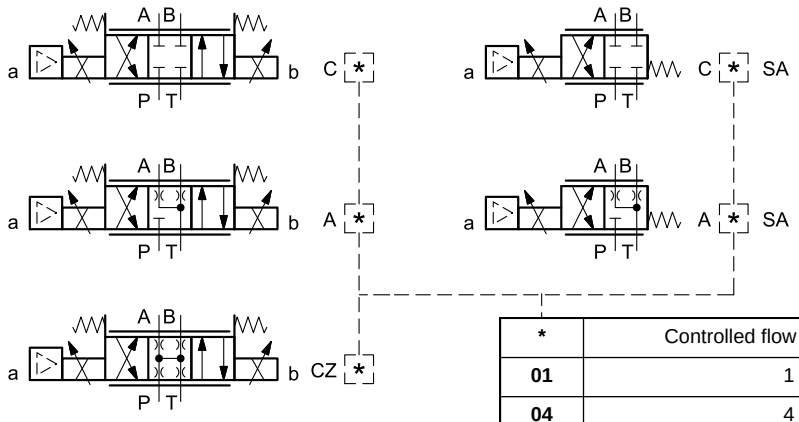
The standard valve is supplied with surface treatment of phosphating black. The zinc-nickel finishing on the valve body makes the valve suitable to ensure a salt spray resistance up to 240 hours. (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

1.3 - Configurations

Valve configuration depends on the combination of the following elements: number of proportional solenoids, spool type, rated flow.

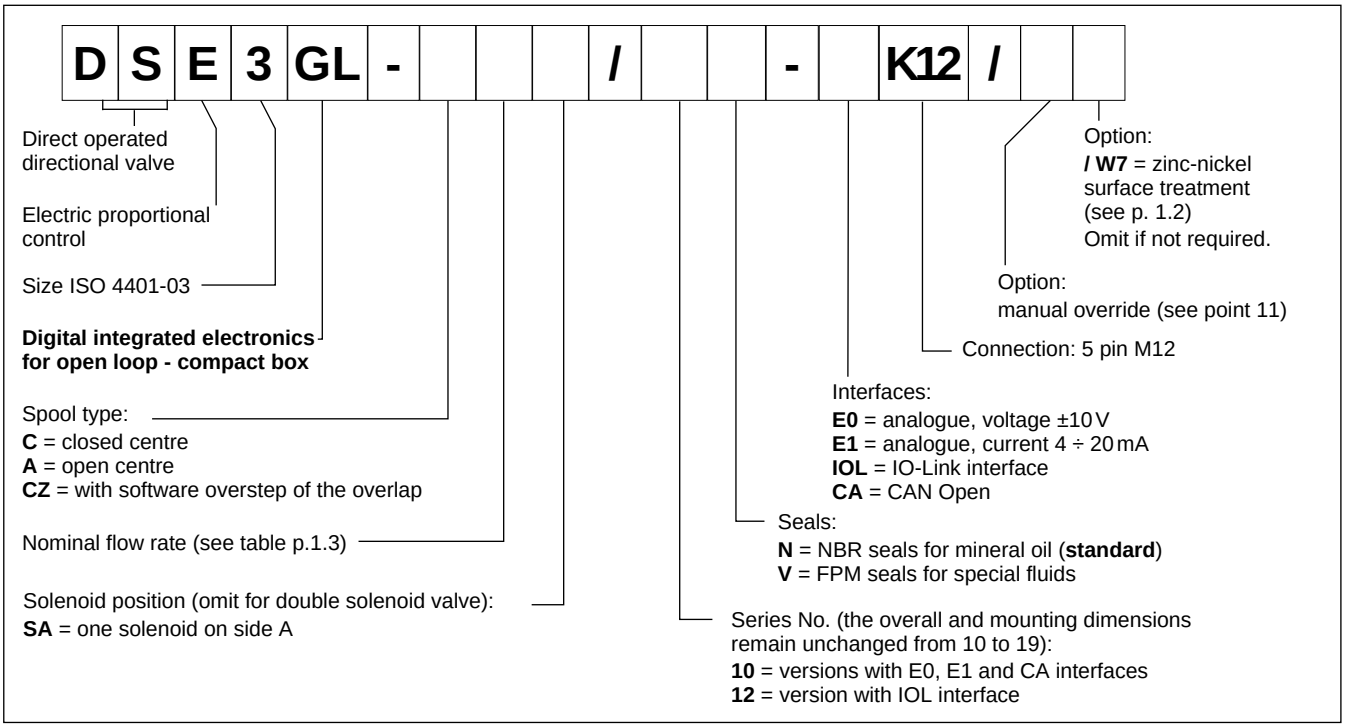
Configuration 2 solenoids :
3 positions with spring centreing

Configuration 1 solenoid on side A "**SA**":
2 positions (central + external) with spring centreing

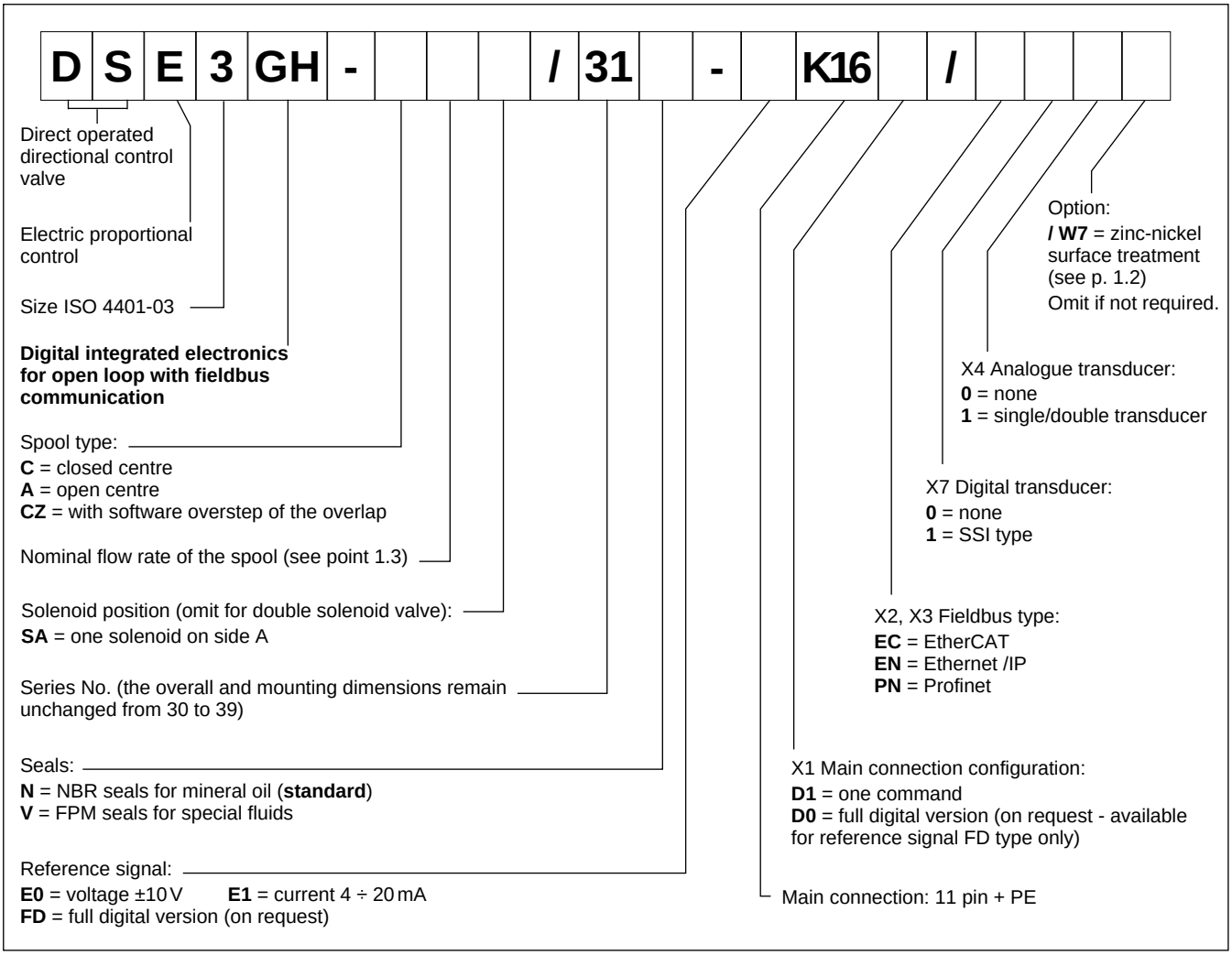


*	Controlled flow with Δp10 bar P-T
01	1 l/min
04	4 l/min
08	8 l/min
16	16 l/min
16/08	16 (P-A) / 08 (B-T) l/min
26	26 l/min
26/13	26 (P-A) / 13 (B-T) l/min

1.4 - Compact electronics



1.5 - Electronics with fieldbus communication



2 - ELECTRONICS COMMON DATA

Duty cycle		100% (continuous operation)
Protection class according to EN 60529		IP65/IP67 (**NOTE**)
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	25
Maximum solenoid current	A	1.88
Fuse protection, external	A	3
Managed breakdowns		Overload and electronics overheating, cable breakdown, supply voltage failures
Electromagnetic compatibility (EMC) emissions EN 61000-6-4, immunity EN 61000-6-2		According to 2014/30/EU standards

NOTE: The IP degree is guaranteed only with mating connector of equivalent IP degree, installed and tightened correctly. Moreover, on the GH versions it is necessary to protect any unused connections with caps.

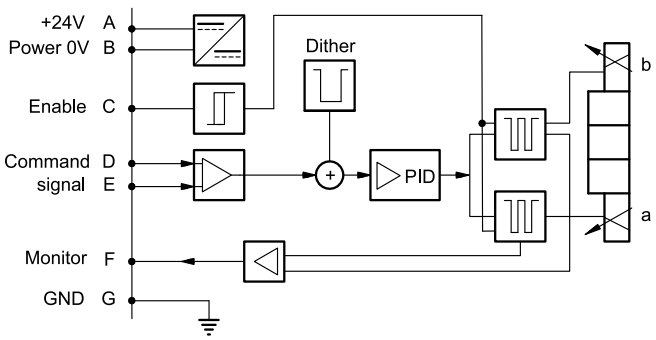
3 - DSE3G - STANDARD ELECTRONICS

3.1 - Electrical characteristics

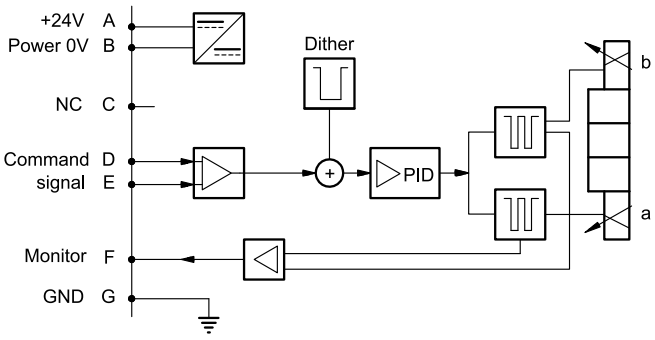
Command signal: voltage (E0) current (E1)	V DC mA	±10 (impedance Ri > 11 kOhm) 4 ÷ 20 (impedance Ri = 58 Ohm)
Monitor signal (current to solenoid): voltage (E0) current (E1)	V DC mA	±10 (impedance Ro > 1 kOhm) 4 ÷ 20 (impedance Ro = 500 Ohm)
Communication for diagnostic		LIN-bus Interface (by means of the optional kit)
Connection		6 pin + PE (MIL-C-5015-G - DIN EN 175201-804)

3.2 - On-board electronics diagrams

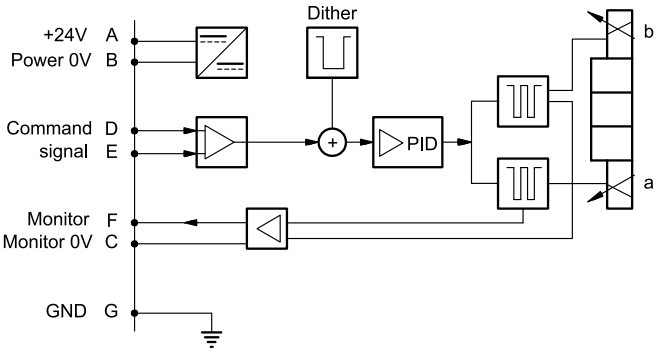
VERSION A - External Enable



VERSION B - Internal Enable

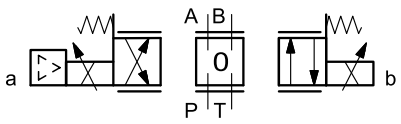


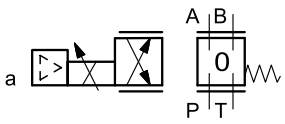
VERSION C - 0V Monitor



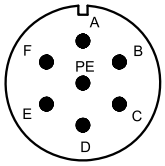
3.3 - Versions with voltage command (E0)

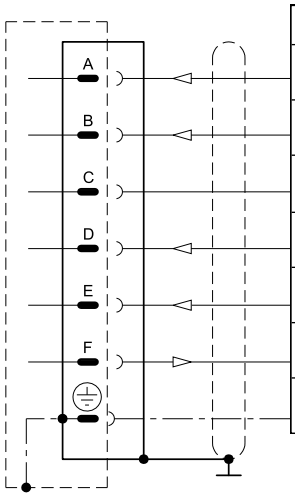
The reference signal is between -10V and +10V on double solenoid valve, and 0 ÷ 10V on single solenoid valve SA. The monitor feature of versions B and C becomes available with a delay of 0.5 sec from the power-on of the card.





COMMAND	**-10V**	**0V**	**+10V**	**COMMAND**	**+10V**	**0V**
MONITOR	**-10V**	**0V**	**+10V**	**MONITOR**	**+10V**	**0V**



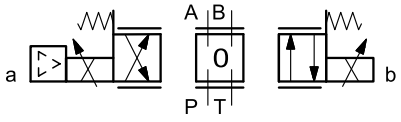


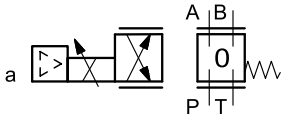
Pin	Values	version A	version B	version C
A	24 V DC	Supply voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	± 10 V	Command		
E	0 V	Command reference		
F	± 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

3.4 - Versions with current command (E1)

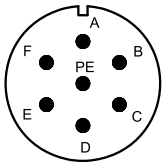
The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower, the card shows a breakdown cable error. To reset the error is sufficient restoring the signal.

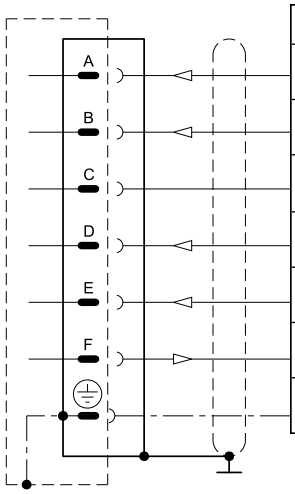
The monitor feature of versions B and C becomes available with a delay of 0.5 sec from the power-on of the card.





COMMAND	**4 mA**	**12 mA**	**20 mA**	**COMMAND**	**20 mA**	**4 mA**
MONITOR	**4 mA**	**12 mA**	**20 mA**	**MONITOR**	**20 mA**	**4 mA**





Pin	Values	version A	version B	version C
A	24 V DC	Supply voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	Command reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

4 - DSE3GL - COMPACT ELECTRONICS

In IO-Link networks, the length of the connecting cables is limited to 20 metres. In CA versions, pin 3 and pin 5 are galvanic isolated up to 100 V to avoid earth loops.

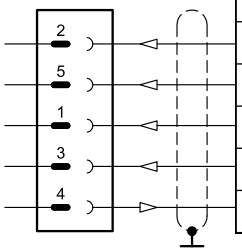
4.1 - Electrical characteristics

Command signal: voltage (E0) current (E1)	V DC mA	±10 (impedance Ri > 11 kOhm) 4 ÷ 20 (impedance Ri = 58 Ohm)
Monitor signal (current to solenoid): voltage (E0) current (E1)	 V DC mA	 0 ÷ 5 (impedance Ro > 1 kOhm) 4 ÷ 20 (impedance Ro = 500 Ohm)
IO-Link communication (IOL): Data rate	 kBaud	IO-Link Port Class B 38.4
Can Open communication (CA): Data rate	 kbit	 10 ÷ 1000
Data register (IOL and CA versions only)		card voltage supply, solenoid faults (shortcircuit, bad configuration), box temperature.
Connection		5-pin M12 code A (IEC 61076-2-101)

4.2 - Pin tables

'E0' connection

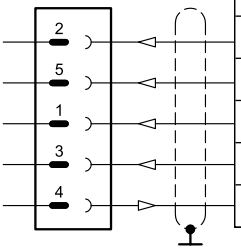




Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	± 10 V	Command
3	0V	Command reference
4	0 ÷ 5V	Monitor (0V reference: pin 5)

'E1' connection

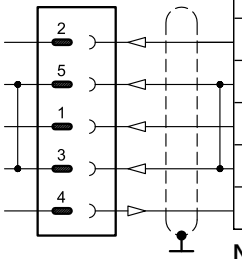




Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	4 ÷ 20 mA	Command
3	0V	Command reference
4	4 ÷ 20 mA	Monitor (0V reference: pin 5)

'IOL' connection



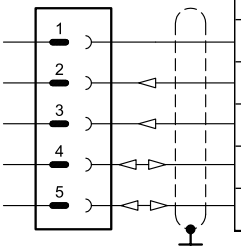


Pin	Values	Function
2	2L+ 24 V DC	Solenoid supply voltage
5	2L- 0 V (GND)	
1	1L+ +24 V DC	Logic and IO-Link supply voltage
3	1L- 0V (GND)	
4	C/Q	IO-Link Communication

NOTE: Pin 3 and pin 5 are linked with each other in the valve electronics. The reference potentials 1L- and 2L- of the two supply voltages must also be linked with each other on the customer side.

'CA' connection





Pin	Values	Function
1	CAN_SH	Shield
2	24 V DC	Supply voltage
3	0 V (GND)	
4	CAN H	Bus line (high)
5	CAN_L	Bus line (low)

5 - DSE3GH - FIELDBUS ELECTRONICS

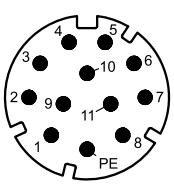
The 11+ PE pin connection allows separate supply voltage for electronics and solenoids.

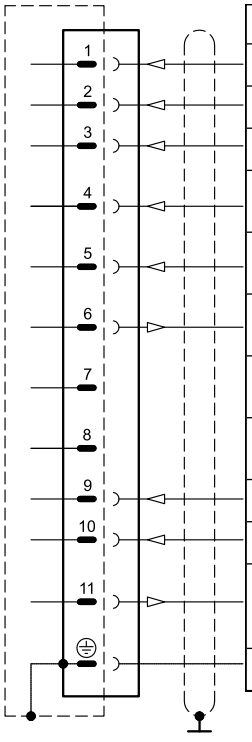
Command - valve position schemes as for the standard electronics. Please refer to pictures in par. 3.3 and 3.4.

5.1 - Electrical characteristics

Command signal: voltage (E0) current (E1) digital (FD)	 V DC mA	 ±10 (impedance Ri > 11 kOhm) 4 ÷ 20 (impedance Ri = 58 Ohm) via fieldbus
Monitor signal (current to solenoid): voltage (E0) current (E1)	 V DC mA	 ±10 (impedance Ro > 1 kOhm) 4 ÷ 20 (impedance Ro = 500 Ohm)
Communication / diagnostic		via Bus register
Communication interface standard		IEC 61158
Communication physical layer		fast ethernet, insulated 100 Base TX
Power connection		11 pin + PE (DIN 43651)

5.2 - X1 Main connection pin table





D1: one command

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	± 10 V (E0) 4 ÷ 20 (E1)	Command
5	0 V	Command reference signal
6	± 10 V (E0) 4 ÷ 20 (E1)	Monitor (0V reference pin 10)
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V reference pin 2)
12	GND	Ground (Earth)

D0: full digital

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	NC	do not connect
5	NC	do not connect
6	NC	do not connect
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V ref. pin 2)
12	GND	Ground (Earth)

5.3 - FIELDBUS connections

Please wire following guidelines provided by the related standards communication protocol. Any connections present and not used must be protected with special caps so as not to nullify the protection against atmospheric agents.

X2 (IN) connection: M12 D 4 pin female



Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

X3 (OUT) connection: M12 D 4 pin female

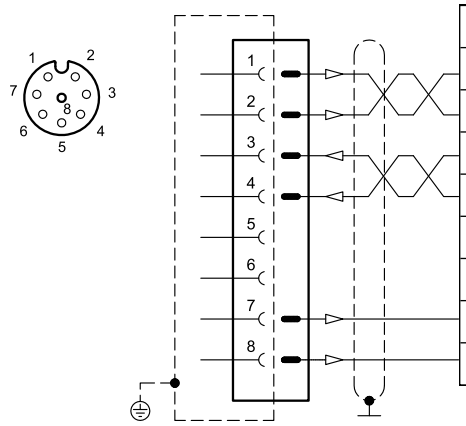


Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

NOTE: Shield connection on connector housing is recommended.

5.4 - Digital transducer connection
X7 connection: M12 A 8 pin female

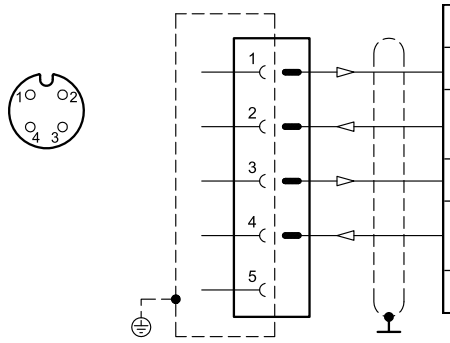
VERSION 1: SSI type



Pin	SSI Values	Function	Notes
1	CLK+	Serial synchronous clock (+)	Input - digital signal
2	CLK-	Serial synchronous clock (-)	
3	MIS0+	Serial position data (+)	
4	MIS0-	Serial position data (-)	
5	NC	-	do not connect
6	NC	-	
7	+24 V	transducer power supply	Output power supply
8	0 V	-	Common GND

5.5 - Analogue transducer connection
X4 connection: M12 A 4 pin female

VERSION 1: single / double transducer
(single or double is a software-selectable option)



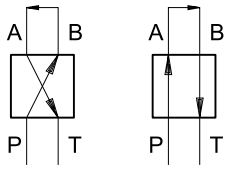
Pin	Values	Notes
1	+24 V	Remote transducer power supply (out) 100 mA
2	±10 V 4 ÷20 mA	Input signal of transducer 1 (range software selectable)
3	0 V	Common reference signal for transducer power and signals
4	±10 V 4 ÷20 mA	Input signal of transducer 2 (range software selectable)
5	-	

6 - CHARACTERISTIC CURVES

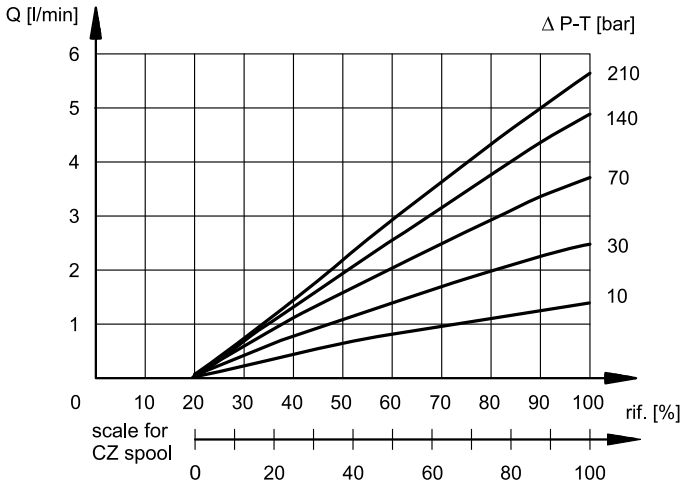
(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

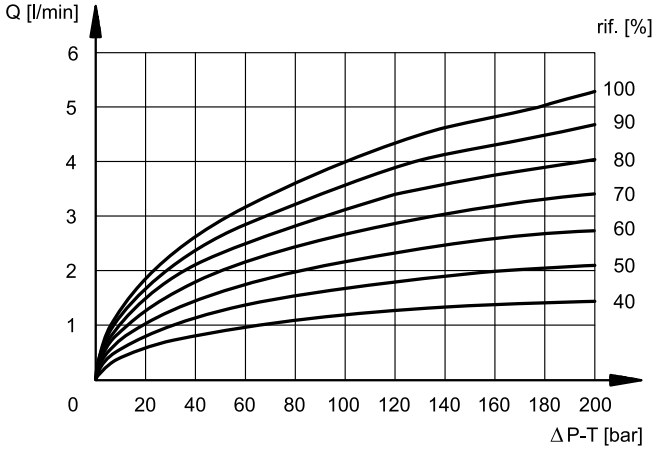
Typical flow rate curves at constant Δp related to the reference signal and measured for the available spools. The Δp values are measured between P and T valve ports.

Curves obtained after linearization of the characteristic curve in factory, through the digital amplifier. The linearization of the curve is performed with a constant Δp of 5 bar and by setting the value of flow start at 20% of the reference signal.

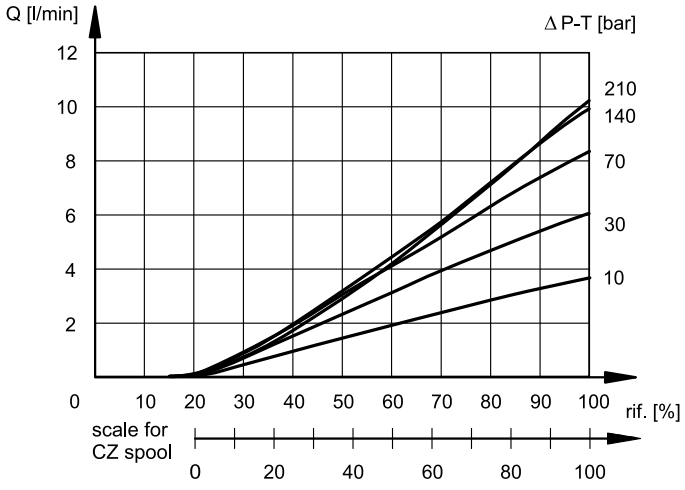


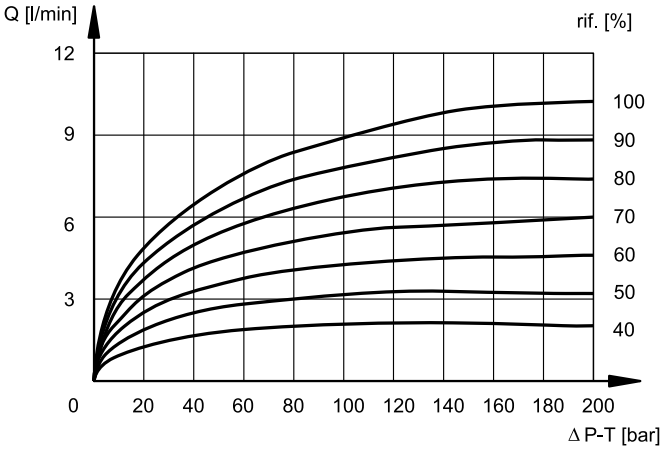
SPOOL TYPE C01/A01



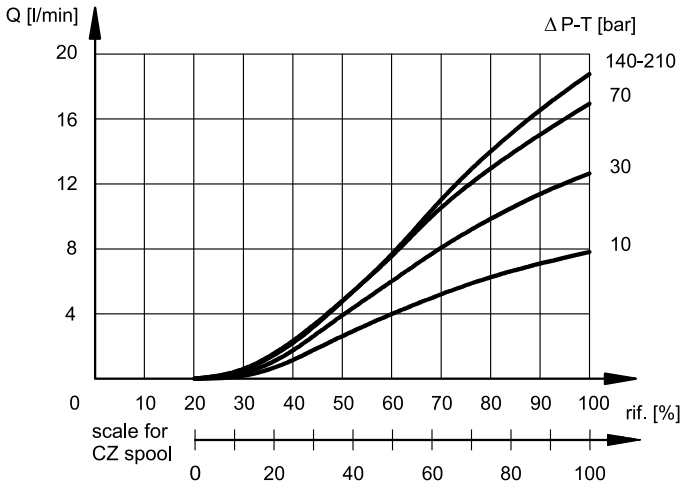


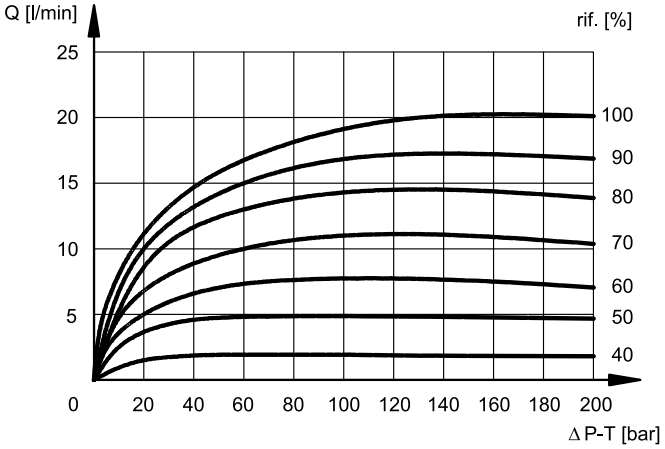
SPOOL TYPE C04/A04



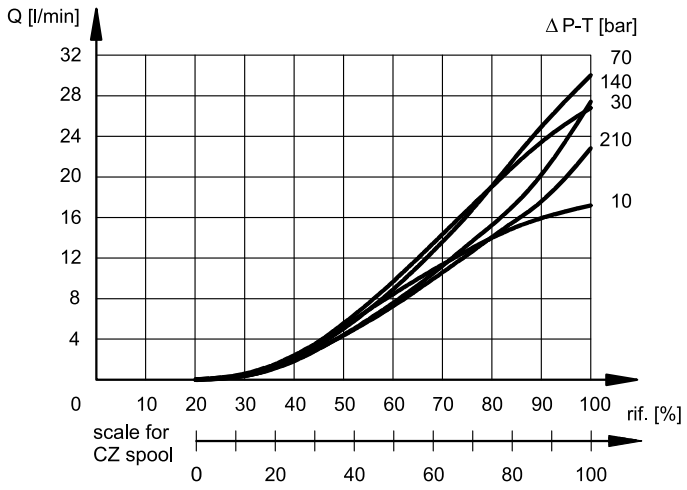


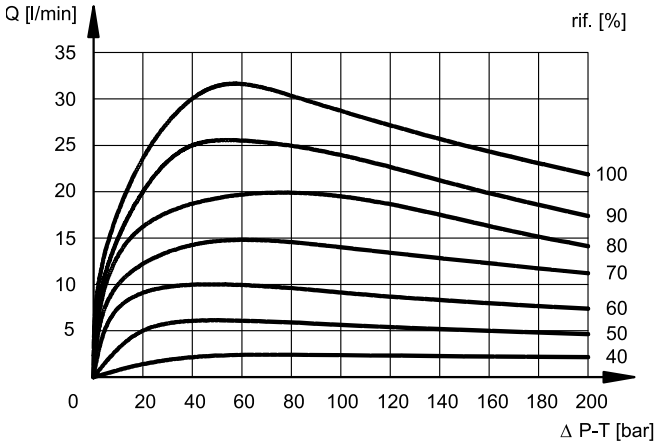
SPOOL TYPE C08/A08



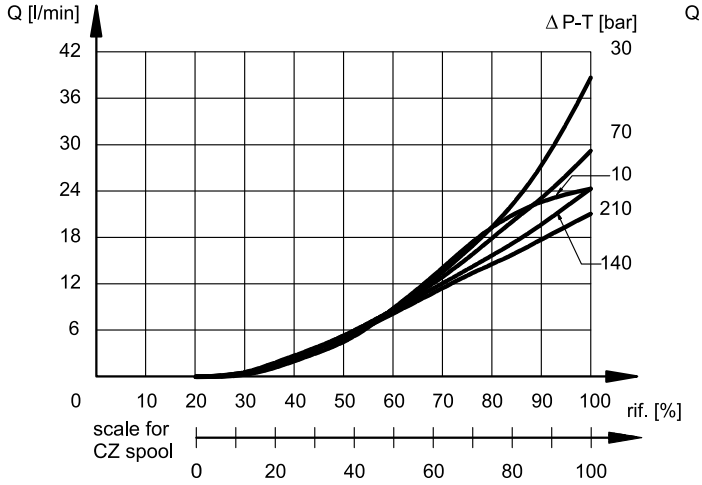


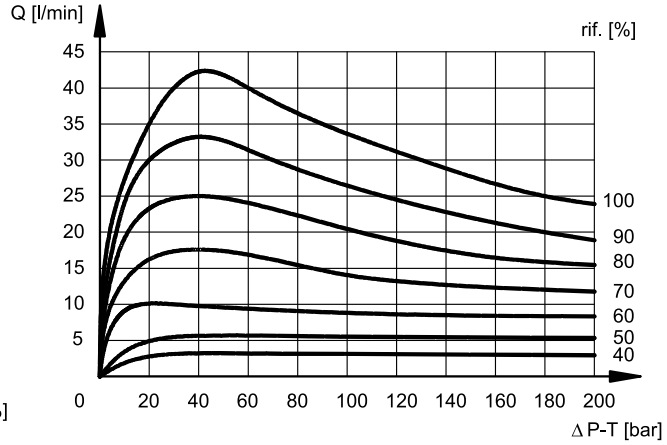
SPOOL TYPE C16/A16





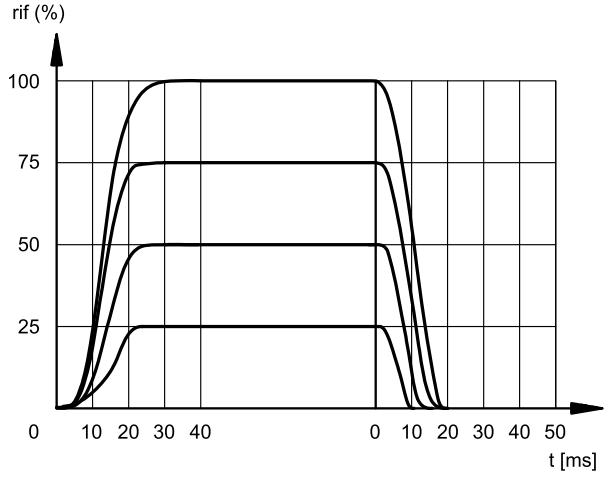
SPOOL TYPE C26/A26





7 - RESPONSE TIMES

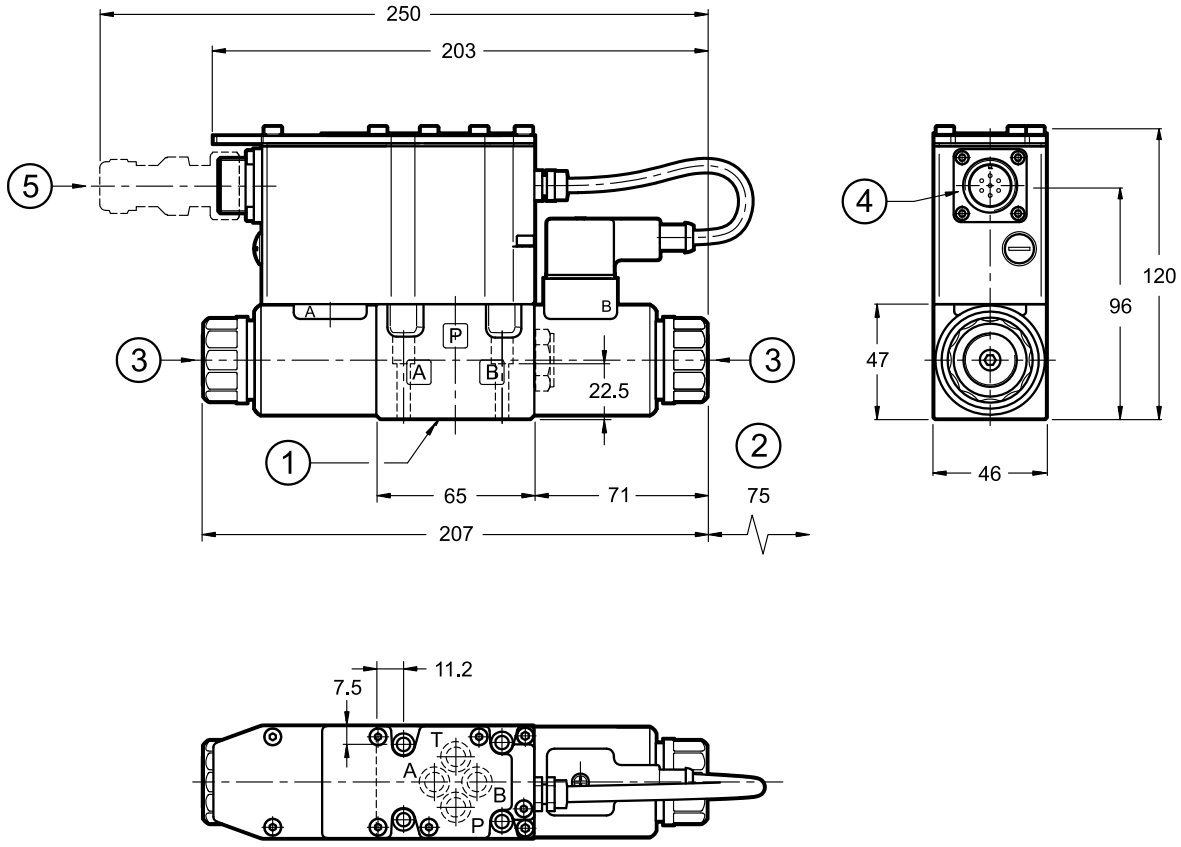
(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)



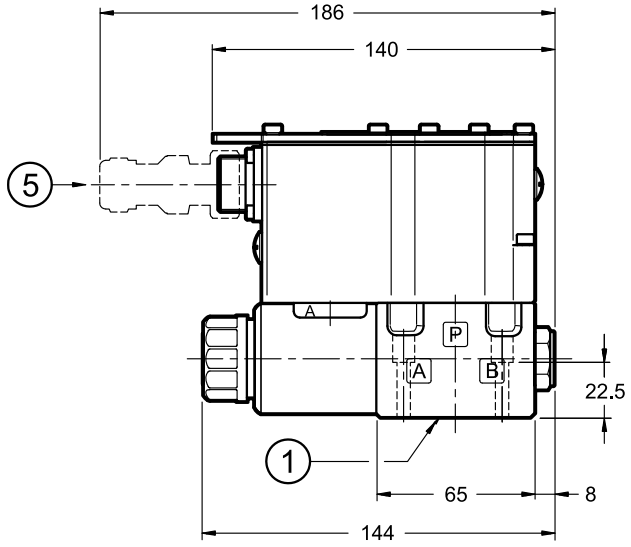
8 - DSE3G - OVERALL AND MOUNTING DIMENSIONS

DSE3G-/K11**

dimensions in mm



DSE3G-*SA/K11

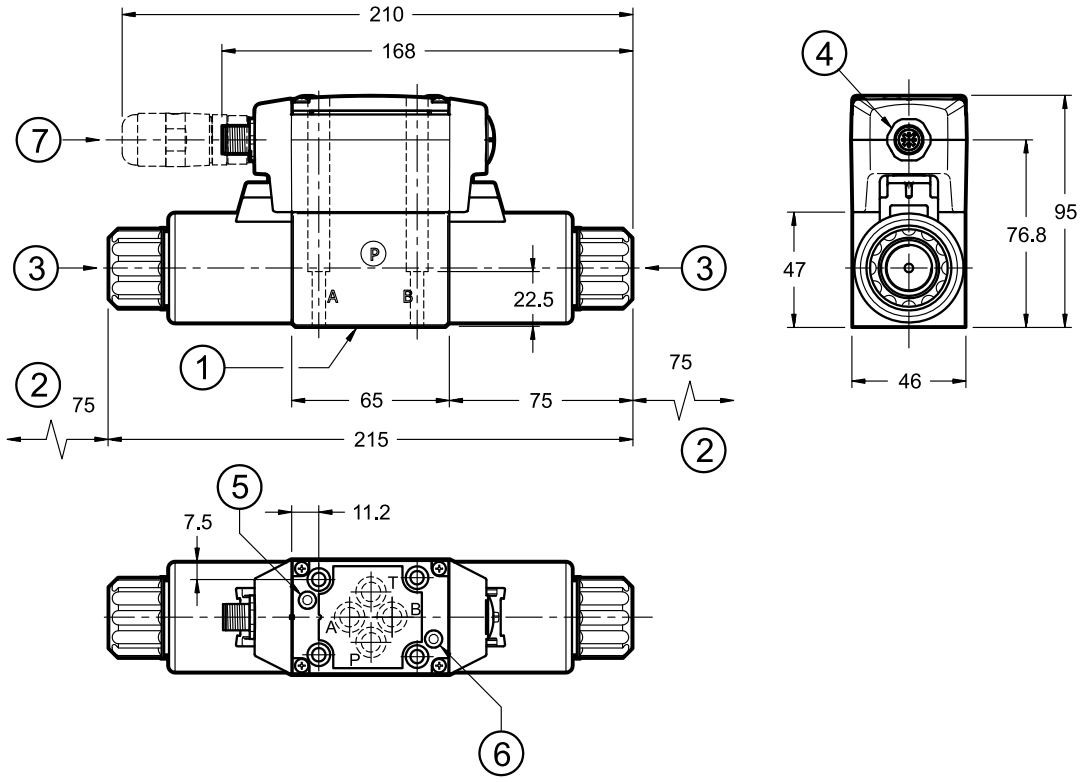


1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Coil removal space (solenoid B only)
3	Manual override by pin embedded in the solenoid tube
4	Main connection 6 pin + PE
5	Mating connector 6 poles + PE , female type MIL-5015-G **To be ordered separately.** See catalogue 89 000

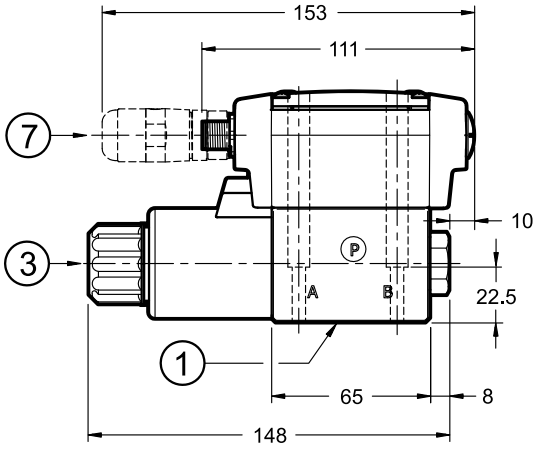
Fastening bolts: 4 bolts M5x30 - ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

9 - DSE3GL - OVERALL AND MOUNTING DIMENSIONS

DSE3GL-/K12**



DSE3GL-*SA/K12



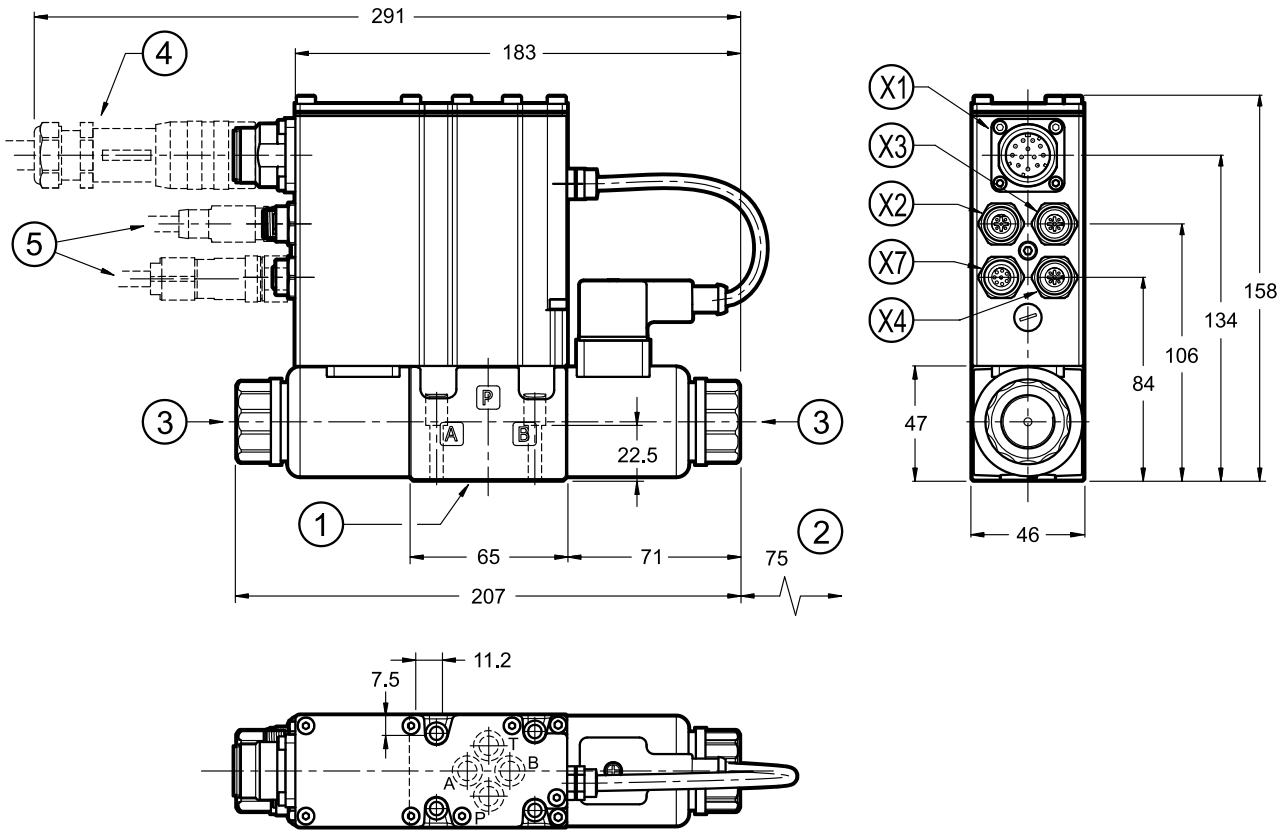
1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Coil removal space
3	Standard manual override embedded in the solenoid tube
4	Connection M12 A 5 pin
5	L1 LED
6	L2 LED
7	Mating connector M12 5 poles - code A, female **To be ordered separately.** See catalogue 89 000

Fastening bolts: 4 bolts M5x30- ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

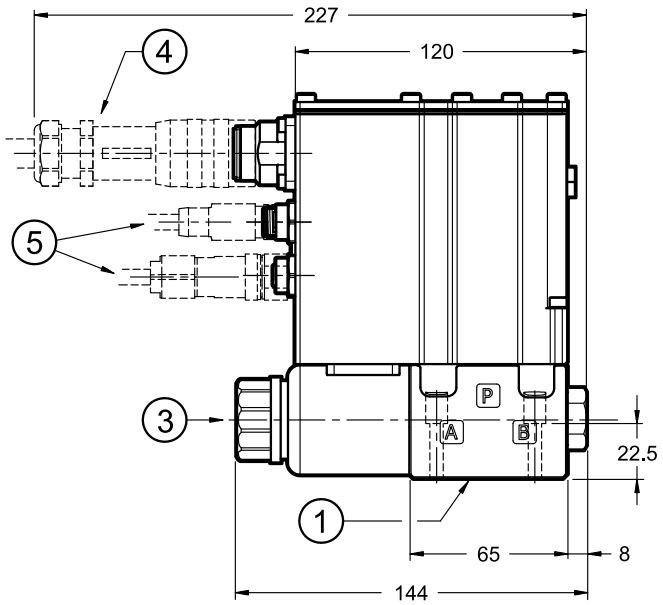
10 - DSE3GH - OVERALL AND MOUNTING DIMENSIONS

DSE3GH-/K16**

dimensions in mm



DSE3GH-*SA/K16



X1	Main connection 11 pin + PE
X2	Fieldbus communication (IN)
X3	Fieldbus communication (OUT)
X4	X4 connection for analogue transducer
X7	X7 connection for digital transducer

1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Coil removal space (solenoid B only)
3	Manual override by pin integrated in the solenoid tube
4	Mating connector 11 poles + PE **To be ordered separately.** See catalogue 89 000
5	Mating connectors for fieldbus communication and signals **To be ordered separately.** See catalogue 89 000

Fastening bolts: 4 bolts M5x30 - ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

NOTE: Depending on the chosen version, X4 and X7 connections may not be present.
Please refer to section 5 for connection descriptions and pinout.

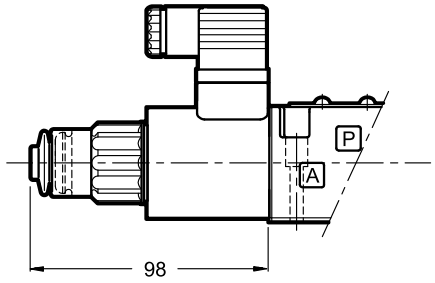
11 - MANUAL OVERRIDES

These valves have solenoids whose pin for manual operation is integrated in the tube. Actuate this override by pushing it with a suitable tool, minding not to damage the sliding surface.

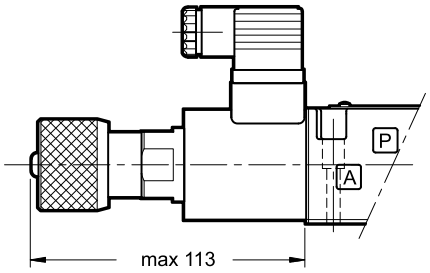
Three other types of manual overrides can fit the DSE3GL valve:

- **CM** version, manual override boot protected
- **CK1** version, turning knob override.
- **CS** version, with metal ring nut provided with a M8 screw and locknut.

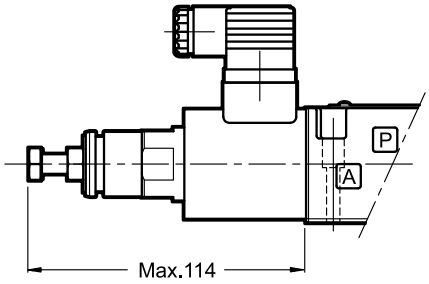
CM Version - Code: 3401150006



CK1 Version - Code: 3401150031



CS Version - Code: 3803210006



12 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

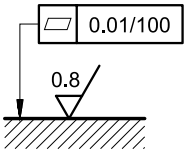
13 - INSTALLATION

DSE3G* valves can be installed in any position without impairing correct operation. Ensure that there is no air in the hydraulic circuit.

Valves are fixed by means of screws or tie rods on a lapped surface with planarity and roughness equal to or better than those indicated in the drawing.

If minimum values are not observed, fluid can easily leak between the valve and the mounting interface.

Surface finishing



14 - ACCESSORIES

(to be ordered separately)

14.1 - Mating connectors

Mating connectors must be ordered separately. See catalogue 89 000.

For K11 and K16 versions we recommend the choice of a metal connector to avoid electromagnetic disturbances and to comply with EMC regulations on electromagnetic compatibility. If you opt for a plastic connector, make sure that it guarantees and maintains the IP and EMC protection characteristics of the valve.

14.2 - Mating connectors and caps for fieldbus communication and for sensors.

Duplomatic offers spare parts to be wired and also ready-to-use cord sets. Please refer to cat. 89 000.

14.3 - Connection cable

The optimal wiring provides for 7 isolated conductors, with separate screen for the signal wires (command, monitor) and an overall screen.

Cross section for power supply:

- up to 20 m cable length : 1,0 mm²
- up to 40 m cable length : 1,5 mm² (IO-Link excluded)

Cross section for signals (command, monitor):

- 0,50 mm²

14.4 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic. See catalogue 89 850.

15 - SUBPLATES

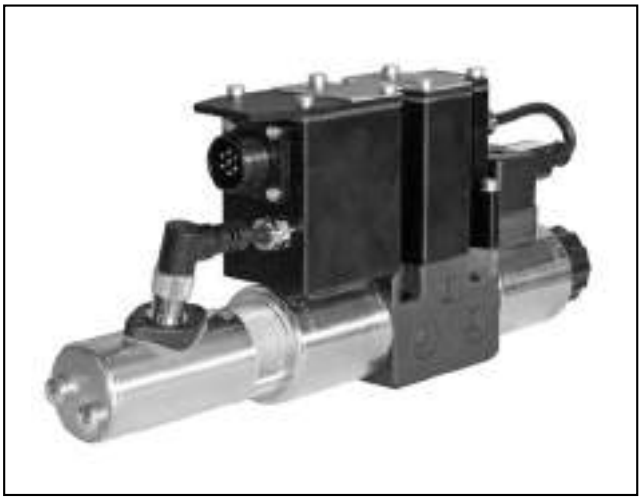
(see catalogue 51 000)

PMMD-AI3G rear ports
PMMD-AL3G side ports
Ports dimensions: P, T, A, B: 3/8” BSP

DUPLOMATIC MOTION SOLUTIONS
a member of DAIKIN group

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duplomaticmotionsolutions.com

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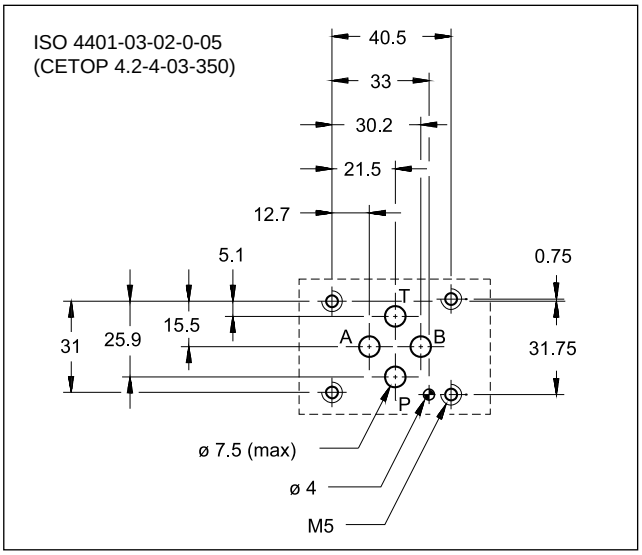
DSE3J*

PROPORTIONAL DIRECTIONAL VALVE WITH FEEDBACK AND INTEGRATED ELECTRONICS

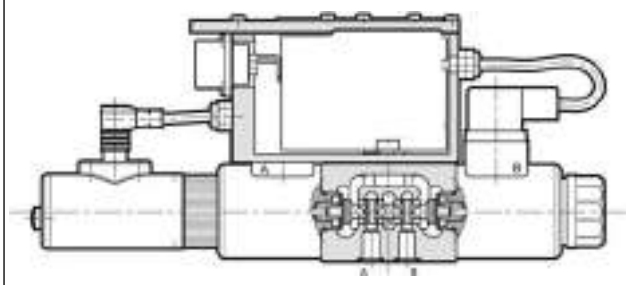
SUBPLATE MOUNTING ISO 4401-03

p max **350** bar
Q max **80** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



— The DSE3J* are proportional directional valves, direct operated, with closed loop position control. The mounting interface is in compliance with ISO 4401 standards.

— The valve opening and hence flow rate can be modulated continuously in proportion to the reference signal. Transducer and digital card allow a fine control of the spool position, reducing both hysteresis and response times and optimizing the valve performance.

— The valves are available with different types of electronics, with analogue or fieldbus interfaces.

— The fail safe function is available for spools type Z.

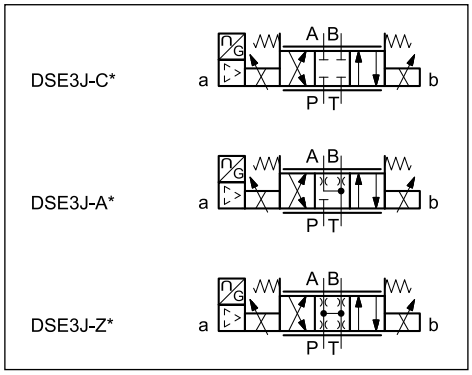
— Valves are easy to install. The driver manages digital settings directly.

PERFORMANCES

(Mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

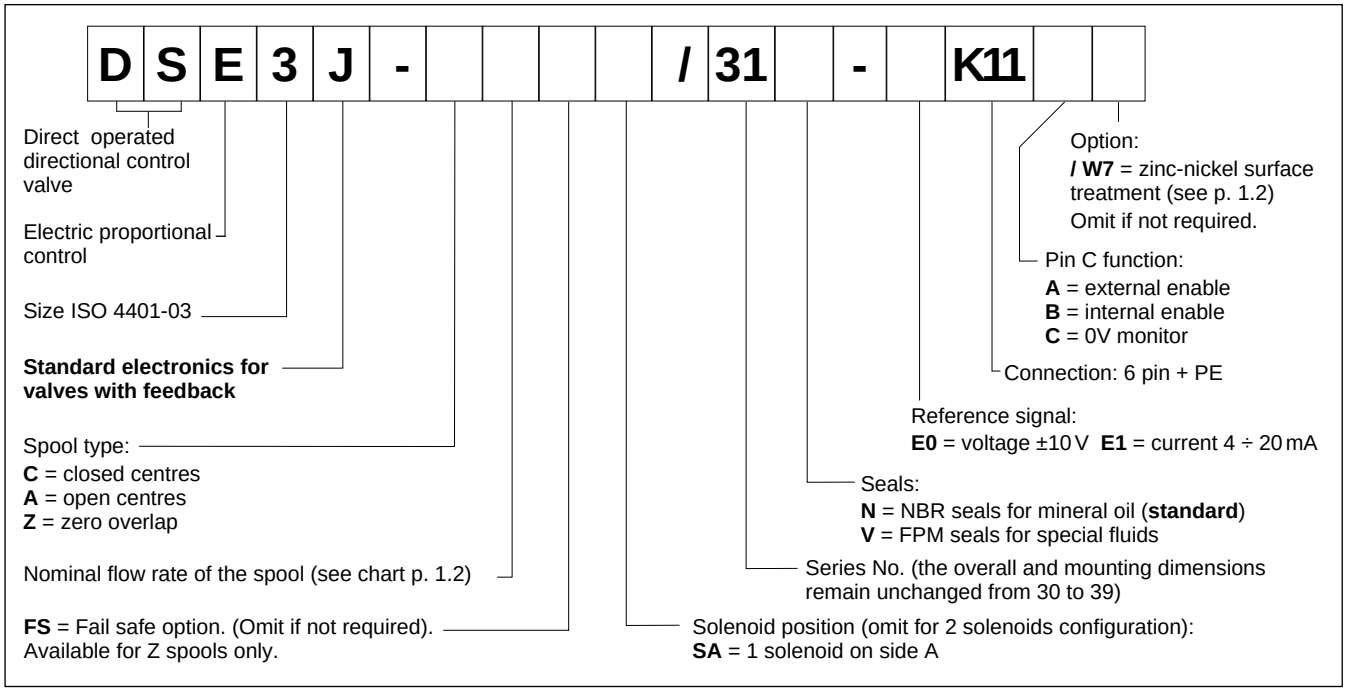
Max operating pressure: P - A - B ports T port	bar	350 210
Nominal flow with Δp 10 bar P-T	l/min	1 - 4 - 12 -18 - 30
Response times	see point 7	
Hysteresis	% of Q_{max}	< 0.2%
Repeatability	% of Q_{max}	< 0.2%
Threshold		< 0.1%
Valve reproducibility		≤ 5%
Electrical characteristics	see point 3	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	according to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass: single solenoid valve double solenoid valve	kg	2.2 2.7

HYDRAULIC SYMBOLS (typical)



1 - IDENTIFICATION CODE

1.1 - Standard electronics



1.2 - Surface treatments

The standard valve is supplied with surface treatment of phosphating black. The zinc-nickel finishing on the valve body makes the valve suitable to ensure a salt spray resistance up to 240 hours. (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

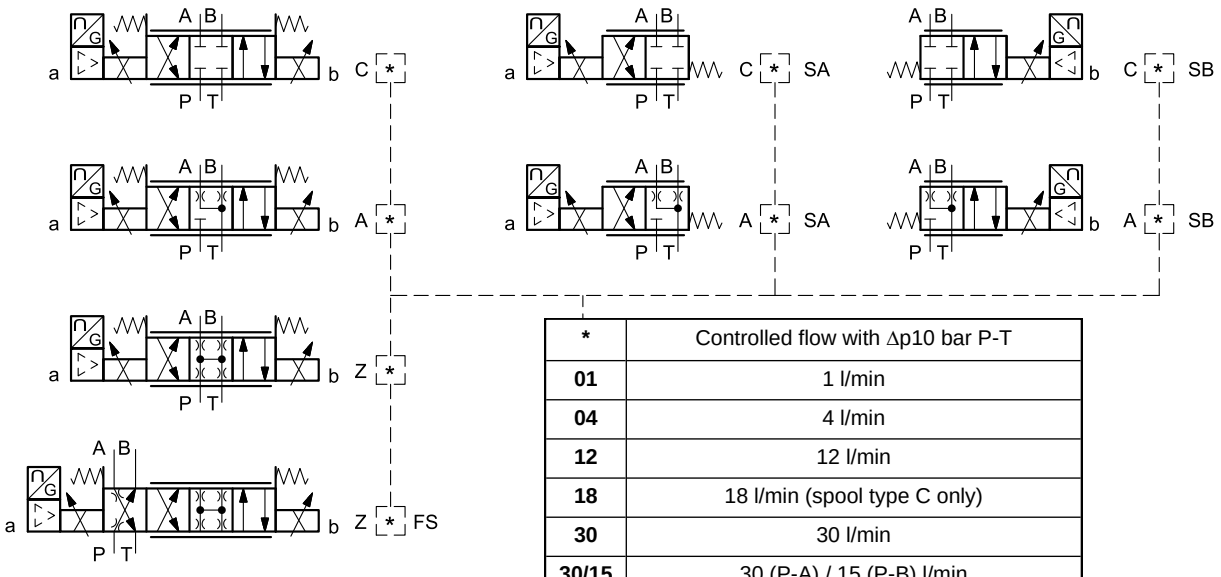
1.3 - Configurations

Valve configuration depends on the combination of the following elements: number of proportional solenoids, spool type, rated flow.

Configuration 2 solenoids (**NOTE**):
3 positions with spring centering

Configuration 1 solenoid on side A "**SA**":
2 positions (central + external)
with spring centering
(for DSE3J and DSE3JH only)

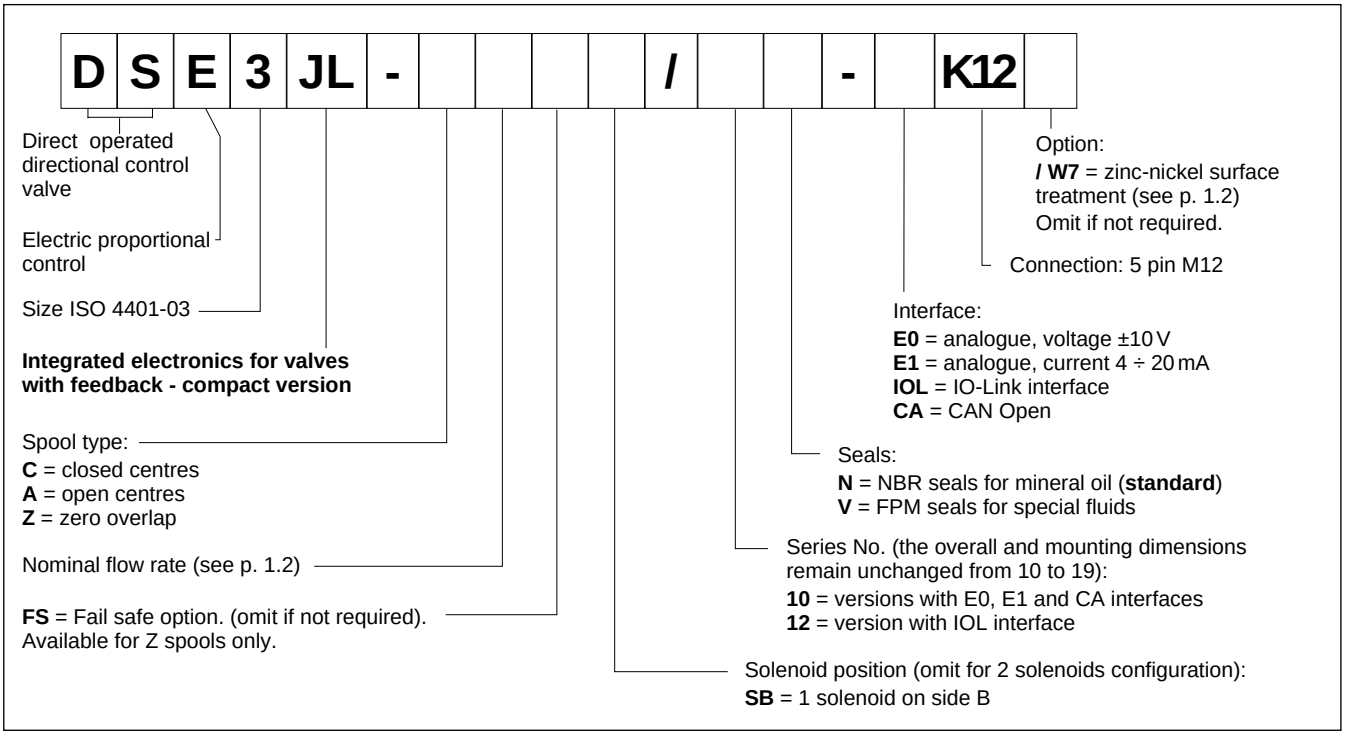
Configuration 1 solenoid on side B "**SB**":
2 positions (central + external)
with spring centering
(for DSE3JL only)



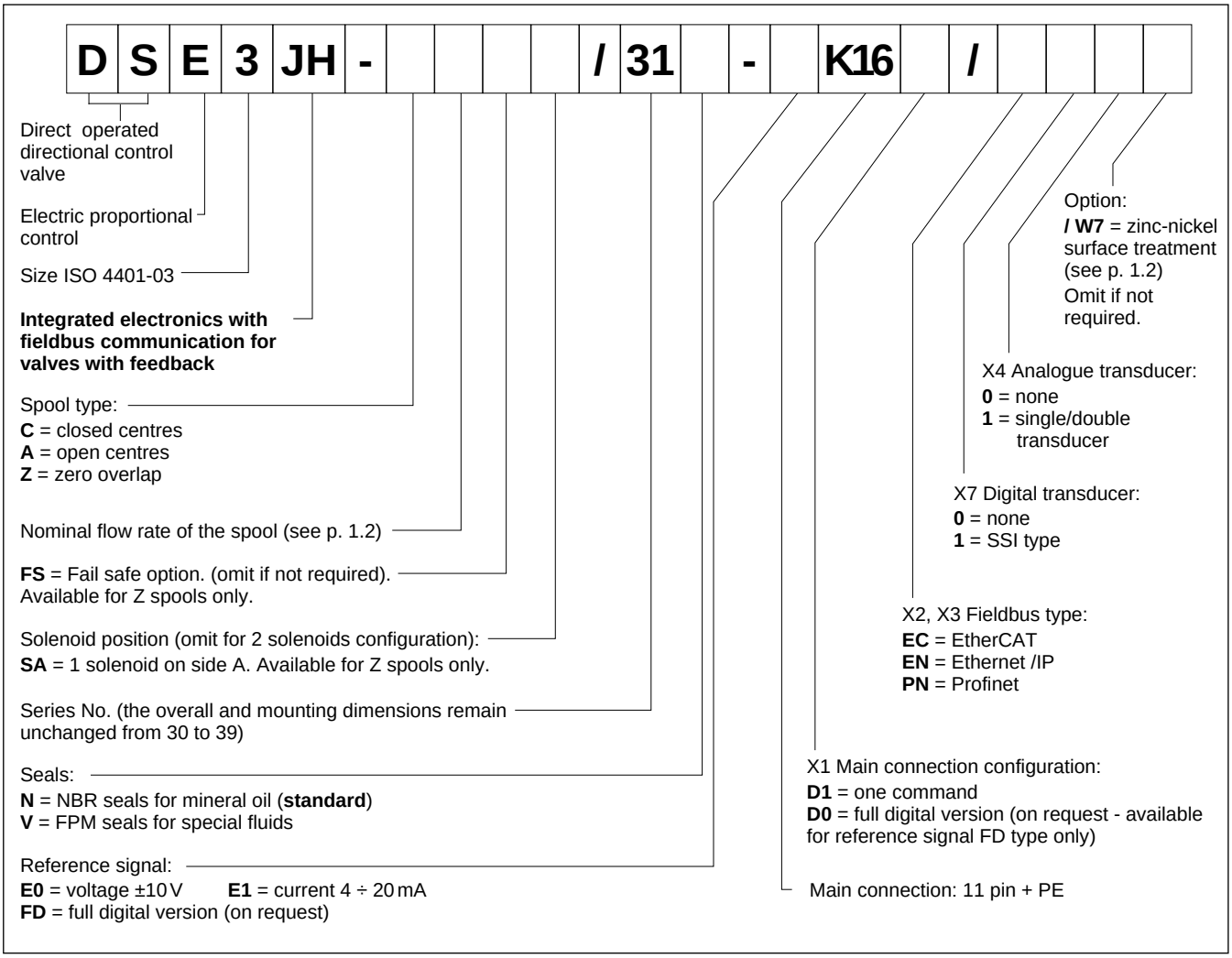
*	Controlled flow with Δp10 bar P-T
01	1 l/min
04	4 l/min
12	12 l/min
18	18 l/min (spool type C only)
30	30 l/min
30/15	30 (P-A) / 15 (P-B) l/min

NOTE: On DSE3JL the feedback is placed at side b

1.4 - Compact electronics



1.5 - Electronics with fieldbus communication



2 - ELECTRONICS COMMON DATA

Duty cycle		100% (continuous operation)
Protection class according to EN 60529		IP65 / IP67 (**NOTE**)
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	25
Maximum solenoid current	A	1.88
Fuse protection, external	A	3
Managed breakdowns		Overload and electronics overheating, LVDT sensor error, cable breakdown, supply voltage failure
Electromagnetic compatibility (EMC) emissions EN 61000-6-4, immunity EN 61000-6-2		According to 2014/30/EU standards

NOTE: The IP degree is guaranteed only with mating connector of equivalent IP degree, installed and tightened correctly. Moreover, on the JH versions it is necessary to protect any unused connections with caps.

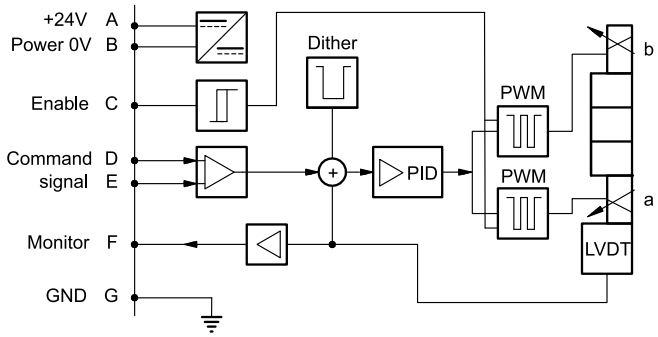
3 - DSE3J - STANDARD ELECTRONICS

3.1 - Electrical characteristics

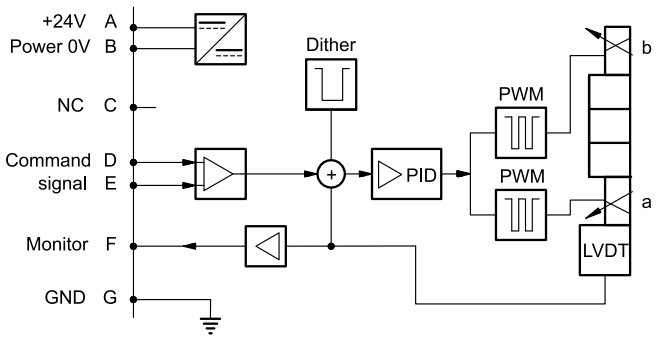
Command signal:	voltage (E0) current (E1)	V DC mA	±10 (impedance Ri > 11 kOhm) 4 ÷ 20 (impedance Ri = 58 Ohm)
Monitor signal:	voltage (E0) current (E1)	V DC mA	±10 (impedance Ro > 1 kOhm) 4 ÷ 20 (impedance Ro = 500 Ohm)
Communication for diagnostic			LIN-bus Interface (by means of the optional kit)
Connection			6 pin + PE (MIL-C-5015-G - DIN EN 175201-804)

3.2 - On-board electronics diagrams

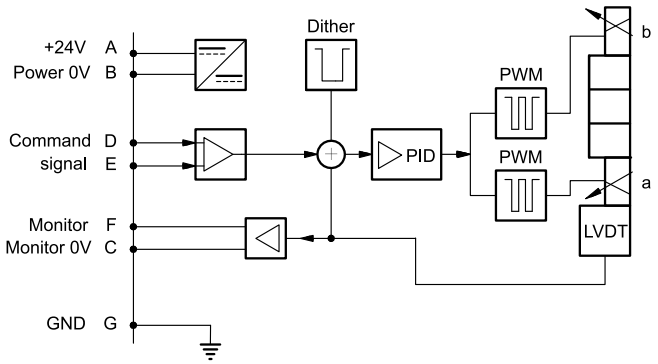
VERSION A - External Enable



VERSION B - Internal Enable

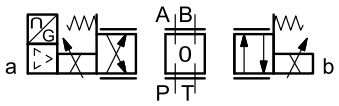


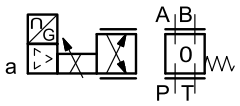
VERSION C - 0V Monitor

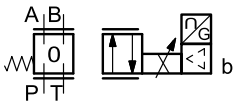


3.3 - Versions with voltage command (E0)

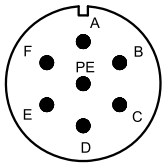
The reference signal is between -10V and +10V on double solenoid valve, and 0 ÷ 10V on single solenoid valve SA. The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.

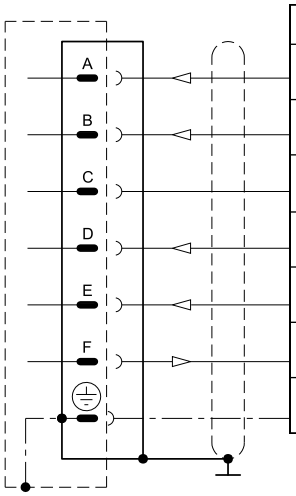






COMMAND	**-10V**	**0V**	**+10V**	**+10V**	**0V**	**0V** **+10V**
MONITOR	**-10V**	**0V**	**+10V**	**+10V**	**0V**	**0V** **+10V**



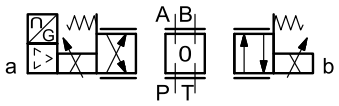


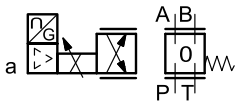
Pin	Values	version A	version B	version C
A	24 V DC	Supply voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	± 10 V	Command		
E	0 V	Command reference		
F	± 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

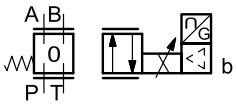
3.4 - Versions with current command (E1)

The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower, the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

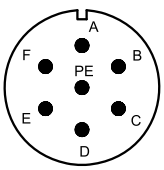
The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.

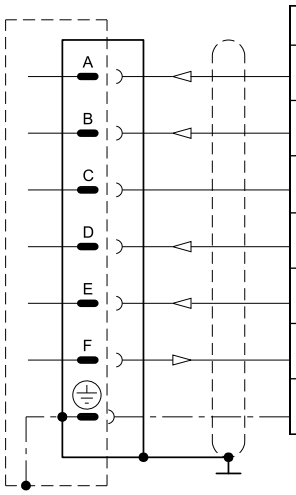






COMMAND	**4 mA**	**12 mA**	**20 mA**	**20 mA**	**4 mA**	**4 mA** **20 mA**
MONITOR	**4 mA**	**12 mA**	**20 mA**	**20 mA**	**4 mA**	**4 mA** **20 mA**





Pin	Values	version A	version B	version C
A	24 V DC	Supply voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	Command reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

4 - DSE3JL - COMPACT ELECTRONICS

In IO-Link networks, the length of the connecting cables is limited to 20 metres. In CA versions, pin 3 and pin 5 are galvanic isolated up to 100 V to avoid earth loops.

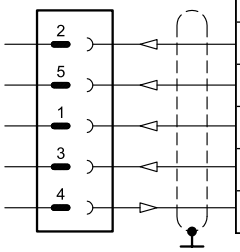
4.1 - Electrical characteristics

Command signal: voltage (E0) current (E1)	V DC mA	±10 (impedance Ri > 11 kOhm) 4 ÷ 20 (impedance Ri = 58 Ohm)
Monitor signal : voltage (E0) current (E1)	V DC mA	0 ÷ 5 (impedance Ro > 1 kOhm) 4 ÷ 20 (impedance Ro = 500 Ohm)
IO-Link communication (IOL): Data rate	 kBaud	IO-Link Port Class B 38.4
Can Open communication (CA): Data rate	 kbit	 10 ÷ 1000
Data register (IOL and CA versions only)		card voltage supply, solenoid faults (shortcircuit, bad configuration), box temperature.
Connection		5-pin M12 code A (IEC 61076-2-101)

4.2 - Pin tables

'E0' connection

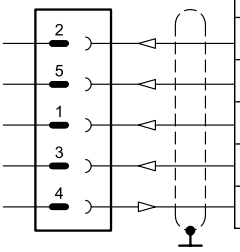




Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	± 10 V	Command
3	0V	Command reference
4	0 ÷ 5V	Monitor (0V reference: pin 5)

'E1' connection

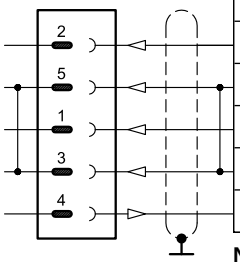




Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	4 ÷ 20 mA	Command
3	0V	Command reference
4	4 ÷ 20 mA	Monitor (0V reference: pin 5)

'IOL' connection



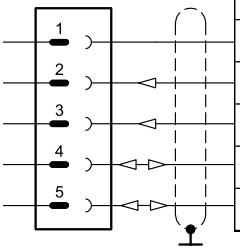


Pin	Values	Function
2	2L+ 24 V DC	Solenoid supply voltage
5	2L- 0 V (GND)	
1	1L+ +24 V DC	Logic and IO-Link supply voltage
3	1L- 0V (GND)	
4	C/Q	IO-Link Communication

NOTE: Pin 3 and pin 5 are linked with each other in the valve electronics. The reference potentials 1L- and 2L- of the two supply voltages must also be linked with each other on the customer side.

'CA' connection





Pin	Values	Function
1	CAN_SH	Shield
2	24 V DC	Supply voltage
3	0 V (GND)	
4	CAN H	Bus line (high)
5	CAN_L	Bus line (low)

5 - DSE3JH - FIELDBUS ELECTRONICS

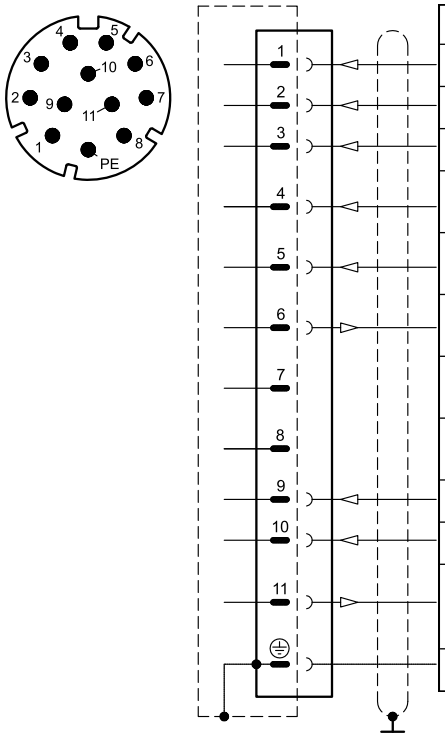
The 11+ PE pin connection allows separate supply voltage for electronics and solenoids.

Command - valve position schemes as for the standard electronics. Please refer to pictures in p. 3.3 and 3.4.

5.1 - Electrical characteristics

Command signal:	voltage (E0) current (E1) digital (FD)	V DC mA	±10 (impedance Ri > 11 kOhm) 4 ÷ 20 (impedance Ri = 58 Ohm) via fieldbus
Monitor signal:	voltage (E0) current (E1)	V DC mA	±10 (impedance Ro > 1 kOhm) 4 ÷ 20 (impedance Ro = 500 Ohm)
Communication / diagnostic			via Bus register
Communication interface standards			IEC 61158
Communication physical layer			fast ethernet, insulated 100 Base TX
Power connection			11 pin + PE (DIN 43651)

5.2 - X1 Main connection pin table



D1: one command

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	± 10 V (E0) 4 ÷ 20 (E1)	Command
5	0 V	Command reference signal
6	± 10 V (E0) 4 ÷ 20 (E1)	Monitor (0V reference pin 10)
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V reference pin 2)
12	GND	Ground (Earth)

D0: full digital

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	NC	do not connect
5	NC	do not connect
6	NC	do not connect
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V ref. pin 2)
12	GND	Ground (Earth)

5.3 - FIELDBUS connections

Please wire following guidelines provided by the related standards communication protocol. Any connections present and not used must be protected with special caps so as not to nullify the protection against atmospheric agents.

X2 (IN) connection: M12 D 4 pin female



Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

X3 (OUT) connection: M12 D 4 pin female



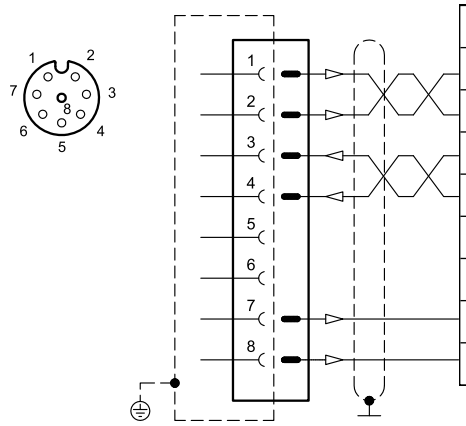
Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

NOTE: Shield connection on connector housing is recommended.

5.4 - Digital transducer connection

X7 connection: M12 A 8 pin female

VERSION 1: SSI type



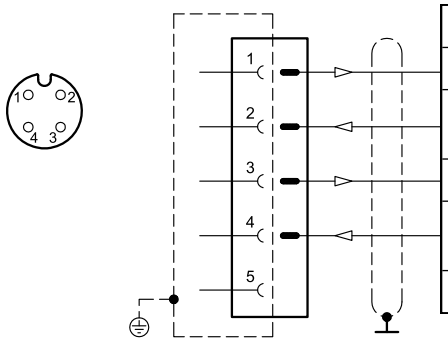
Pin	SSI Values	Function	Notes
1	CLK+	Serial synchronous clock (+)	Input - digital signal
2	CLK-	Serial synchronous clock (-)	
3	MIS0+	Serial position data (+)	
4	MIS0-	Serial position data (-)	
5	NC	-	do not connect
6	NC	-	
7	+24 V	transducer power supply	Output power supply
8	0 V	-	Common GND

5.5 - Analogue transducer connection

X4 connection: M12 A 4 pin female

VERSION 1: single / double transducer

(single or double is a software-selectable option)

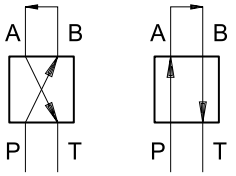


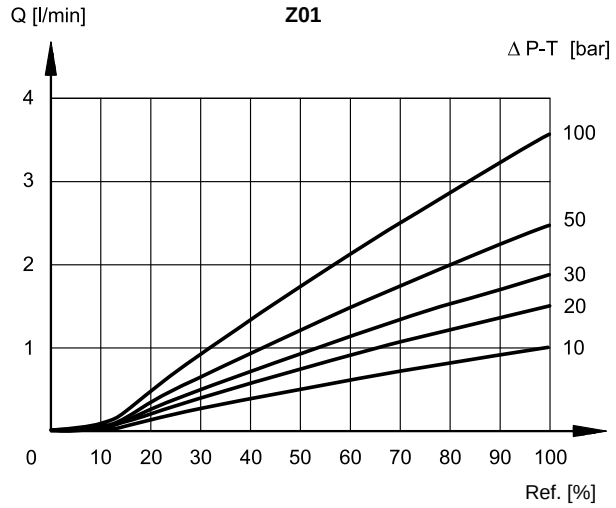
Pin	Values	Notes
1	+24 V	Remote transducer power supply (out) 100 mA
2	±10 V 4 ÷20 mA	Input signal of transducer 1 (range software selectable)
3	0 V	Common reference signal for transducer power and signals
4	±10 V 4 ÷20 mA	Input signal of transducer 2 (range software selectable)
5	-	

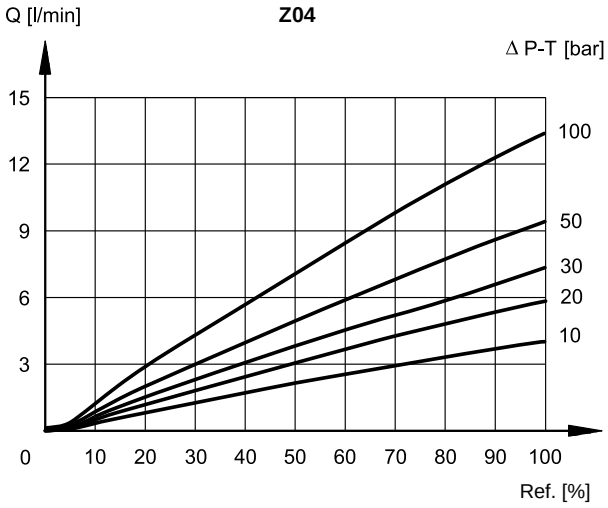
6 - CHARACTERISTIC CURVES

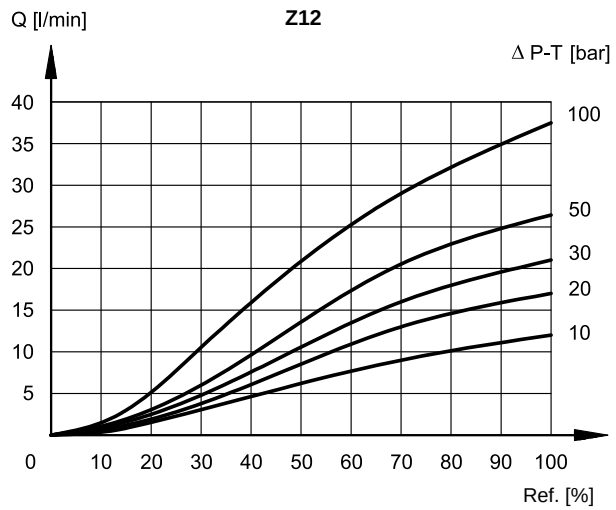
(obtained with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronics)

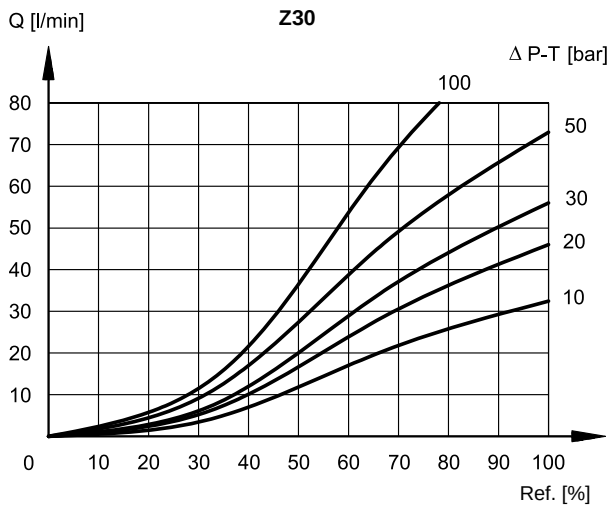
Typical flow rate curves related to the reference signal and measured for the available spools. The Δp values are measured between P and T valve ports.



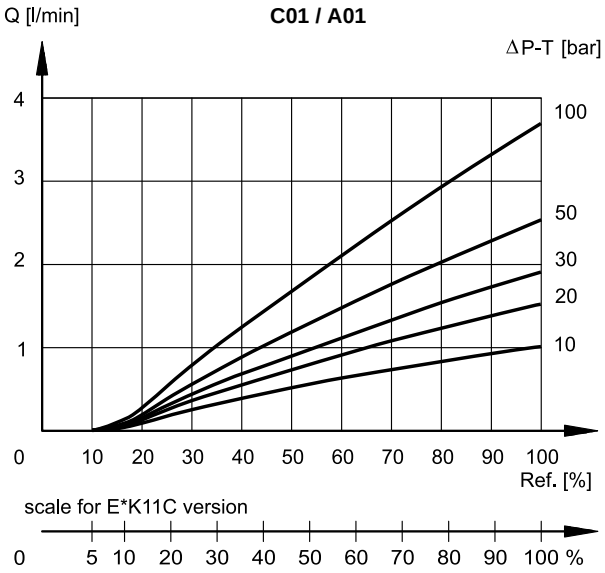




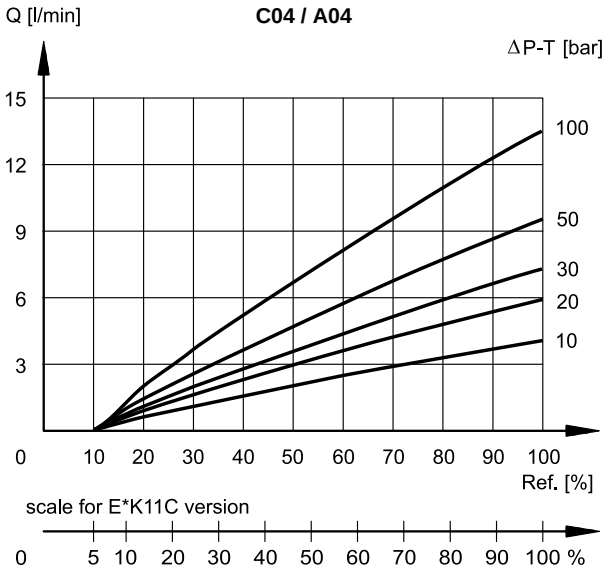




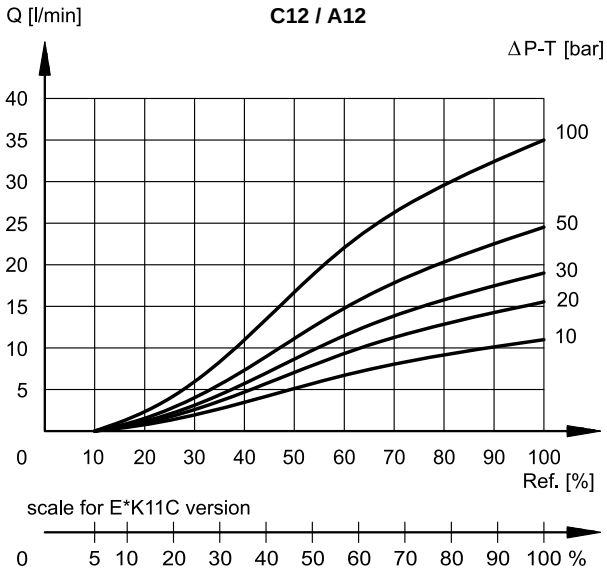
C01 / A01



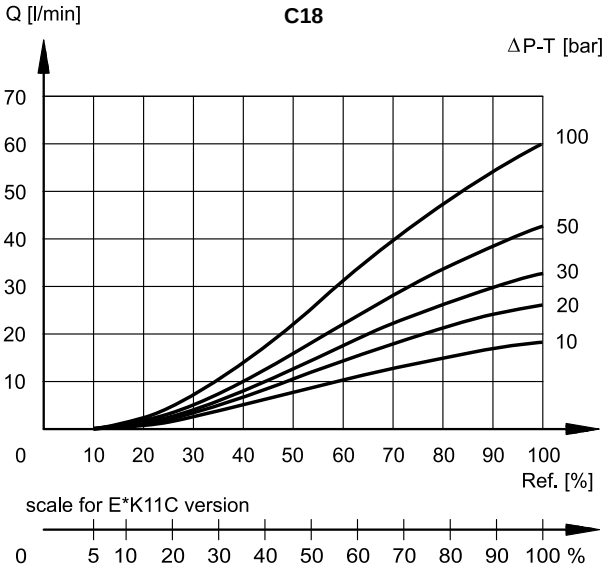
C04 / A04



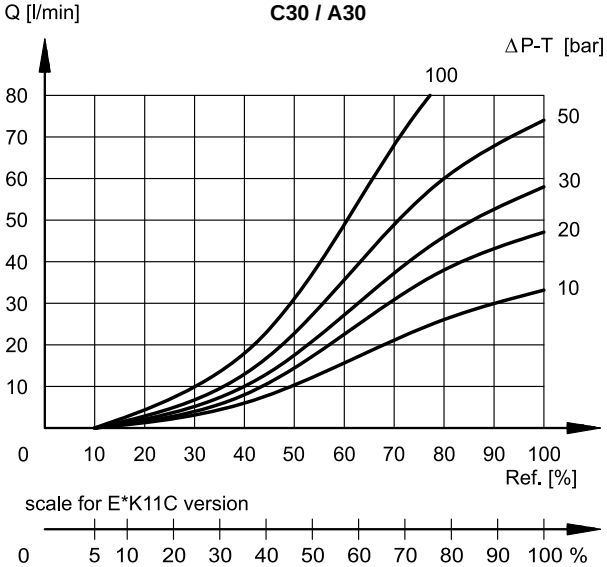
C12 / A12



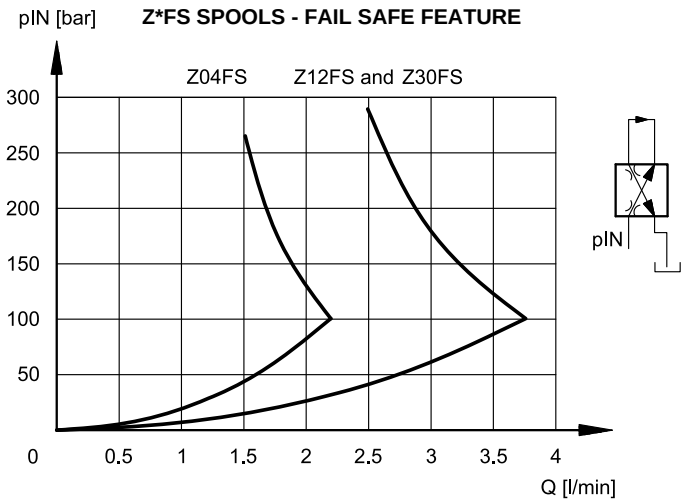
C18



C30 / A30



Z*FS SPOOLS - FAIL SAFE FEATURE

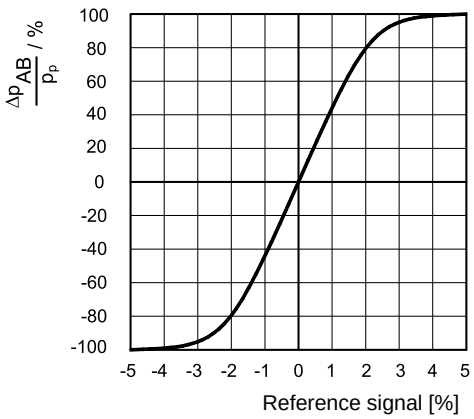


Flow P→B / A→T with valve in fail safe position, depending on the inlet pressure.

When a power failure (enabling OFF) occurs, the valve moves in 'fail safe' position, maintaining a minimum flow that allows the actuator to return slowly to a safe position.

During the black-out the centering springs retain the spool in fail safe-position.

Z SPOOLS - PRESSURE GAIN



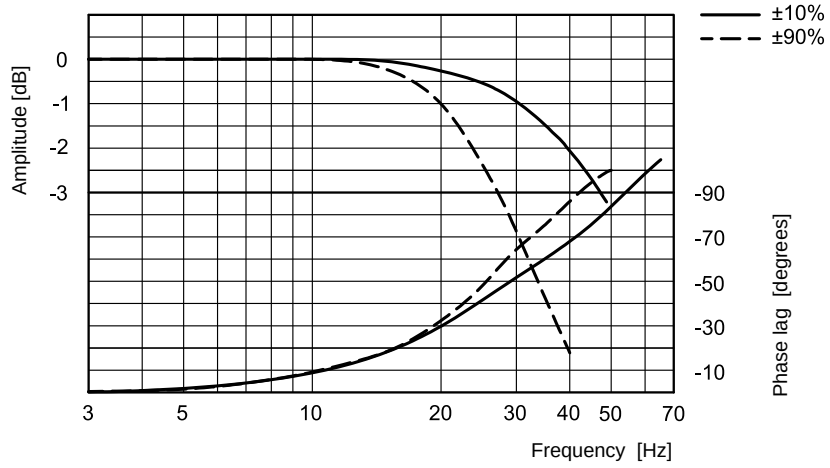
The diagram shows the valve pressure gain, expressed as % of the ratio between the port pressure variation in A or B (Δp AB) and the P system pressure, according to the reference signal.

In practice, the pressure gain states the valve reaction towards external disturbances aimed at changing the actuator position.

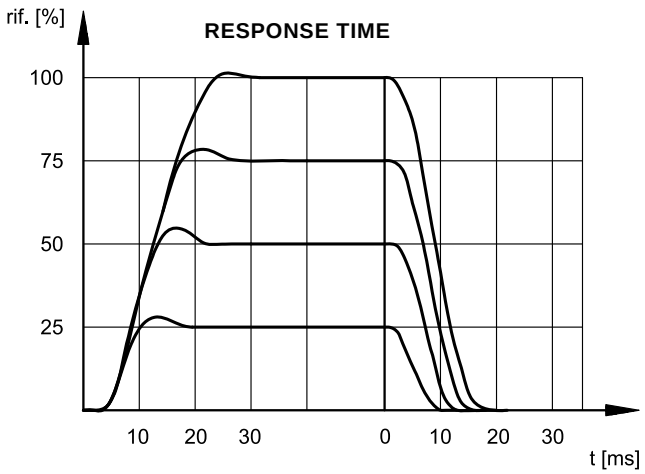
7 - RESPONSE TIMES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and 140 bar Δp P→T)

FREQUENCY RESPONSE (Z SPOOLS)



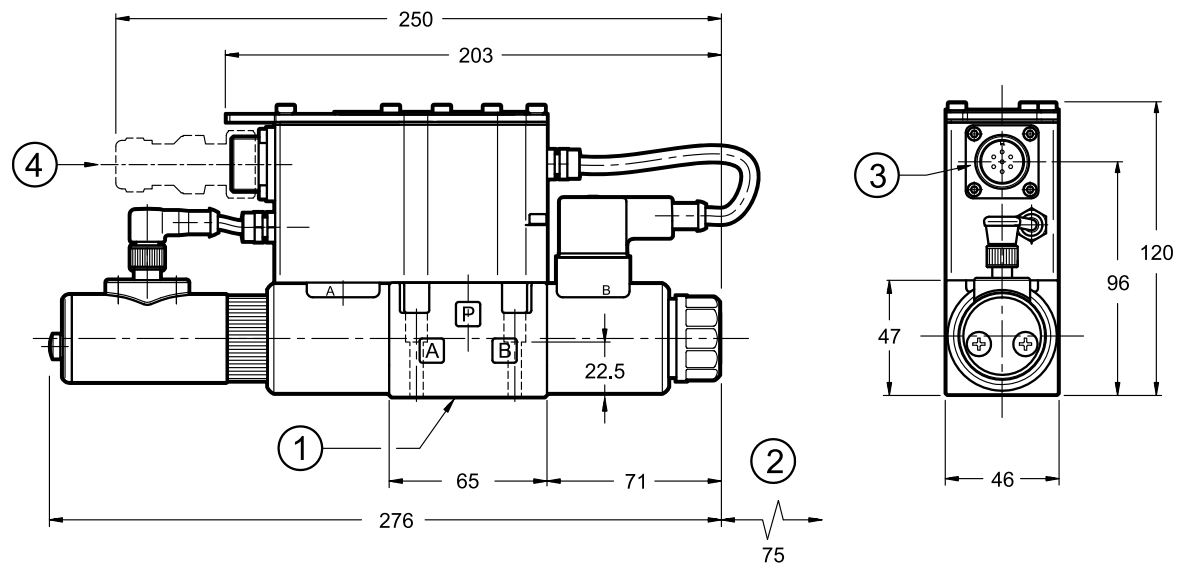
RESPONSE TIME

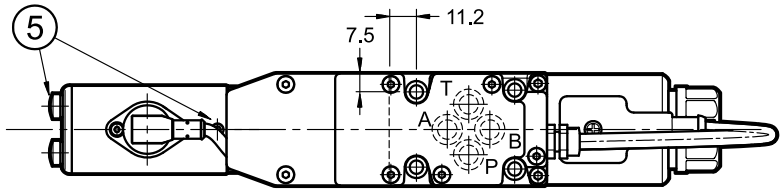


8 - DSE3J - OVERALL AND MOUNTING DIMENSIONS

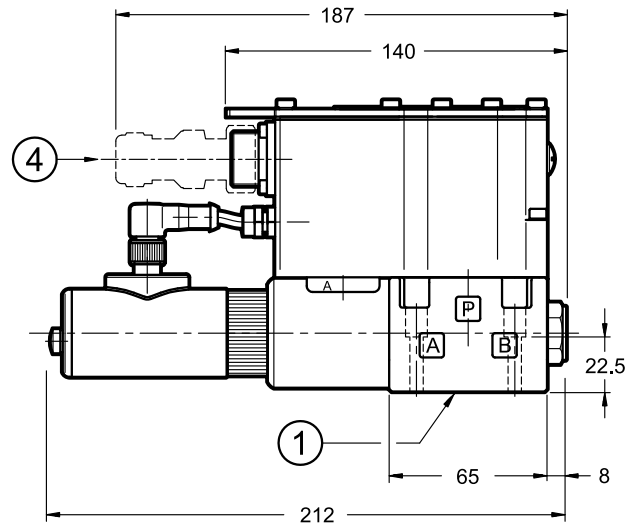
dimensions in mm

DSE3J-/K11**





DSE3J-*SA/K11



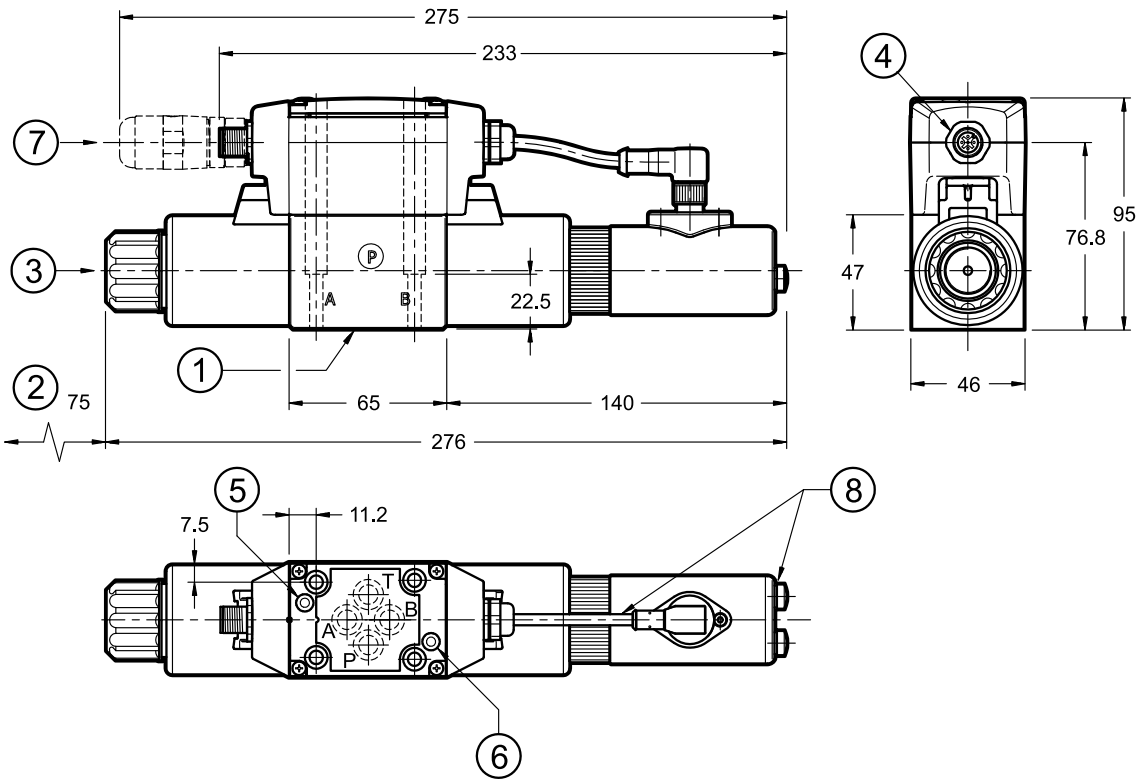
Valve fastening: 4 SHC screws M5x30 - ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Coil removal space (solenoid B only)
3	Main connection 6 pin + PE
4	Mating connector 6 poles + PE, female type MIL-5015-G **To be ordered separately.** See catalogue 89 000
5	Adjustment sealing performed at factory. Do not disassemble the transducer.

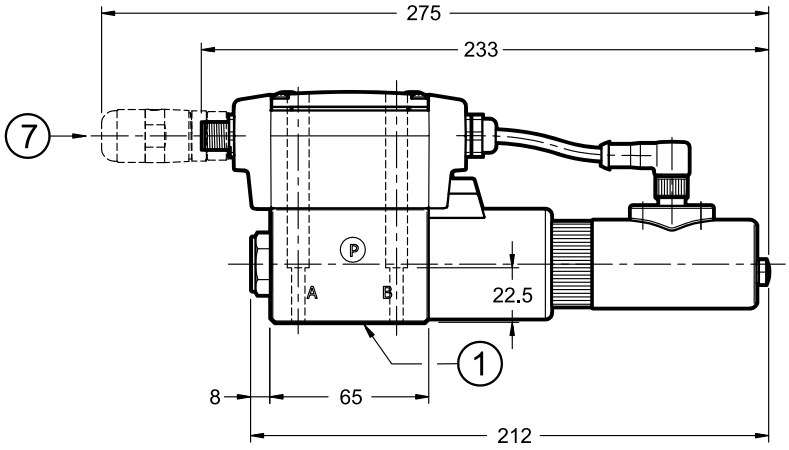
9 - DSE3JL - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

DSE3JL-/K12**



DSE3JL-*SB/K12



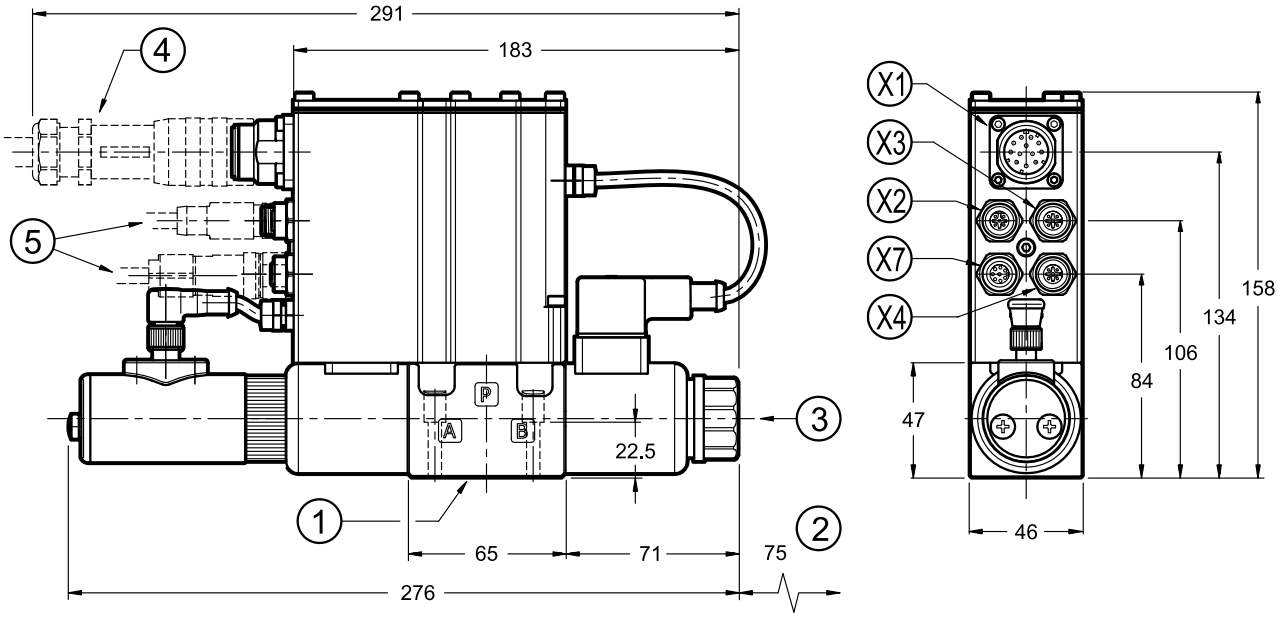
1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Coil removal space
3	Manual override by pin integrated in the solenoid tube
4	Connection M12 A 5 pin
5	L1 LED
6	L2 LED
7	Mating connector M12 5 poles - code A, female. **To be ordered separately.** See catalogue 89 000
8	Adjustment sealing performed at factory. Do not disassemble the transducer.

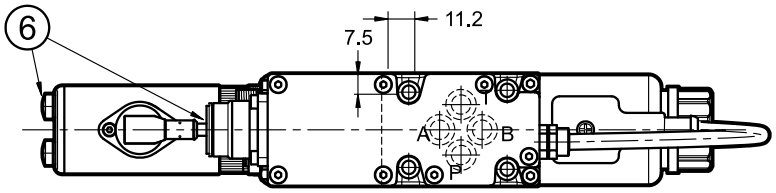
Valve fastening: 4 SHC screws M5x30 - ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

10 - DSE3JH - OVERALL AND MOUNTING DIMENSIONS

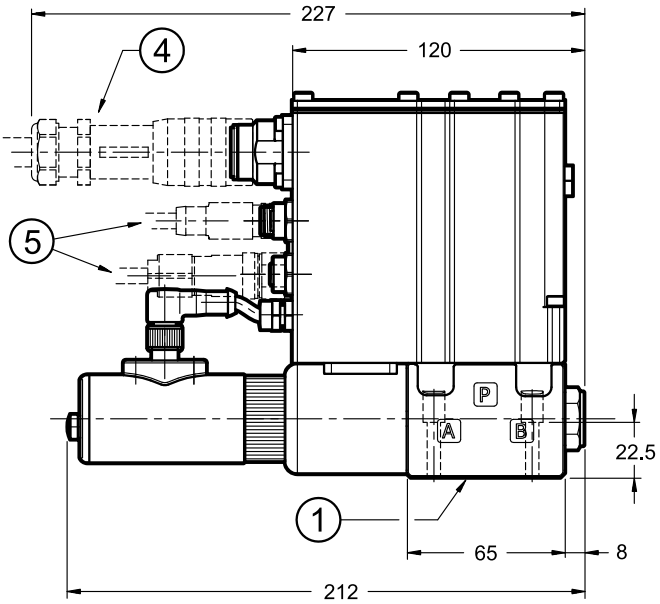
dimensions in mm

DSE3JH-/K16**





DSE3JH-*SA/K16



X1	Main connection 11 pin + PE
X2	Fieldbus communication (IN)
X3	Fieldbus communication (OUT)
X4	X4 connection for analogue transducer
X7	X7 connection for digital transducer

1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Coil removal space (solenoid B only)
3	Manual override by pin integrated in the solenoid tube
4	Mating connector 11 poles + PE **To be ordered separately.** See catalogue 89 000
5	Mating connectors for fieldbus communication and signals **To be ordered separately.** See catalogue 89 000

Valve fastening: 4 SHC screws M5x30 ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

NOTE: Depending on the chosen version, X4 and X7 connections may not be present.
Please refer to section 5 for connection descriptions and pinout.

11 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

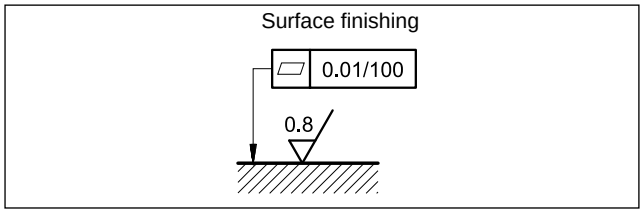
The fluid must be preserved in its physical and chemical characteristics.

12 - INSTALLATION

DSE3J valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.



13 - ACCESSORIES

(to be ordered separately)

13.1 - Mating connectors

Mating connectors must be ordered separately. See catalogue 89 000.

For K11 and K16 versions we recommend the choice of a metal connector to avoid electromagnetic disturbances and to comply with EMC regulations on electromagnetic compatibility. If you opt for a plastic connector, make sure that it guarantees and maintains the IP and EMC protection characteristics of the valve.

13.2 - Mating connectors and caps for fieldbus communication and for sensors.

Duplomatic offers spare parts to be wired and also ready-to-use cord sets. Please refer to cat. 89 000.

13.3 - Connection cable

The optimal wiring provides for 7 isolated conductors, with separate screen for the signal wires (command, monitor) and an overall screen.

Cross section for power supply:
- up to 20 m cable length : 1,0 mm^2
- up to 40 m cable length : 1,5 mm^2 (IO-Link excluded)

Cross section for signals (command, monitor):
- 0,50 mm^2

13.4 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic. See catalogue 89 850.

14 - SUBPLATES

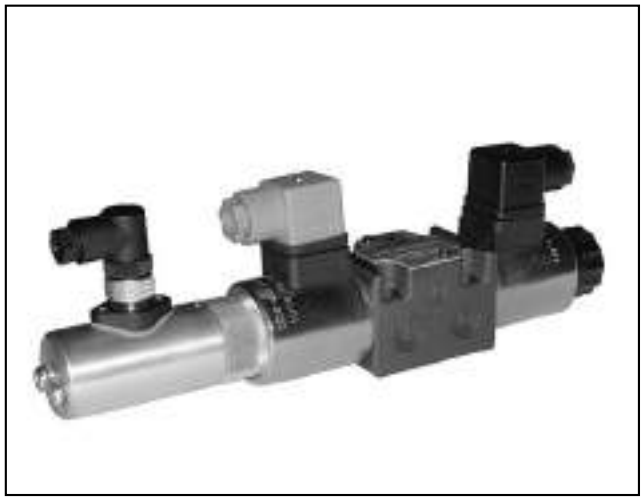
(see catalogue 51 000)

PMMD-AI3G rear ports
PMMD-AL3G side ports
Ports dimensions: P, T, A, B: 3/8” BSP

DUPLOMATIC MOTION SOLUTIONS
a member of DAIKIN group

DUPLOMATIC MS Spa
via Mario Re Depaolini, 24 | 20015 Parabiago (MI) | Italy
T +39 0331 895111 | E vendite.ita@duplomatic.com | sales.exp@duplomatic.com
duplomaticmotionsolutions.com

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DSE3F

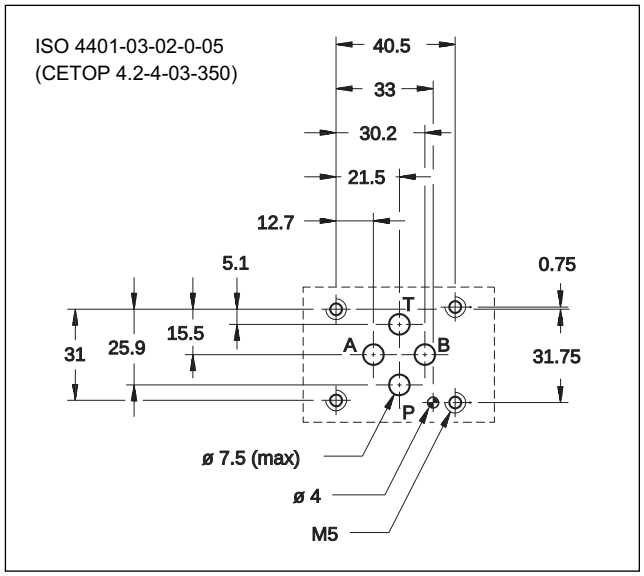
DIRECTIONAL VALVE WITH PROPORTIONAL CONTROL AND ELECTRICAL FEEDBACK

SERIES 11

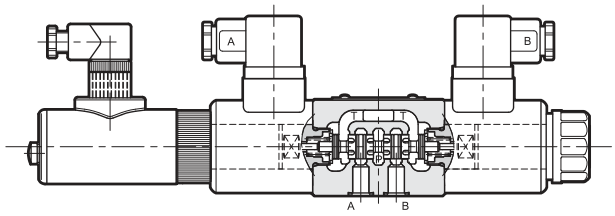
SUBPLATE MOUNTING
ISO 4401-03 (CETOP 03)

p max **350** bar
Q max **40** l/min

MOUNTING SURFACE



OPERATING PRINCIPLE



The DSE3F is a direct operated directional valve with proportional control, electrical feedback and mounting interface in compliance with ISO 4401 (CETOP RP 121H) standards.

— It is normally used to control position and the speed of hydraulic actuators.

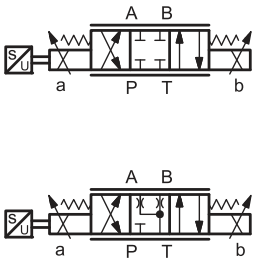
— The valve opening and hence flow rate can be modulated continuously in proportion to the reference signal.

— The valve must be controlled directly by the UEIK-*RSD digital card (see par.9), that maximize the valve performances: the input signal and the signal from the valve are compared to obtain an accurate positioning and a reduces hysteresis.

PERFORMANCES (Obtained with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronic)

Max operating pressure: - P - A - B ports - T port	bar	 350 210
Nominal flow with Δp 10 bar P-T	l/min	8 - 16 - 26
Response times	see paragraph 6	
Hysteresis	% of Q_{max}	< 1,5 %
Repeatability	% of Q_{max}	< 1 %
Electrical characteristics, IP	see paragraph 5	
Valve reproducibility		< 5%
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	according to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass: single solenoid valve double solenoid valve	kg	1,9 2,3

HYDRAULIC SYMBOLS (typical)



1 - IDENTIFICATION CODE

D	S	E	3	F	-				/	11		-	D12	K1

Direct operated directional control valve

Electric proportional control

Size ISO 4401-03 (CETOP 03)

Position feedback

Spool type:
C = closed centres
A = open centres

Nominal flow rate:
08 = 8 l/min
16 = 16 l/min
26 = 26 l/min

Solenoid position (omit for configuration with two solenoids):
SA = 1 solenoid on side A

Coil electrical connection:
plug for connector type DIN 43650 (**standard**)

Nominal solenoid voltage 12 VDC

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

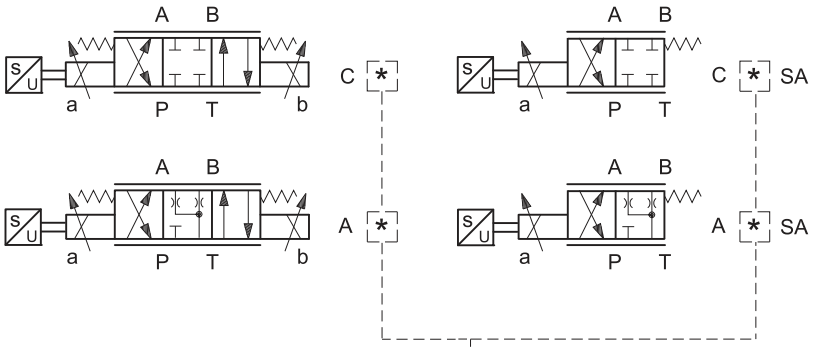
Series No. (the overall and mounting dimensions remain unchanged from 10 to 19)

2 - CONFIGURATIONS

Valve configuration depends on the combination of the following elements:
number of proportional solenoids, spool type, rated flow.

Configuration 2 solenoids :
3 positions with spring centering

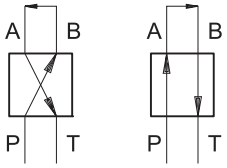
Configuration 1 solenoid on side A "**SA**":
2 positions (central + external) with spring centering



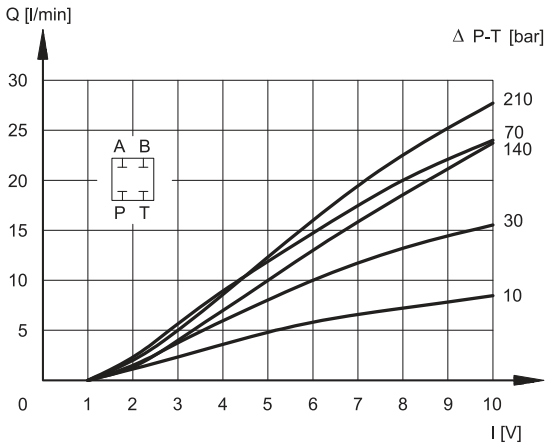
*	Controlled flow with Δp10 bar P-T
08	8 l/min
16	16 l/min
26	26 l/min

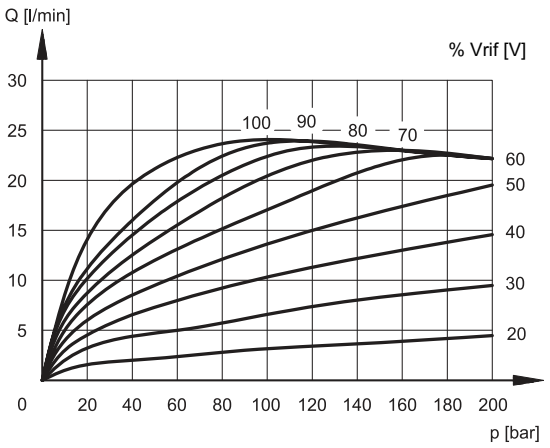
3 - CHARACTERISTIC CURVES (obtained with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronics)

Typical flow rate curves at constant Δp related to the reference signal and measured for the available spools. The Δp values are measured between P and T valve ports.

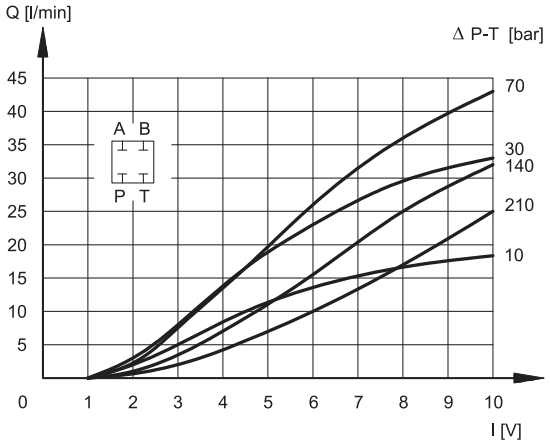


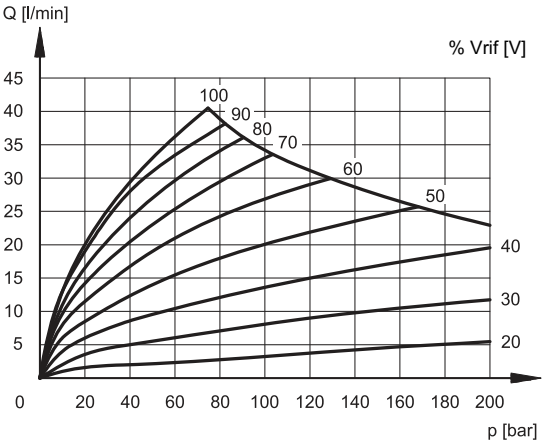
SPOOL C08



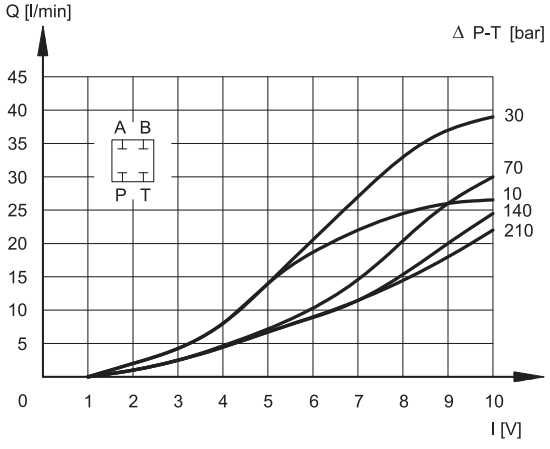


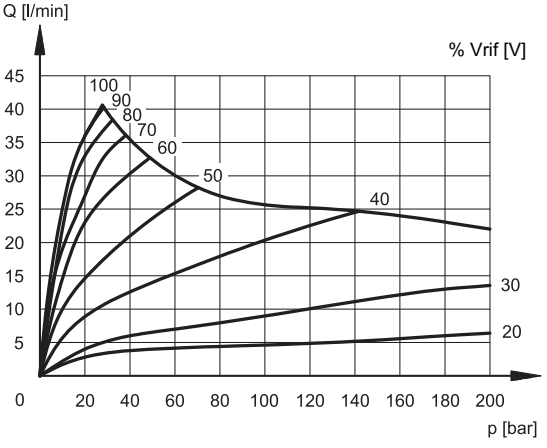
SPOOL C16



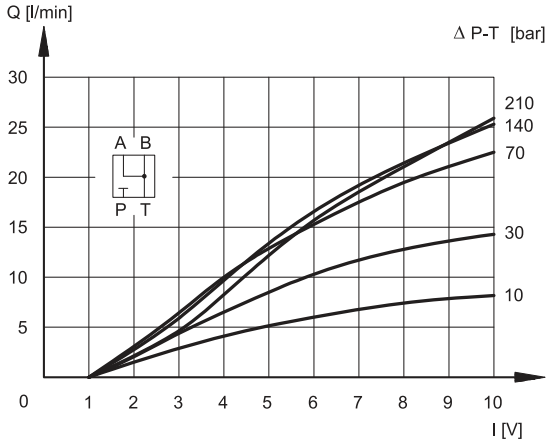


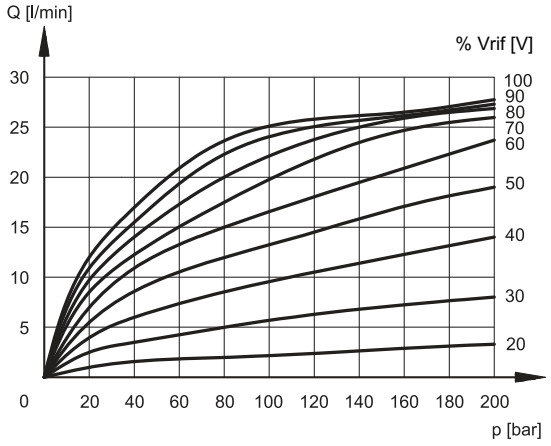
SPOOL C26



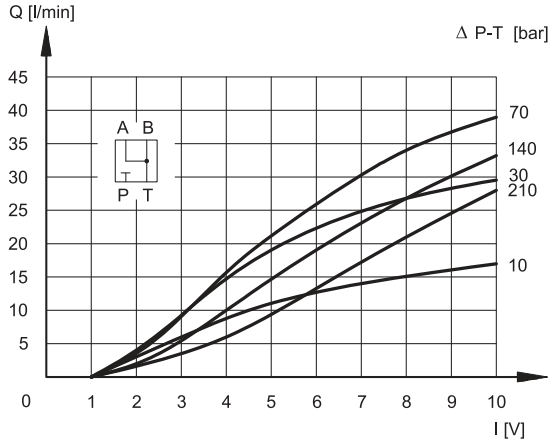


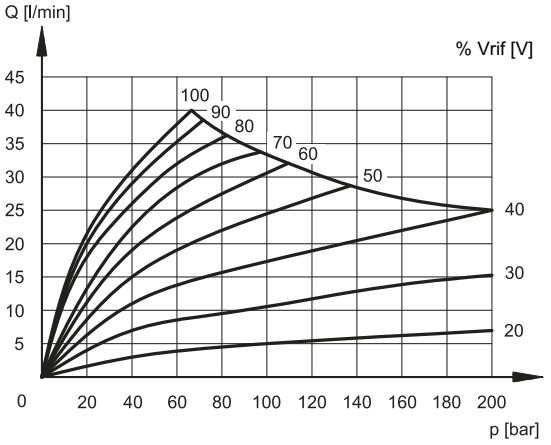
SPOOL A08



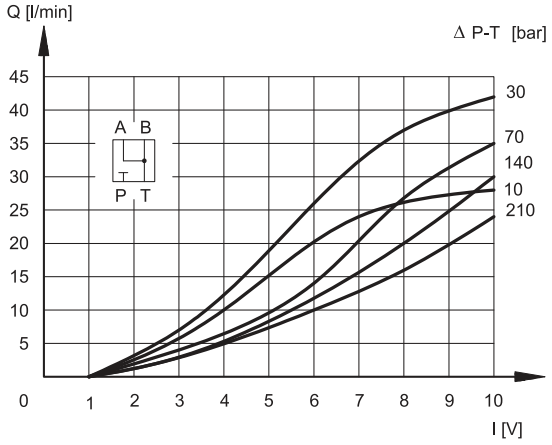


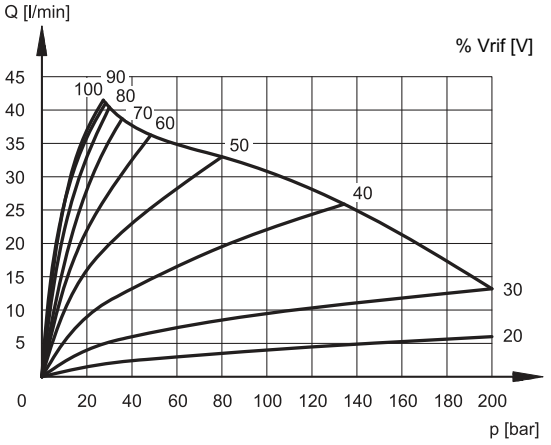
SPOOL A16





SPOOL A26





4 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

5 - ELECTRICAL CHARACTERISTICS

NOMINAL VOLTAGE	V DC	**12**
RESISTANCE (at 20°C)	Ω	3.66
MAXIMUM CURRENT	A	1.88
DUTY CYCLE		100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2004/108/CE	
CLASS OF PROTECTION: Atmospheric agents (CEI EN 60529)	IP 65	

5.1 - Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to reduce friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube and secured by means of a lock nut and can be rotated through 360°depending on installation clearances.

5.2 - Positional transducer

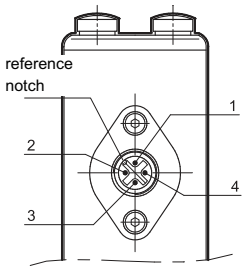
The DSE3F valve mounts an LVDT type positional transducer with amplified signal to enable precise control of the restrictor and the set flow rate, thus improving repeatability and hysteresis characteristics.

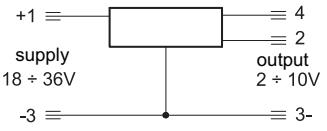
The transducer is fitted coaxially on the proportional solenoid and the connector features 360° positioning.

We recommend to use a screened cable to avoid interferences. Technical specifications and connections are indicated here beside.

The transducer is protected against polarity inversion on the power line.

Position transducer connection		**Electronic card connections** (see par. 9)
pin 1	supply 18 ÷ 36 V	pin 8c
pin 2	output 2 ÷ 10 V	pin 24a
pin 3	0 V	pin 22c
pin 4	NC	NC





6 - STEP RESPONSE (measured with mineral oil with viscosity of 36 cSt at 50°C with electronic control unit)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

The table illustrates typical response times with the C13 spool and with Δp = 30 bar P-T.

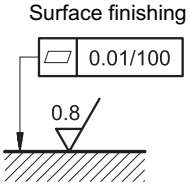
REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms]	30	25

7 - INSTALLATION

DSE3F valves can be installed in any position without impairing correct operation.

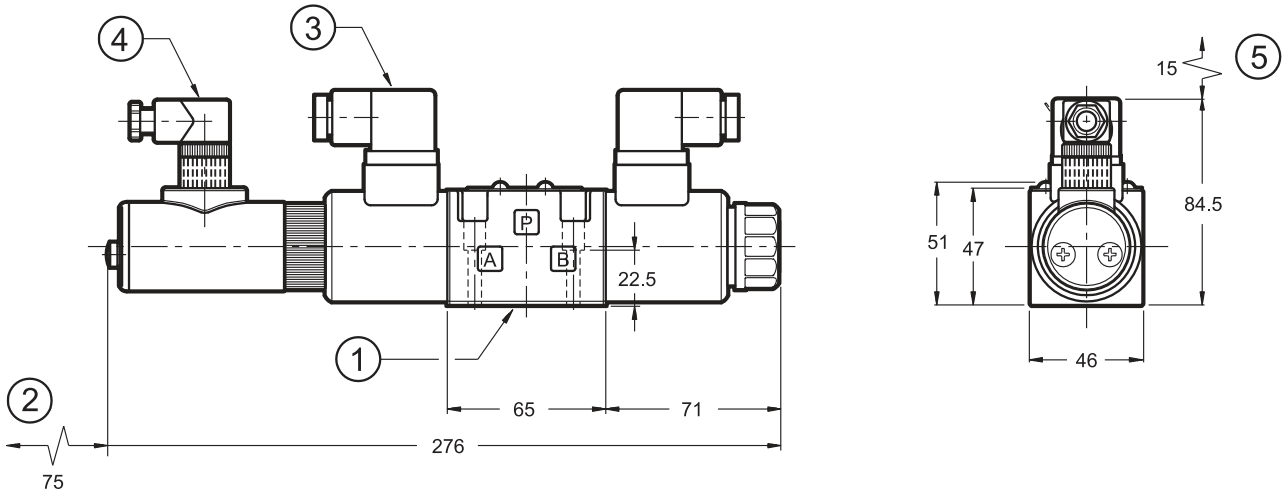
Ensure that there is no air in the hydraulic circuit.

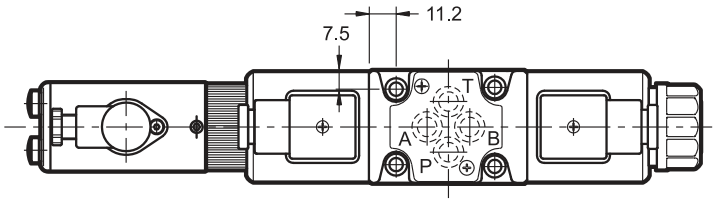
Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed fluid can easily leak between the valve and mounting surface.



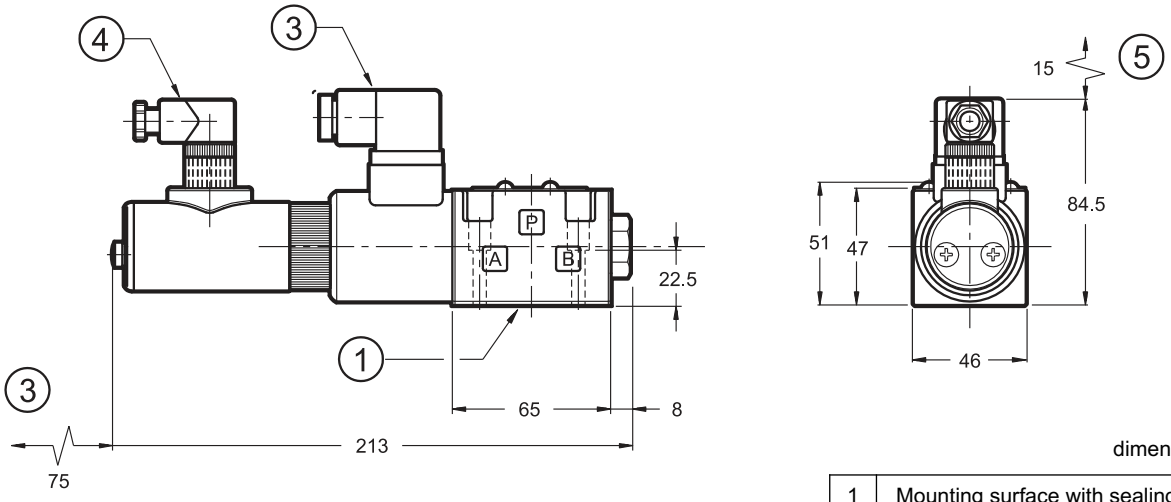
9 - OVERALL AND MOUNTING DIMENSIONS

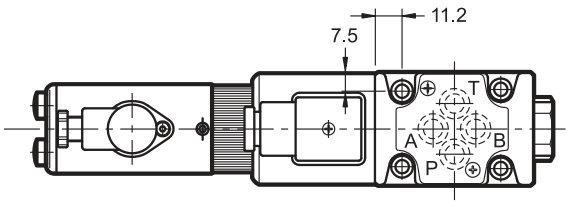
DSE3F-A*
DSE3F-C*





DSE3F-A* SA
DSE3F-C* SA





dimensions in mm

1	Mounting surface with sealing rings: 4 OR type 2037 (9.25 x 1.78) - 90 shore
2	Transducer and coil removal space
3	Main electrical connector DIN 43650
4	Electrical connector 4 pin EC4S/M12S/10 code 3491001002 for position transducer (included)
5	Removal space of the main electrical connector

Fastening bolts: 4 bolts M5x30 - ISO 4762
Torque: 5 Nm

9 - ELECTRONIC CONTROL UNITS

UEIK-21RSD	for two solenoids valves 12V DC	Eurocard format	see cat. 89 335
UEIK-11RSD	for single solenoid valve 12V DC	Eurocard format	see cat. 89 315

A card holder, PSC-32D/20 is available, to be ordered separately with code 3899000001.

10 - SUBPLATES (see catalogue 51 000)

PMMD-AI3G rear ports
PMMD-AL3G side ports
Ports dimensions: P, T, A, B: 3/8” BSP

DUPLOMATIC OLEODINAMICA

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DSE5

DIRECTIONAL VALVE WITH PROPORTIONAL CONTROL

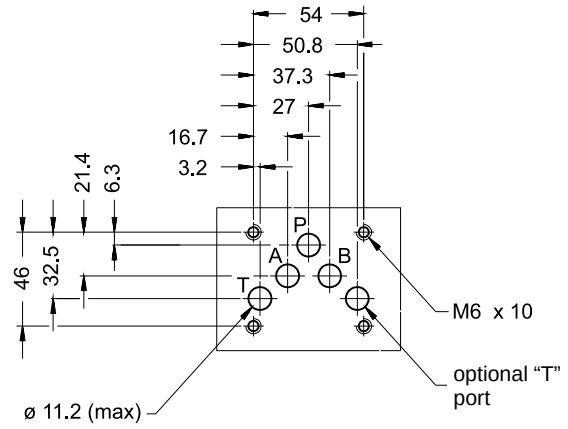
SERIES 10

SUBPLATE MOUNTING ISO 4401-05

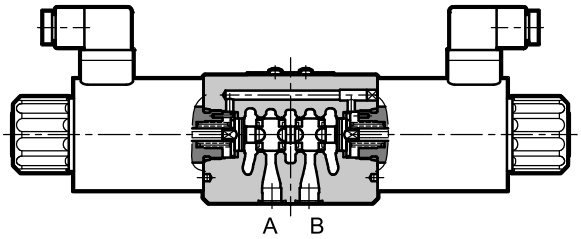
p max **320** bar
Q max **90** l/min

MOUNTING INTERFACE

ISO 4401-05-04-0-05
(CETOP 4.2-4-05-320)



OPERATING PRINCIPLE



— The DSE5 valve is a directly operated directional control valve with electric proportional control and with ports in compliance with ISO 4401 standards.

— It is used for directional and speed control of the hydraulic actuators.

— Valve opening and hence flow rate can be modulated continuously in proportion to the current supplied to the solenoid.

— The valve can be controlled directly by a current control supply unit or combined with an external electronic card to maximize the valve performances (see point 11).

— Other two versions with external subplate drain port are available (see point 9).

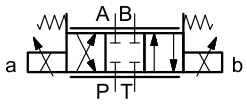
PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

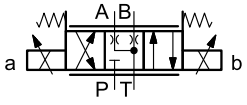
Maximum operating pressure: - P - A - B ports - T port : standard version version with Y port	bar	 320 210 320
Maximum flow with Δp 10 bar P-T	l/min	30 - 60
Step response	see point 6	
Hysteresis (with PWM 100 Hz)	% of Q max	< 6%
Repeatability	% of Q max	< ±1.5%
Electrical characteristics	see point 5	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass: single solenoid valve double solenoid valve	kg	4.4 5.9

HYDRAULIC SYMBOLS (typical)

DSE5-C*



DSE5-A*



1 - IDENTIFICATION CODE

D	S	E	5	-				/	10		-			/		

Directly operated directional control valve

Electric proportional control

Size ISO 4401-05

Spool type:
C = closed centers
A = open centers

Spool nominal flow (see table 2)

Solenoid position (omit for configuration with two solenoids):
SA = 1 solenoid on side A
SB = 1 solenoid on side B

Option:
/ W7 = Zinc-nickel surface treatment (see **NOTE**)
Omit if not required

Option: manual override (see at par. 10)

Coil electrical connection:
plug for connector type EN 175301-803 (ex DIN 43650) (**standard**)

D12 = Nominal solenoid voltage 12V DC
D24 = Nominal solenoid voltage 24V DC

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Series No. (from 10 to 19 sizes and mounting dimensions remain unchanged)

NOTE: The standard valve is supplied with surface treatment of phosphating black.

The zinc-nickel finishing makes the valve suitable to ensure a salt spray resistance up to 240 hours (test operated according to EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

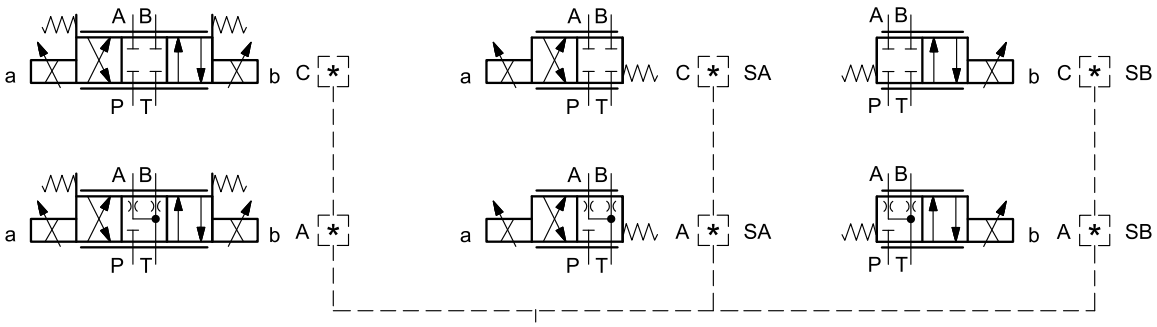
2 - CONFIGURATIONS

Valve configuration depends on the combination of the following elements: number of proportional solenoids, spool type, nominal flow rate.

2 solenoids configuration:
3 positions with spring centering

"**SA**" configuration: 1 solenoid on side A.
2 positions (central + external)
with return spring

"**SB**" configuration: 1 solenoid on side B.
2 positions (central + external)
with return spring



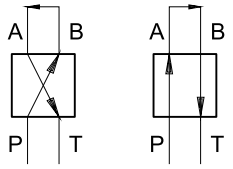
*	Controlled flow with Δp 10 bar P→T
30	30 l/min
60	60 l/min
60/30	60 (P-A) / 30 (B-T) l/min

3 - CHARACTERISTIC CURVES

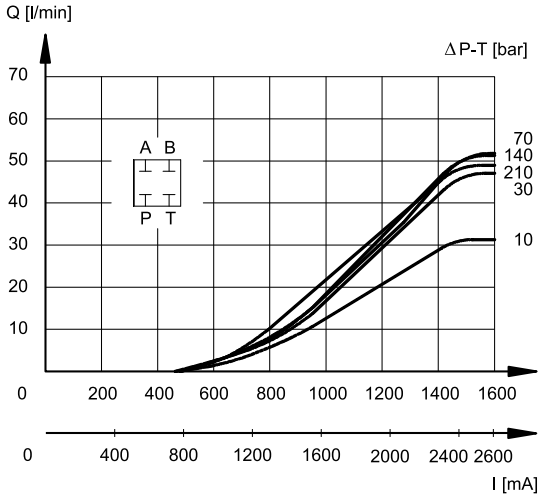
(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

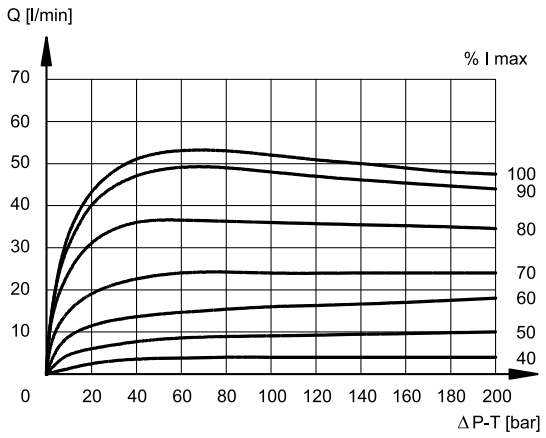
Typical constant flow rate control curves at Δp according to current supply to solenoid (D24 version, maximum current 1600 mA), measured for the various spools types available.

The reference Δp values are measured between ports P and T on the valve.

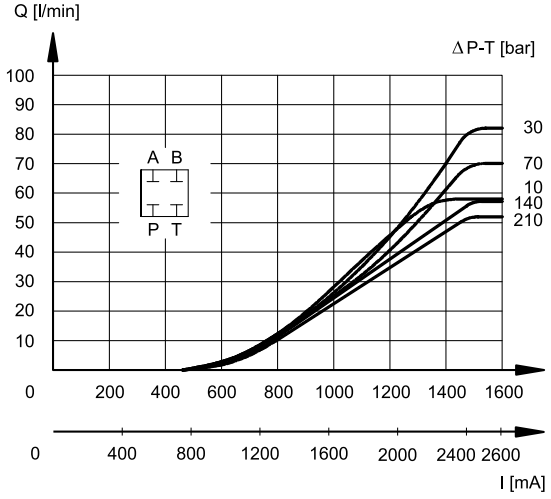


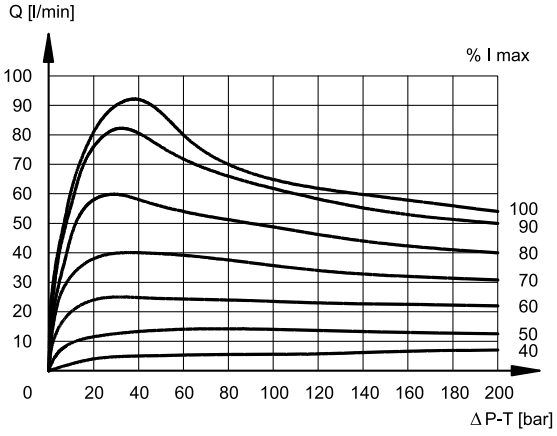
SPOOL TYPE C30



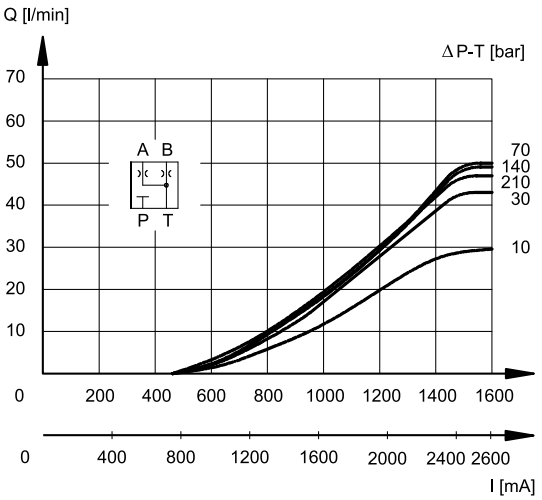


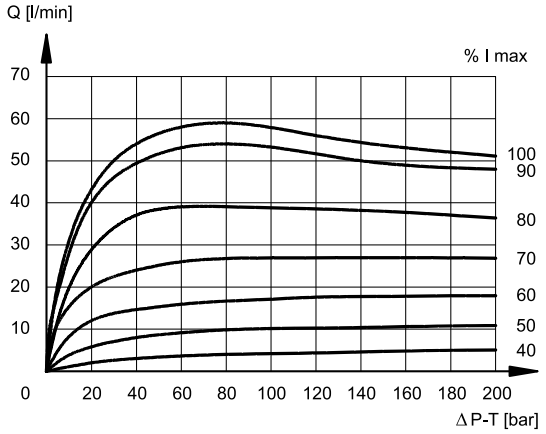
SPOOL TYPE C60



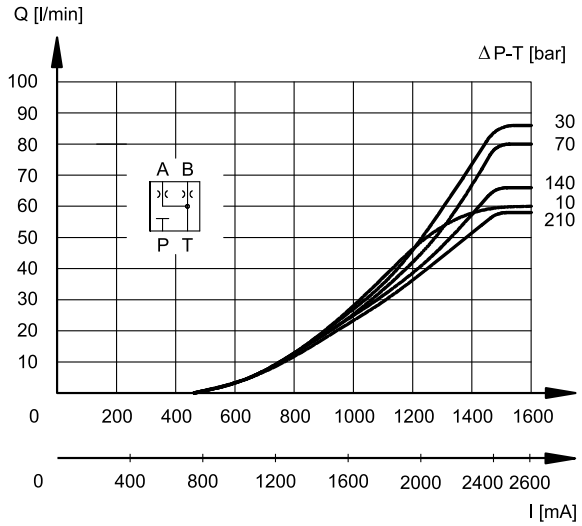


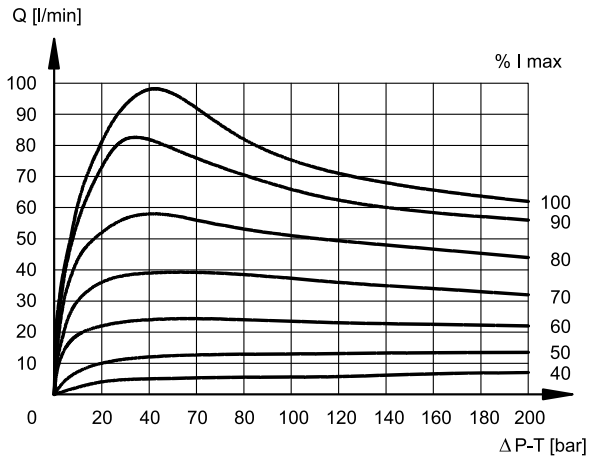
SPOOL TYPE A30





SPOOL TYPE A60





4 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

5 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut.

It can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	VDC	**12**	**24**
RESISTANCE (at 20°C)	ohm	3.1	8.65
MAXIMUM CURRENT	A	2.6	1.6
DUTY CYCLE	100%		
ELECTROMAGNETIC COMPATIBILITY (EMC)	according to 2014/30/EU		
CLASS OF PROTECTION atmospheric agents (IEC 60529) coil insulation (VDE 0580) Impregnation	IP65 class H class F		

6 - STEP RESPONSE

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Step response is the time taken for the valve to reach 90% of the set position value following a step change of reference signal.

The table shows typical response times tested with spool type C60 and Δp = 20 bar P-T.

REFERENCE SIGNAL STEP	0→100%	100%→0
Step response [ms]	50	40

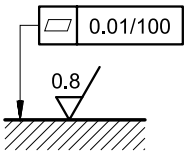
7 - INSTALLATION

DSE5 valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed fluid can easily leak between the valve and support surface.

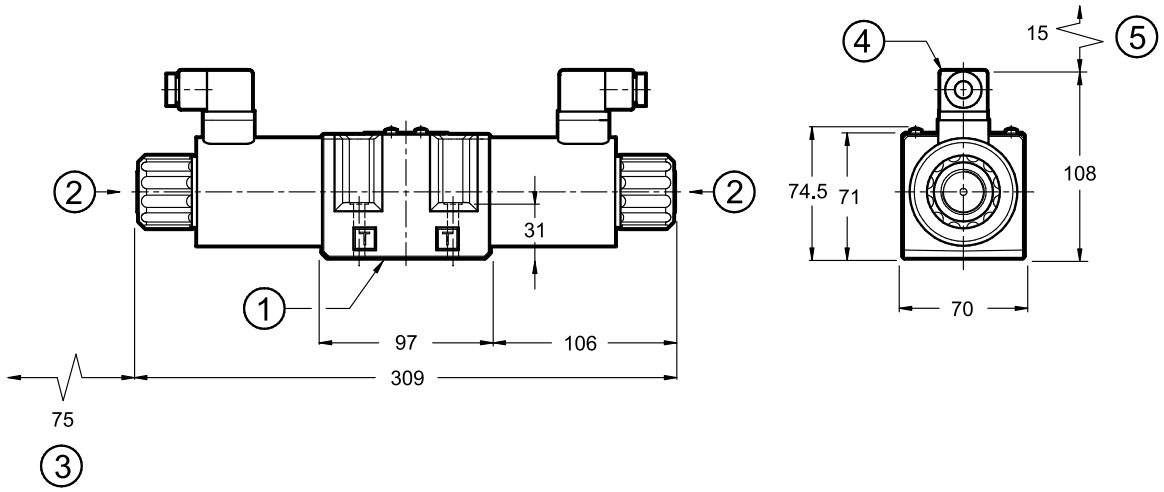
Surface finishing

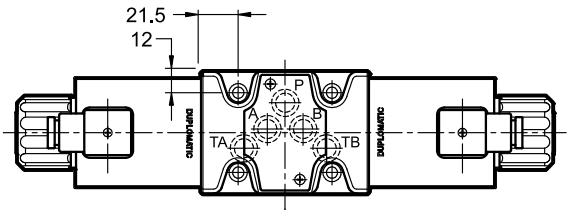


8 - OVERALL AND MOUNTING DIMENSIONS

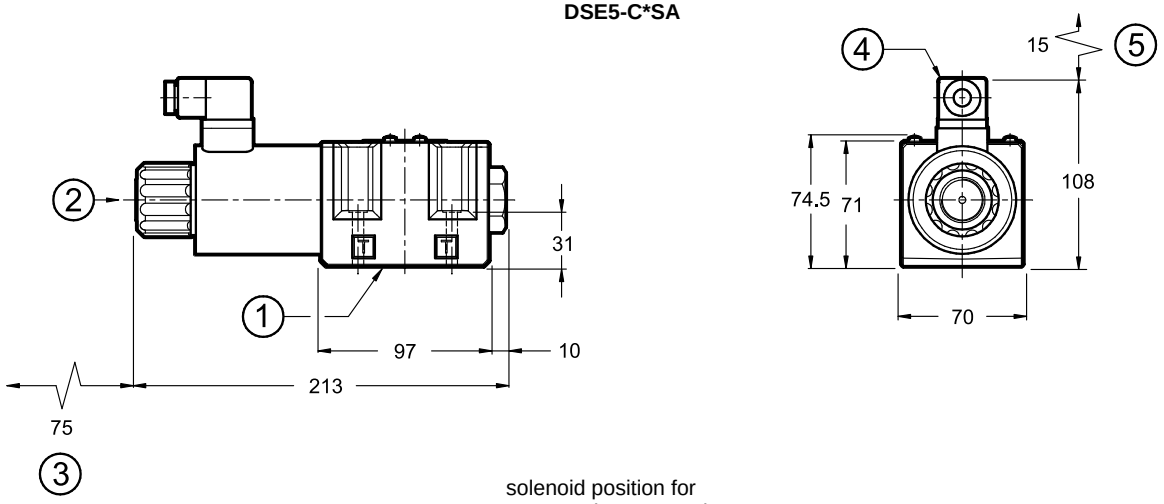
dimensions in mm

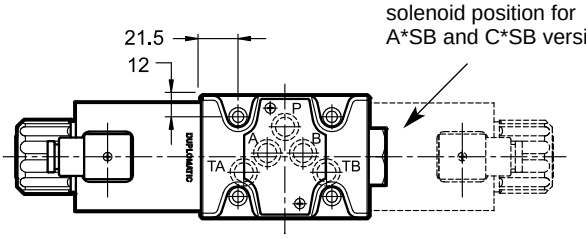
DSE5-A*
DSE5-C*





DSE5-A*SA
DSE5-C*SA



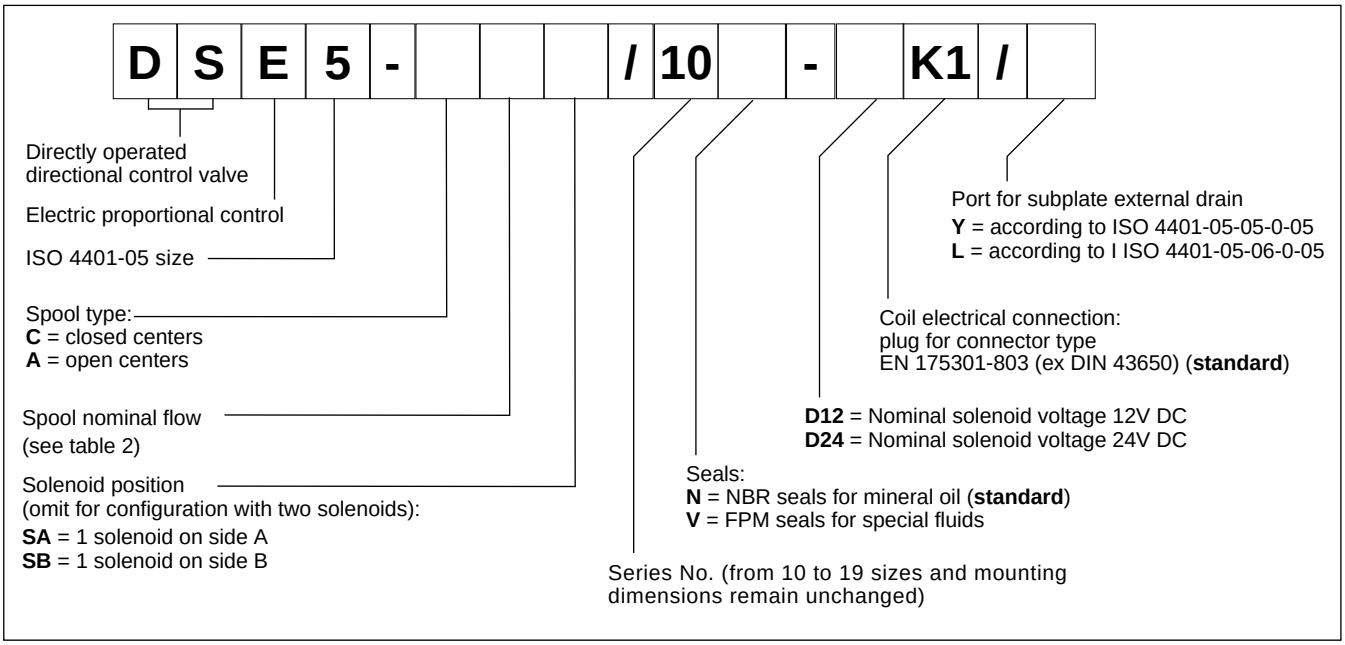


Fastening bolts: 4 SHC screws ISO 4762 M6x40	
Torque: 8 Nm (bolts A8.8)	
Threads of mounting holes: M6x10	

1	Mounting surface with sealing rings: 5 OR type 2050 (12.42x1.78) - 90 Shore Additional for version Y: 1 OR 2037 (9.25x1.78) - 90 Shore Additional for version L: 1 OR 2025 (6.07x1.78) - 90 Shore
2	Standard manual override integrated in the solenoid tube
3	Coil removal space
4	EN 175301-803 (ex DIN 43650) electric connector
5	Connector removal space

9 - VERSIONS WITH EXTERNAL DRAIN PORT

9.1 - Identification Code



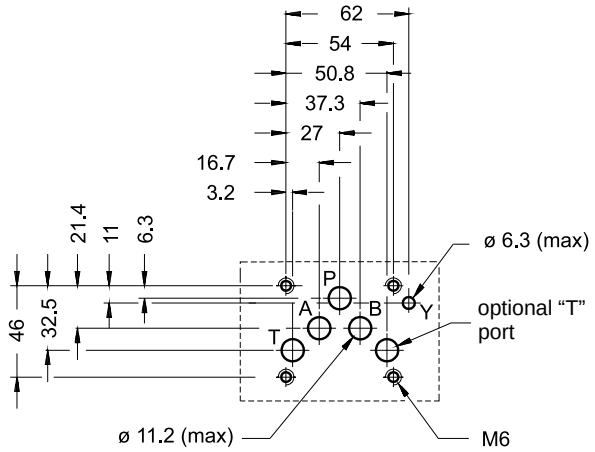
These versions allow the operation with pressures up to 320 bar on T port of the valve .

The additional drain port is connected with the solenoid chamber: in this way the tubes are not stressed by the pressure operating on the T port of the valve.

9.2 - Y Version

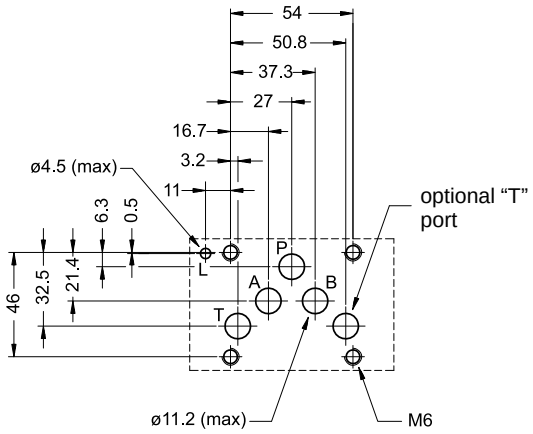
The drain port Y is realized on the valve mounting surface in compliance with ISO 4401-05-05-0-05 standard.

There is no X port.



9.3 - L version

It consists of a drain port on the mounting surface of the valve according to ISO 4401-05-06-0-05 standard



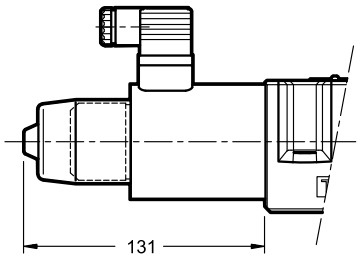
10 - MANUAL OVERRIDE

These valves have solenoids whose pin for manual operation is integrated in the tube. Actuate this override by pushing it with a suitable tool, minding not to damage the sliding surface.

Two different manual override versions are available upon request:

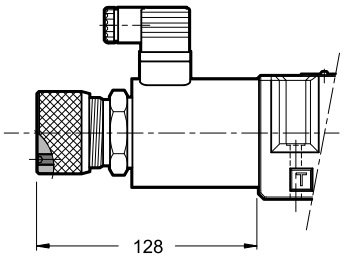
- **CM** version, manual override boot protected.
- **CK** version, knob. When the set screw is screwed and its point is aligned with the edge of the knob, tighten the knob till it touches the spool: in this position the override is not engaged and the valve is de-energized. After adjusting the override, tighten the set screw in order to avoid the knob loosing.

CM Version



Code: 3803260004

CK Version



Allen key for set screw: 3 mm
Code: 3803260003

11 - ELECTRONIC CONTROL UNITS

DSE5-SA (SB)**

EDC-131	for solenoid 24V DC	plug version	see catalogue 89 120
EDC-151	for solenoid 12V DC		
EDM-M131	for solenoid 24V DC	DIN EN 50022 rail mounting	see catalogue 89 252
EDM-M151	for solenoid 12V DC		

DSE5-A* **DSE5-C***

EDM-M231	for solenoid 24V DC	DIN EN 50022 rail mounting	see catalogue 89 252
EDM-M251	for solenoid 12V DC		

12 - SUBPLATES

(see cat. 51 000)

Type PMD4-AI4G with rear ports 3/4” BSP
Type PMD4-AL4G with side ports 1/2” BSP

DUPLOMATIC MOTION SOLUTIONS
a member of DAIKIN group

DUPLOMATIC MS Spa
via Mario Re Depaolini, 24 | 20015 Parabiago (MI) | Italy
T +39 0331 895111 | E vendite.ita@duplomatic.com | sales.exp@duplomatic.com
duplomaticmotionsolutions.com

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DSE5G*

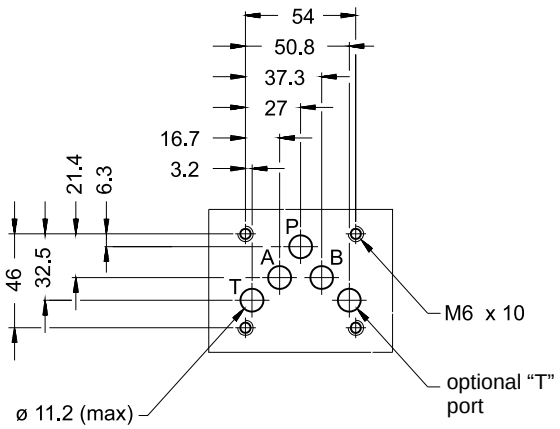
PROPORTIONAL DIRECTIONAL CONTROL VALVE WITH INTEGRATED ELECTRONICS

SUBPLATE MOUNTING ISO 4401-05

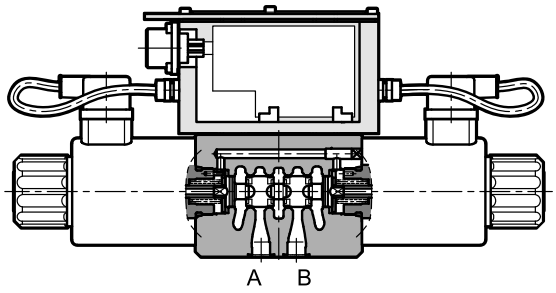
p max **320** bar
Q max **90** l/min

MOUNTING SURFACE

ISO 4401-05-04-0-05
(CETOP 4.2-4-05-320)



OPERATING PRINCIPLE



— The DSE5G* are proportional directional control valves, direct operated, with integrated electronics and mounting surface compliant with ISO 4401-05 standards.

— They are used for the control of position and speed of hydraulic actuators.

— Valves are available with different types of electronics,with analogue or fieldbus interfaces.

— A solenoid current monitoring signal is available.

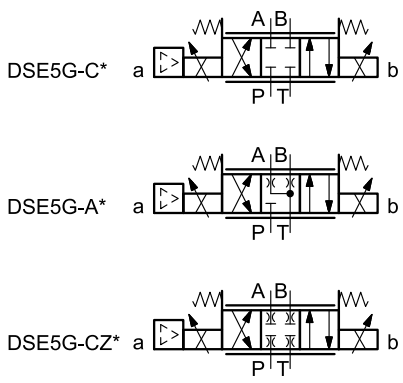
— The valves are easy to install. The driver manages digital settings directly.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50 °C and p = 140 bar)

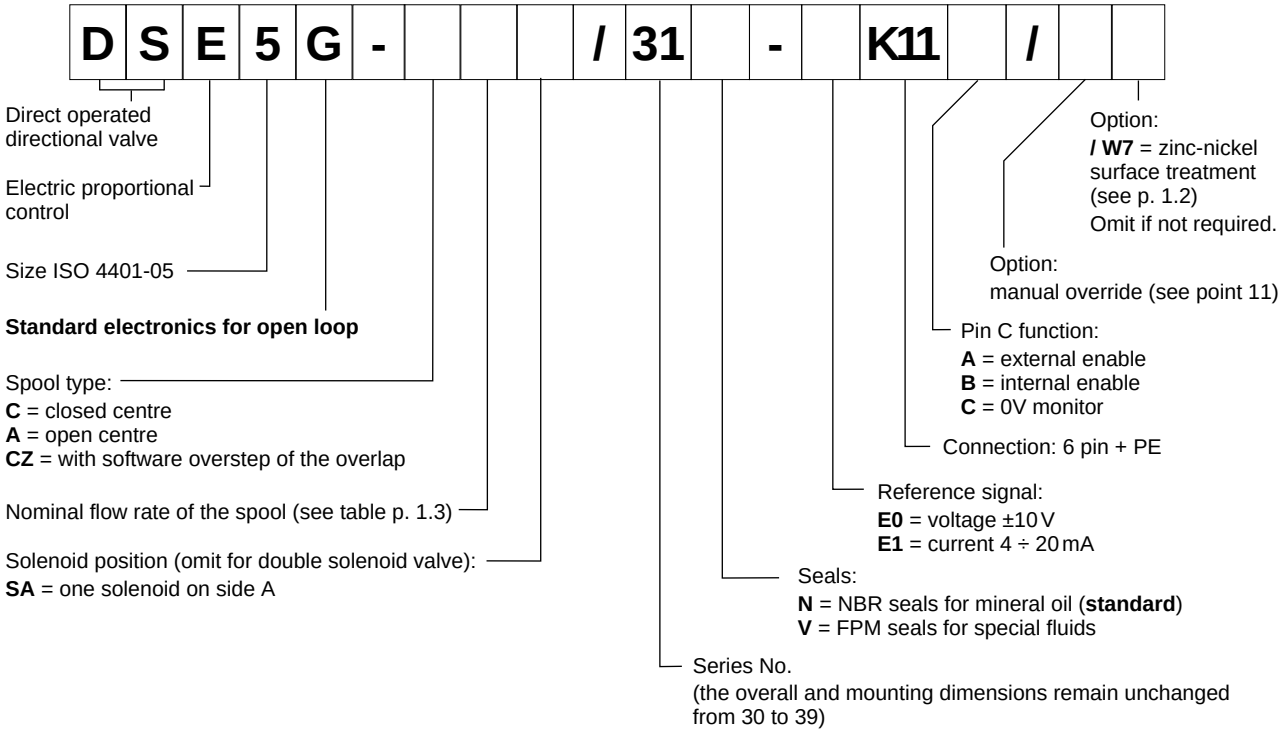
Maximum operating pressure: - P - A - B ports - T port	bar	 320 140
Maximum flow with Δp 10 bar P-T	l/min	30 - 60
Response times	see point 7	
Hysteresis	% of Q max	< 3%
Repeatability	% of Q max	< ±1%
Electrical characteristics	see point 3	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass: single solenoid valve double solenoid valve	kg	5.0 6.5

HYDRAULIC SYMBOLS (typical)



1 - IDENTIFICATION CODE

1.1 - Standard electronics



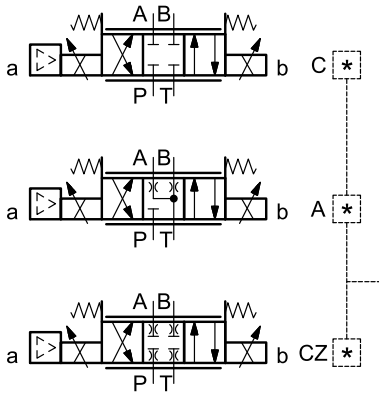
1.2 - Surface treatments

The standard valve is supplied with surface treatment of phosphating black. The zinc-nickel finishing on the valve body makes the valve suitable to ensure a salt spray resistance up to 240 hours. (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

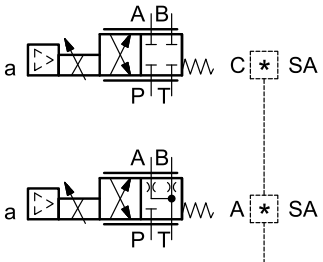
1.3 - Available configurations

The valve configuration depends on the combination of the following elements:
number of proportional solenoids, spool type, rated flow.

Configuration 2 solenoids :
3 positions with spring centreing

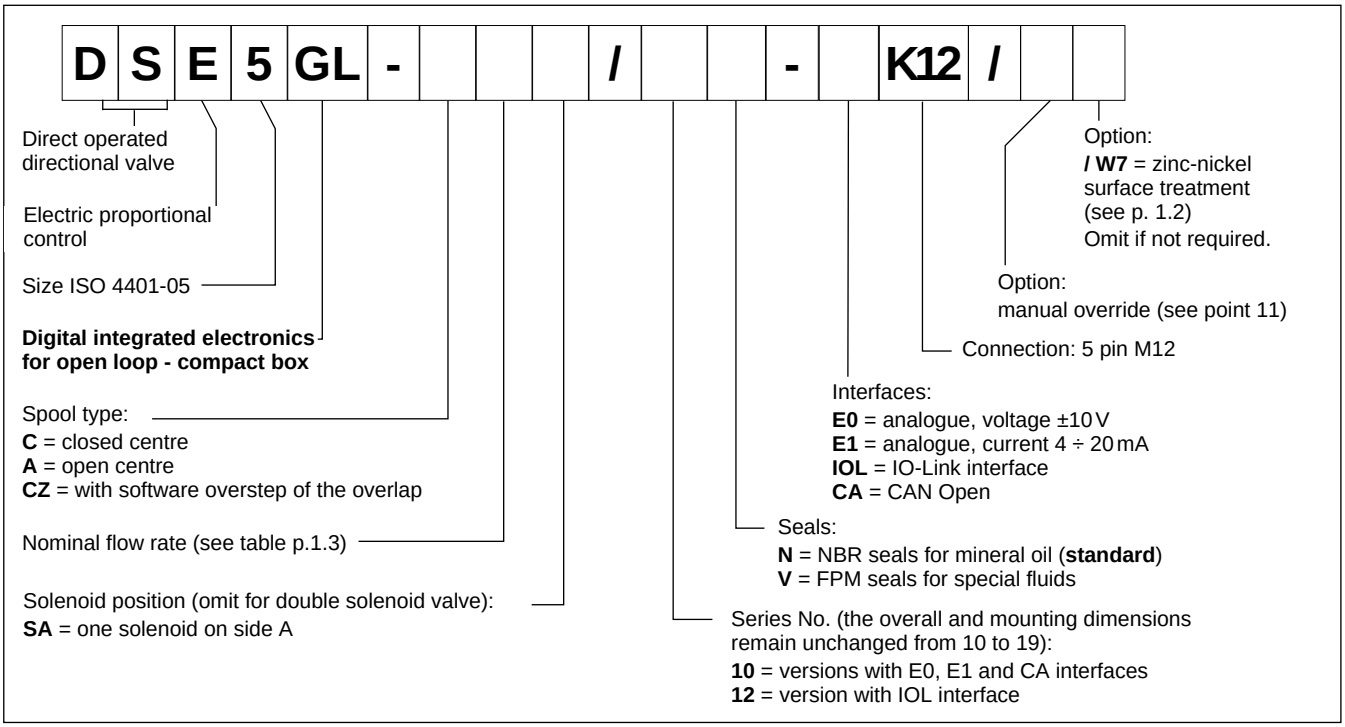


Configuration 1 solenoid on side A "**SA**":
2 positions (central + external)
with spring centreing

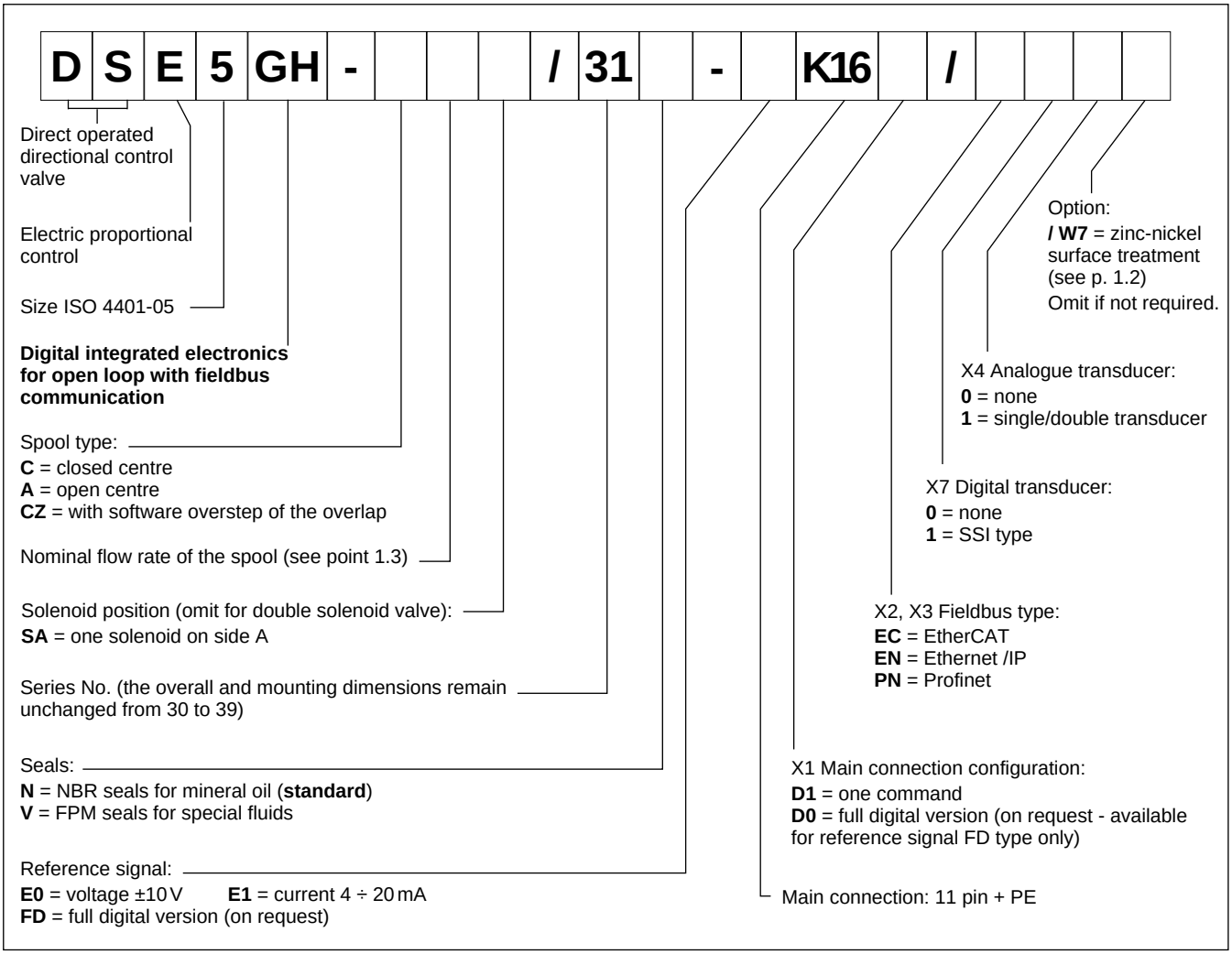


*	Controlled flow with Δp 10 bar P-T
30	30 l/min
60	60 l/min
60/30	60 (P-A) / 30 (P-B) l/min

1.3 - Compact electronics



1.4 - Electronics with fieldbus communication



2 - ELECTRONICS COMMON DATA

Duty cycle		100% (continuous operation)
Protection class according to EN 60529		IP65/IP67 (**NOTE**)
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	40
Maximum solenoid current	A	2.8
Fuse protection, external	A	3
Managed breakdowns		Overload and electronics overheating, cable breakdown, supply voltage failures
Electromagnetic compatibility (EMC) emissions EN 61000-6-4, immunity EN 61000-6-2		According to 2014/30/EU standards

NOTE: The IP degree is guaranteed only with mating connector of equivalent IP degree, installed and tightened correctly. Moreover, on the GH versions it is necessary to protect any unused connections with caps.

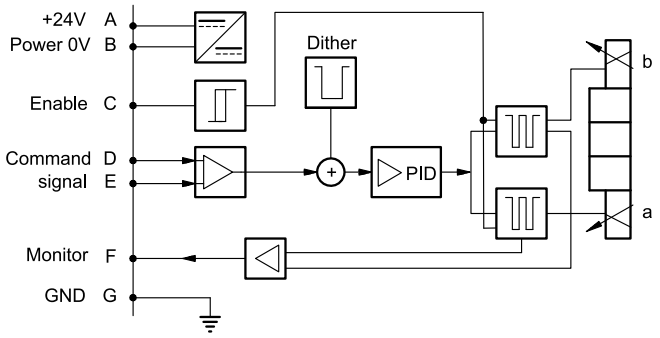
3 - DSE5G - STANDARD ELECTRONICS

3.1 - Electrical characteristics

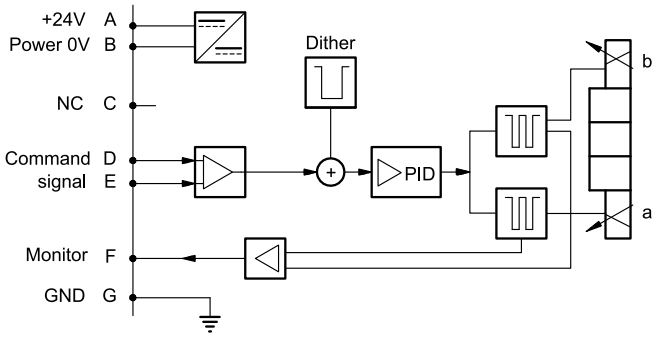
Command signal: voltage (E0) current (E1)	V DC mA	±10 (impedance Ri > 11 kOhm) 4 ÷ 20 (impedance Ri = 58 Ohm)
Monitor signal (current to solenoid): voltage (E0) current (E1)	V DC mA	 ±10 (impedance Ro > 1 kOhm) 4 ÷ 20 (impedance Ro = 500 Ohm)
Communication for diagnostic		LIN-bus Interface (by means of the optional kit)
Connection		6 pin + PE (MIL-C-5015-G - DIN EN 175201-804)

3.2 - On-board electronics diagrams

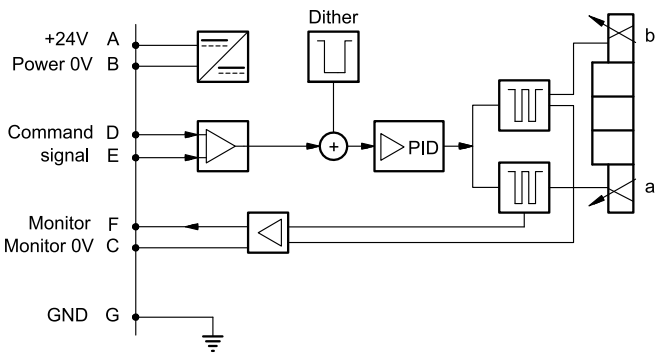
VERSION A - External Enable



VERSION B - Internal Enable

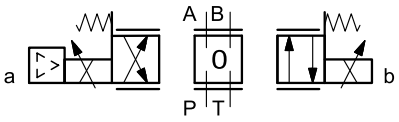


VERSION C - 0V Monitor

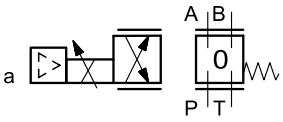


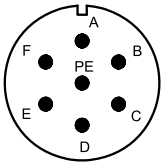
3.3 - Versions with voltage command (E0)

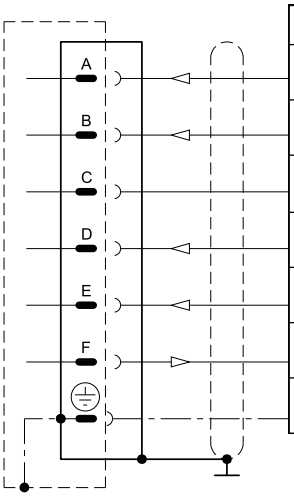
The reference signal is between -10V and +10V on double solenoid valve, and 0 ÷ 10V on single solenoid valve SA. The monitor feature of versions B and C becomes available with a delay of 0.5 sec from the power-on of the card.



COMMAND	**-10V**	**0V**	**+10V**		**COMMAND**	**+10V**	**0V**
MONITOR	**-10V**	**0V**	**+10V**		**MONITOR**	**+10V**	**0V**





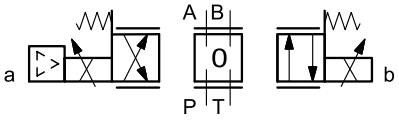


Pin	Values	version A	version B	version C
A	24 V DC	Supply voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	± 10 V	Command		
E	0 V	Command reference		
F	± 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

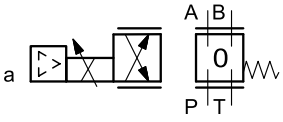
3.4 - Versions with current command (E1)

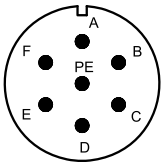
The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower, the card shows a breakdown cable error. To reset the error is sufficient restoring the signal.

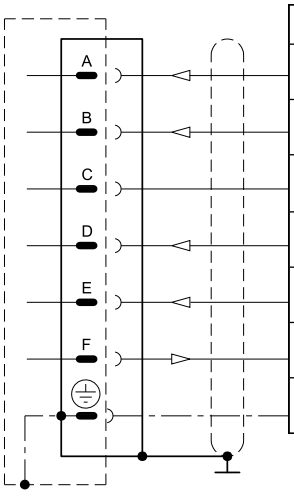
The monitor feature of versions B and C becomes available with a delay of 0.5 sec from the power-on of the card.



COMMAND	**4 mA**	**12 mA**	**20 mA**		**COMMAND**	**20 mA**	**4 mA**
MONITOR	**4 mA**	**12 mA**	**20 mA**		**MONITOR**	**20 mA**	**4 mA**







Pin	Values	version A	version B	version C
A	24 V DC	Supply voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	Command reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

4 - DSE3GL - COMPACT ELECTRONICS

In IO-Link networks, the length of the connecting cables is limited to 20 metres. In CA versions, pin 3 and pin 5 are galvanic isolated up to 100 V to avoid earth loops.

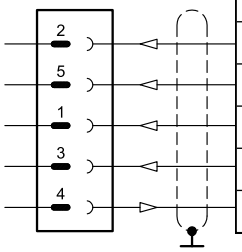
4.1 - Electrical characteristics

Command signal: voltage (E0) current (E1)	V DC mA	±10 (impedance Ri > 11 kOhm) 4 ÷ 20 (impedance Ri = 58 Ohm)
Monitor signal (current to solenoid): voltage (E0) current (E1)	 V DC mA	 0 ÷ 5 (impedance Ro > 1 kOhm) 4 ÷ 20 (impedance Ro = 500 Ohm)
IO-Link communication (IOL): Data rate	 kBaud	IO-Link Port Class B 38.4
Can Open communication (CA): Data rate	 kbit	 10 ÷ 1000
Data register (IOL and CA versions only)		card voltage supply, solenoid faults (shortcircuit, bad configuration), box temperature.
Connection		5-pin M12 code A (IEC 61076-2-101)

4.2 - Pin tables

'E0' connection

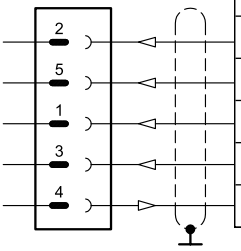




Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	± 10 V	Command
3	0V	Command reference
4	0 ÷ 5V	Monitor (0V reference: pin 5)

'E1' connection

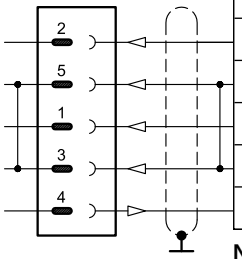




Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	4 ÷ 20 mA	Command
3	0V	Command reference
4	4 ÷ 20 mA	Monitor (0V reference: pin 5)

'IOL' connection



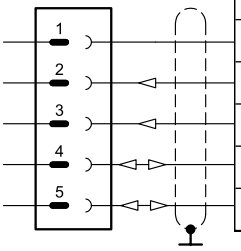


Pin	Values	Function
2	2L+ 24 V DC	Solenoid supply voltage
5	2L- 0 V (GND)	
1	1L+ +24 V DC	Logic and IO-Link supply voltage
3	1L- 0V (GND)	
4	C/Q	IO-Link Communication

NOTE: Pin 3 and pin 5 are linked with each other in the valve electronics. The reference potentials 1L- and 2L- of the two supply voltages must also be linked with each other on the customer side.

'CA' connection





Pin	Values	Function
1	CAN_SH	Shield
2	24 V DC	Supply voltage
3	0 V (GND)	
4	CAN H	Bus line (high)
5	CAN_L	Bus line (low)

5 - DSE5GH - FIELDBUS ELECTRONICS

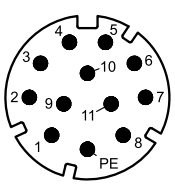
The 11+ PE pin connection allows separate supply voltage for electronics and solenoids.

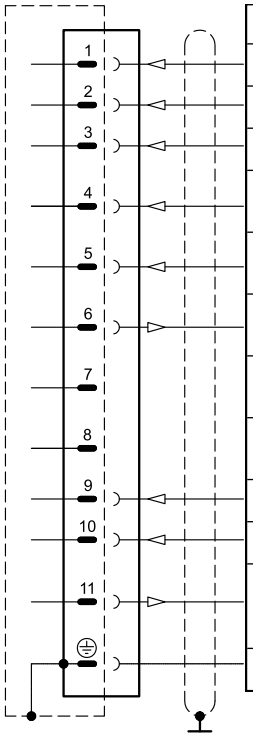
Command - valve position schemes as for the standard electronics. Please refer to pictures in points 3.3 and 3.4.

5.1 - Electrical characteristics

Command signal: voltage (E0) current (E1) digital (FD)	 V DC mA	 ±10 (impedance Ri > 11 kOhm) 4 ÷ 20 (impedance Ri = 58 Ohm) via fieldbus
Monitor signal (current to solenoid): voltage (E0) current (E1)	 V DC mA	 ±10 (impedance Ro > 1 kOhm) 4 ÷ 20 (impedance Ro = 500 Ohm)
Communication / diagnostic		via Bus register
Communication interface standard		IEC 61158
Communication physical layer		fast ethernet, insulated 100 Base TX
Power connection		11 pin + PE (DIN 43651)

5.2 - X1 Main connection pin table





D1: one command

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	± 10 V (E0) 4 ÷ 20 (E1)	Command
5	0 V	Command reference signal
6	± 10 V (E0) 4 ÷ 20 (E1)	Monitor (0V reference pin 10)
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V reference pin 2)
12	GND	Ground (Earth)

D0: full digital

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	NC	do not connect
5	NC	do not connect
6	NC	do not connect
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V ref. pin 2)
12	GND	Ground (Earth)

5.3 - FIELDBUS connections

Please wire following guidelines provided by the related standards communication protocol. Any connections present and not used must be protected with special caps so as not to nullify the protection against atmospheric agents.

X2 (IN) connection: M12 D 4 pin female



Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

X3 (OUT) connection: M12 D 4 pin female

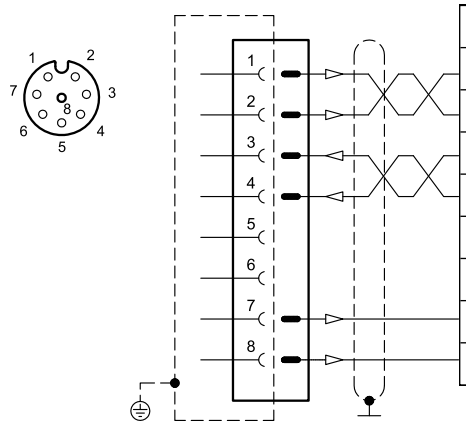


Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

NOTE: Shield connection on connector housing is recommended.

5.4 - Digital transducer connection
X7 connection: M12 A 8 pin female

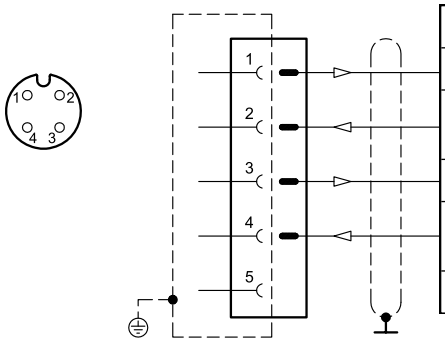
VERSION 1: SSI type



Pin	SSI Values	Function	Notes
1	CLK+	Serial synchronous clock (+)	Input - digital signal
2	CLK-	Serial synchronous clock (-)	
3	MIS0+	Serial position data (+)	
4	MIS0-	Serial position data (-)	
5	NC	-	do not connect
6	NC	-	
7	+24 V	transducer power supply	Output power supply
8	0 V	-	Common GND

5.5 - Analogue transducer connection
X4 connection: M12 A 4 pin female

VERSION 1: single / double transducer
(single or double is a software-selectable option)



Pin	Values	Notes
1	+24 V	Remote transducer power supply (out) 100 mA
2	±10 V 4 ÷20 mA	Input signal of transducer 1 (range software selectable)
3	0 V	Common reference signal for transducer power and signals
4	±10 V 4 ÷20 mA	Input signal of transducer 2 (range software selectable)
5	-	

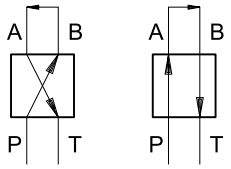
6 - CHARACTERISTIC CURVES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

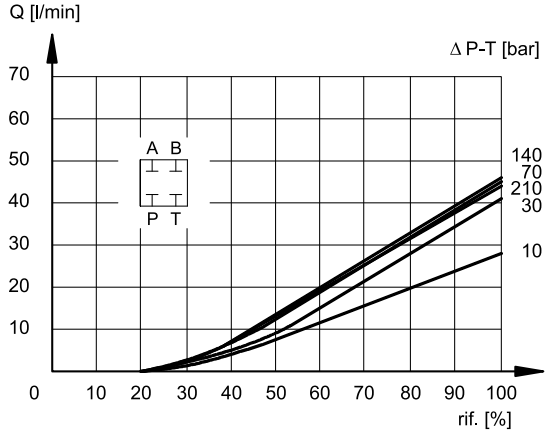
Typical flow rate curves at constant Δp related to the reference signal and measured for the available spools.

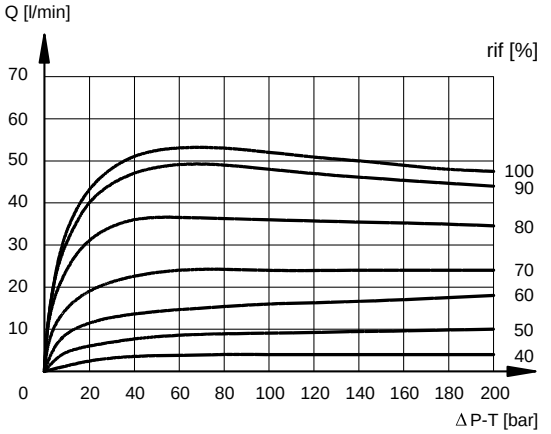
The curves are obtained with a constant meter-in with Δp of 5 bar and by setting the value of flow start at 20% of the reference signal.

NOTE: for spools with overlap jump (Z), please refer to the characteristic curves of spools C type, considering that the starting flow rate value is approx. 150 mV.

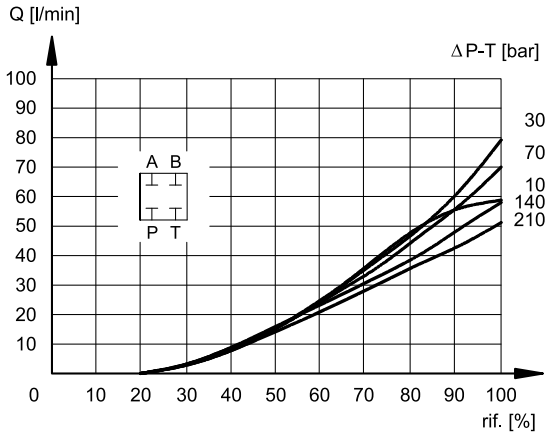


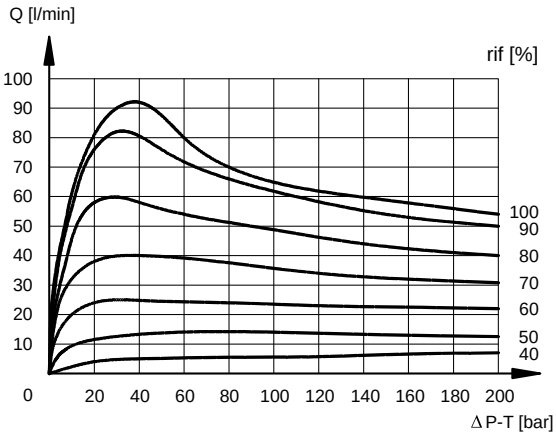
SPOOL TYPE C30



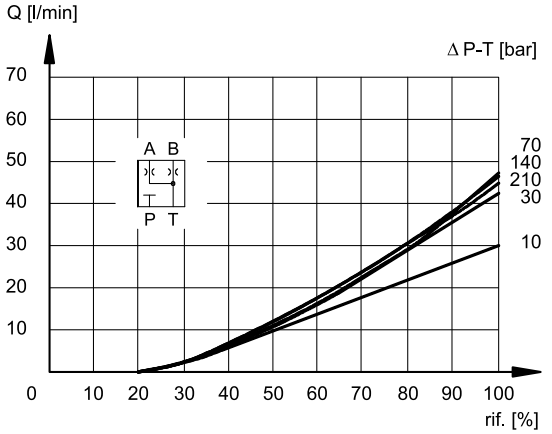


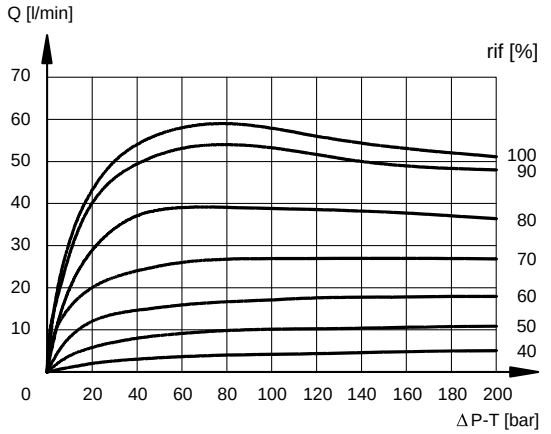
SPOOL TYPE C60



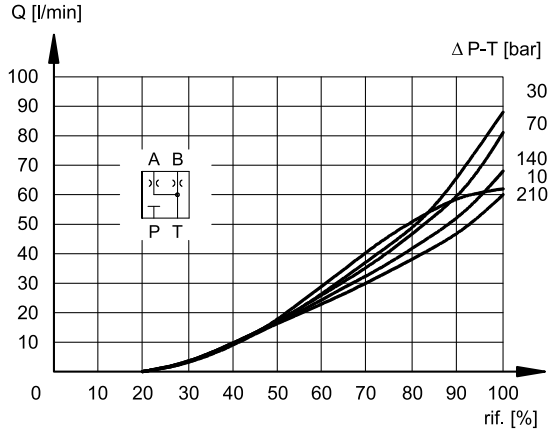


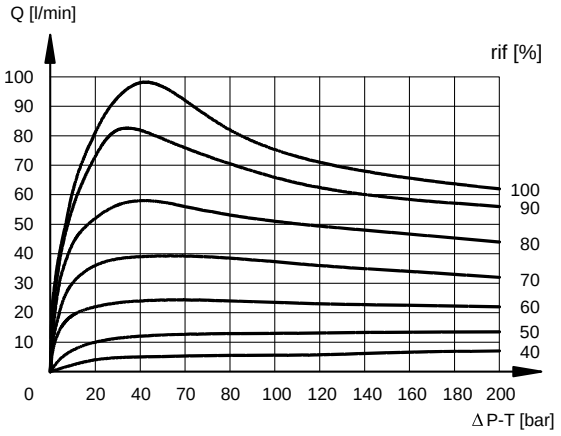
SPOOL TYPE A30





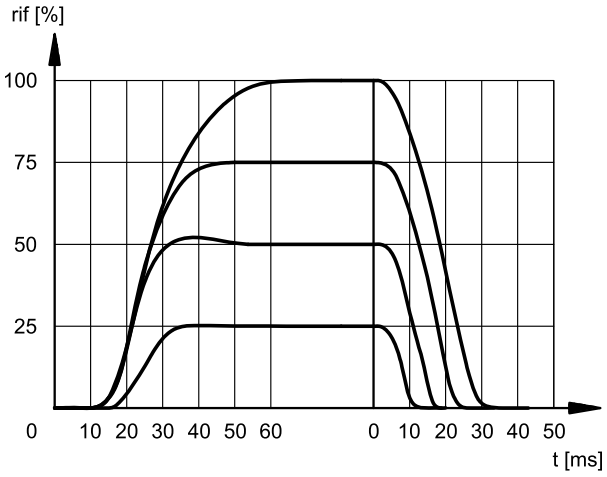
SPOOL TYPE A60





7 - RESPONSE TIMES

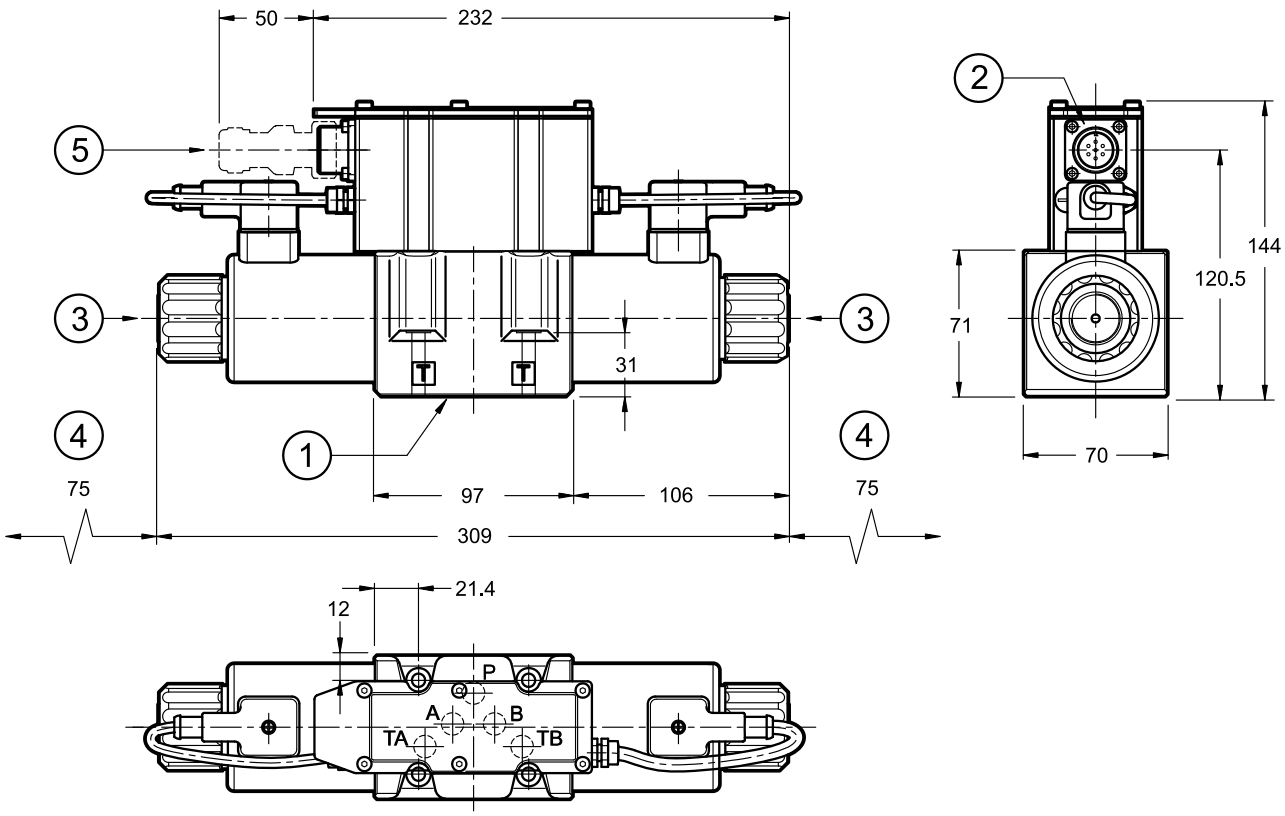
(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)



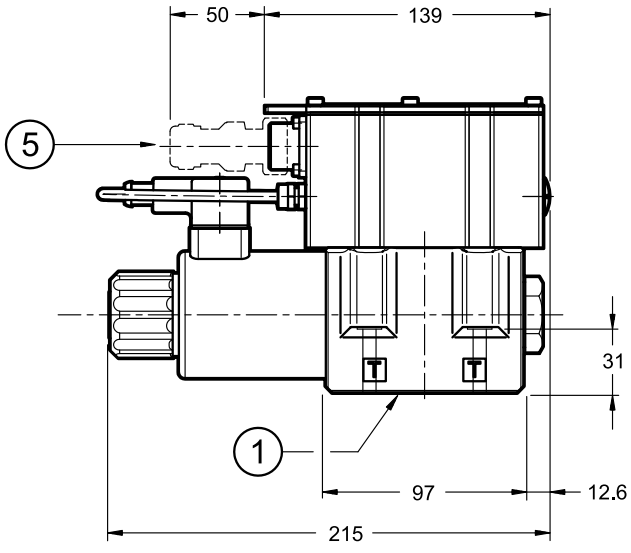
8 - DSE5G - OVERALL AND MOUNTING DIMENSIONS

DSE5G-/K11**

dimensions in mm



DSE5G-*SA/K11



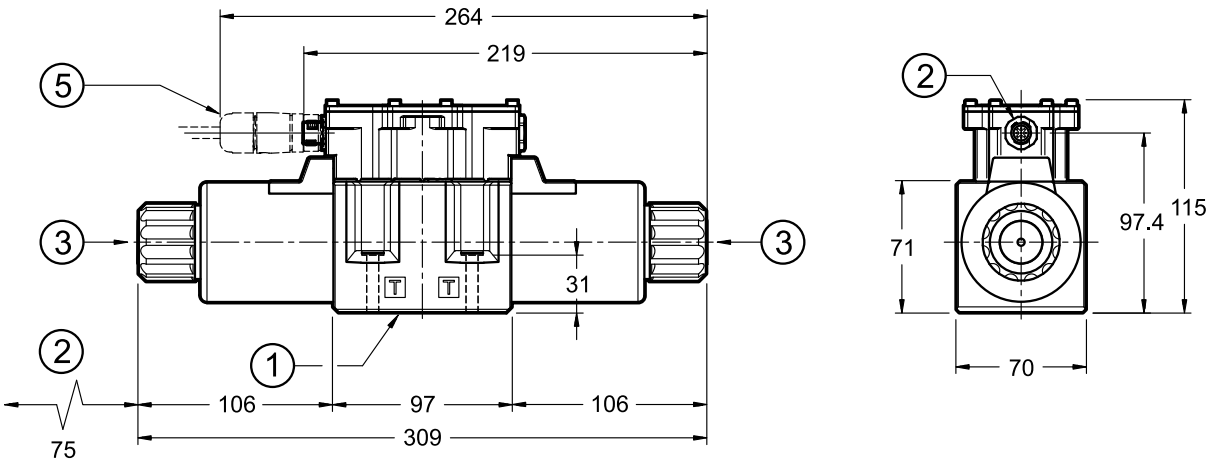
1	Mounting surface with sealing rings: 5 OR type 2050 (12.42x1.78) 90 Shore
2	Main connection 6 pin + PE
3	Standard manual override embedded in the solenoid tube
4	Coil removal space
5	Mating connector 6 poles + PE, female type MIL-5015-G **To be ordered separately.** See catalogue 89 000

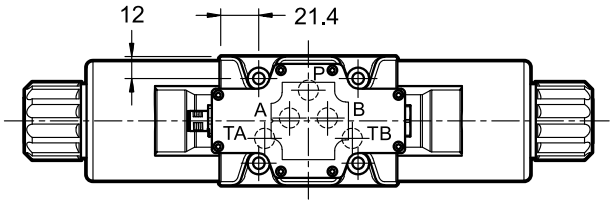
Fastening bolts: 4 SHC bolts M6x40 - ISO 4762
Torque: 8 Nm (A8.8)
Threads of mounting holes: M6x10

9 - DSE5GL - OVERALL AND MOUNTING DIMENSIONS

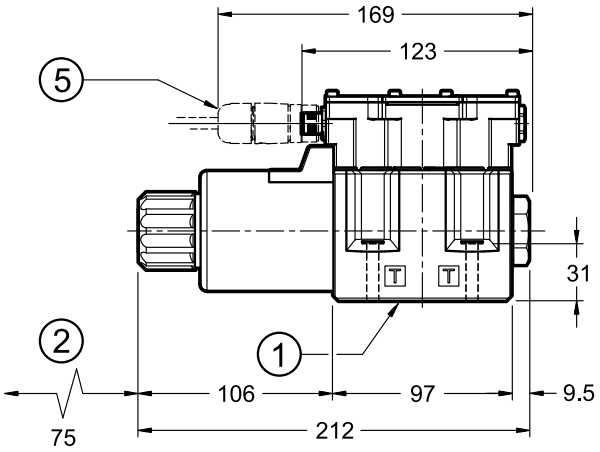
dimensions in mm

DSE5GL-/K12**





DSE5GL-*SA/K12



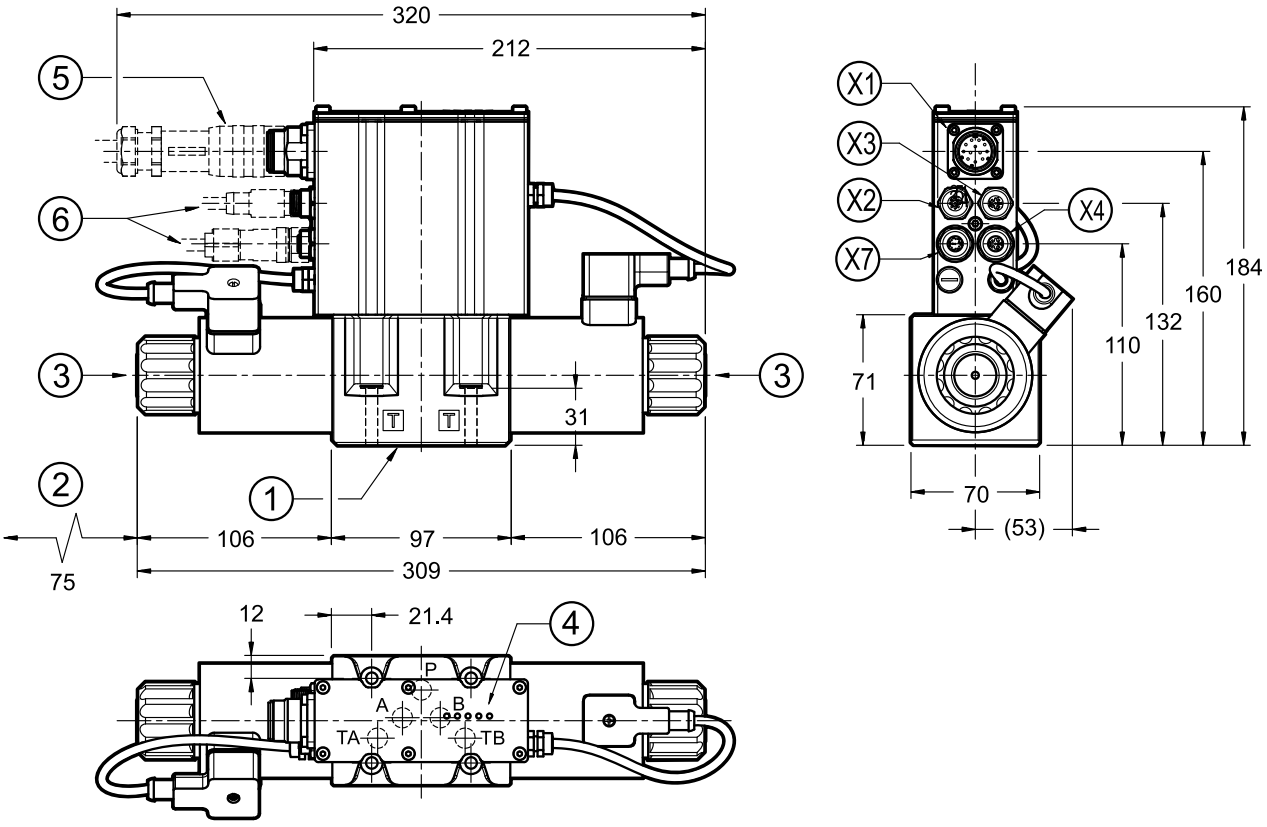
1	Mounting surface with sealing rings: 5 OR type 2050 (12.42x1.78) 90 Shore
2	Connection M12 A 5 pin
3	Standard manual override embedded in the solenoid tube
4	Coil removal space
5	Mating connector M12 5 poles - code A, female **To be ordered separately.** See catalogue 89 000

Fastening bolts: 4 SHC bolts M6x40 - ISO 4762
Torque: 8 Nm (A8.8)
Threads of mounting holes: M6x10

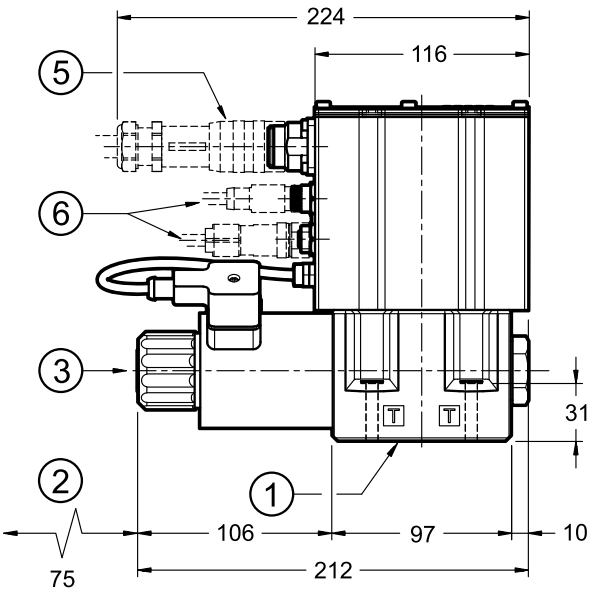
10 - DSE5GH - OVERALL AND MOUNTING DIMENSIONS

DSE5GH-/K16**

dimensions in mm



DSE5GH-*SA/K16



X1	Main connection 11 pin + PE
X2	Fieldbus communication (IN)
X3	Fieldbus communication (OUT)
X4	X4 connection for analogue transducer
X7	X7 connection for digital transducer

1	Mounting surface with sealing rings: 5 OR type 2050 (12.42x1.78) 90 Shore
2	Coil removal space
3	Manual override by pin integrated in the solenoid tube
4	Fieldbus LED
5	Mating connector 11 poles + PE **To be ordered separately.** See catalogue 89 000
6	Mating connectors for fieldbus communication and signals **To be ordered separately.** See catalogue 89 000

Fastening bolts: 4 SHC bolts M6x40 - ISO 4762
Torque: 8 Nm (A8.8)
Threads of mounting holes: M6x10

NOTE 1: Depending on the chosen version, X4 and X7 connections may not be present. Please refer to point 5 for connection descriptions and pinout

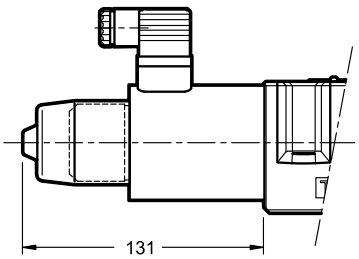
11 - MANUAL OVERRIDE

These valves have solenoids whose pin for manual operation is integrated in the tube. Actuate this override by pushing it with a suitable tool, minding not to damage the sliding surface.

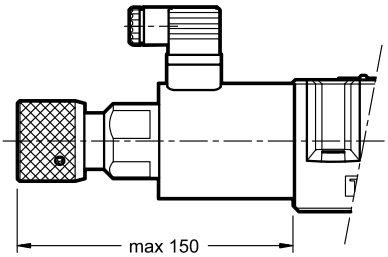
Three other types of manual overrides can fit the DSE5 and DSE5GL valve:

- **CM**: manual override boot protected.
- **CK**: turning knob override.
- **CK2**: push and twist

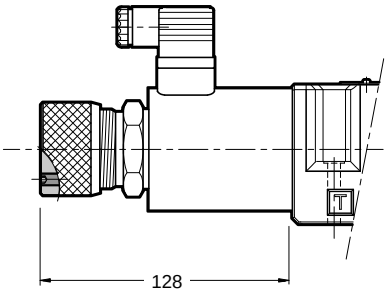
CM version - Code: 3803260004



CK2 version - Code: 3401310004



CK version - Code: 3803260003



When the set screw is screwed and its point is aligned with the edge of the knob, tighten the knob till it touches the spool: in this position the override is not engaged and the valve is de-energized.

After adjusting the override, tighten the set screw in order to avoid the knob loosing

Spanner for set screw: 3 mm

12 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

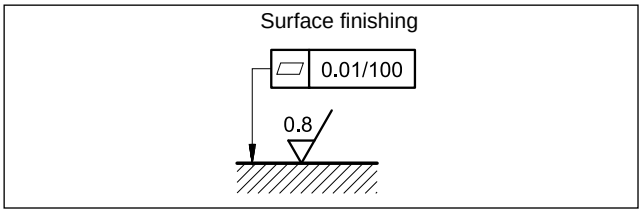
The fluid must be preserved in its physical and chemical characteristics.

13 - INSTALLATION

These valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.



14 - ACCESSORIES

(to be ordered separately)

14.1 - Mating connectors

Mating connectors must be ordered separately. See catalogue 89 000.

For K11 and K16 versions we recommend the choice of a metal connector to avoid electromagnetic disturbances and to comply with EMC regulations on electromagnetic compatibility. If you opt for a plastic connector, make sure that it guarantees and maintains the IP and EMC protection characteristics of the valve.

14.2 - Mating connectors and caps for fieldbus communication and for sensors.

Duplomatic offers spare parts to be wired and also ready-to-use cord sets. Please refer to cat. 89 000.

14.3 - Connection cable

The optimal wiring provides for 7 isolated conductors, with separate screen for the signal wires (command, monitor) and an overall screen.

Cross section for power supply:
- up to 20 m cable length : 1,0 mm²
- up to 40 m cable length : 1,5 mm² (IO-Link excluded)

Cross section for signals (command, monitor):
- 0,50 mm²

14.4 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic. See catalogue 89 850.

15 - SUBPLATES

(see catalogue 51 000)

PMD4-AI4G rear ports 3/4” BSP
PMD4-AL4G side ports 1/2” BSP

DUPLOMATIC MOTION SOLUTIONS
a member of DAIKIN group

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duplomaticmotionsolutions.com

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DSE5J

DIRECTIONAL VALVE WITH PROPORTIONAL CONTROL FEEDBACK AND INTEGRATED ELECTRONICS

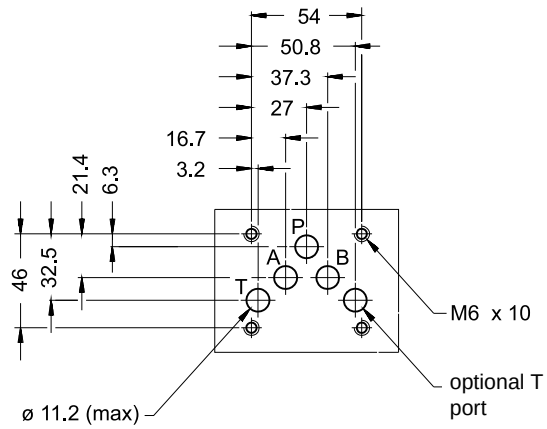
SERIES 31

SUBPLATE MOUNTING ISO 4401-05

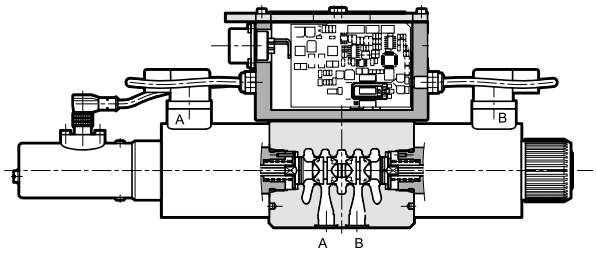
p max **320** bar
Q max **180** l/min

MOUNTING INTERFACE

ISO 4401-05-04-0-05
(CETOP 4.2-4-05-320)



OPERATING PRINCIPLE



— The DSE5J is a direct operated directional valve with electric proportional control, on-board electronics and feedback, with mounting interface in compliance with ISO 4401 standards.

— It is used to control the direction and the speed of hydraulic actuators.

— Transducer and digital card allow a fine control of the positioning of the cursor, reducing hysteresis and response time and optimizing the performance of the valve.

— The valves are available with command signal in voltage or current and on board electronics with internal enable, external enable or 0V monitor on pin C.

— The monitoring of the spool position is available on pin F.

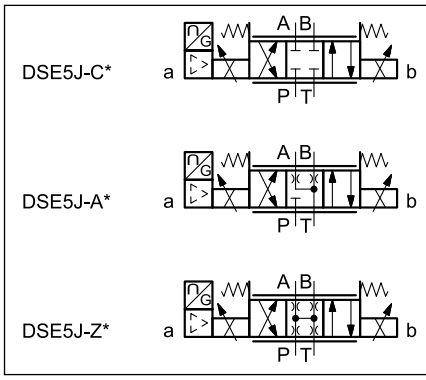
— The valve is easy to install. The driver directly manages digital settings (see p. 6). In the event of special applications, you can customize the settings using the optional kit (see p. 11).

PERFORMANCES

(Obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

Max operating pressure: - P - A - B ports - T port	bar	320 210
Nominal flow with Δp 10 bar P-T	l/min	50 - 75
Response times	see point 7	
Hysteresis	% of Q max	< 0,2%
Repeatability	% of Q max	< ± 0,1%
Threshold		< 0,1%
Valve reproducibility		≤ 5%
Electrical characteristics, IP	see point 3	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	according to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass: single solenoid valve double solenoid valve	kg	5,6 7,1

HYDRAULIC SYMBOLS (typical)



1 - IDENTIFICATION CODE

D S E 5 J - [ ] [ ] [ ] [ ] / 31 [ ] - [ ] K11 [ ]

Direct operated directional control valve

Electric proportional control

Size ISO 4401-05

Digital integrated electronics for valves with feedback

Spool type:
C = closed centre
A = open centre
Z = zero overlap
RC = regenerative closed centre

Nominal flow rate of the spool (see p. 2)

FS = Fail safe option (omit if not required).
Available on spools type Z only.

Solenoid position (omit for 2 solenoids configuration):
SA = 1 solenoid on side A

Series N. (the overall and mounting dimensions remain unchanged from 30 to 39)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Reference signal:
E0 = voltage ±10 V
E1 = current 4 ÷ 20 mA

Main connector 6 pin + PE

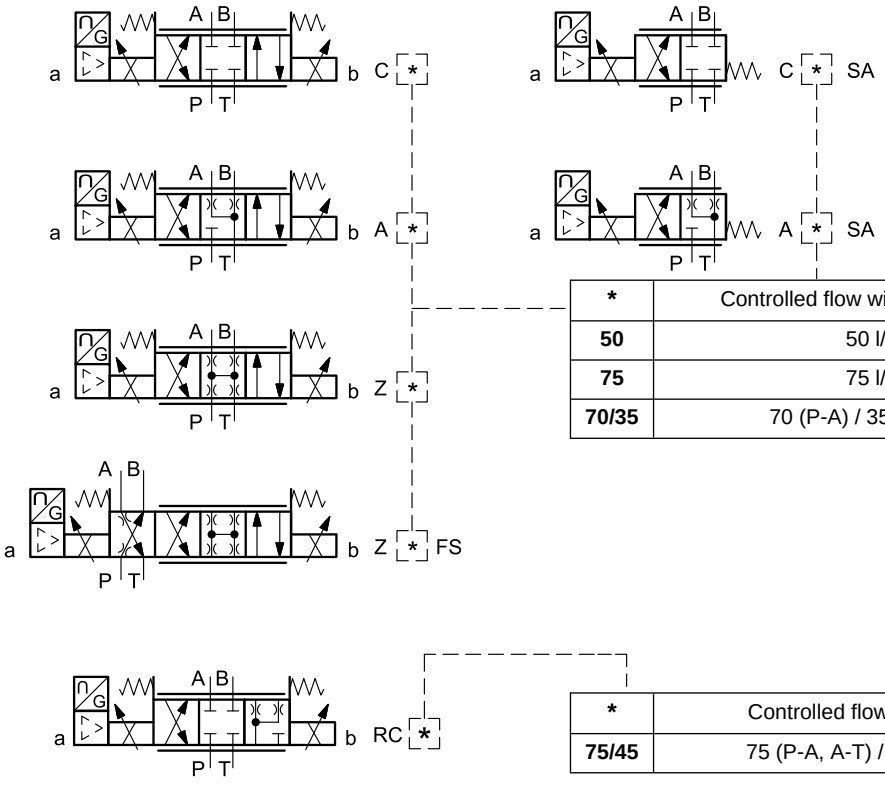
Pin C function:
A = external enable
B = internal enable
C = 0V monitor

2 - CONFIGURATIONS

The valve configuration depends on the combination of the following elements:
number of proportional solenoids, spool type, rated flow.

Configuration 2 solenoids :
3 positions with spring centering

Configuration 1 solenoid on side A "**SA**":
2 positions (central + external) with spring centering



*	Controlled flow with Δp 10 bar P-T
50	50 l/min
75	75 l/min
70/35	70 (P-A) / 35 (P-B) l/min

*	Controlled flow with Δp 5 bar
75/45	75 (P-A, A-T) / 45 (B-P) l/min

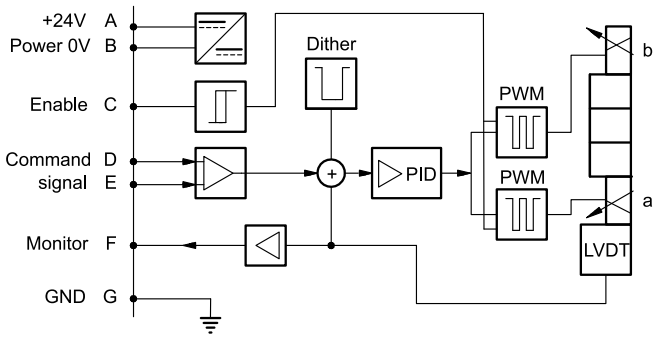
3 - ELECTRICAL CHARACTERISTICS

3.1 - Electrical on board electronics

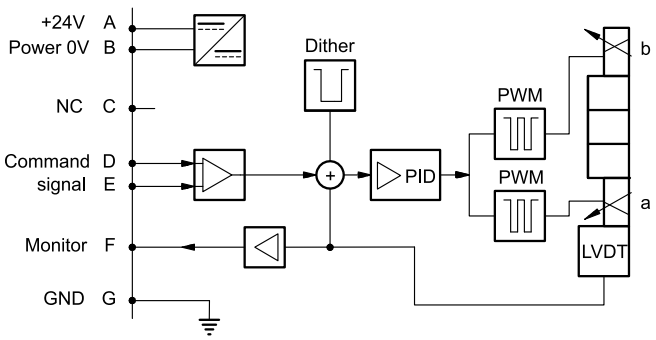
Duty cycle			100% (continuous operation)
Protection class according to EN 60529			IP65/IP67
Supply voltage		V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption		VA	40
Maximum solenoid current		A	2.8
Fuse protection, external			3A
Command signals:	voltage (E0) current (E1)	V DC mA	±10 (Impedance Ri > 11 kohm) 4 ÷ 20 (Impedance Ri = 58 ohm)
Monitor signals:	voltage (E0) current (E1)	V DC mA	±10 (Impedance Ro > 1 kohm) 4 ÷ 20 (Impedance Ro = 500 ohm)
Managed breakdowns			Overload and electronics overheating, LVDT sensor error, cable breakdown, supply voltage failure
Communication			LIN-bus Interface (with the optional kit)
Connection			7 - pin MIL-C-5015-G (DIN-EN 175201-804)
Electromagnetic compatibility (EMC) emissions EN 61000-6-4 immunity EN 61000-6-2			According to 2014/30/EU standards

3.2 - On-board electronics diagrams

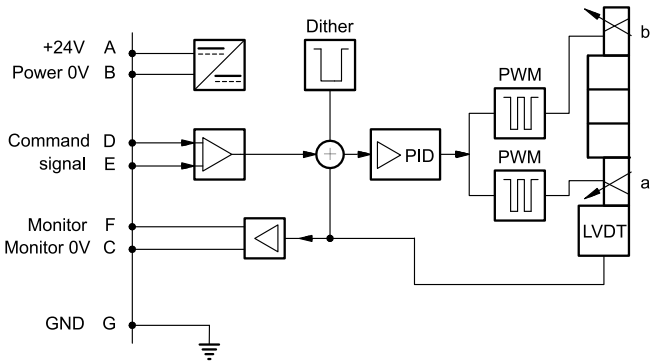
VERSION A - External Enable



VERSION B - Internal Enable

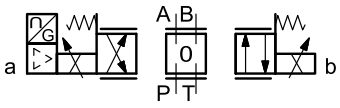


VERSION C - 0V Monitor

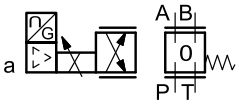


4 - VERSIONS WITH VOLTAGE COMMAND (E0)

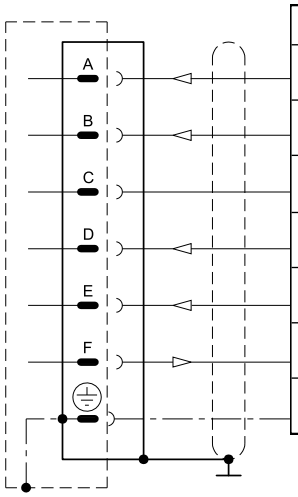
The reference signal is between -10V and +10V on double solenoid valves, and 0 ÷ 10V on single solenoid valves SA. The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**-10V**	**0V**	**+10V**
MONITOR	**-10V**	**0V**	**+10V**



COMMAND	**+10V**	**0V**	
MONITOR	**+10V**	**0V**	

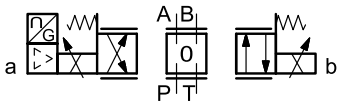


Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	not used -	PIN F reference 0 V
D	± 10 V	Command (differential input)		
E	0 V	PIN D reference		
F	± 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

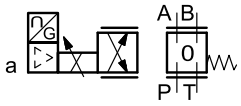
5 - VERSIONS WITH CURRENT COMMAND (E1)

The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower ,the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

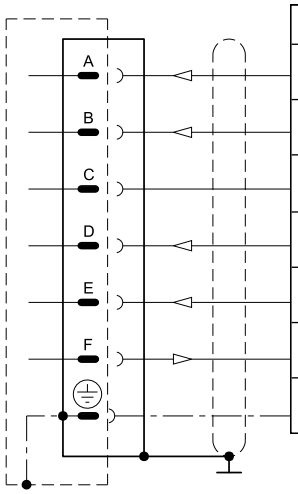
The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**4 mA**	**12 mA**	**20 mA**
MONITOR	**4 mA**	**12 mA**	**20 mA**



COMMAND	**20 mA**	**4 mA**	
MONITOR	**20 mA**	**4 mA**	

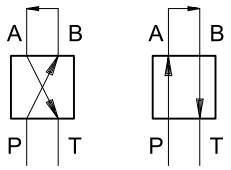


Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	not used -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	PIN D reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

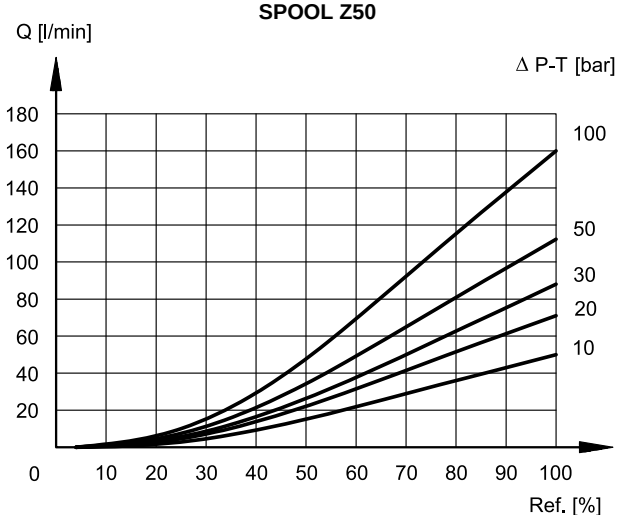
6 - CHARACTERISTIC CURVES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

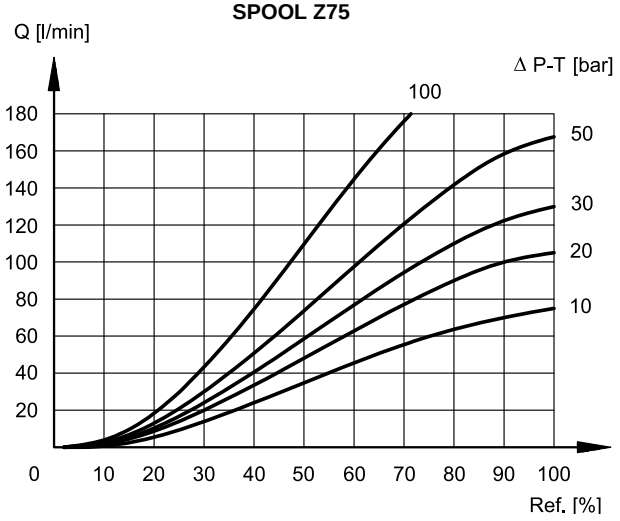
Typical flow rate curves related to the reference signal and measured for the available spools.
The Δp values are measured between P and T valve ports.



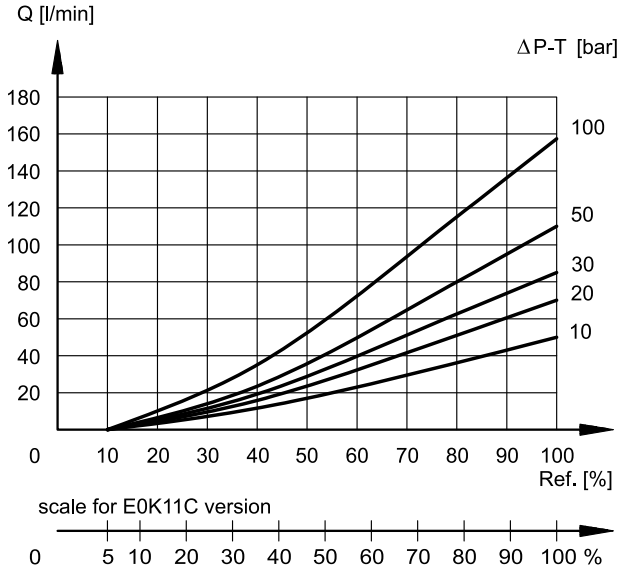
SPOOL Z50



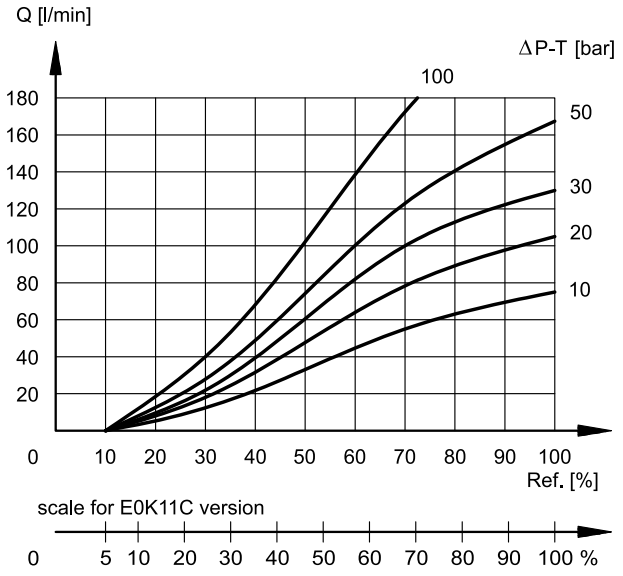
SPOOL Z75



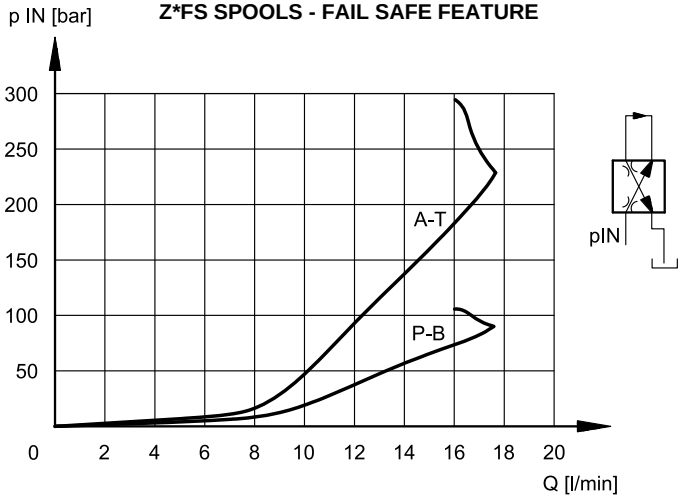
SPOOLS A50 - C50



SPOOLS A75 - C75



Z*FS SPOOLS - FAIL SAFE FEATURE

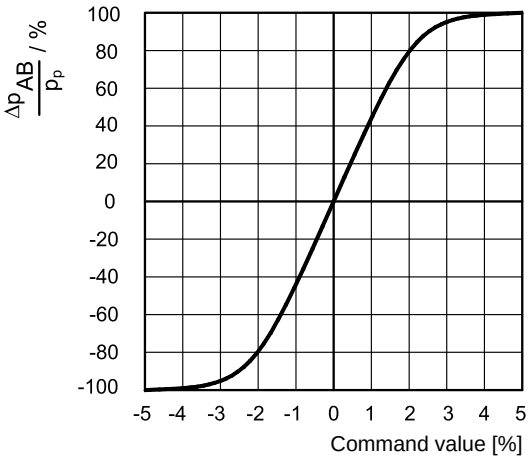


Flow P→B / A→T with valve in fail safe position, depending on the incoming pressure.

When a power failure (enabling OFF) occurs, the valve moves in 'fail safe' position by maintaining a minimum flow that allows the actuator to return slowly to a safety position.

During the black-out the centering springs retain the spool in fail safe-position.

Z SPOOLS - PRESSURE GAIN



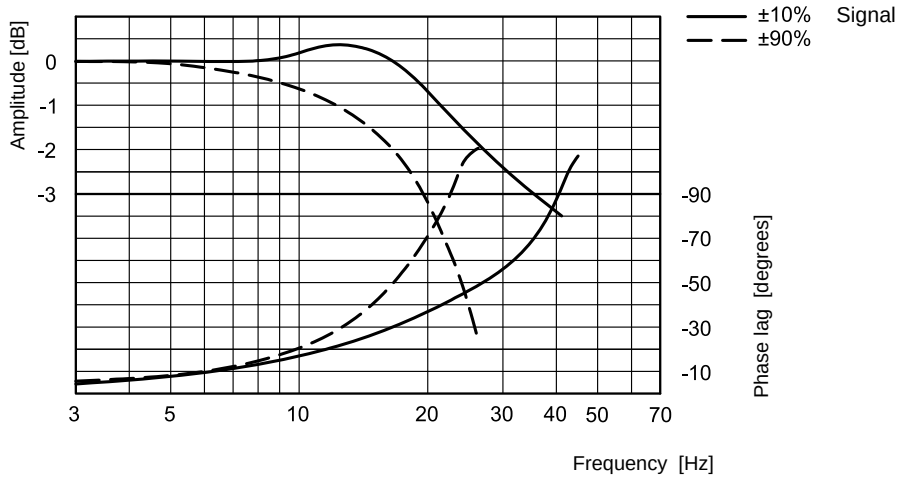
The diagram shows the valve pressure gain, expressed as % of the ratio between the port pressure variation in A or B (Δp AB) and the P system pressure, according to the reference signal.

In practice, the pressure gain states the valve reaction towards external disturbances aimed at changing the actuator position.

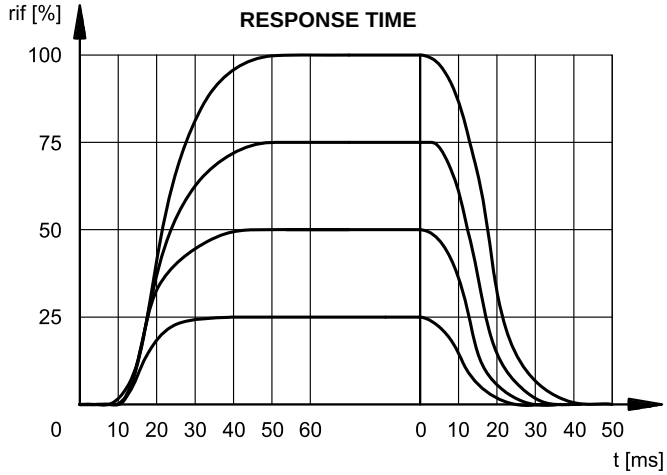
7 - RESPONSE TIMES

(obtained with mineral oil with viscosity of 36 cSt at 50°C 140 bar Δp P→T)

FREQUENCY RESPONSE (SPOOL Z - 4/3 valve)



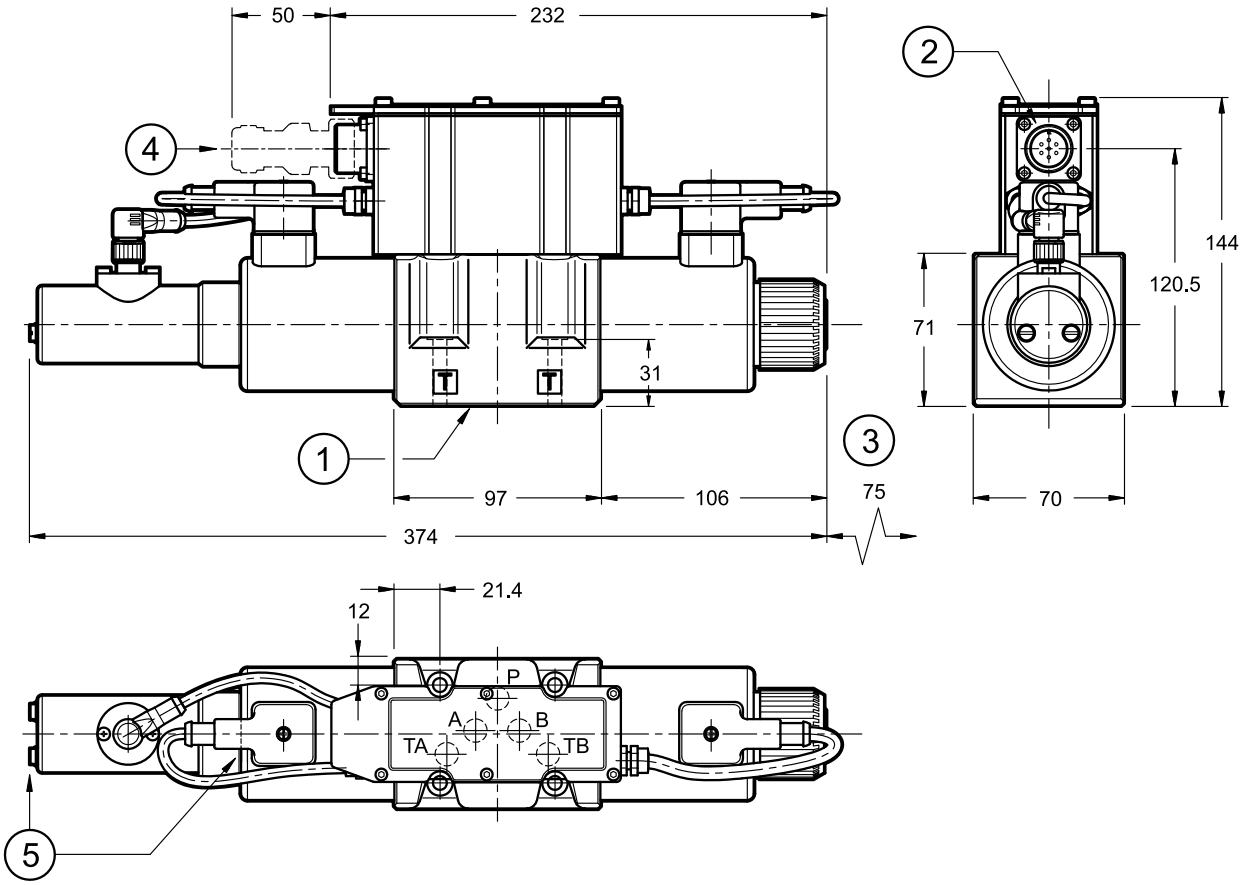
RESPONSE TIME



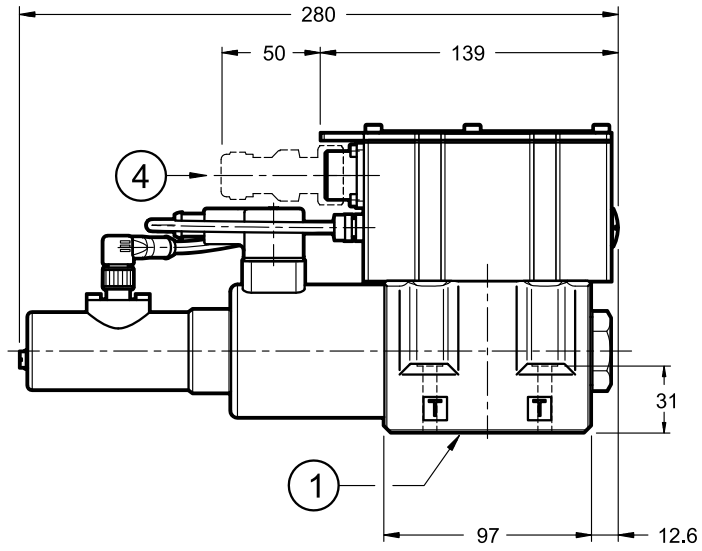
8 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

DSE5J-A*
DSE5J-C*, DSE5J-RC*
DSE5J-Z*



DSE5J-A* SA
DSE5J-C* SA



Fastening bolts: 4 SHC bolts M6x40 - ISO 4762
Torque: 8 Nm (A8.8)
Threads of mounting holes: M6x10

1	Mounting surface with sealing rings: 5 OR type 2050 (12.42x1.78) 90 Shore
2	Main connection
3	Coil removal space (solenoid B only)
4	Mating connector. **To be ordered separately.** See point 11
5	Adjustment sealing performed at factory. Do not disassemble the transducer.

9 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

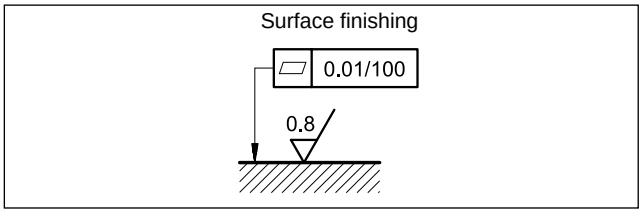
The fluid must be preserved in its physical and chemical characteristics.

10 - INSTALLATION

DSE5J valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.

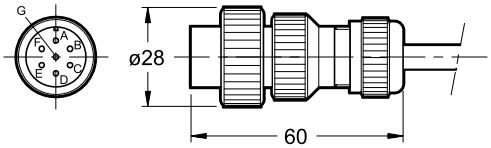


11 - ACCESSORIES

(to be ordered separately)

11.1 Mating connector

These valves have a plug for 7-pin mating connector, that is placed on the box of the integral motion control.



So as to avoid electromagnetic troubles and comply with the electromagnetic compatibility regulation EMC, it is recommended the use of a metal connector.

If a plastic connector is used, make sure that the protection characteristics IP and EMC of the valve are guaranteed.

Duplomatic can provide a metal cable connector type MIL-C-5015-G (EN 175201-804).

name: **EX7S/L/10** code **3890000003**

11.2 - Connection cables size

Power supply:
- up to 20 m cable length : 1,0 mm²
- up to 40 m cable length : 1,5 mm²

Signal: 0,50 mm²

A suitable cable would have 7 isolated conductors, a separate screen for the signal wires and an overall screen.

11.3 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic, see catalogue 89850.

12 - SUBPLATES

(see catalogue 51 000)

PMD4-AI4G rear ports 3/4” BSP
PMD4-AL4G side ports 1/2” BSP

DUPLOMATIC MOTION SOLUTIONS
a member of DAIKIN group

DUPLOMATIC MS Spa
via Mario Re Depaolini, 24 | 20015 Parabiago (MI) | Italy
T +39 0331 895111 | E vendite.ita@duplomatic.com | sales.exp@duplomatic.com
duplomaticmotionsolutions.com

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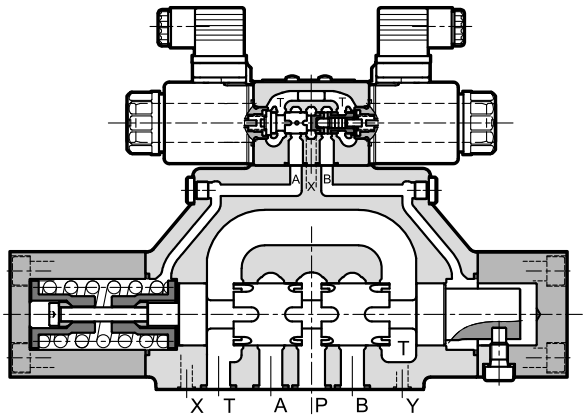
DSPE*

PROPORTIONAL DIRECTIONAL VALVES, PILOT OPERATED, ELECTRO-HYDRAULIC OR HYDRAULIC (DSCE*) ACTUATED

SUBPLATE MOUNTING

DSPE5	**CETOP P05**
DSPE5R	**ISO 4401-05**
DSPE7	**ISO 4401-07**
DSPE8	**ISO 4401-08**
DSPE10	**ISO 4401-10**
DSPE11	**ISO 4401-10** oversize ports

OPERATING PRINCIPLE



— The DSPE* are proportional directional control valves with electric proportional control and mounting interface in compliance with ISO 4401 standards.

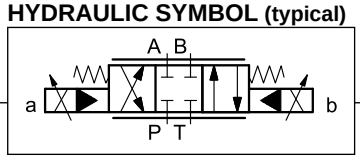
— DSCE* are the hydraulic actuated versions for external actuation by pressure control valve.

— They are suitable for directional and speed control of hydraulic actuators.

— Valve opening and hence flow rate can be modulated continuously in proportion to the current supplied to the solenoid.

— The valves can be actuated by a current control supply unit or by an external electronic card, to maximize the valve performances (see point 19).

HYDRAULIC SYMBOL (typical)

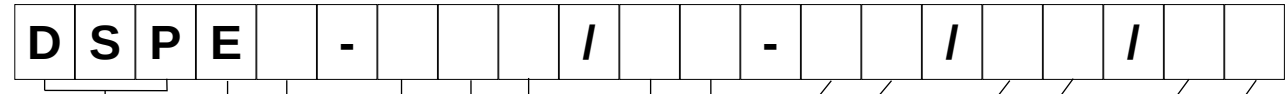


PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

		DSPE5 DSPE5R	DSPE7	DSPE8	DSPE10	DSPE11
Max operating pressure: - P - A - B ports - T port	bar	350 see point 8				320 see p. 8
Rated flow rate with Δp 10 bar P-T	l/min	80	150	300	800	1000
Step response		see point 6				
Hysteresis (with PWM 100 Hz)	% Q max	< 6%				
Repeatability	% Q max	< ±2%				
Electrical characteristics		see point 5				
Ambient temperature range	°C	-20 / +60				
Fluid temperature range	°C	-20 / +80				
Fluid viscosity range	cSt	10 ÷ 400				
Fluid contamination degree		According to ISO 4406:1999 class 18/16/13				
Recommended viscosity	cSt	25				
Mass: DSPE* single solenoid valve DSPE* double solenoid valve DSCE*	kg	6.3 7 5.5	7.7 8.4 6.9	15.4 15.9 14.4	42.8 43.5 41	40 40.7 39.2

1 - IDENTIFICATION CODE FOR ELECTRO-HYDRAULIC ACTUATED VALVES



Pilot operated directional control valve

Electric proportional control

Nominal size:
5 = CETOP P05 (**NOTE 1**)
5R = ISO 4401-05
7 = ISO 4401-07
8 = ISO 4401-08
10 = ISO 4401-10
11 = ISO 4401-10 with oversize ports

Spool type:
C = closed centre
A = open centre
RC = regenerative, closed centre
RA = regenerative, open centre

Spool nominal flow rate (see table point 2)

Configurations for single solenoid version (omit for double solenoid version):
SA = 1 solenoid for cross configuration
SB = 1 solenoid for parallel configuration

Series No.
20 = DSPE5, DSPE5R, DSPE7, DSPE8 and DSPE10
12 = DSPE11

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Piloting: **I** = internal
E = external
Z = internal piloting with 30 bar fixed adj. pressure reducing valve (see points 8 and 14)

Drain: **I** = internal
E = external

D12 = voltage 12V DC
D24 = voltage 24V DC

Coil electrical connection:
K1 = plug for connector type EN 175301-803 (ex DIN 43650) (**standard**)
K7 = plug DEUTSCH DT04-2P, for male connector type DEUTSCH DT06-2S.

Manual override:
(see point 16)

Option:
/ W7 = Zinc-nickel surface treatment (see **NOTE 2**)
Omit if not required

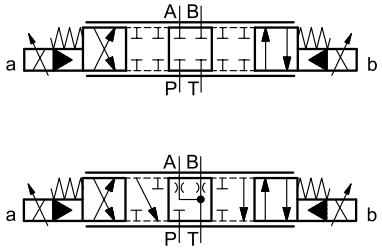
NOTE 1: This version is interchangeable with the model E4E Duplomatic.

NOTE 2: The standard valve is supplied with surface treatment of phosphating black. The zinc-nickel finishing on the valve body makes the valve suitable to ensure a salt spray resistance up to **240** hours. For a salt spray resistance up to **600** hours refer to **point 9**.
(test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

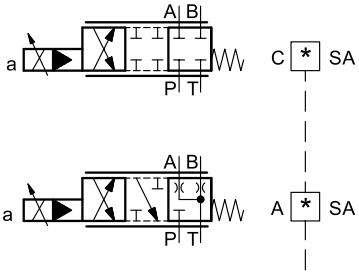
2 - AVAILABLE CONFIGURATIONS

The valve configuration depends on the combination of the following elements:
number of proportional solenoids, spool type, nominal flow rate.

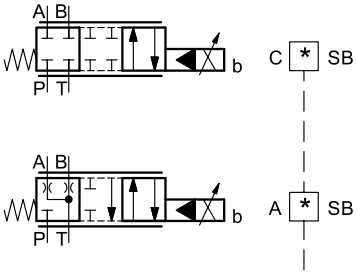
2 solenoids configuration:
3 positions with spring centering



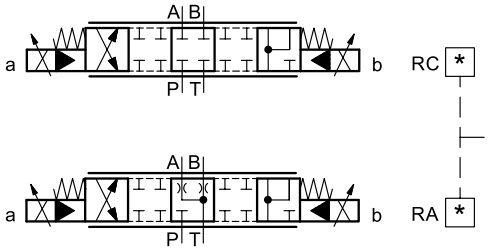
"**SA**" configuration: 1 solenoid on side A.
2 positions (central + external) with return spring



"**SB**" configuration: 1 solenoid on side B.
2 positions (central + external) with return spring



Type of valve	*	Nominal flow with Δp10 bar P→T
DSPE5 DSPE5R	**80**	80 l/min
	80/40	80 (P-A) / 40 (B-T) l/min
DSPE7	**100**	100 l/min
	150	150 l/min
	150/75	150 (P-A) / 75 (B-T) l/min
DSPE8	**200**	200 l/min
	300	300 l/min
	300/150	300 (P-A) / 150 (B-T) l/min
DSPE10	**350**	350 l/min
	500	500 l/min
	500/250	500 (P-A) / 250 (B-T) l/min
	800	800 l/min
DSPE11	**1000**	1000 l/min



Type of valve	*	Nominal flow with Δp10 bar P→T
DSPE7	**150/75**	150 (P-A, A-T) / 75 (P-B, B-P) l/min
DSPE8	**300/150**	300 (P-A, A-T) / 150 (P-B, B-P) l/min
DSPE10	**500/250**	500 (P-A, A-T) / 250 (P-B, B-P) l/min

3 - IDENTIFICATION CODE FOR HYDRAULIC ACTUATED VALVES

D	S	C	E		-			/			-	E	E	

Directional control valve for external actuation by pressure control valve

For proportional control

Nominal size:
5 = CETOP P05
5R = ISO 4401-05
7 = ISO 4401-07
8 = ISO 4401-08
10 = ISO 4401-10
11 = ISO 4401-10 with oversize ports

Spool type:
C = closed centre
A = open centre

Spool nominal flow rate (see point 2)

Series No.
20 = DSCE5, DSCE5R, DSCE7, DSCE8 and DSCE10
12 = DSCE11

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

External pilot supply

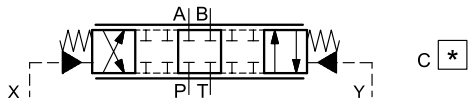
External drain

Option:
/ W7 = Zinc-nickel surface treatment (see **NOTE**)
Omit if not required

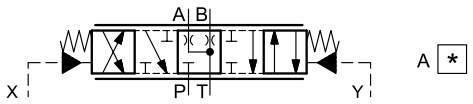
Spool types

DSCE* valves are delivered with short-circuit subplate.

The hydraulic actuation takes place by pressurization in X and Y ports.



C [*]



A [*]

NOTE: The standard valve is supplied with surface treatment of phosphating black.

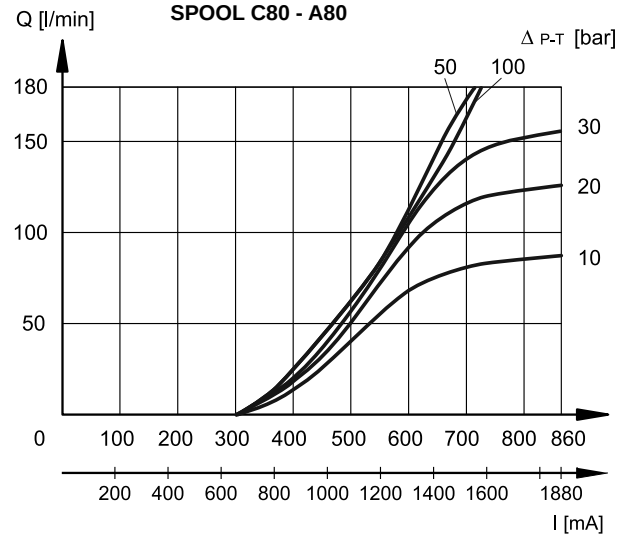
The zinc-nickel finishing makes the valve suitable to ensure a salt spray resistance up to **600** hours.
(test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

4 - CHARACTERISTIC CURVES

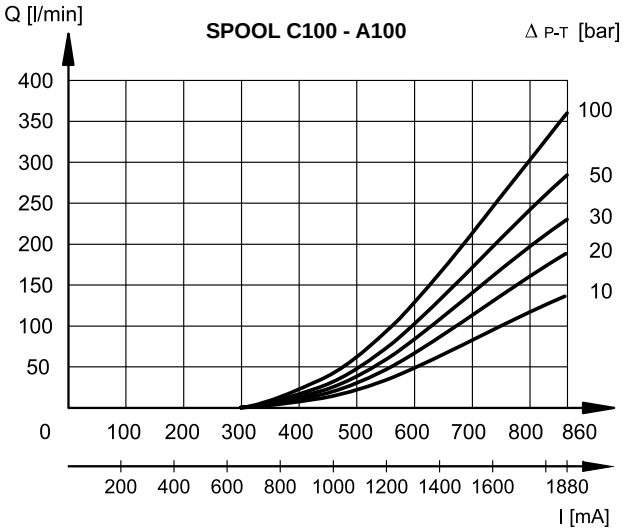
(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

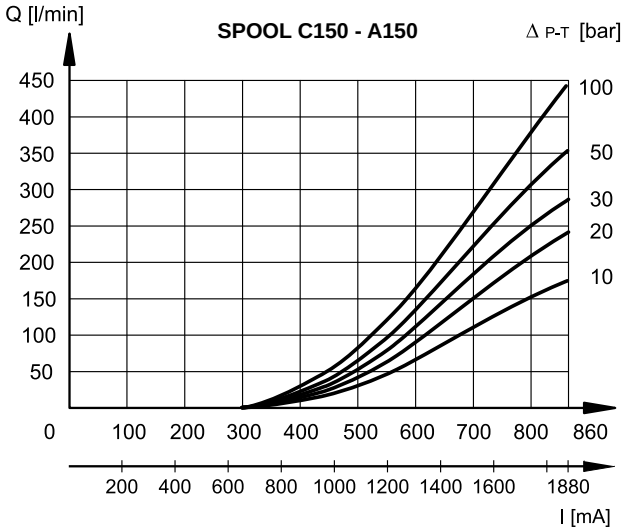
Typical flow rate control curves at constant Δp according to the current supply to the solenoid, measured for the available spool types. The reference Δp values are measured between P and T valve ports.

4.1 - Characteristic curves DSPE5 and DSPE5R

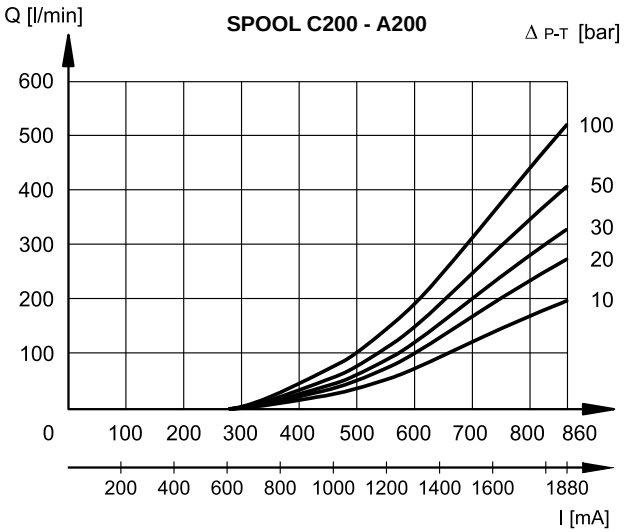


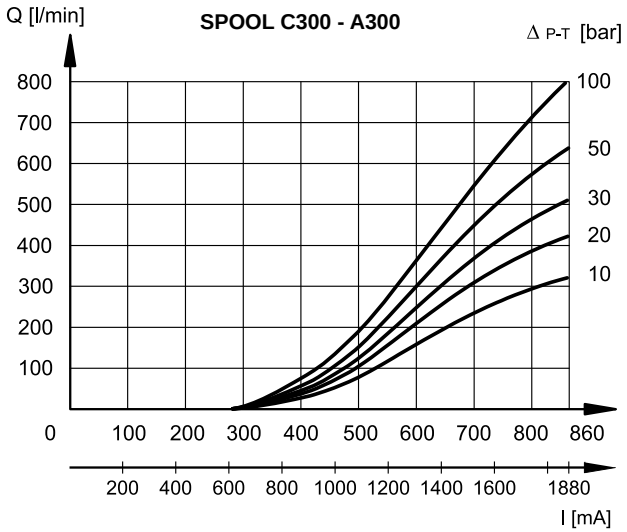
4.2 - Characteristic curves DSPE7



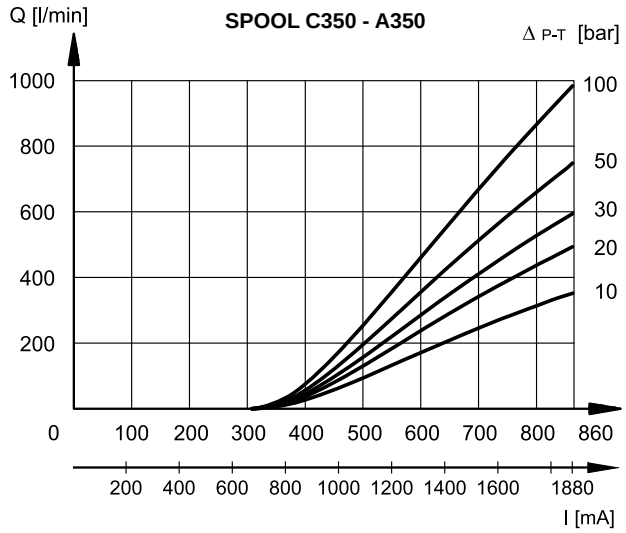


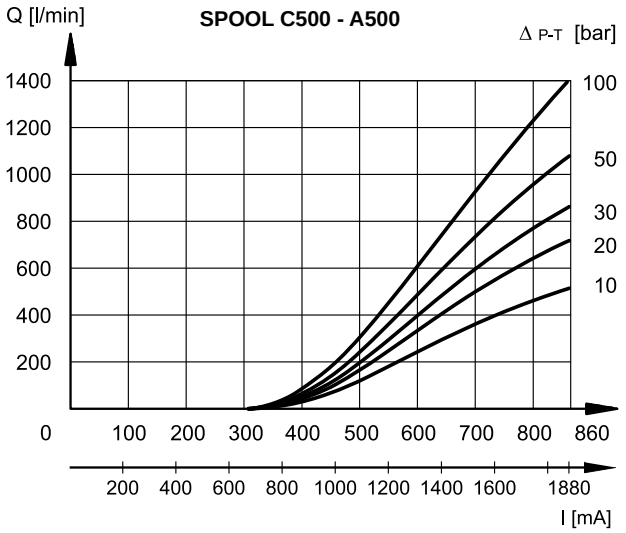
4.3 - Characteristic curves DSPE8

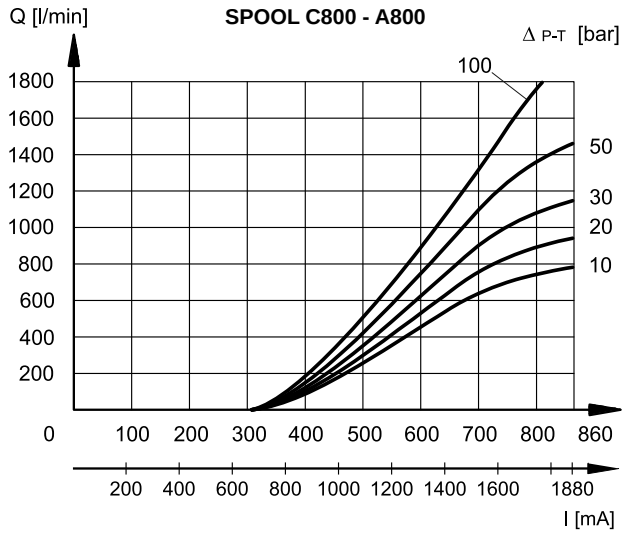




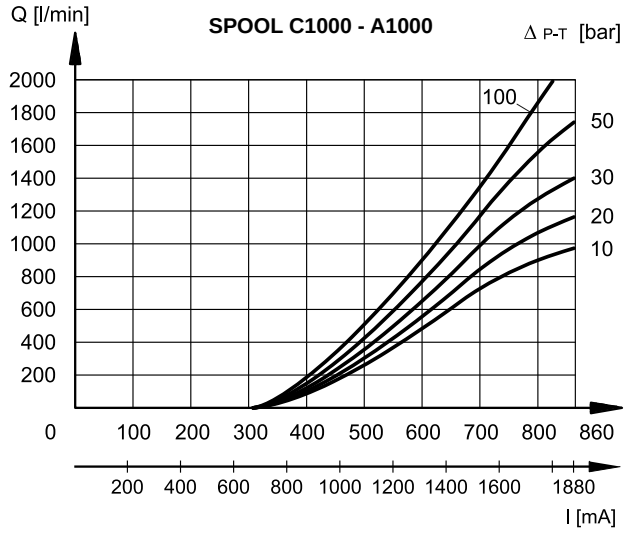
4.4 - Characteristic curves DSPE10







4.5 - Characteristic curves DSPE11



5 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut. It can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20°C) K1 coil K7, WK1, WK7 coil	ohm	 3.66 4.4	 17.6 18.6
NOMINAL CURRENT	A	1.88	0.86
DUTY CYCLE		100%	
ELECTROMAGNETIC COMPATIBILITY (EMC)		According to 2014/30/EU	
PROTECTION FROM ATMOSPHERIC AGENTS (IEC 60529)		IP65	
CLASS OF PROTECTION Coil insulation (VDE 0580) Impregnation		 class H class F	

6 - STEP RESPONSE

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

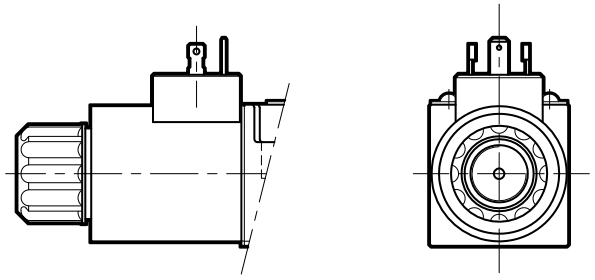
The table shows the typical step response tested with static pressure 100 bar.

REFERENCE SIGNAL	0 → 100%	100 → 0%
	Step response [ms]	
DSPE5 / DSPE5R	50	40
DSPE7	80	50
DSPE8	100	70
DSPE10 / DSPE11	200	120

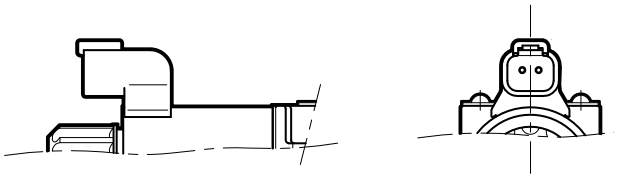
7 - ELECTRIC CONNECTIONS

Connectors for K1 connection are always delivered together with the valve.

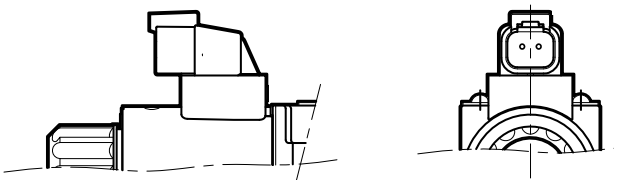
connection for EN 175301-803
(ex DIN 43650) connector
code **K1** (**standard**)
code **WK1** (W7 version only)



connection for
DEUTSCH DT06-2S male connector
code **K7**



connection for
DEUTSCH DT06-2S male connector
code **WK7** (W7 version only)



8 - HYDRAULIC CHARACTERISTICS

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

		DSPE5 DSPER5	DSPE7	DSPE8	DSPE10	DSPE11
Max flow rate	l/min	180	450	800	1800	2000
Pilot supply flow requested with operation 0 →100%	l/min	2.1	2.4	5.5	6.5	6.5
Pilot supply volume requested with operation 0 →100%	cm^3	1.7	3.2	9.2	21.6	21.6

PRESSURES (bar)	MIN	MAX
Piloting pressure on X port (DSPE*)	30	210 (**NOTE**)
Pressure on T port with internal drain	–	10
Pressure on T port with external drain	–	250

NOTE: if the valve operates at higher pressures it is necessary to use the version with external pilot supply with reduced pressure.

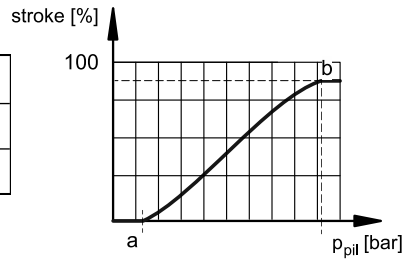
Otherwise, the valve with internal pilot and pressure reducing valve with 30 bar fixed adjustment can be ordered (piloting type: Z, see point 1 and 14).

8.1 - Pilot supply pressures for DSCE* valves

These values are intended at nominal Δp. The resistive forces increase at higher Δp and therefore the maximum pilot pressure must be higher to move the main spool for its entire stroke.

Max pilot pressure must not exceed 30 bar.

		DSCE5	DSCE7	DSCE8	DSCE10	DSCE11
Valve opening (a)	bar	5.0	4.0	3.5	4.5	4.5
Max spool stroke (b)	bar	24.0	24.0	23.5	23.0	23.0



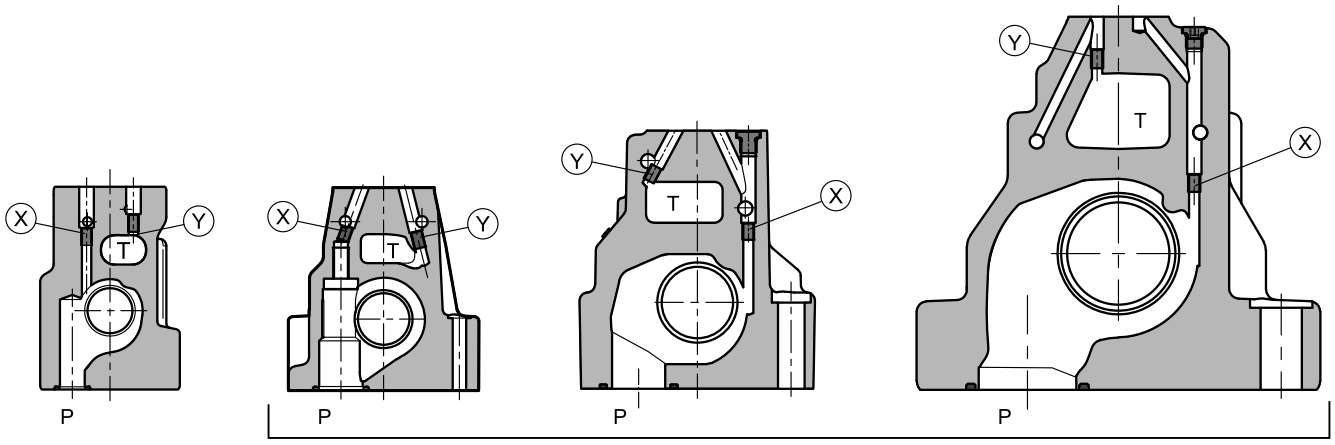
8.2 - Pilot and drain

DSPE* valves are available with pilot and drain both internal or external. The version with external drain allows a higher back pressure on the unloading. The version with external pilot with reduced pressure must be used when higher pressures are needed.

The pilot supply Z type consists of an arrangement with internal piloting and 30 bar supply pressure for the pilot stage by means of a fixed adjustment pressure reducing valve.

NOTE: The configuration of pilots and drains must be chosen when ordering. Subsequent modifications are allowed only to specialized operators with authorization and in factory.

TYPE OF VALVE		Plug assembly	
		X	Y
IE	internal pilot and external drain	NO	YES
II	internal pilot and internal drain	NO	NO
EE	external pilot and external drain	YES	YES
EI	external pilot and internal drain	YES	NO



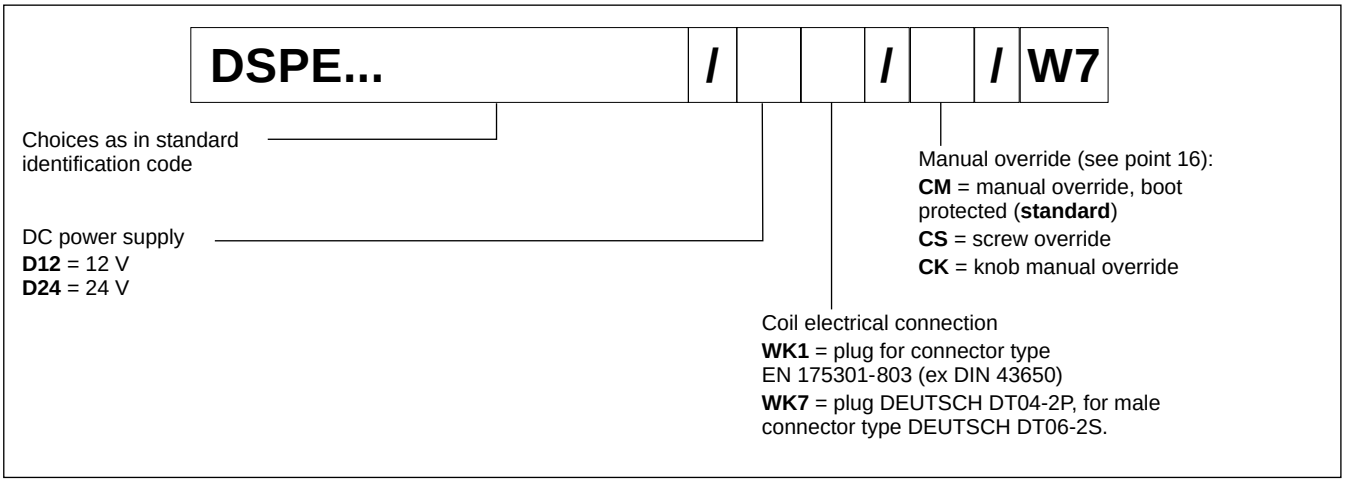
DSPE5 / DSPE5R

X: plug M5x6 for external pilot
Y: plug M5x6 for external drain

DSPE7, DSPE8, DSPE10/11

X: plug M6x8 for external pilot
Y: plug M6x8 for external drain

9 - HIGH IP AND CORROSION RESISTANCE VERSION



9.1 - Corrosion resistance

This version features the zinc-nickel coating on all exposed metal parts of the valve, making it resistant to exposure to the salt spray for **600** hours (test performed according to UNI EN ISO 9227 and assessment test performed according to UNI EN ISO 10289).

The boot protected manual override is fitted as standard in order to protect the solenoid tube. See the dimensions of the CM manual override in point 16.

9.2 - Coils

The coils feature a zinc-nickel surface treatment. The electrical characteristics do not change compared to the standard version: see table in point 5.

9.3 - Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree correctly connected and installed.

electric connection	electric connection protection	whole valve protection
WK1 EN 175301-803 (ex DIN 43650)	IP66	IP66
WK7 DEUTSCH DT04 male	IP66/IP68/IP69 IP69K*	IP66/IP68/IP69 IP69K*

(*****) The IP69K protection degree is not taken into account in IEC 60529 but it is included in ISO 20653.

NOTE: As regards the liquid ingress protection (second digit), there are three means of protection.

Codes from 1 to 6 are related to water jets.

Rates 7 and 8 are related to immersion.

Rate 9 is reserved for high pressure and temperature water jets.

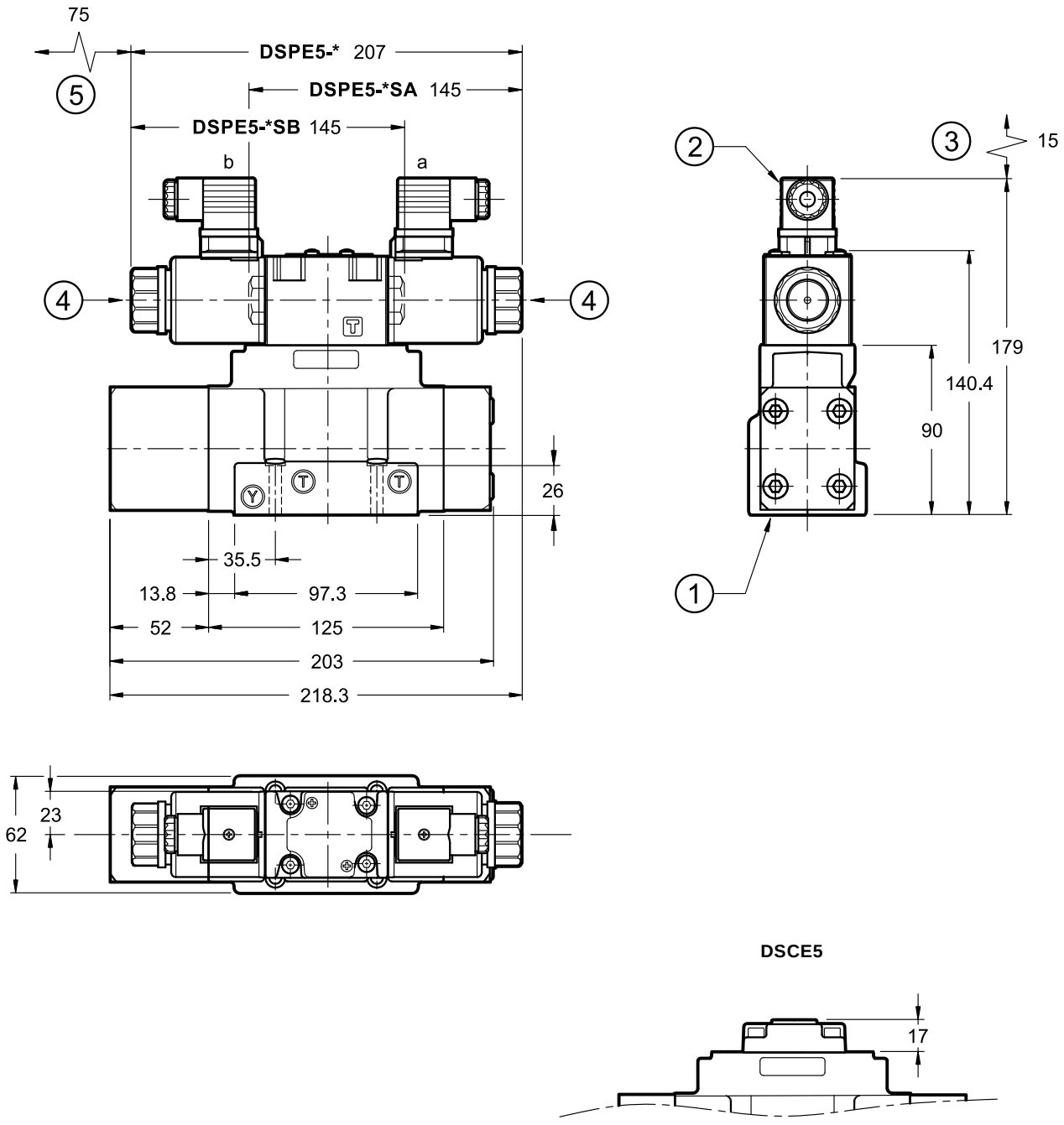
This means that IPX6 covers all the lower steps, rate IPX8 covers IPX7 but not IPX6 and lower, instead IPX9 does not cover any of them.

Whether a device meets two types of protection requirements it must be indicated by listing both the tests separated by a slash.

(E.g. a marking of an equipment covered both by temporary immersion and water jets is IP66/IP68).

10 - OVERALL AND MOUNTING DIMENSIONS DS*E5 AND DS*E5R

dimensions in mm



DSCE5

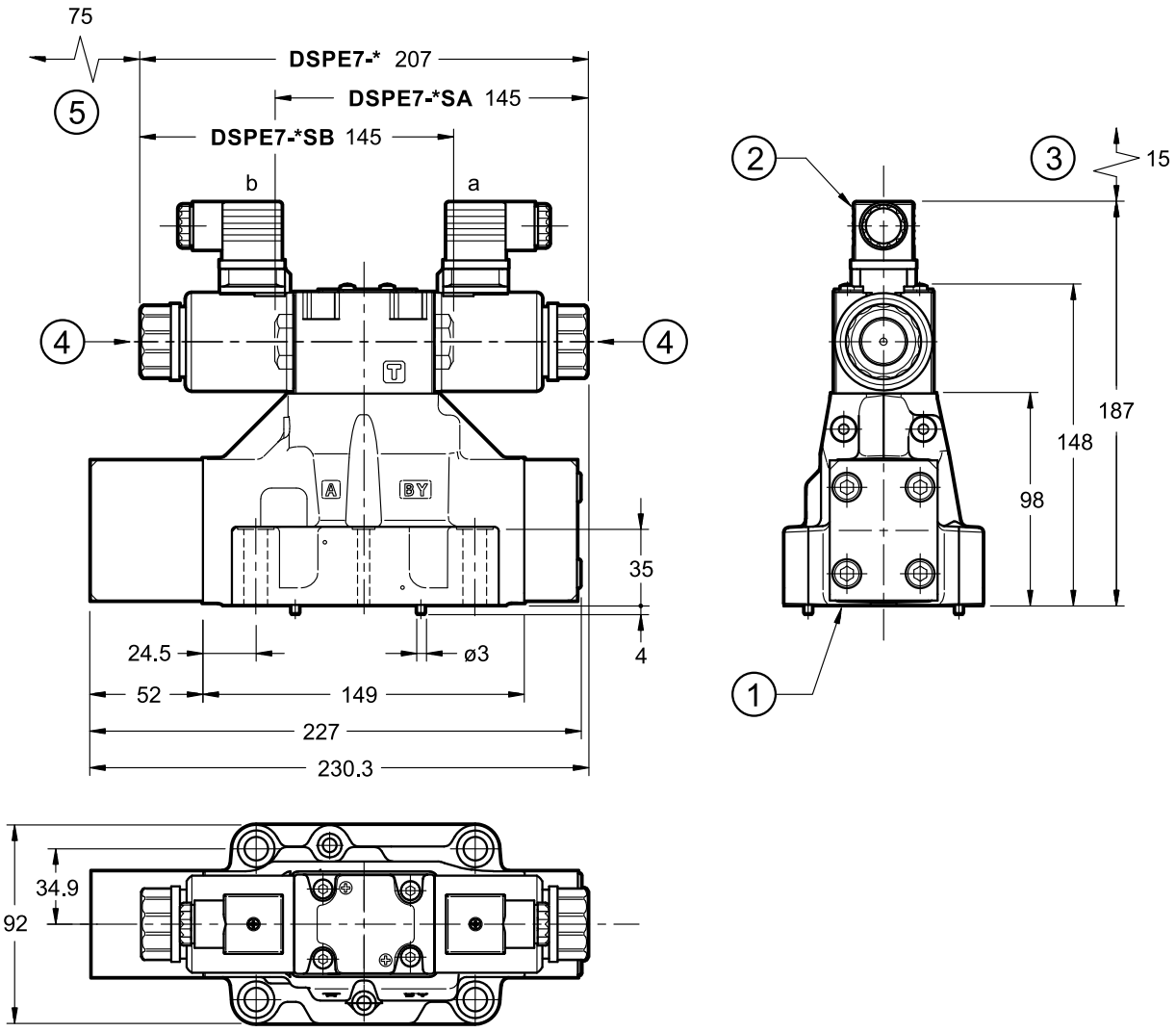
NOTE: for overall dimensions with Z option
(fixed adjustment pressure reducing valve) see point 14.
- Mounting interface at point 15.

Valve fastening: N. 4 SHC screws M6x35 - ISO 4762
Tightening torque: 8 Nm (A 8.8 bolts)
Thread of mounting holes: M6x10

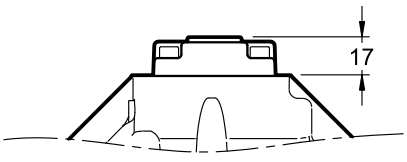
1	Mounting surface with sealing rings: N. 5 OR type 2050 (12.42x1.78) - 90 Shore N. 2 OR type 2037 (9.25x1.78) - 90 Shore
2	EN 175301-803 (ex DIN 43650) electrical connector
3	Connector removal space
4	Standard manual override embedded in the solenoid tube
5	Coil removal space

11 - OVERALL AND MOUNTING DIMENSIONS DS*E7

dimensions in mm



DSCE7



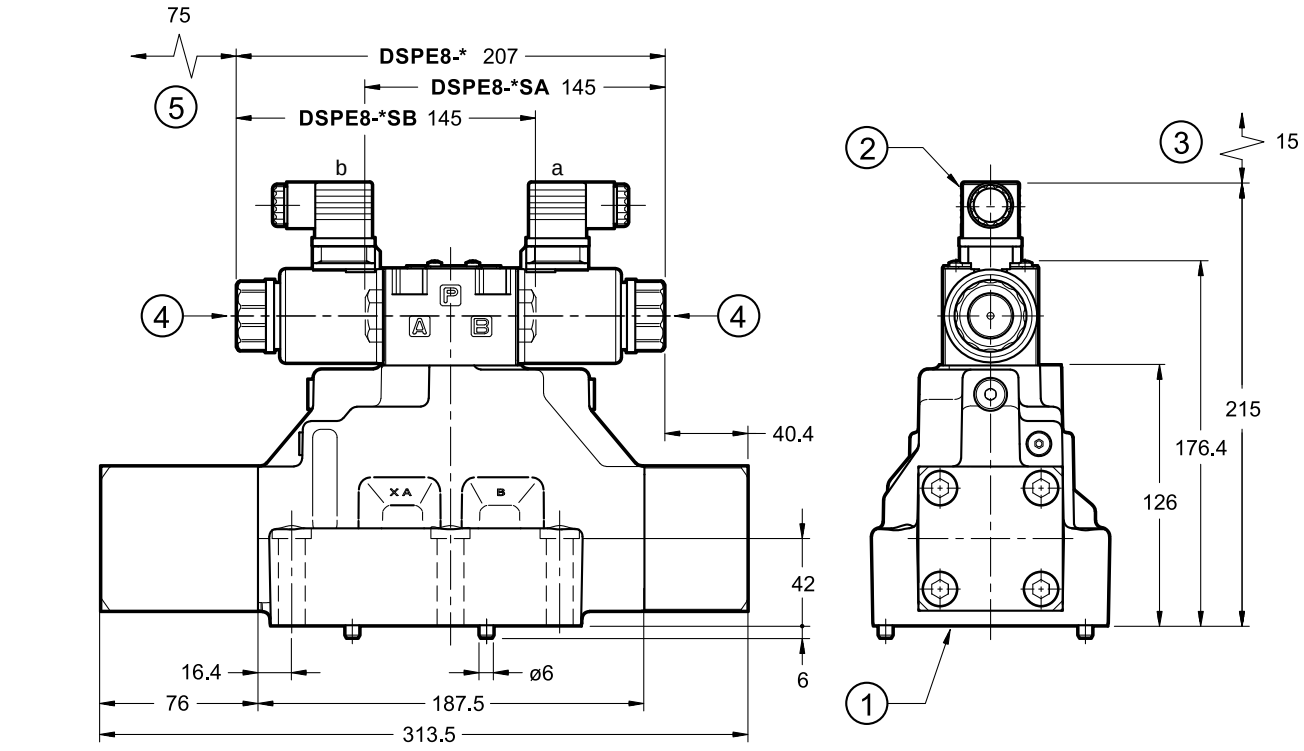
NOTE: for overall dimensions with Z option
(fixed adjustment pressure reducing valve) see point 14.
- Mounting interface at point 15.

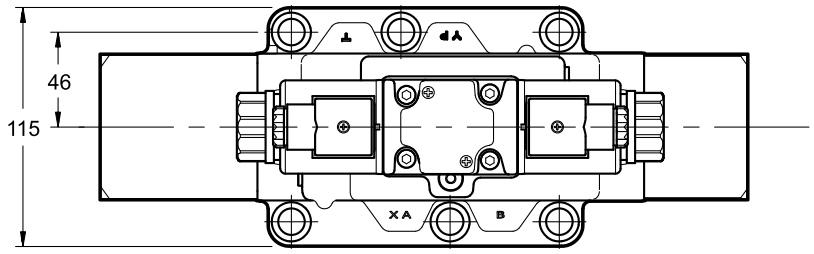
Single valve fastening:	N. 4 SHC M10x50 bolts - ISO 4762 N. 2 SHC M6x50 bolts - ISO 4762
Tightening torque:	M10x50: 40 Nm (A 8.8 bolts) M6x50: 8 Nm (A 8.8 bolts)
Thread of mounting holes:	M6x18; M10x18

1	Mounting surface with sealing rings: N. 4 OR type 130 (22.22x2.62) - 90 Shore N. 2 OR type 2043 (10.82x1.78) - 90 Shore
2	EN 175301-803 (ex DIN 43650) electrical connector
3	Connector removal space
4	Standard manual override embedded in the solenoid tube
5	Coil removal space

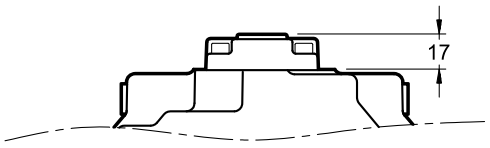
12 - OVERALL AND MOUNTING DIMENSIONS DS*E8

dimensions in mm





DSCE8



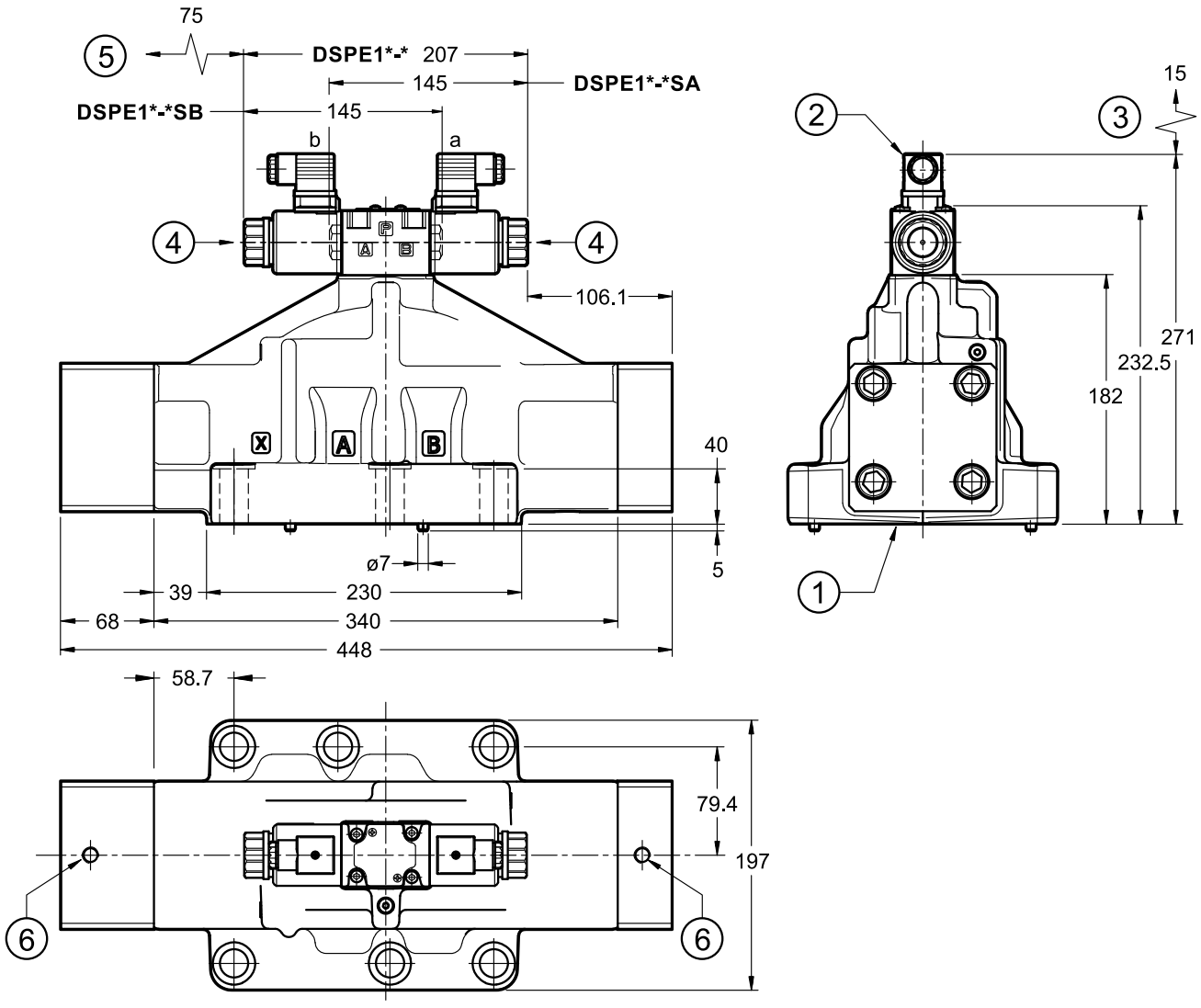
NOTE: for overall dimensions with Z option
(fixed adjustment pressure reducing valve) see point 14.
- Mounting interface at point 15.

Valve fastening: N. 6 SHC M12x60 bolts - ISO 4762
Tightening torque: 69 Nm (A 8.8 bolts)
Thread of mounting holes: M12x20

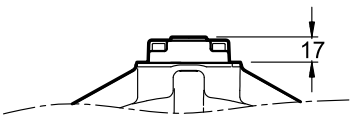
1	Mounting surface with sealing rings: N. 4 OR type 3131 (32.99x2.62) - 90 Shore N: 2 OR type 3087 (21.89x2.62) - 90 Shore
2	EN 175301-803 (ex DIN 43650) electrical connector
3	Connector removal space
4	Standard manual override embedded in the solenoid tube
5	Coil removal space

13 - OVERALL AND MOUNTING DIMENSIONS DS*E10 AND DS*E11

dimensions in mm



DSCE10 / DSCE11



NOTE: for overall dimensions with Z option
(fixed adjustment pressure reducing valve) see point 14.
- Mounting interface at point 15.

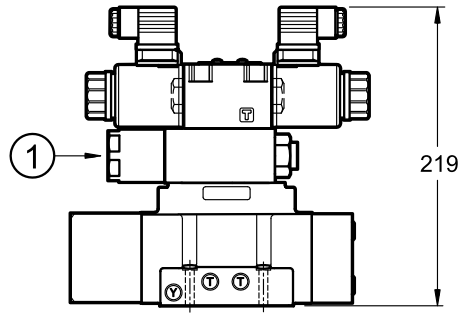
Valve fastening: 6 SHC screws M20x70 - ISO 4762 (supplied)
Tightening torque: 470 Nm (A10.9 screws)
Threads of mounting holes: M20x40

1	Mounting surface with sealing rings: **DS*E10** N. 4 OR type 4162 (40.86x3.53) - 90 Shore N. 2 OR type 3081 (20.24x2.62) - 90 Shore **DS*E11** N. 4 OR type 4212 (53.57x3.53) - 90 Shore N. 2 OR type 3081 (20.24x2.62) - 90 Shore
2	EN 175301-803 (ex DIN 43650) electrical connector
3	Connector removal space
4	Standard manual override embedded in the solenoid tube
5	Coil removal space
6	N. 2 M12 holes for eyebolts lifting

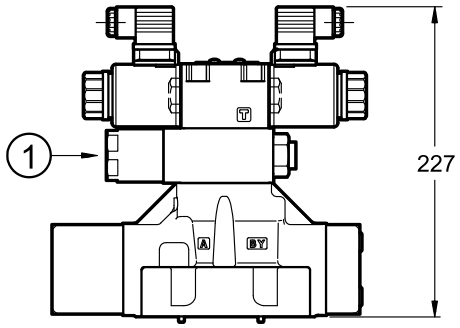
14 - OVERALL AND MOUNTING DIMENSIONS - PILOT SUPPLY TYPE Z

dimensions in mm

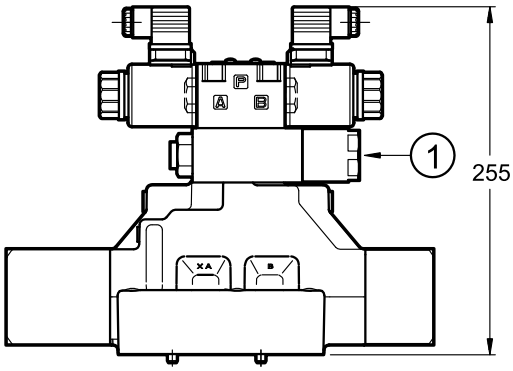
DSPE5



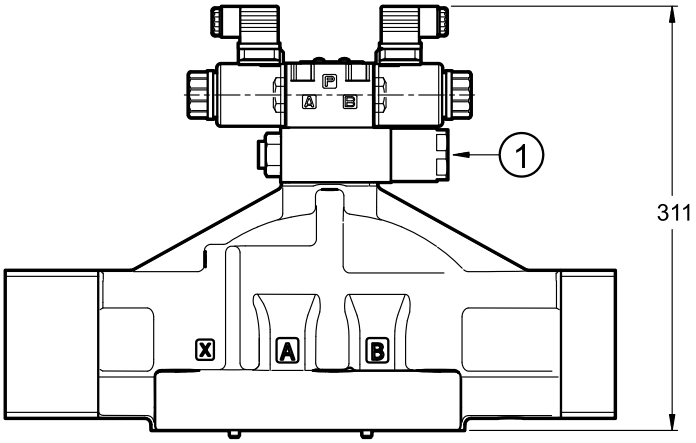
DSPE7



DSPE8



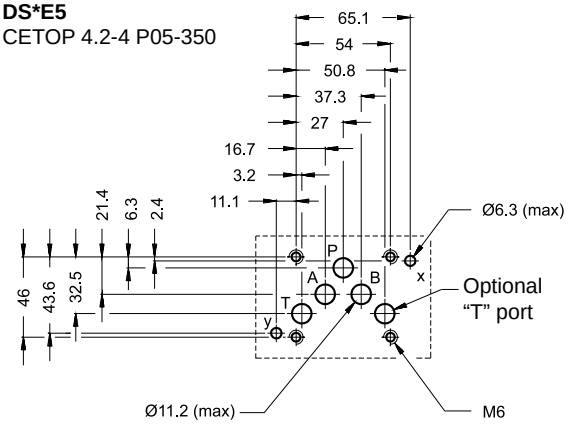
DSPE10 / DSPE11



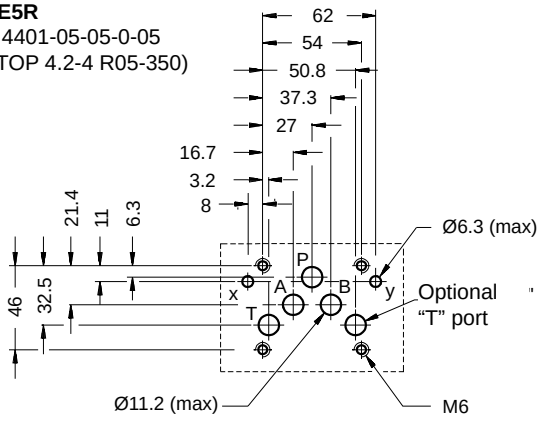
1	30 bar fixed adjustment pressure reducing valve

15 - MOUNTING SURFACES

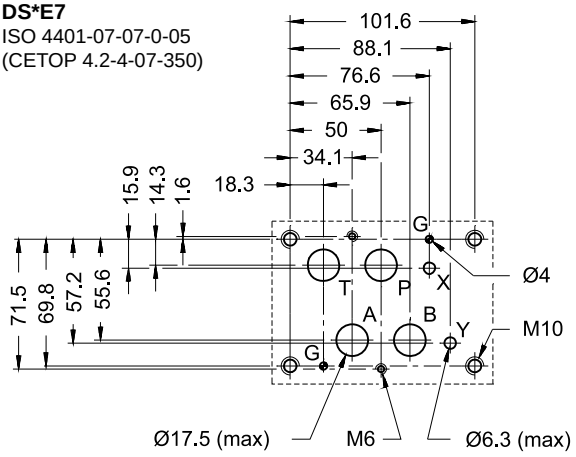
DS*E5
CETOP 4.2-4 P05-350



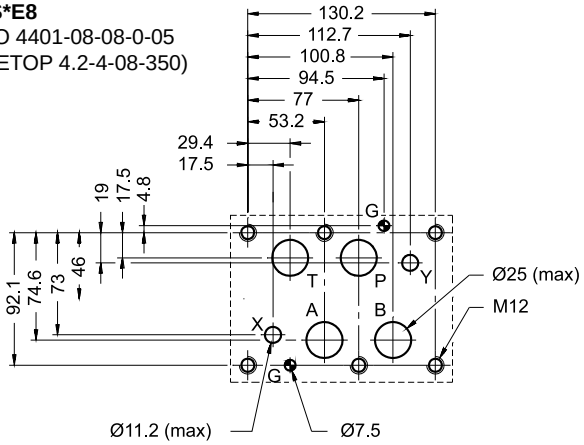
DS*E5R
ISO 4401-05-05-0-05
(CETOP 4.2-4 R05-350)



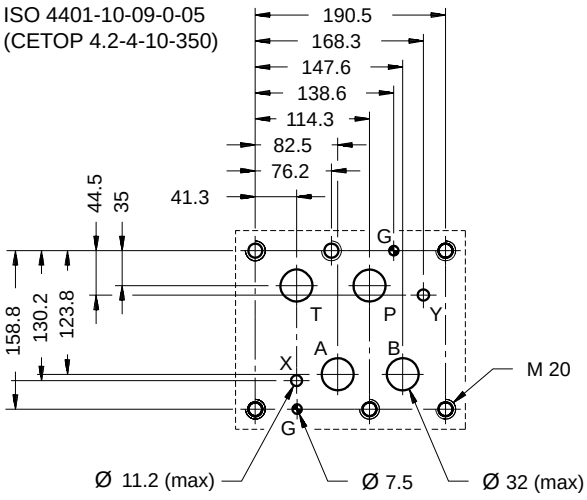
DS*E7
ISO 4401-07-07-0-05
(CETOP 4.2-4-07-350)



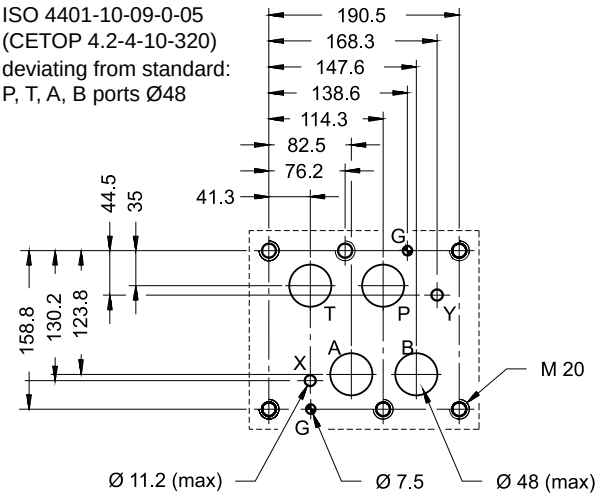
DS*E8
ISO 4401-08-08-0-05
(CETOP 4.2-4-08-350)



DS*E10
ISO 4401-10-09-0-05
(CETOP 4.2-4-10-350)



DS*E11
ISO 4401-10-09-0-05
(CETOP 4.2-4-10-320)
deviating from standard:
P, T, A, B ports Ø48



16 - MANUAL OVERRIDE

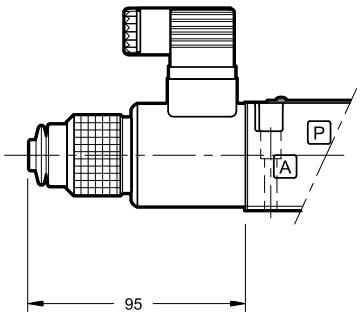
The standard valve has solenoids whose pin for the manual operation is integrated in the tube. The operation of this control must be executed with a suitable tool, minding not to damage the sliding surface.

Three different manual override version are available upon request:

- **CM** version, manual override belt protected
- **CS** version, with metal ring nut provided with a M4 screw and a blocking locknut
- **CK** version, knob. When the set screw is screwed and aligned with the edge of the knob, tighten the knob till it touches the spool: in this position the override is not engaged and the valve is de-energized. After adjusting the override, tighten the set screw in order to avoid the knob loosing.

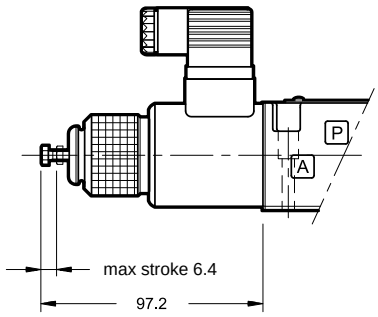
NOTE: The manual override use doesn't allow any proportional regulation; in fact, using this kind of override the main stage spool opens completely and the valve will behave as an on-off valve.

CM version



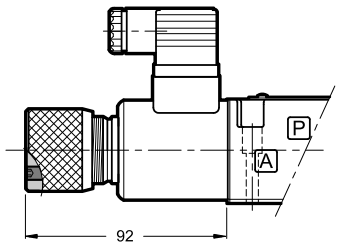
Code: 3803210003

CS version



Code: 3803210004

CK version



Allen key for set screw: 3 mm

Code: 3803210005

17 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

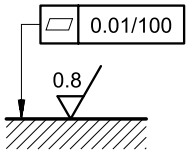
18 - INSTALLATION

The DSPE* valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak from the mounting surface.

Surface finishing



19 - ELECTRONIC CONTROL UNITS

DSPE*-SA, DSPE*-**SB,**

EDC-111	for solenoid 24V DC	plug version	see cat. 89 120
EDC-141	for solenoid 12V DC		
EDM-M111	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 252
EDM-M141	for solenoid 12V DC		

DSPE*-A*, DSPE*-C*

EDM-M211	for solenoid 24V DC	rail mounting DIN EN 50022	see cat. 89 252
EDM-M241	for solenoid 12V DC		

20 - SUBPLATES

(see catalogue 51 000)

No subplates are available for DS*E5R, DS*E10 and DS*E11.

		DS*E5	DS*E7	DS*E8
Model with rear ports		PME4-AI5G	PME07-AI6G	-
Model with side ports		PME4-AL5G	PME07-AL6G	PME5-AL8G
Thread of ports:	P - T - A - B X - Y	3/4” BSP 1/4” BSP	1” BSP 1/4” BSP	1½” BSP 1/4” BSP

DUPLOMATIC
MOTION SOLUTIONS
a member of DAIKIN group

DUPLOMATIC MS Spa
via Mario Re Depaolini, 24 | 20015 Parabiago (MI) | Italy
T +39 0331 895111 | E vendite.ita@duplomatic.com | sales.exp@duplomatic.com
duplomaticmotionsolutions.com



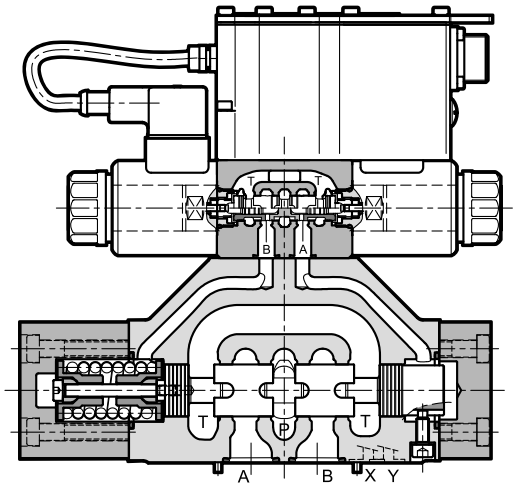
DSPE*G*

PROPORTIONAL DIRECTIONAL VALVES, PILOT OPERATED WITH INTEGRATED ELECTRONICS

SUBPLATE MOUNTING

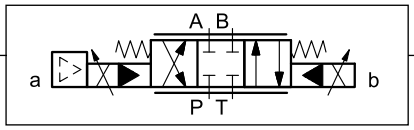
DSPE5G* **CETOP P05**
DSPE5RG* **ISO 4401-05**
DSPE7G* **ISO 4401-07**
DSPE8G* **ISO 4401-08**
DSPE10G* **ISO 4401-10**
DSPE11G* **ISO 4401-10** oversize ports

OPERATING PRINCIPLE



— The DSPE*G* are proportional directional control valves, pilot operated, with integrated electronics and with mounting interface in compliance with ISO 4401 standards.
— They control direction and flow of the fluid.
— The valves are available with different types of electronics, with analogue or fieldbus interfaces.
— The valves are easy to install. The driver directly manages digital settings.

HYDRAULIC SYMBOL (typical)



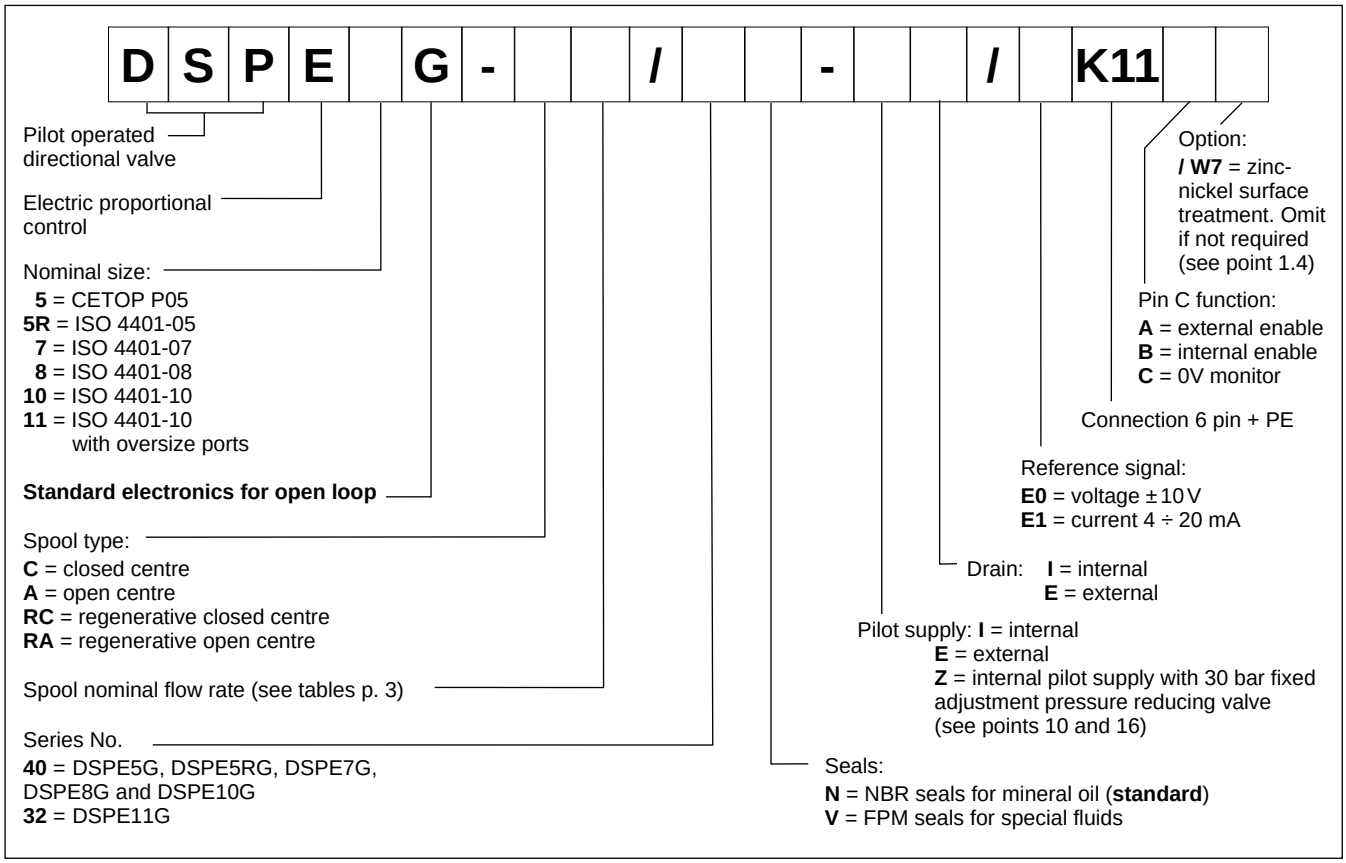
PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

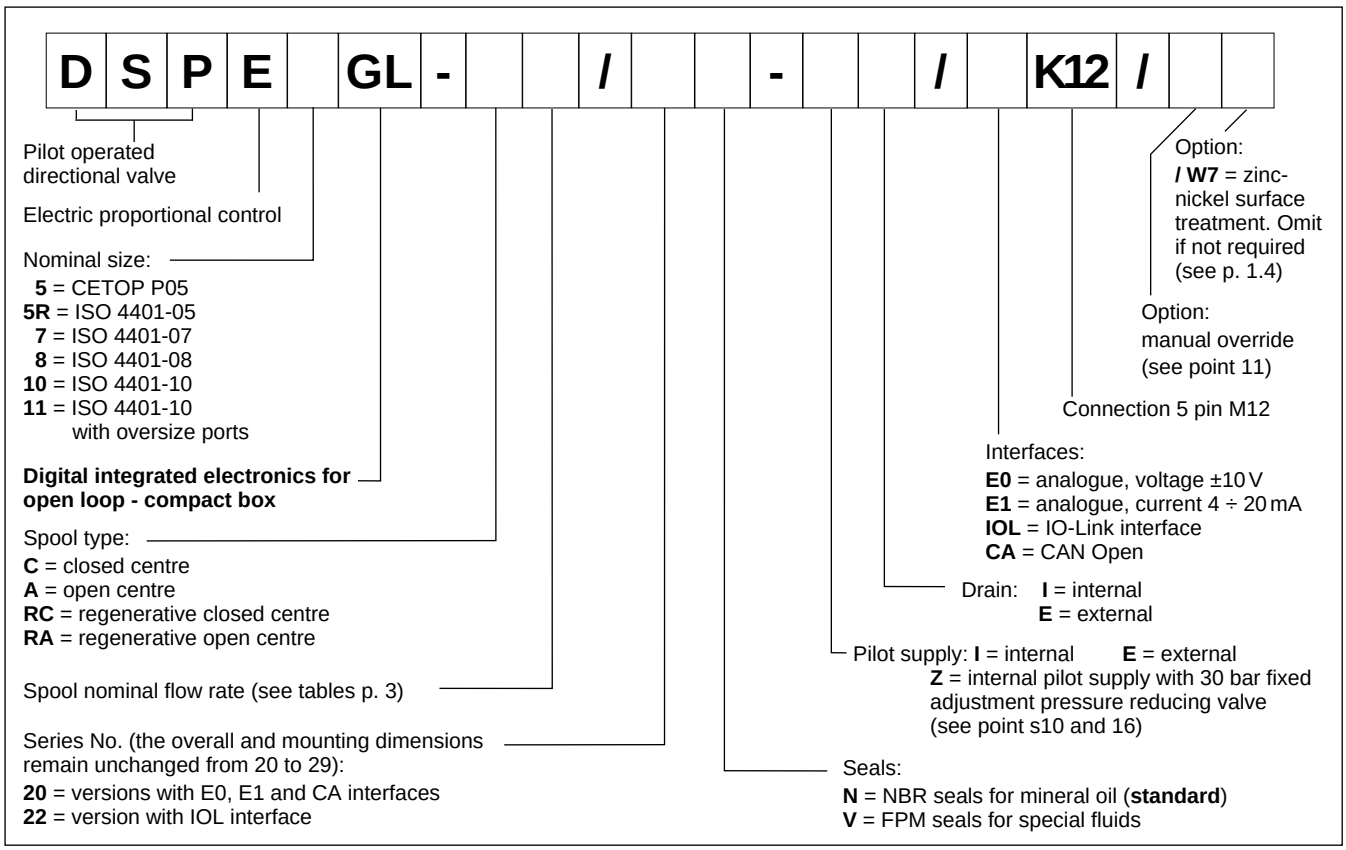
		DSPE5G* DSPE5RG*	DSPE7G*	DSPE8G*	DSPE10G*	DSPE11G*
Max operating pressure: P - A - B ports T port	bar	350 see point 10				320 see p. 10
Max flowrate	l/min	180	450	800	1800	2000
Hysteresis	% Q max	< 6 %				
Repeatability	% Q max	< ± 1%				
Electrical characteristics		see point 4				
Ambient temperature range	°C	-20 / +60				
Fluid temperature range	°C	-20 / +80				
Fluid viscosity range	cSt	10 ÷ 400				
Fluid contamination degree		According to ISO 4406:1999 class 18/16/13				
Recommended viscosity	cSt	25				
Mass	kg	7.3	8.2	16.4	44.1	41.3

1 - IDENTIFICATION CODES

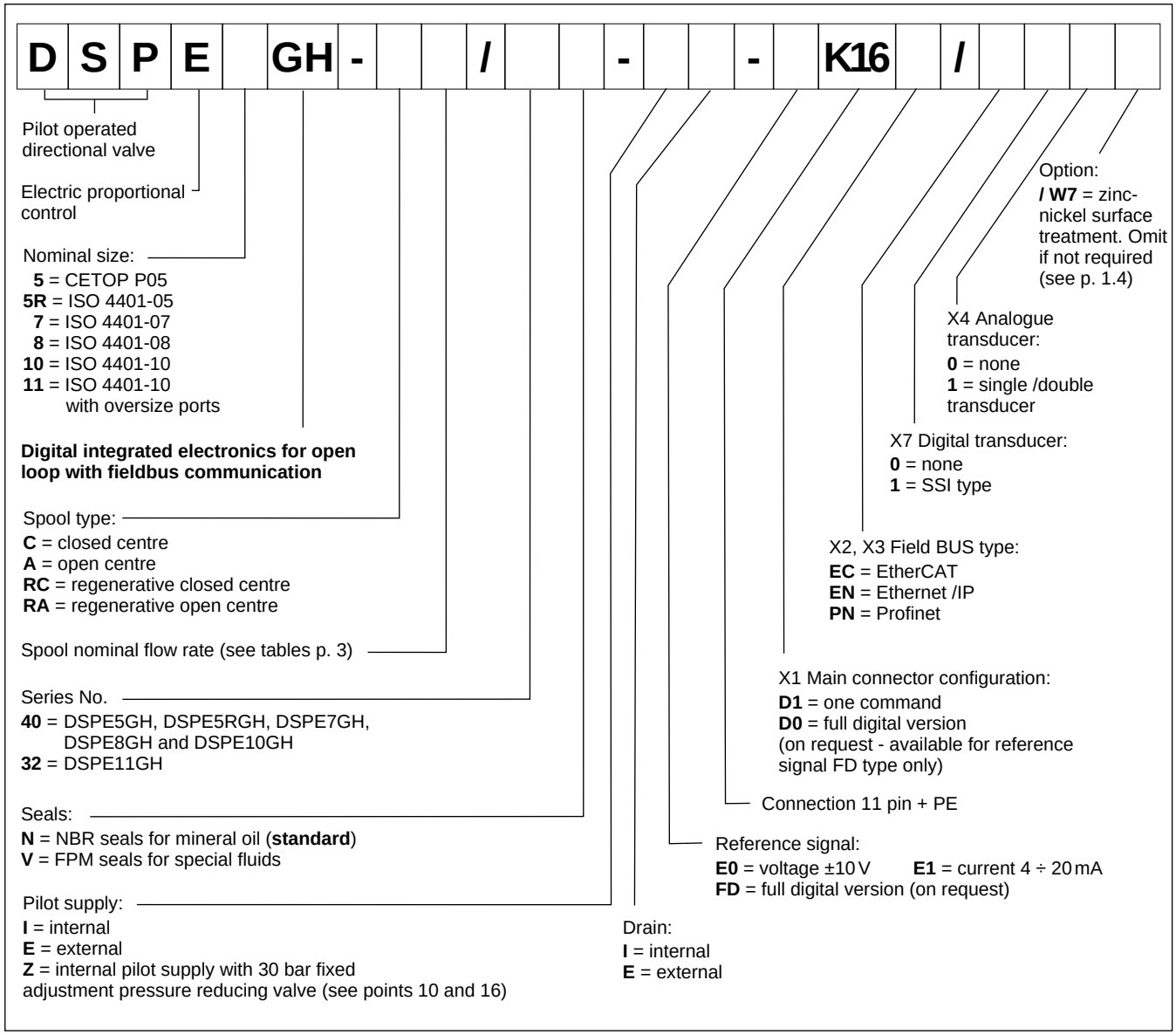
1.1 - Standard electronics



1.2 - Compact electronics



1.3 - Electronics with fieldbus communication

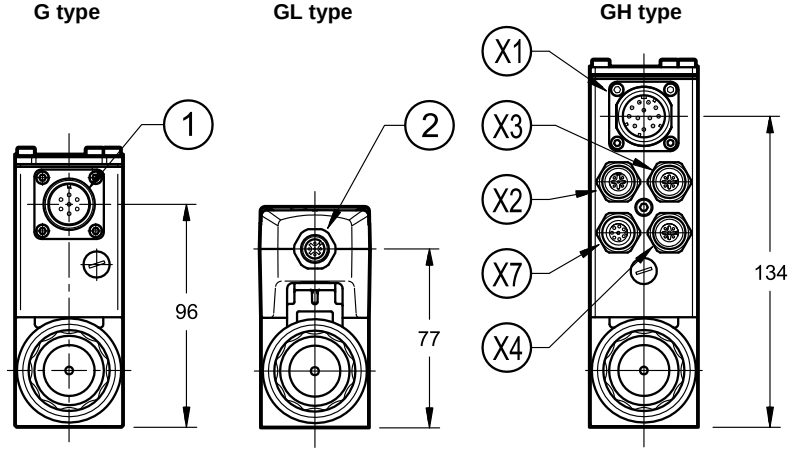


1.4 - Surface treatments

The standard valve is supplied with surface treatment of phosphating black. The zinc-nickel finishing makes the valve suitable to ensure a salt spray resistance up to 240 hours. (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

2 - COMPARISON AMONG INTEGRATED ELECTRONICS

dimensions in mm



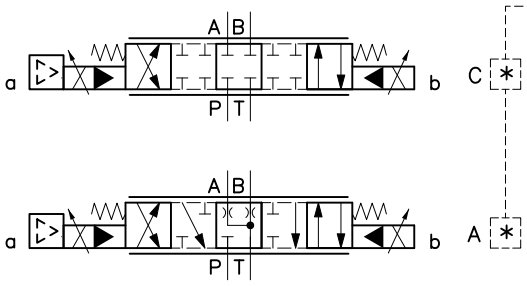
1	Connection 6 pin + PE
2	Connection M12 5 pin, code A, male
X1	Main connection 11 pin + PE
X2	Fieldbus communication (IN)
X3	Fieldbus communication (OUT)
X4	Connection for analogue transducer
X7	Connection for digital transducer

NOTE 1: Depending on the chosen version, X4 and X7 connections may not be present. Please refer to section 7 for connections descriptions and pinouts.
NOTE 2: Related mating connectors have to be ordered separately. See catalogue 89 000.

3 - AVAILABLE CONFIGURATIONS

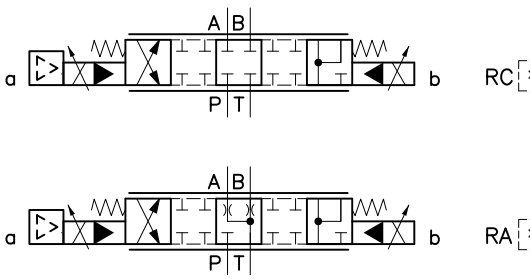
The valve configuration depends on the combination of spool type and rated flow.

3 positions with spring centering



valve type	*	Nominal flow with Δp 10 bar P→T
DSPE5G* DSPE5RG*	**80**	80 l/min
	80 / 40	80 (P-A) / 40 (B-T) l/min
DSPE7G*	**100**	100 l/min
	150	150 l/min
	150 / 75	150 (P-A) / 75 (B-T) l/min
DSPE8G*	**200**	200 l/min
	300	300 l/min
	300 / 150	300 (P-A) / 150 (B-T) l/min
DSPE10G*	**350**	350 l/min
	500	500 l/min
	500 / 250	500 (P-A) / 250 (B-T) l/min
	800	800 l/min
	800 / 500	800 (P-A) / 500 (B-T) l/min
DSPE11G*	**1000**	1000 l/min

regenerative spool



Type of valve	*	Nominal flow with Δp10 bar P→T
DSPE7G*	**150/75**	150 (P-A, A-T) / 75 (P-B, B-P) l/min
DSPE8G*	**300/150**	300 (P-A, A-T) / 150 (P-B, B-P) l/min
DSPE10G*	**500/250**	500 (P-A, A-T) / 250 (P-B, B-P) l/min

4 - ELECTRONICS COMMON DATA

Duty cycle		100% (continuous operation)
Protection class according to EN 60529 (**NOTE**): DSPE*G, DSPE*GH DSPE*GL		 IP65/IP67 IP65
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	25
Maximum solenoid current	A	1.88
Fuse protection, external	A	3
Managed breakdowns		Overload and electronics overheating, cable breakdown, supply voltage failures
Electromagnetic compatibility (EMC) emissions EN 61000-6-4, immunity EN 61000-6-2		According to 2014/30/EU standards

NOTE: The IP degree is guaranteed only with mating connector of equivalent IP degree, installed and tightened correctly. Moreover, on the GH versions it is necessary to protect any unused connections with caps.

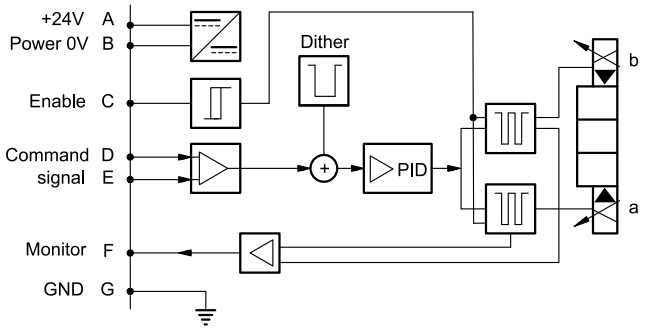
5 - DSPE*G - STANDARD ELECTRONICS

5.1 - Electrical characteristics

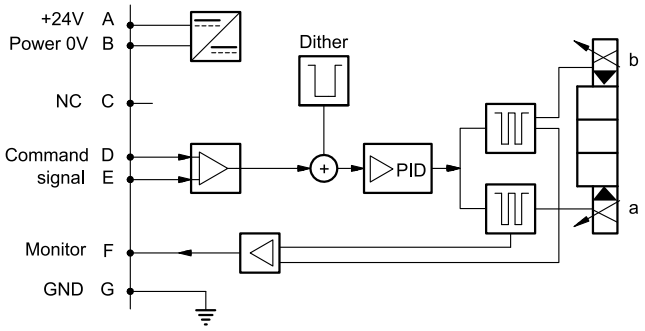
Command signal:	voltage (E0) current (E1)	V DC mA	± 10 (Impedance Ri > 11 kohm) 4 ÷ 20 (Impedance Ri = 58 ohm)
Monitor signal:	voltage (E0) current (E1)	V DC mA	± 10 (Impedance Ro > 1 kohm) 4 ÷ 20 (Impedance Ro = 500 ohm)
Communication for diagnostic			LIN-bus Interface (by means of the optional kit)
Connection			6 pin + PE (MIL-C-5015-G - DIN EN 175201-804)

5.2 - On-board electronics diagrams

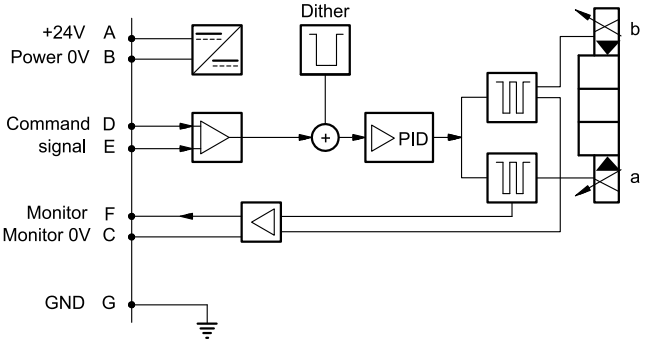
VERSION A - External Enable



VERSION B - Internal Enable

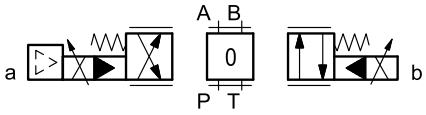


VERSION C - 0V Monitor

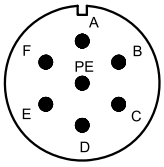


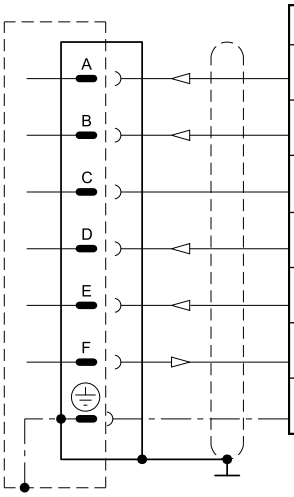
5.3 - Versions with voltage command (E0)

The reference signal is between -10V and +10V. The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**-10V**	**0V**	**+10V**
MONITOR	**-10V**	**0V**	**+10V**



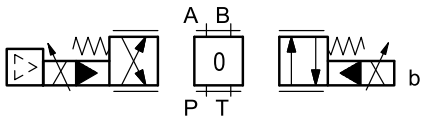


Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	± 10 V	Command		
E	0 V	Command reference		
F	± 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

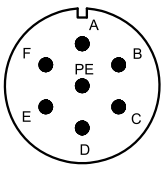
5.4 - Versions with current command (E1)

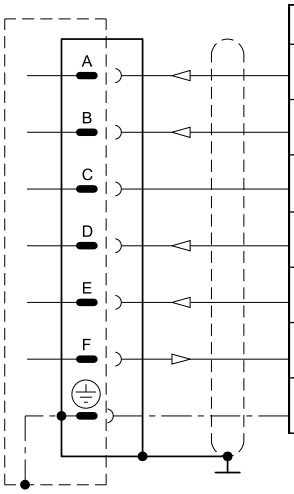
The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**4 mA**	**12 mA**	**20 mA**
MONITOR	**4 mA**	**12 mA**	**20 mA**





Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	Command reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

6 - DSPE*GL - COMPACT ELECTRONICS

In IO-Link networks, the length of the connecting cables is limited to 20 metres. In CA versions, pin 3 and pin 5 are galvanic isolated up to 100 V to avoid earth loops.

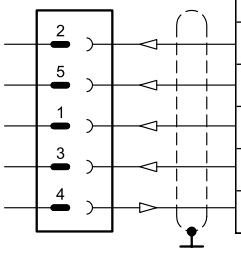
6.1 - Electrical characteristics

Command signal:	voltage (E0) current (E1)	V DC mA	±10 (impedance Ri > 11 kohm) 4 ÷ 20 (impedance Ri = 58 ohm)
Monitor signal :	voltage (E0) current (E1)	V DC mA	0 ÷ 5 (impedance Ro > 1 kohm) 4 ÷ 20 (impedance Ro = 500 ohm)
IO-Link communication (IOL): Data rate		kBaud	IO-Link Port Class B 38.4
Can Open communication (CA): Data rate		kbit	10 ÷ 1000
Data register (IOL and CA versions only)			card voltage supply, solenoid faults (shortcircuit, bad configuration), box temperature.
Connection			5-pin M12 code A (IEC 61076-2-101)

6.2 - Pin tables

'E0' connection

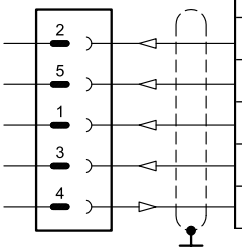




Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	± 10 V	Command
3	0V	Command reference
4	0 ÷ 5V	Monitor (0V reference: pin 5)

'E1' connection

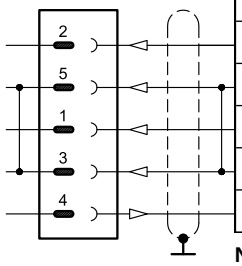




Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	4 ÷ 20 mA	Command
3	0V	Command reference
4	4 ÷ 20 mA	Monitor (0V reference: pin 5)

'IOL' connection



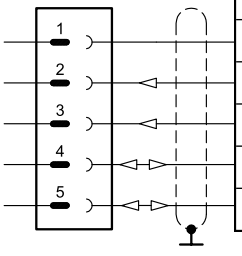


Pin	Values		Function
2	2L+	24 V DC	Solenoid supply voltage
5	2L-	0 V (GND)	
1	1L+	+24 V DC	Logic and IO-Link supply voltage
3	1L-	0V (GND)	
4	C/Q		IO-Link Communication

NOTE: Pin 3 and pin 5 are linked with each other in the valve electronics. The reference potentials 1L- and 2L- of the two supply voltages must also be linked with each other on the customer side.

'CA' connection





Pin	Values	Function
1	CAN_SH	Shield
2	24 V DC	Supply voltage
3	0 V (GND)	
4	CAN H	Bus line (high)
5	CAN_L	Bus line (low)

7 - DSPE*GH - FIELDBUS ELECTRONICS

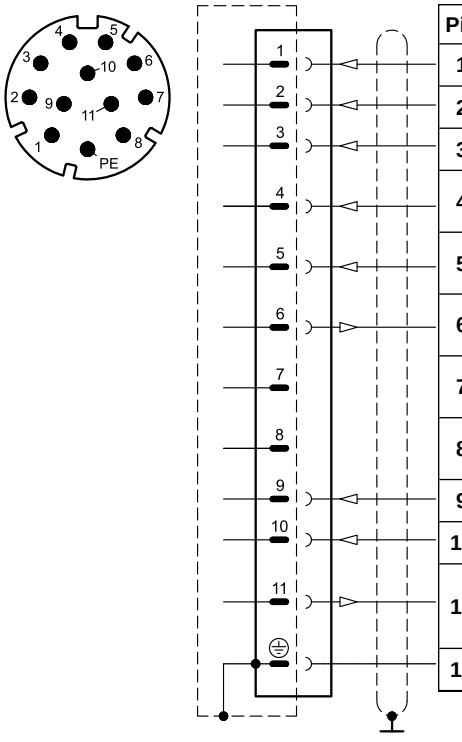
The 11 + PE pin connection allows separate supply voltage for electronics and solenoids.

Command - valve position schemes as for the standard electronics. Please refer to pictures in p. 5.3 and 5.4.

7.1 - Electrical characteristics

Command signal: voltage (E0) current (E1) digital (FD)	 V DC mA	 ±10 (Impedance Ri > 11 kohm) 4 ÷ 20 (Impedance Ri = 58 ohm) via fieldbus
Monitor signal (current to solenoid): voltage (E0) current (E1)	 V DC mA	 ±10 (Impedance Ro > 1 kohm) 4 ÷ 20 (Impedance Ro = 500 ohm)
Communication / diagnostic		via Bus register
Communication interface standards		IEC 61158
Communication physical layer		fast ethernet, insulated 100 Base TX
Power connection		11 pin + PE (DIN 43651)

7.2 - X1 Main connection pin table



D1: one command

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	± 10 V (E0) 4 ÷ 20 (E1)	Command
5	0 V	Command reference signal
6	± 10 V (E0) 4 ÷ 20 (E1)	Monitor (0V reference pin 10)
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V reference pin 2)
12	GND	Ground (Earth)

D0: full digital

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	NC	do not connect
5	NC	do not connect
6	NC	do not connect
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V ref. pin 2)
12	GND	Ground (Earth)

7.3 - FIELDBUS connections

Please wire following guidelines provided by the related standards communication protocol. Any connections present and not used must be protected with special caps so as not to nullify the protection against atmospheric agents.

X2 (IN) connection M12 D 4 pin female



Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

X3 (OUT) connection: M12 D 4 pin female

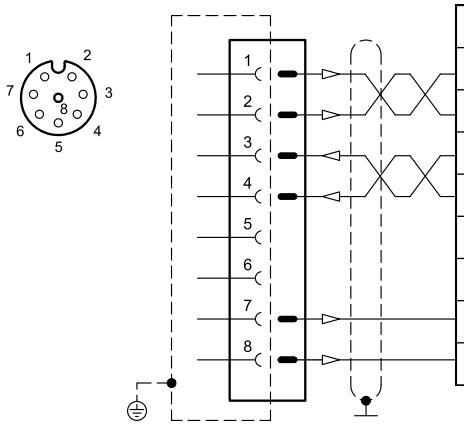


Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

NOTE: Shield connection on connector housing is recommended.

7.4 - Digital transducer connection
X7 connection: M12 A 8 pin female

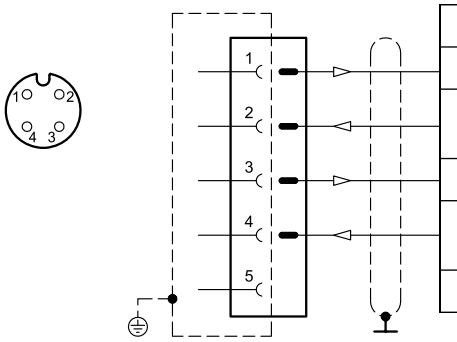
VERSION 1: SSI type



Pin	SSI Values	Function	Notes
1	CLK+	Serial synchronous clock (+)	Input - digital signal
2	CLK-	Serial synchronous clock (-)	
3	MIS0+	Serial position data (+)	
4	MIS0-	Serial position data (-)	
5	NC	-	do not connect
6	NC	-	
7	+24 V	transducer power supply	Output power supply
8	0 V	-	Common GND

7.5 - Analogue transducer connection
X4 connection: M12 A 4 pin female

VERSION 1: single / double transducer
(single or double is a software-selectable option)

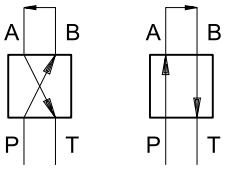


Pin	Values	Notes
1	+24 V	Remote transducer power supply (out) 100 mA
2	±10 V 4 ÷20 mA	Input signal of transducer 1 (range software-selectable)
3	0 V	Common reference signal for transducer power and signals
4	±10 V 4 ÷20 mA	Input signal of transducer 2 (range software-selectable)
5	-	

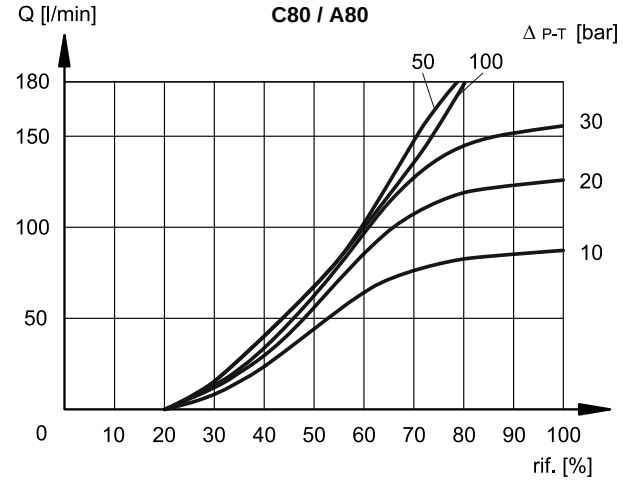
8 - CHARACTERISTIC CURVES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

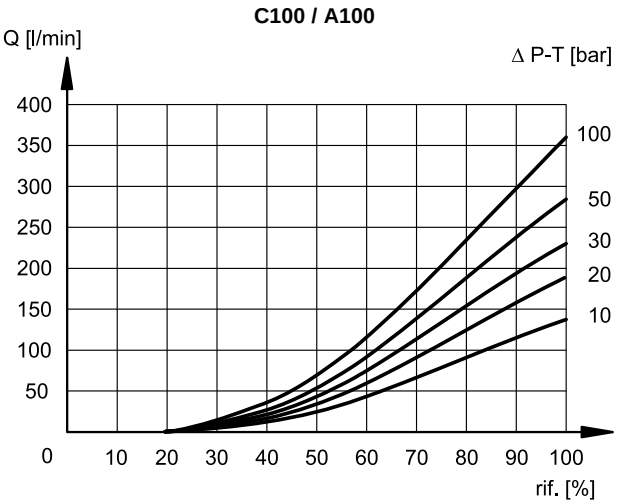
Typical flow rate curves at constant Δp related to the reference signal and measured for the available spools. The Δp values are measured between P and T valve ports.

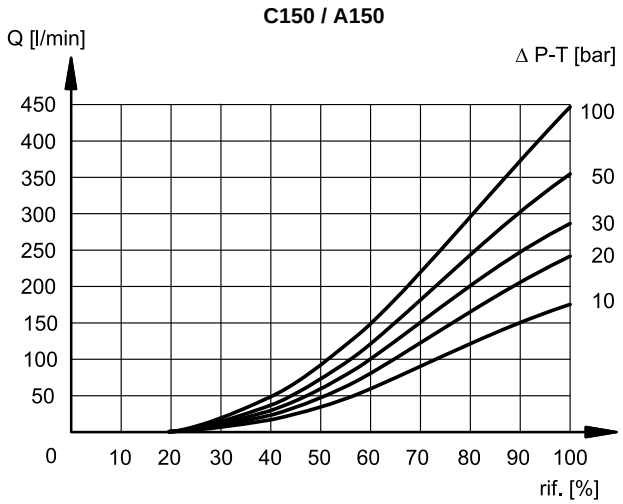


8.1 - Characteristic curves DSPE5G* and DSPE5RG*

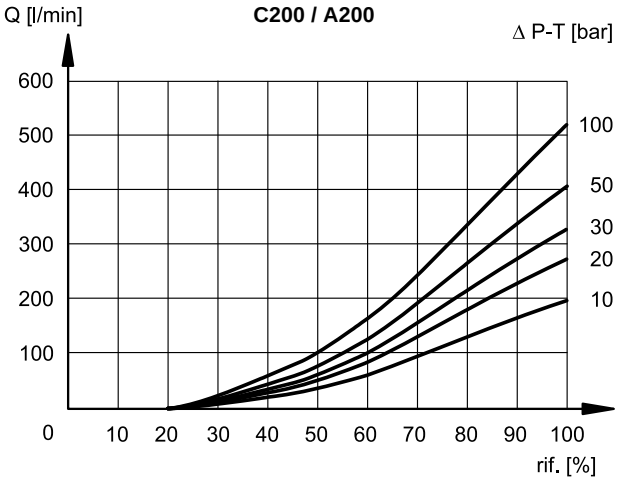


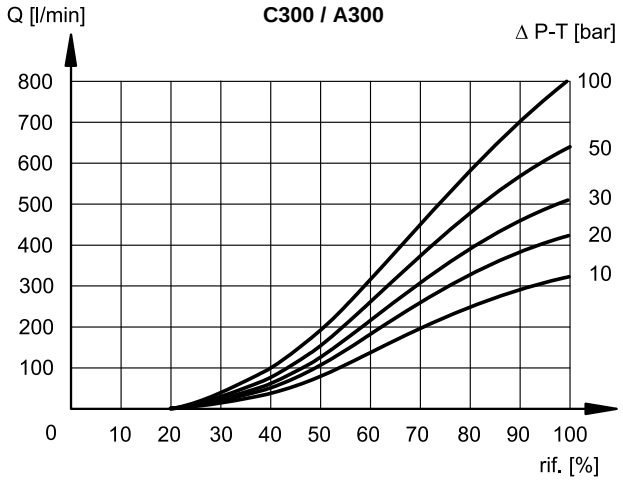
8.2 - Characteristic curves DSPE7G*





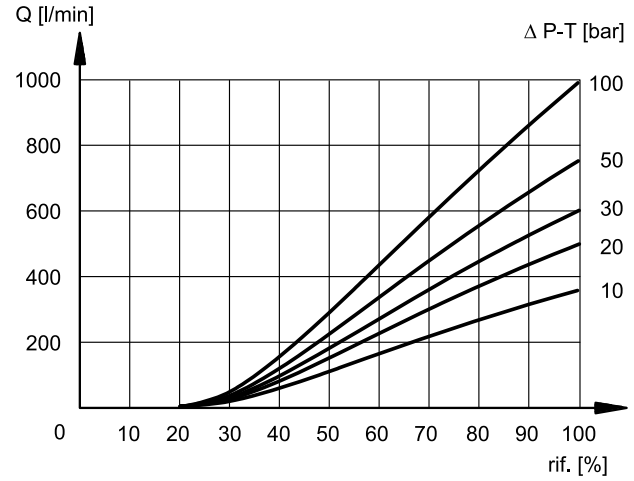
8.3 - Characteristic curves DSPE8G*



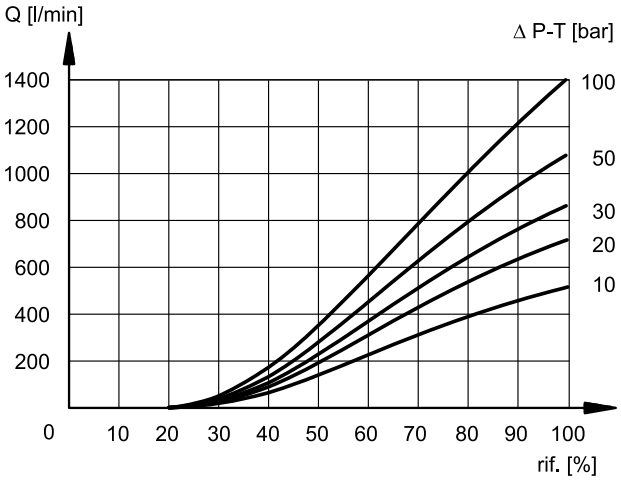


8.4 - Characteristic curves DSPE10G*

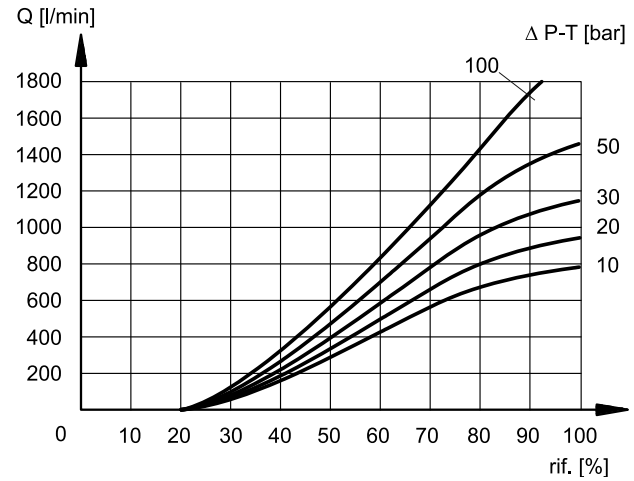
C350 / A350



C500 / A500

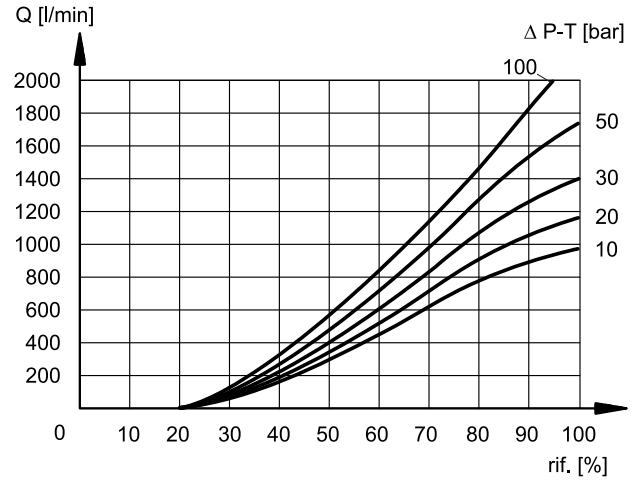


C800 / A800



8.5 - Characteristic curves DSPE11G*

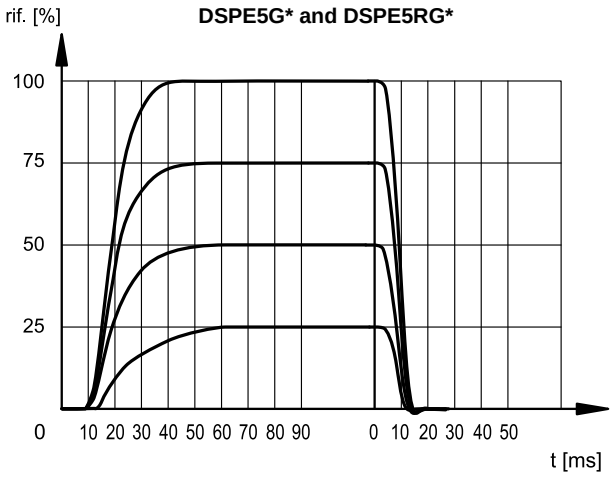
C1000 / A1000



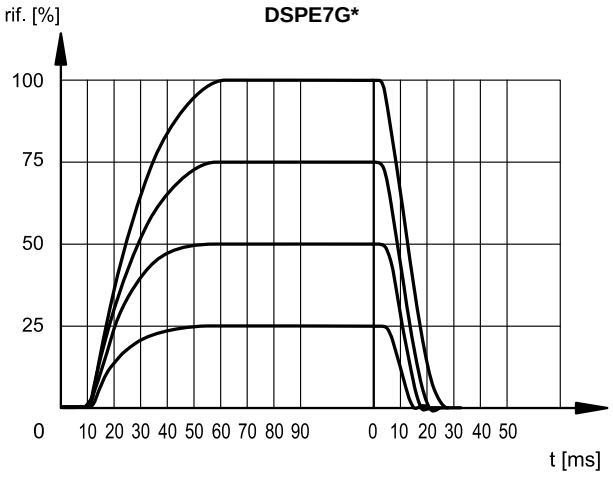
9 - STEP RESPONSE

(obtained with mineral oil with viscosity of 36 cSt at 50°C and static pressure = 100 bar)

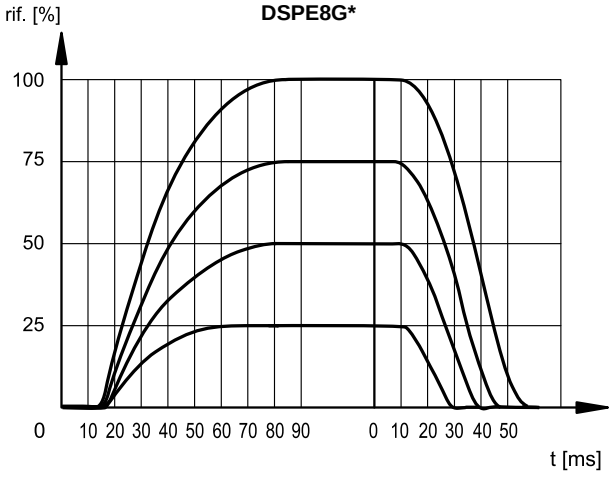
DSPE5G* and DSPE5RG*



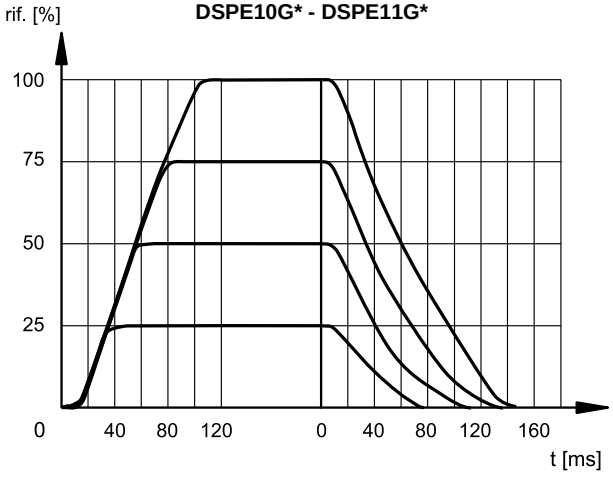
DSPE7G*



DSPE8G*



DSPE10G* - DSPE11G*



10 - HYDRAULIC CHARACTERISTICS

(with mineral oil with viscosity of 36 cSt at 50°C and static pressure = 100 bar)

FLOWRATES		**DSPE5G* DSPER5G***	**DSPE7G***	**DSPE8G***	**DSPE10G***	**DSPE11G***
Max flow rate	l/min	180	450	800	1800	2000
Pilot supply flow requested with operation 0 →100%	l/min	3.5	4.3	9.2	14.5	14.5
Pilot supply volume requested with operation 0 →100%	cm^3	1.7	3.2	9.1	21.6	21.6

PRESSURES (bar)	MIN	MAX
Pilot pressure on X port	30	210 (**NOTE**)
Pressure on T port with internal drain	–	10
Pressure on T port with external drain	–	250

NOTE: if the valve operates with higher pressures, it is necessary to use the version with external pilot and reduced pressure.

Otherwise, the valve with internal pilot and pressure reducing valve with 30 bar fixed adjustment can be ordered (pilot supply type: Z, see section 1).

10.1 - Pilot and drain

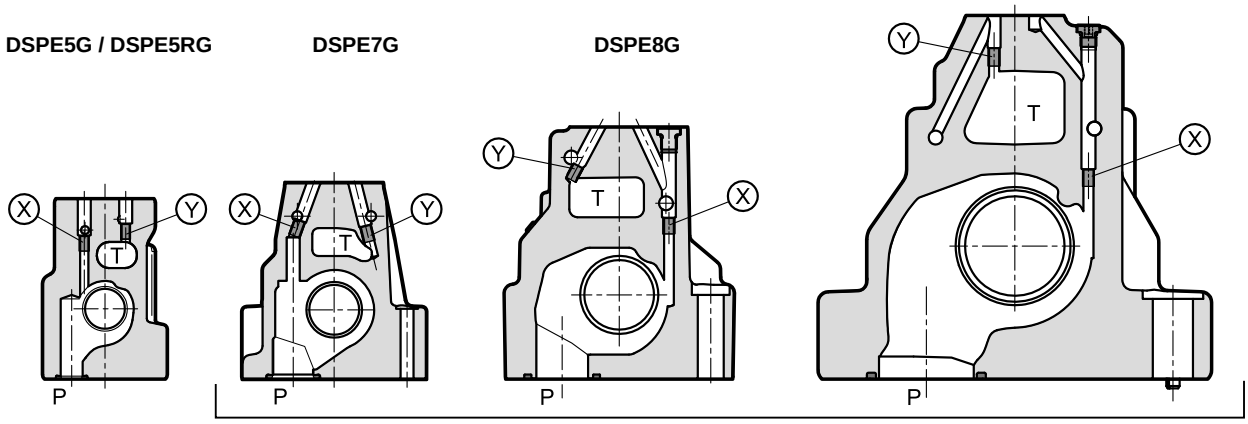
DSPE*G valves are available with pilot and drain both internal or external. The version with external drain allows a higher back pressure on the unloading. The version with external pilot with reduced pressure must be used when higher pressures are needed.

The pilot supply Z type consists of an arrangement with internal pilot supply and 30 bar supply pressure for the pilot stage by means of a fixed adjustment pressure reducing valve.

NOTE: The configuration of pilots and drains must be chosen when ordering. Subsequent modifications are allowed only to specialized operators with authorization and in factory.

TYPE OF VALVE		Plug assembly	
		X	Y
IE	internal pilot and external drain	NO	YES
II	internal pilot and internal drain	NO	NO
EE	external pilot and external drain	YES	YES
EI	external pilot and internal drain	YES	NO

DSPE5G / DSPE5RG **DSPE7G** **DSPE8G** **DSPE10/11G**



X: plug M5x6 for external pilot
Y: plug M5x6 for external drain

X: plug M6x8 for external pilot
Y: plug M6x8 for external drain

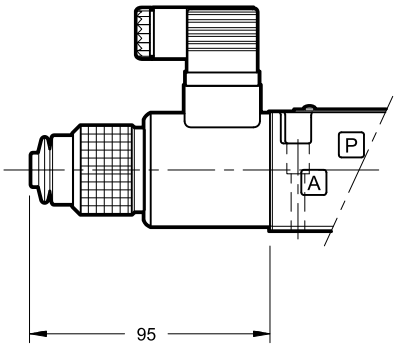
11 - MANUAL OVERRIDE

These valves have solenoids whose pin for manual operation is integrated in the tube. Actuate this override by pushing it with a suitable tool, minding not to damage the sliding surface.

Two other types of manual overrides can fit the DSPE*GL valve:

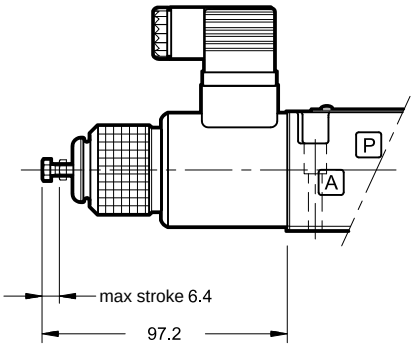
- **CM** version, manual override boot protected
- **CS** version, with metal ring nut provided with a M4 screw and a blocking locknut.

CM Version



Code: 3803210003

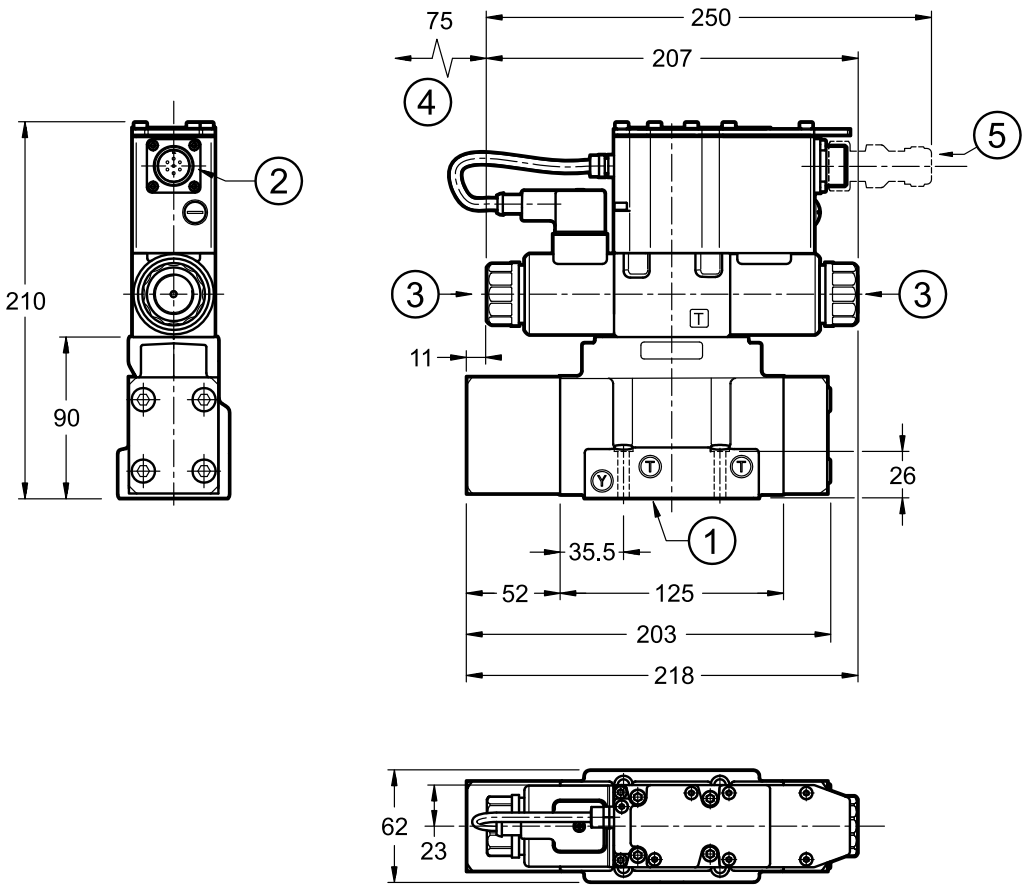
CS Version



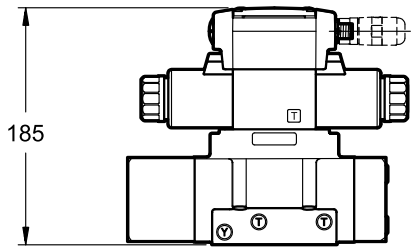
Code: 3803210004

12 - DSPE5G* - OVERALL AND MOUNTING DIMENSIONS

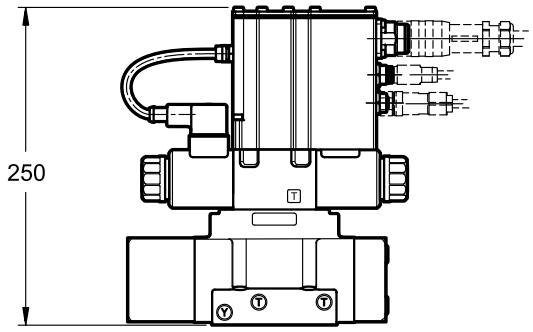
dimensions in mm



DSPE5GL



DSPE5GH



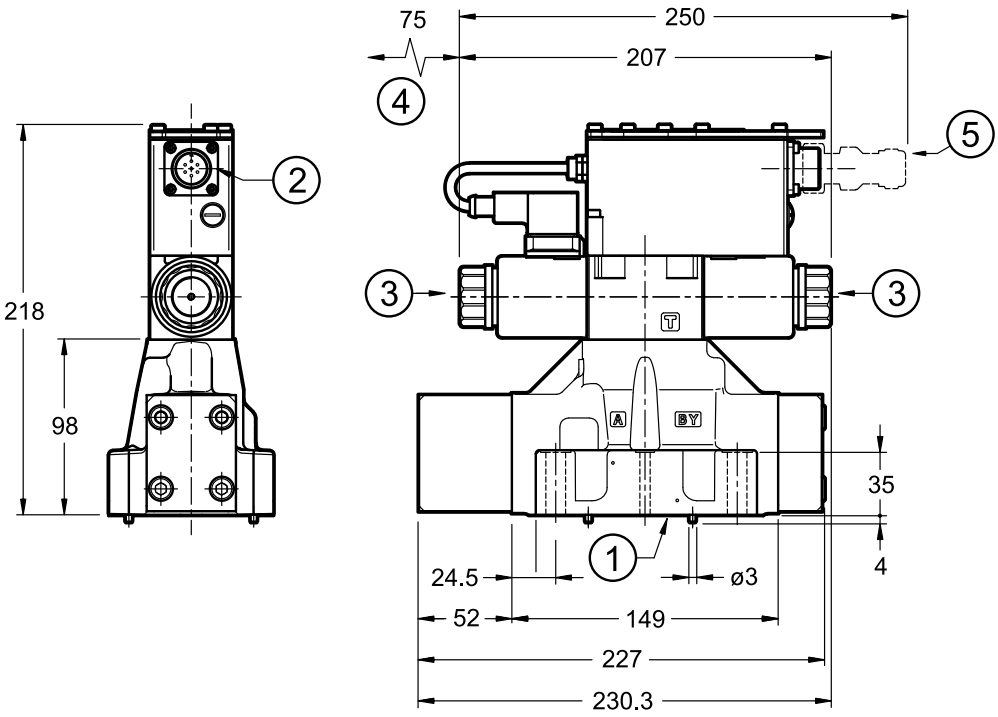
NOTES:
- Mounting surface at point 17.

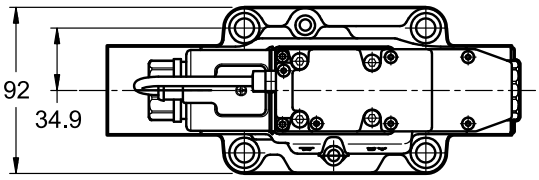
1	Mounting surface with sealing rings: 5 OR type 2050 (12.42x1.78) - 90 Shore 2 OR type 2037 (9.25x1.78) - 90 Shore
2	Main connection 6 pin + PE
3	Manual override embedded in the solenoid tube
4	Coil removal space
5	Mating connector. **To be ordered separately.** See catalogue 89 000

Valve fastening: 4 SHC screws M6x35 - ISO 4762
Tightening torque: 8 Nm (A8.8 screws)
Threads of mounting holes: M6x10

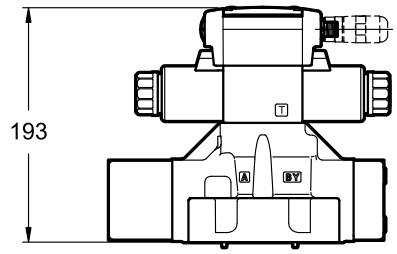
13 - DSPE7G* - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

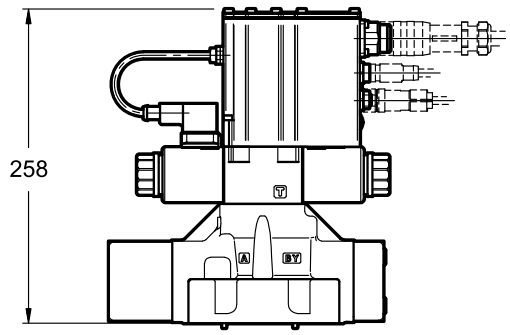




DSPE7GL



DSPE7GH



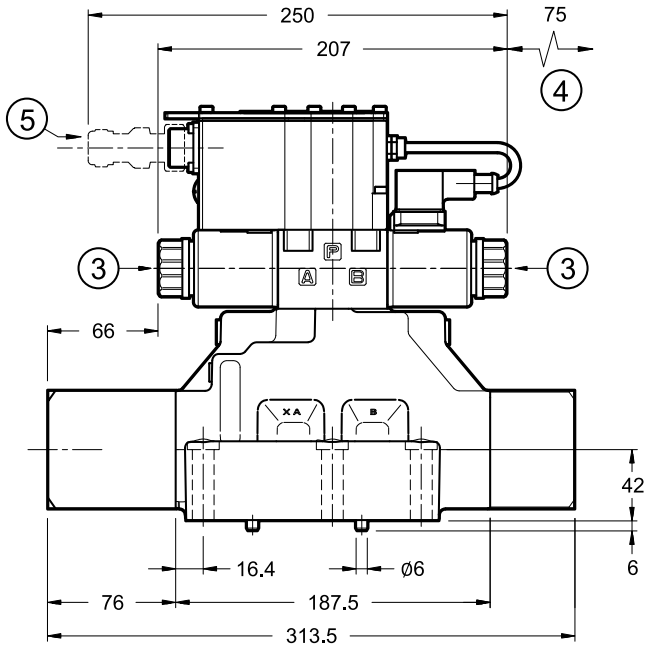
NOTES:
- Mounting surface at point 17.

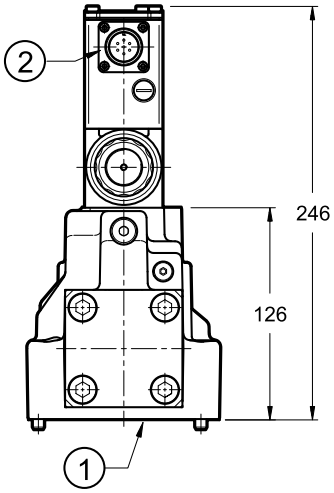
1	Mounting surface with sealing rings: 4 OR type 130 (22.22x2.62) - 90 Shore 2 OR type 2043 (10.82x1.78) - 90 Shore
2	Main connection 6 pin + PE
3	Manual override embedded in the solenoid tube
4	Coil removal space
5	Mating connector. **To be ordered separately.** See catalogue 89 000

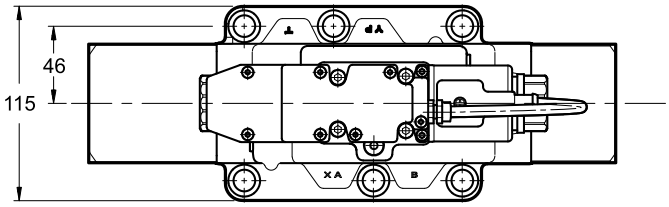
Valve fastening: 4 SHC screws M10x50 - ISO 4762 2 SHC screws M6x50 - ISO 4762
Tightening torque: M10x50: 40 Nm (A8.8 screws) M6x50: 8 Nm (A8.8 screws)
Threads of mounting holes: M6x18; M10x18

14 - DSPE8G* - OVERALL AND MOUNTING DIMENSIONS

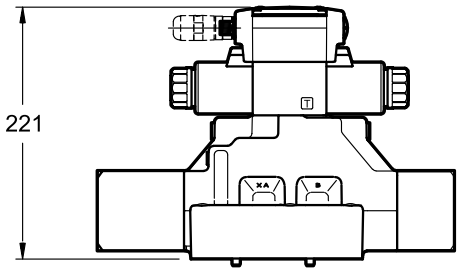
dimensions in mm



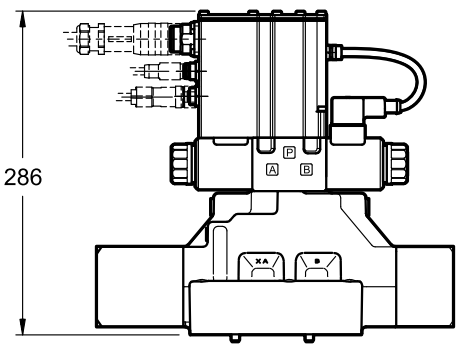




DSPE8GL



DSPE8GH



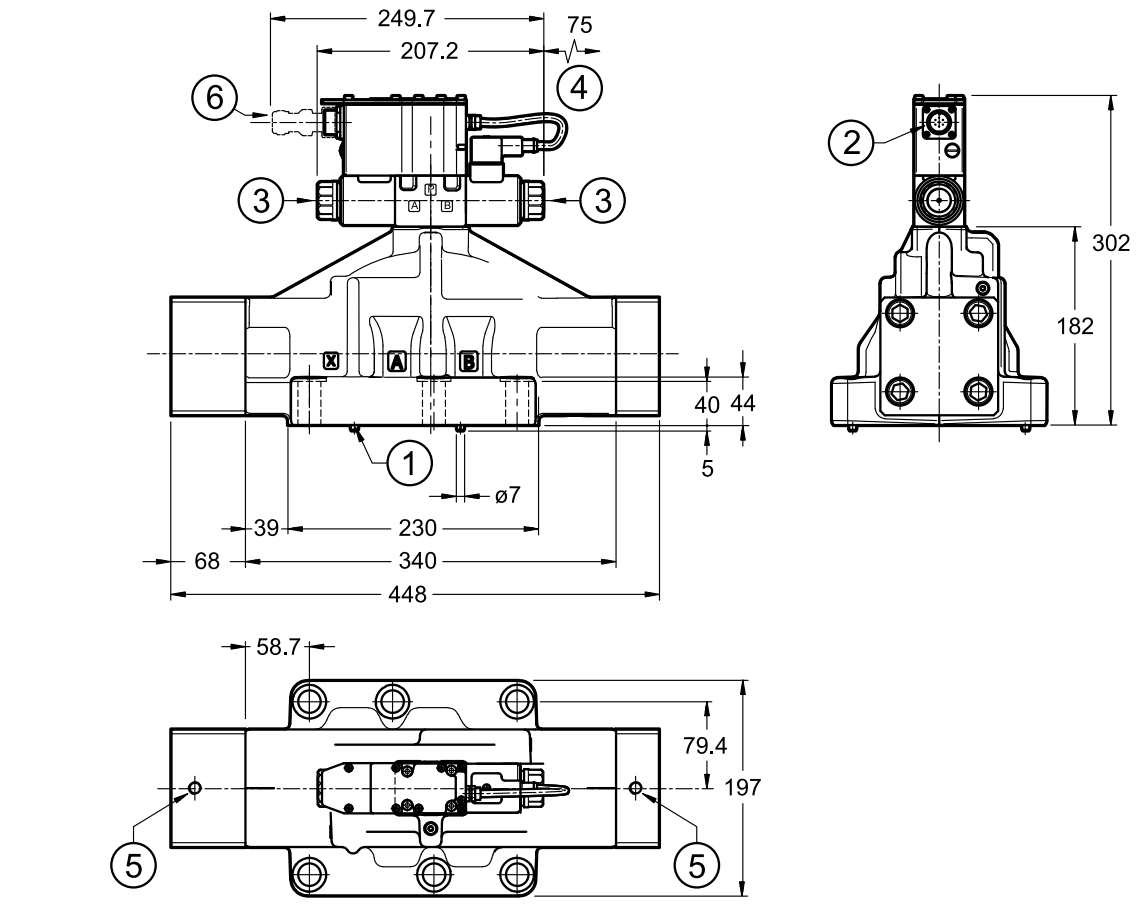
NOTES:
- Mounting surface at point 17.

1	Mounting surface with sealing rings: 4 OR type 3131 (32.99x2.62) - 90 Shore 2 OR type 3087 (21.89x2.62) - 90 Shore
2	Main connection 6 pin + PE
3	Manual override embedded in the solenoid tube
4	Coil removal space
5	Mating connector. **To be ordered separately.** See catalogue 89 000

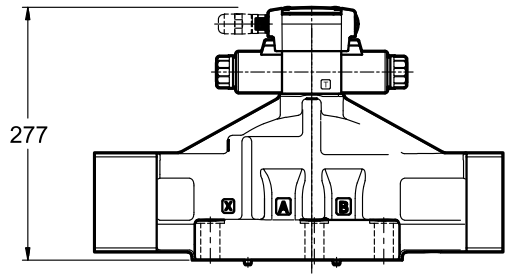
Valve fastening: 6 SHC screws M12x60 - ISO 4762
Tightening torque: 69 Nm (A8.8 screws)
Threads of mounting holes: M12x20

15 - DSPE10G* / DSPE11G* - OVERALL AND MOUNTING DIMENSIONS

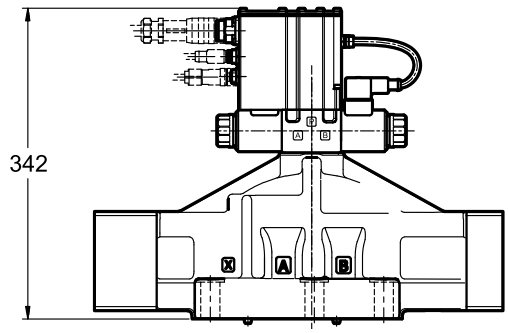
dimensions in mm



DSPE1*GL



DSPE1*GH



NOTES:
- Mounting surface at point 17.

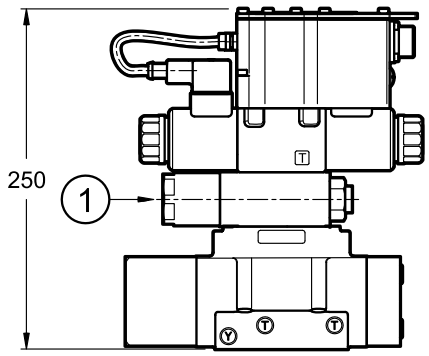
1	Mounting surface with sealing rings: **DSPE10G*** 4 OR type 4162 (40.86x3.53) - 90 Shore 2 OR type 3081 (20.24x2.62) - 90 Shore **DSPE11G*** 4 OR type 4212 (53.57x3.53) - 90 Shore 2 OR type 3081 (20.24x2.62) - 90 Shore
2	Main connection 6 pin + PE
3	Manual override embedded in the solenoid tube
4	Coil removal space
5	M12 eyebolt seat for safe lift
6	Mating connector. **To be ordered separately.** See catalogue 89 000

Valve fastening: 6 SHC screws M20x70 - ISO 4762 (supplied)
Tightening torque: 470 Nm (A10.9 screws)
Threads of mounting holes: M20x40

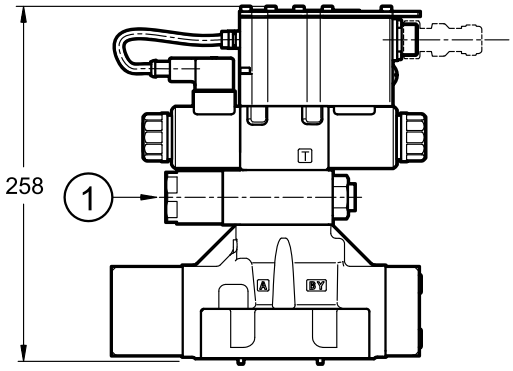
16 - OVERALL AND MOUNTING DIMENSIONS - PILOT SUPPLY TYPE Z

dimensions in mm

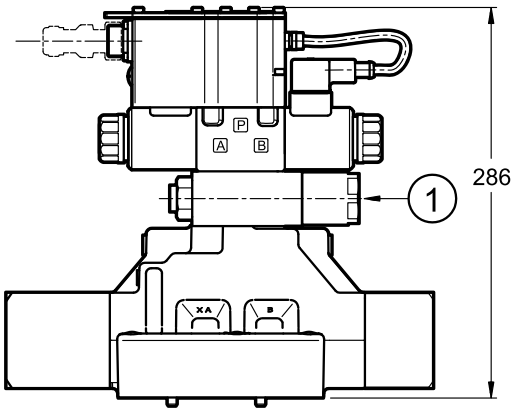
DSPE5G*



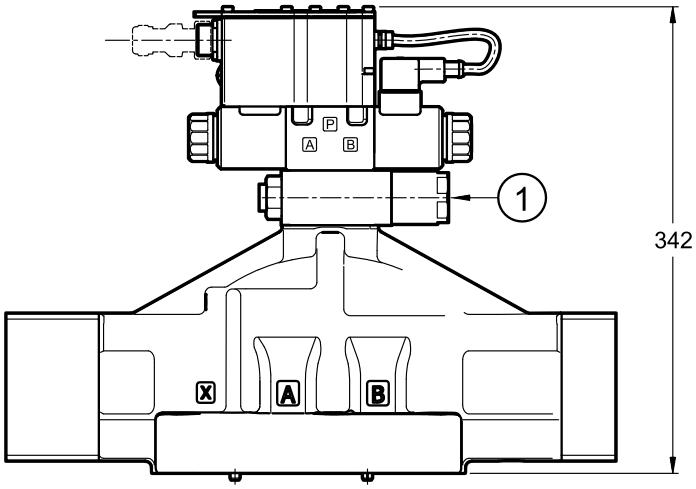
DSPE7G*



DSPE8G*



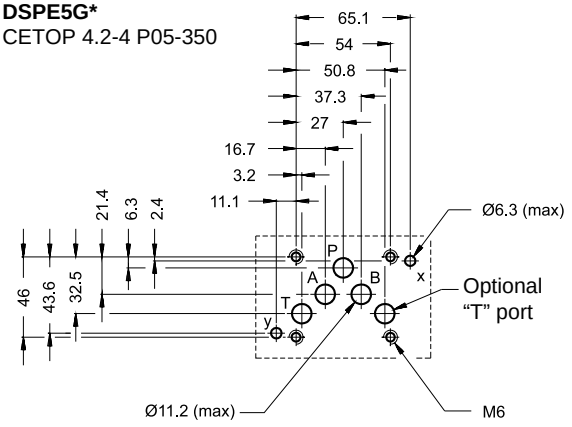
DSPE1*G*



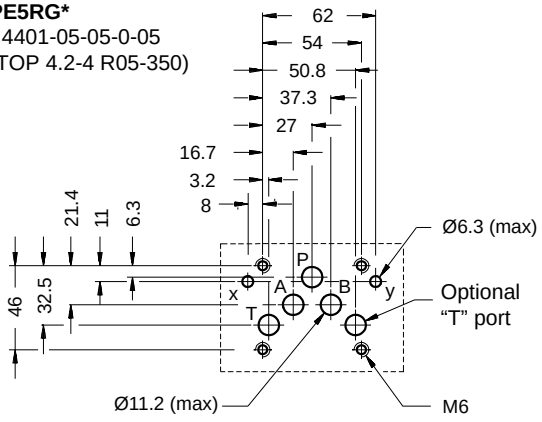
1	30 bar fixed adjustment pressure reducing valve

17 - MOUNTING SURFACES

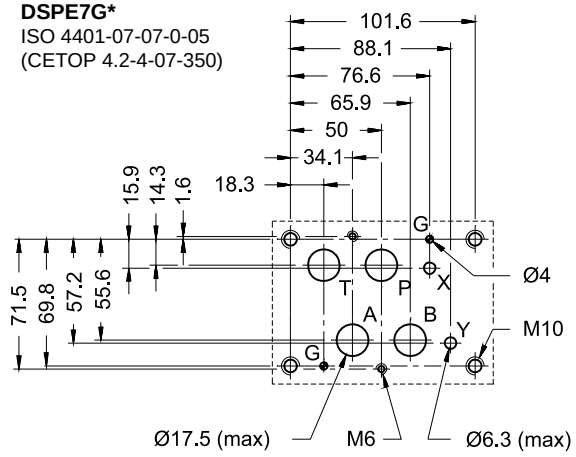
DSPE5G*
CETOP 4.2-4 P05-350



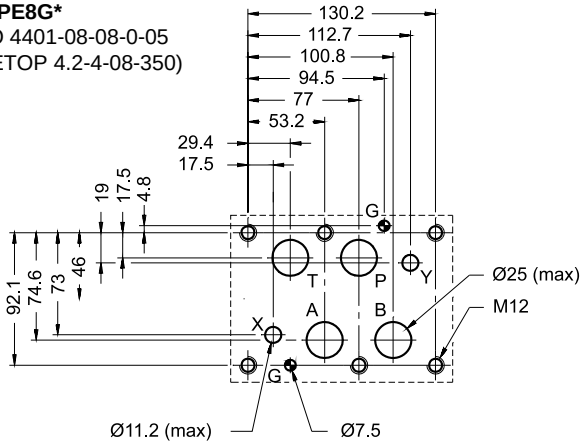
DSPE5RG*
ISO 4401-05-05-0-05
(CETOP 4.2-4 R05-350)



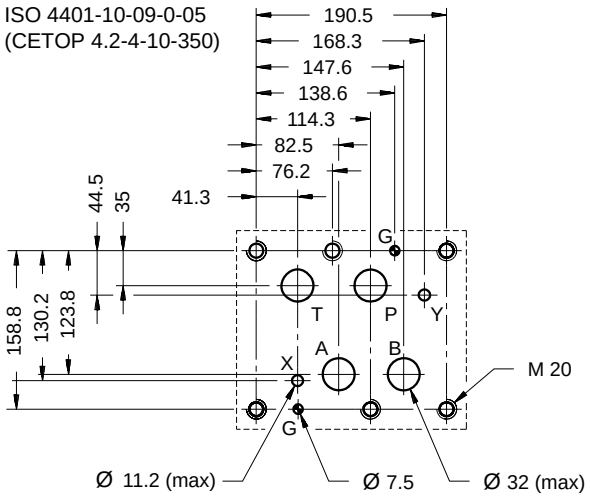
DSPE7G*
ISO 4401-07-07-0-05
(CETOP 4.2-4-07-350)



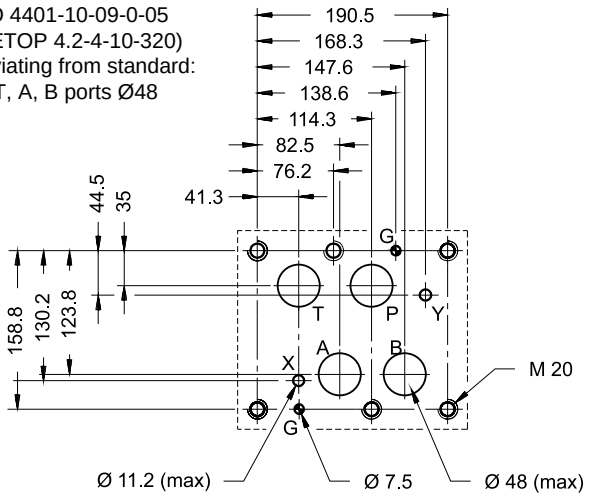
DSPE8G*
ISO 4401-08-08-0-05
(CETOP 4.2-4-08-350)



DSPE10G*
ISO 4401-10-09-0-05
(CETOP 4.2-4-10-350)



DSPE11G*
ISO 4401-10-09-0-05
(CETOP 4.2-4-10-320)
deviating from standard:
P, T, A, B ports Ø48



18 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

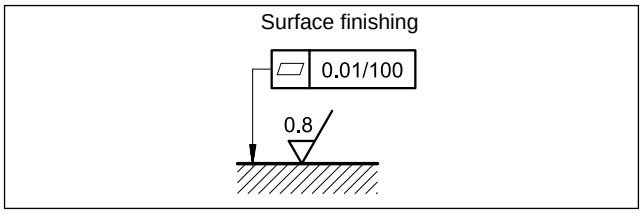
The fluid must be preserved in its physical and chemical characteristics.

19 - INSTALLATION

The valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.



20 - ACCESSORIES

(to be ordered separately)

20.1 - Mating connectors

Mating connectors must be ordered separately. See catalogue 89 000.

For K11 and K16 versions we recommend the choice of a metal connector to avoid electromagnetic disturbances and to comply with EMC regulations on electromagnetic compatibility. If you opt for a plastic connector, make sure that it guarantees and maintains the IP and EMC protection characteristics of the valve.

20.2 - Mating connectors and caps for fieldbus communication and for sensors.

Duplomatic offers spare parts to be wired and also ready-to-use cord sets. Please refer to cat. 89 000.

20.3 - Connection cable

The optimal wiring provides for 7 isolated conductors, with separate screen for the signal wires (command, monitor) and an overall screen.

Cross section for power supply:
- up to 20 m cable length : 1,0 mm^2
- up to 40 m cable length : 1,5 mm^2 (IO-Link excluded)

Cross section for signals (command, monitor):
- 0,50 mm^2

20.4 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic. See catalogue 89 850.

21 - SUBPLATES

(see catalogue 51 000)

No subplates are available for DSPE5RG*, DSPE10G* and DSPE11G*.

	DSPE5G*	DSPE7G*	DSPE8G*
Type with rear ports	PME4-AI5G	PME07-AI6G	-
Type with side ports	PME4-AL5G	PME07-AL6G	PME5-AL8G
P, T, A, B ports dimensions X, Y ports dimensions	3/4” BSP 1/4” BSP	1” BSP 1/4” BSP	1 ½” BSP 1/4” BSP

DUPLOMATIC MOTION SOLUTIONS
a member of DAIKIN group

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T +39 0331 895111 | E vendite.ita@duplomatic.com | sales.exp@duplomatic.com
duplomaticmotionsolutions.com

REPRODUCTION IS FORBIDDEN. THE COMPANY RESERVES THE RIGHT TO APPLY ANY MODIFICATIONS.



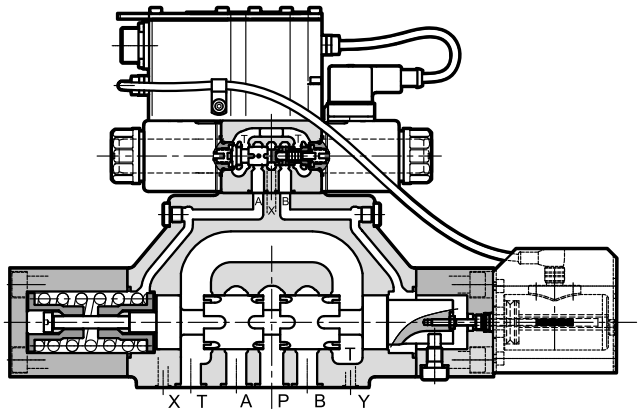
DSPE*J*

PROPORTIONAL DIRECTIONAL VALVES, PILOT OPERATED, WITH FEEDBACK AND INTEGRATED ELECTRONICS

SUBPLATE MOUNTING

DSPE5J* **CETOP P05**
DSPE5RJ* **ISO 4401-05**
DSPE7J* **ISO 4401-07**
DSPE8J* **ISO 4401-08**
DSPE10J* **ISO 4401-10**
DSPE11J* **ISO 4401-10** oversize ports

OPERATING PRINCIPLE



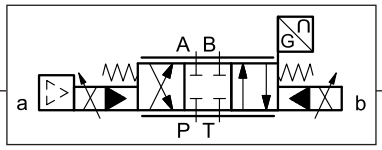
— The DSPE*J* are proportional directional valves, pilot operated, with feedback and integrated electronics, with mounting interface in compliance with ISO 4401 standards.

— They are controlled directly by the integrated electronics. Transducer and digital card allow a fine control of the main spool position, reducing both hysteresis and response times and optimizing the valve performance.

— The valves are available with different types of electronics, with analogue or fieldbus interfaces.

— The valves are easy to install. The driver manages the digital settings directly.

HYDRAULIC SYMBOL (typical)



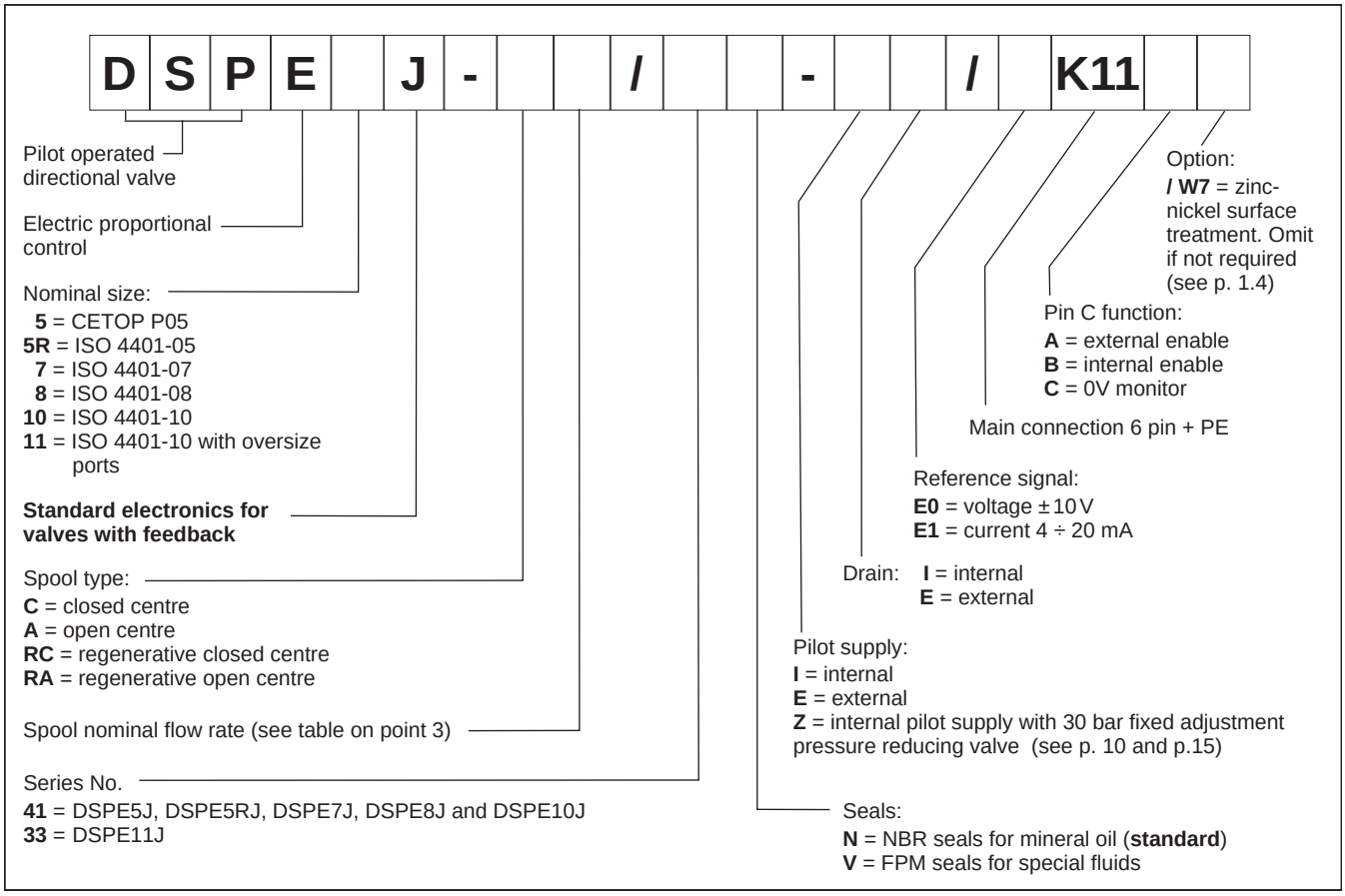
PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50 °C and p = 140 bar)

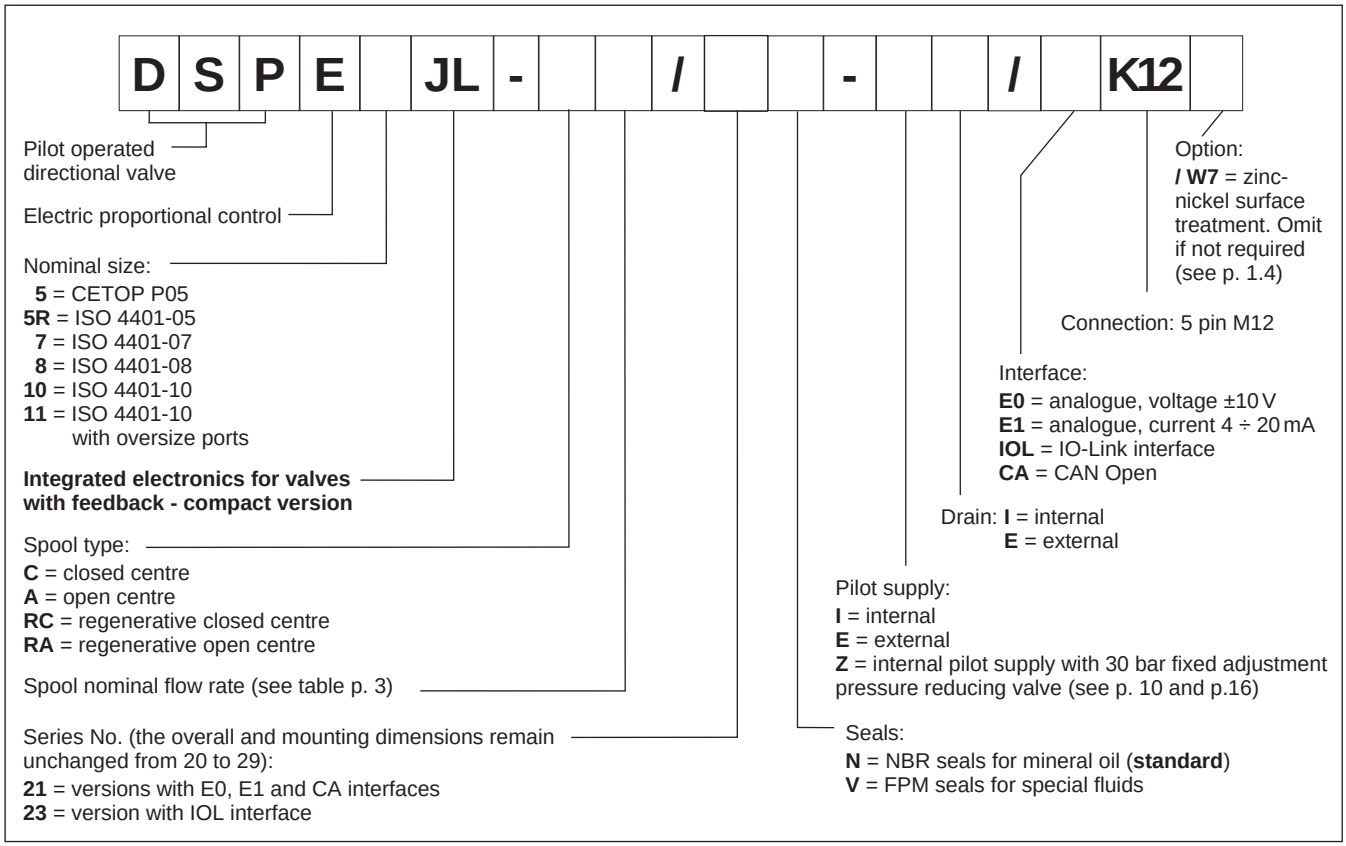
		DSPE5J* DSPE5RJ*	DSPE7J*	DSPE8J*	DSPE10J*	DSPE11J*
Max operating pressure: P - A - B ports T port	bar	350 see point 10				320 see p. 10
Max flow rate	l/min	180	450	800	1800	2000
Hysteresis	% Q_{max}	< 0,5%				
Repeatability	% Q_{max}	< ± 0,2%				
Electrical characteristics		see point 4				
Ambient temperature range	°C	-20 / +60				
Fluid temperature range	°C	-20 / +80				
Fluid viscosity range	cSt	10 ÷ 400				
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13					
Recommended viscosity	cSt	25				
Mass	kg	8.1	9.5	17.8	44.6	41.8

1 - IDENTIFICATION CODES

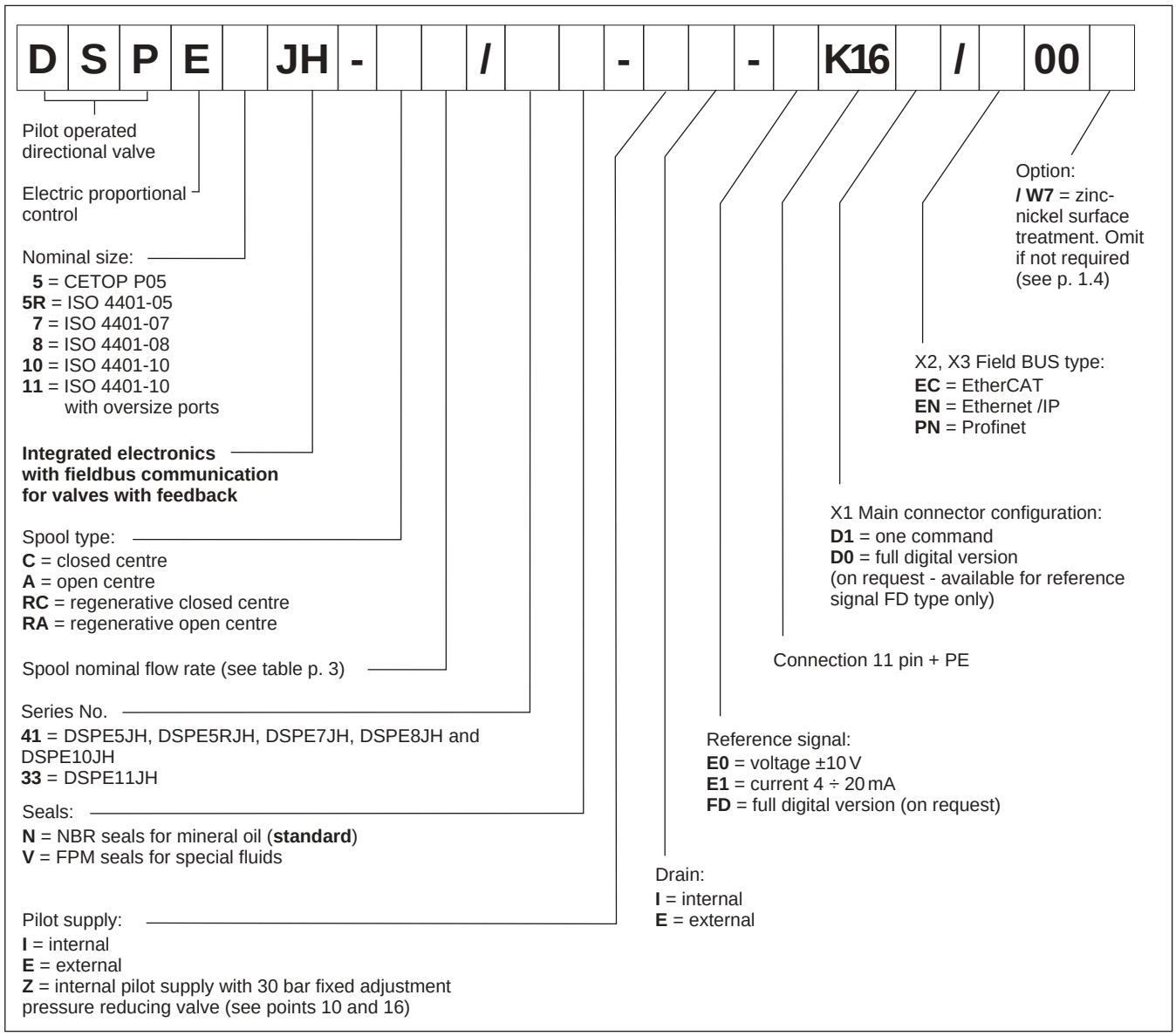
1.1 - Standard electronics



1.2 - Compact electronics



1.3 - Electronics with fieldbus communication

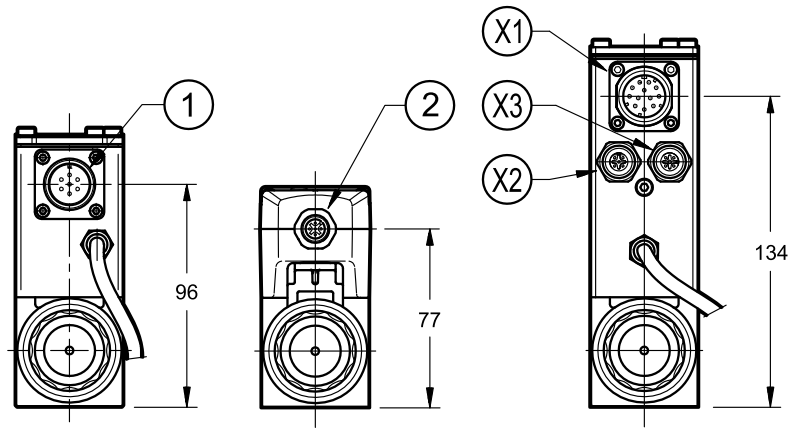


1.4 - Surface treatments

The standard valve is supplied with surface treatment of phosphating black. The zinc-nickel finishing on the valve body makes the valve suitable to ensure a salt spray resistance up to 240 hours. (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

2 - COMPARISON AMONG INTEGRATED ELECTRONICS

J type **JL type** **JH type** dimensions in mm



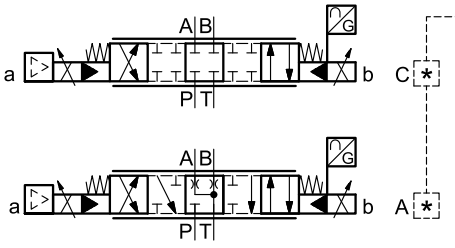
1	Connection 6 pin + PE
2	Connection M12 5 pin, code A, male
X1	Main connection 11 pin + PE
X2	Fieldbus communication (IN)
X3	Fieldbus communication (OUT)

NOTE 1: Please refer to section 7 for connections descriptions and pinouts.
NOTE 2: Related mating connectors have to be ordered separately.
See catalogue 89 000.

3 - AVAILABLE CONFIGURATIONS

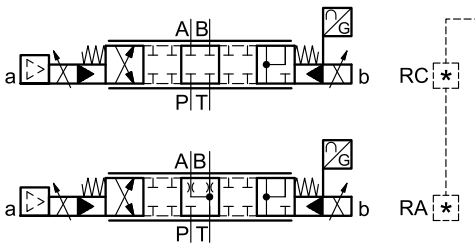
The valve configuration depends on the combination of spool type and rated flow.

3 positions with spring centreing



valve type	*	Nominal flow with Δp 10 bar P→T
DSPE5J* DSPE5RJ*	**80**	80 l/min
	80/40	80 (P-A) / 40 (B-T) l/min
DSPE7J*	**100**	100 l/min
	150	150 l/min
	150/75	150 (P-A) / 75 (B-T) l/min
DSPE8J*	**200**	200 l/min
	300	300 l/min
	300/150	300 (P-A) / 150 (B-T) l/min
DSPE10J*	**350**	350 l/min
	500	500 l/min
	500/250	500 (P-A) / 250 (B-T) l/min
	800	800 l/min
	800/500	800 (P-A) / 500 (B-T) l/min
DSPE11J*	**1000**	1000 l/min

regenerative spools



valve type	*	Nominal flow with Δp10 bar P→T
DSPE7J*	**150/75**	150 (P-A, A-T) / 75 (P-B, B-P) l/min
DSPE8J*	**300/150**	300 (P-A, A-T) / 150 (P-B, B-P) l/min
DSPE10J*	**500/250**	500 (P-A, A-T) / 250 (P-B, B-P) l/min

4 - ELECTRONICS COMMON DATA

Duty cycle		100% (continuous operation)
Protection class according to EN 60529 (**NOTE**): DSPE*J, DSPE*JH DSPE*JL		 IP65/IP67 IP65
Supply voltage	V DC	24 (from 19 to 30 V DC), ripple max 3 Vpp
Power consumption	VA	25
Maximum solenoid current	A	1.88
Fuse protection, external	A	3
Managed breakdowns		Overload and electronics overheating, cable breakdown, supply voltage failures
Electromagnetic compatibility (EMC) emissions EN 61000-6-4, immunity EN 61000-6-2		According to 2014/30/EU standards

NOTE: The IP degree is guaranteed only with a mating connector of equivalent IP degree, installed and tightened correctly. Moreover, on the JH versions, it is necessary to protect any unused connections with caps.

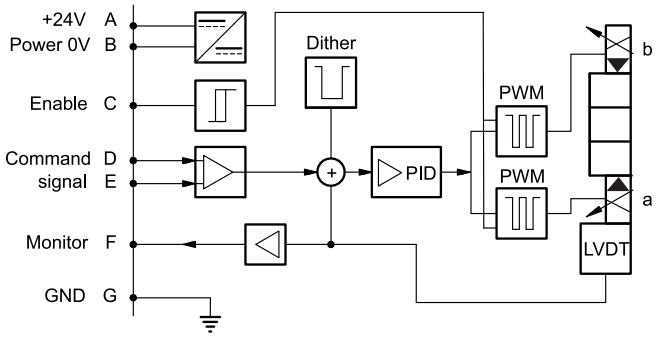
5 - DSPE*J* - STANDARD ELECTRONICS

5.1 - Electrical characteristics

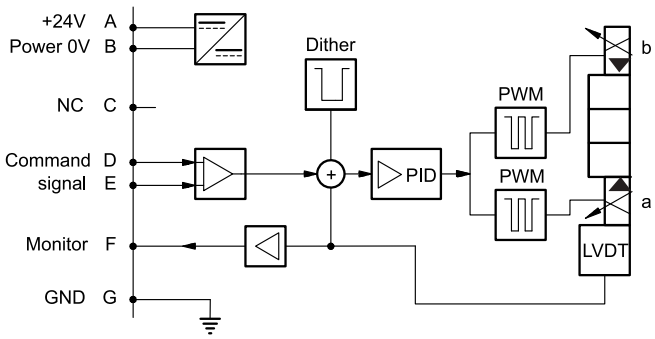
Command signal: voltage (E0) current (E1)	V DC mA	± 10 (Impedance Ri > 11 kohm) 4 ÷ 20 (Impedance Ri = 58 ohm)
Monitor signal (main spool position): voltage (E0) current (E1)	 V DC mA	 ± 10 (Impedance Ro > 1 kohm) 4 ÷ 20 (Impedance Ro = 500 ohm)
Communication for diagnostic		LIN-bus Interface (by means of the optional kit)
Connection		6 pin + PE (MIL-C-5015-G - DIN EN 175201-804)

5.2 - On-board electronics diagrams

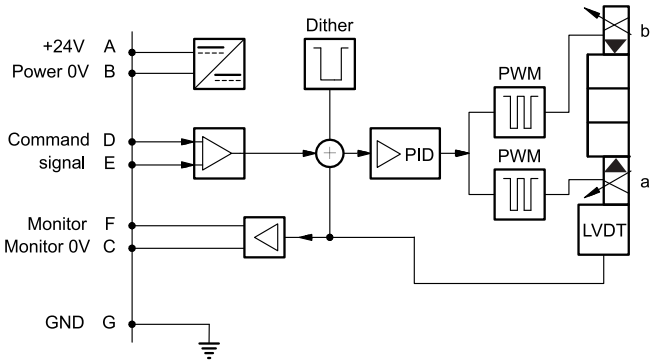
VERSION A - External Enable



VERSION B - Internal Enable

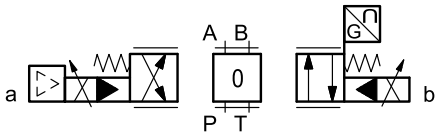


VERSION C - 0V Monitor

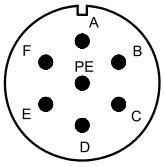


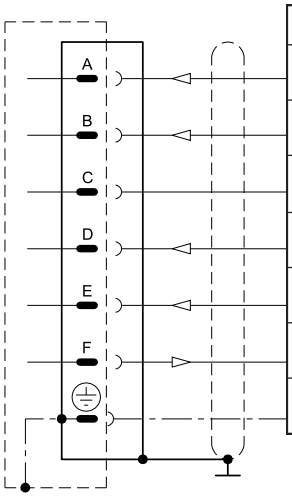
5.3 - Versions with voltage command (E0)

The reference signal is between -10V and +10V. The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**-10V**	**0V**	**+10V**
MONITOR	**-10V**	**0V**	**+10V**



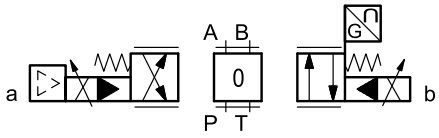


Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	± 10 V	Command		
E	0 V	Command reference		
F	± 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

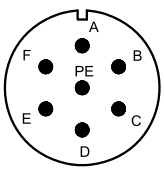
5.4 - Versions with current command (E1)

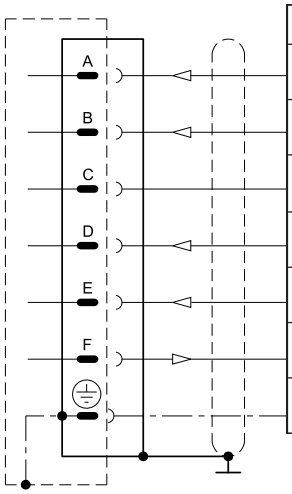
The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**4 mA**	**12 mA**	**20 mA**
MONITOR	**4 mA**	**12 mA**	**20 mA**





Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	Command reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

6 - DSPE*JL - COMPACT ELECTRONICS

In IO-Link networks, the length of the connecting cables is limited to 20 metres. In CA versions, pin 3 and pin 5 are galvanic isolated up to 100 V to avoid earth loops.

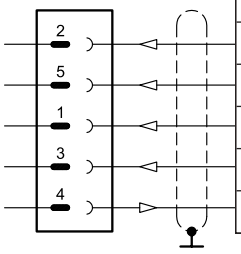
6.1 - Electrical characteristics

Command signal:	voltage (E0) current (E1)	V DC mA	±10 (impedance Ri > 11 kohm) 4 ÷ 20 (impedance Ri = 58 ohm)
Monitor signal :	voltage (E0) current (E1)	V DC mA	0 ÷ 5 (impedance Ro > 1 kohm) 4 ÷ 20 (impedance Ro = 500 ohm)
IO-Link communication (IOL): Data rate		kBaud	IO-Link Port Class B 38.4
Can Open communication (CA): Data rate		kbit	10 ÷ 1000
Data register (IOL and CA versions only)			card voltage supply, solenoid faults (shortcircuit, bad configuration), box temperature.
Connection			5-pin M12 code A (IEC 61076-2-101)

6.2 - Pin tables

'E0' connection

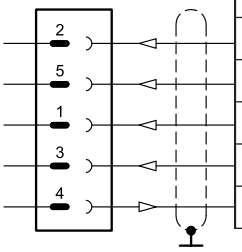




Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	± 10 V	Command
3	0V	Command reference
4	0 ÷ 5V	Monitor (0V reference: pin 5)

'E1' connection

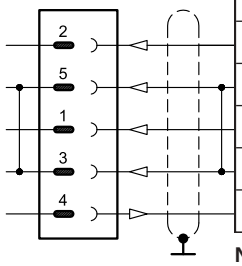




Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	4 ÷ 20 mA	Command
3	0V	Command reference
4	4 ÷ 20 mA	Monitor (0V reference: pin 5)

'IOL' connection



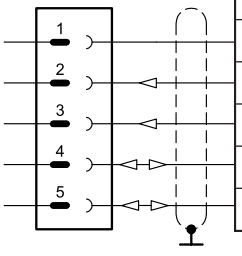


Pin	Values		Function
2	2L+	24 V DC	Solenoid supply voltage
5	2L-	0 V (GND)	
1	1L+	+24 V DC	Logic and IO-Link supply voltage
3	1L-	0V (GND)	
4	C/Q		IO-Link Communication

NOTE: Pin 3 and pin 5 are linked with each other in the valve electronics. The reference potentials 1L- and 2L- of the two supply voltages must also be linked with each other on the customer side.

'CA' connection





Pin	Values	Function
1	CAN_SH	Shield
2	24 V DC	Supply voltage
3	0 V (GND)	
4	CAN H	Bus line (high)
5	CAN_L	Bus line (low)

7 - DSPE*JH - FIELDBUS ELECTRONICS

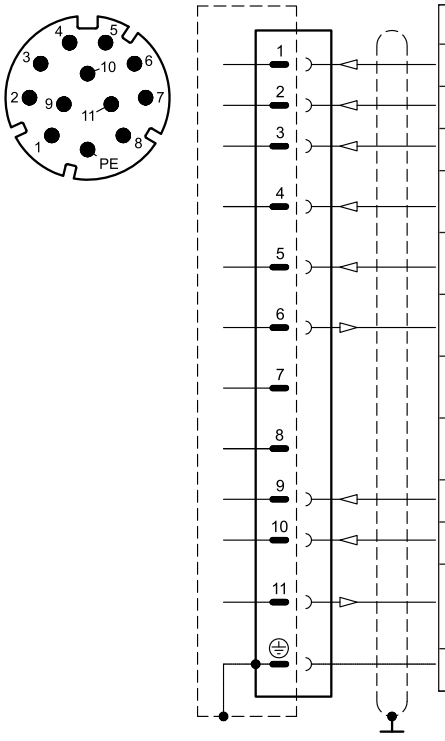
The 11 + PE pin connection allows separate supply voltage for electronics and solenoids.

Command - valve position schemes as for the standard electronics. Please refer to pictures in p. 5.3 and 5.4.

7.1 - Electrical characteristics

Command signal: voltage (E0) current (E1) digital (FD)	V DC mA	±10 (Impedance Ri > 11 kohm) 4 ÷ 20 (Impedance Ri = 58 ohm) via fieldbus
Monitor signal (main spool position): voltage (E0) current (E1)	V DC mA	±10 (Impedance Ro > 1 kohm) 4 ÷ 20 (Impedance Ro = 500 ohm)
Communication / diagnostic		via Bus register
Communication interface standards		IEC 61158
Communication physical layer		fast ethernet, insulated 100 Base TX
Power connection		11 pin + PE (DIN 43651)

7.2 - X1 Main connection pin table



D1: one command

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	± 10 V (E0) 4 ÷ 20 (E1)	Command
5	0 V	Command reference signal
6	± 10 V (E0) 4 ÷ 20 (E1)	Monitor (0V reference pin 10)
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V reference pin 2)
12	GND	Ground (Earth)

D0: full digital

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	NC	do not connect
5	NC	do not connect
6	NC	do not connect
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V ref. pin 2)
12	GND	Ground (Earth)

7.3 - FIELDBUS connections

Please wire following guidelines provided by the related standards communication protocol. Any connections present and not used must be protected with special caps so as not to nullify the protection against atmospheric agents.

X2 (IN) connection M12 D 4 pin female



Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

X3 (OUT) connection: M12 D 4 pin female



Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

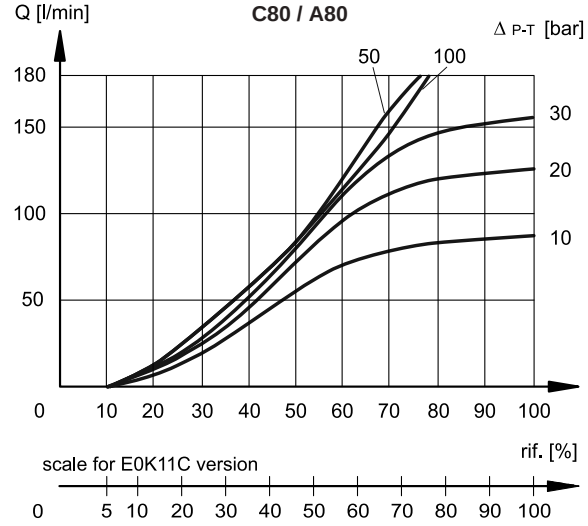
NOTE: Shield connection on connector housing is recommended.

8 - CHARACTERISTIC CURVES

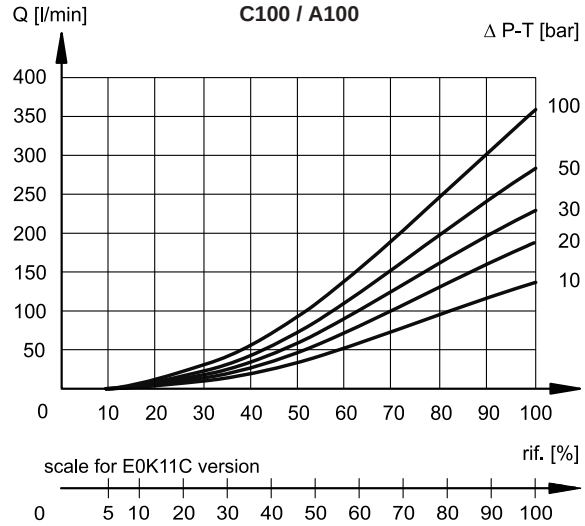
(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

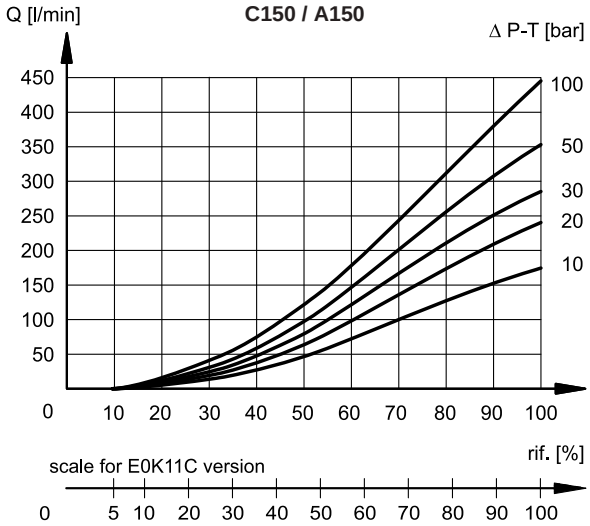
Typical flow rate curves at constant Δp related to the reference signal and measured for the available spools. The Δp values are measured between P and T valve ports.

8.1 - Characteristic curves DSPE5J* and DSPE5RJ*

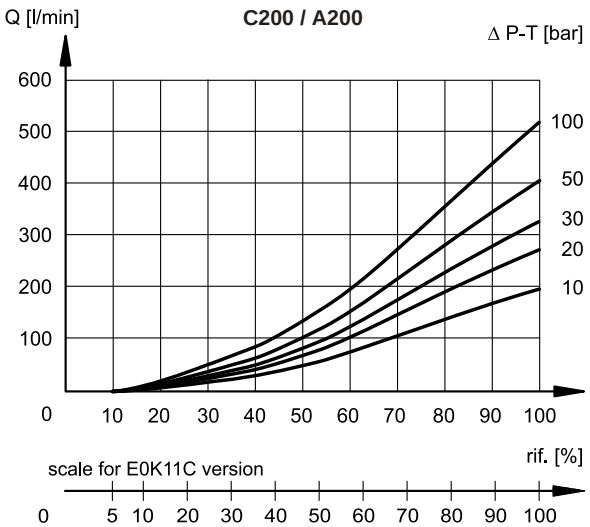


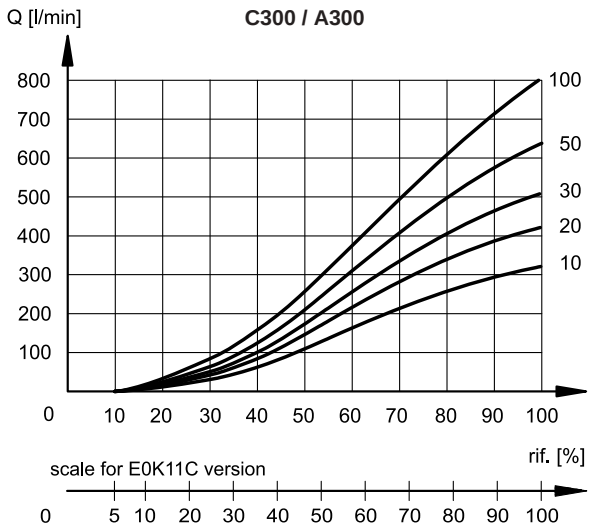
8.2 - Characteristic curves DSPE7J*



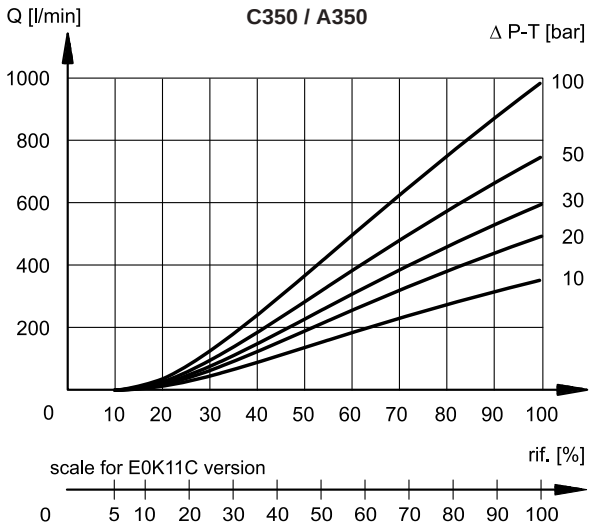


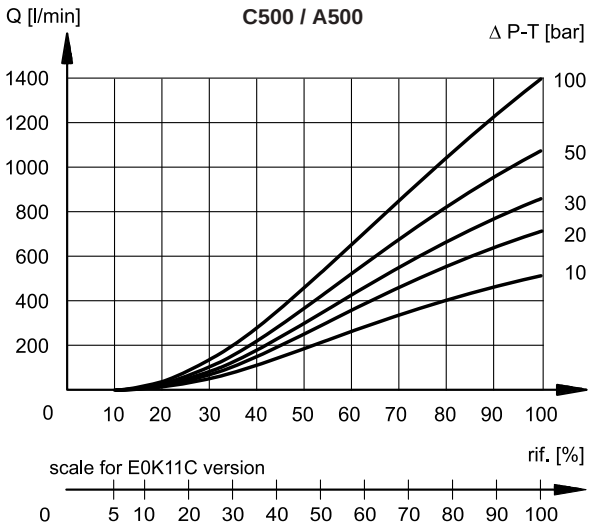
8.3 - Characteristic curves DSPE8J*

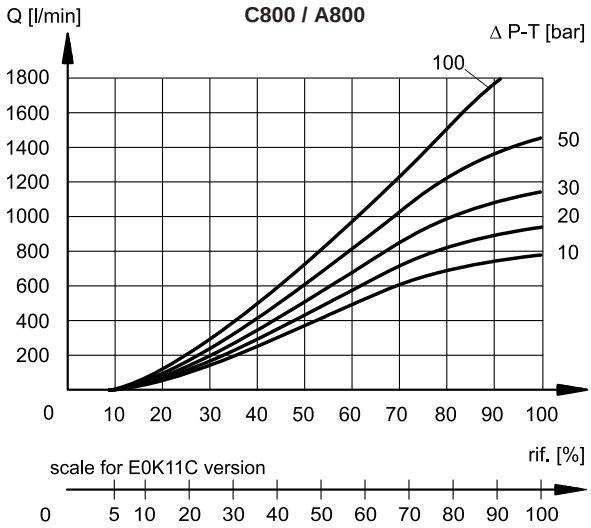




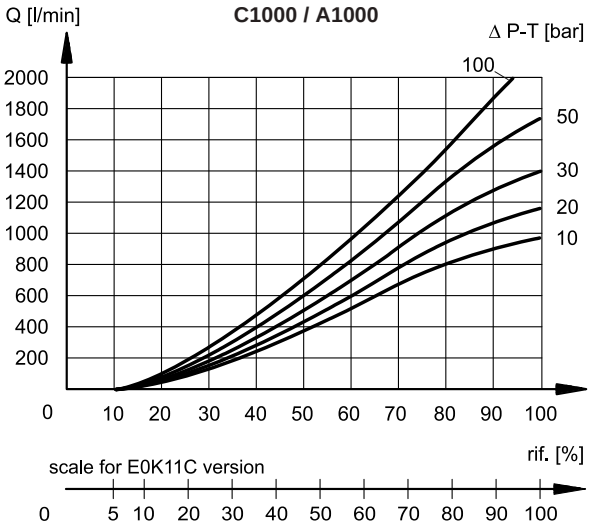
8.4 - Characteristic curves DSPE10J*





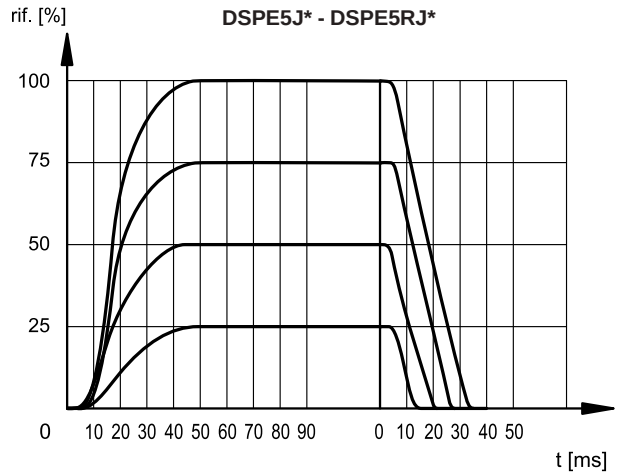


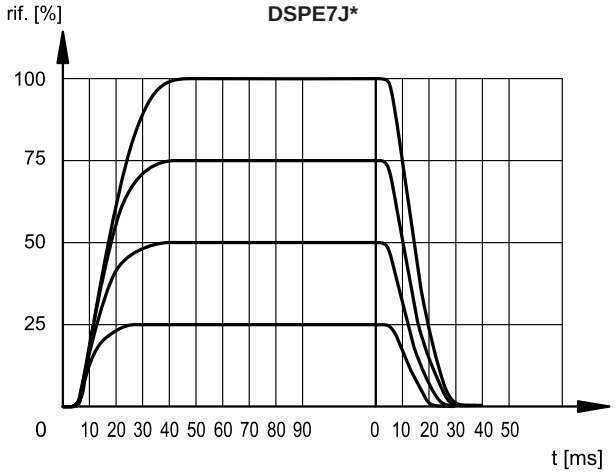
8.5 - Characteristic curves DSPE11J*

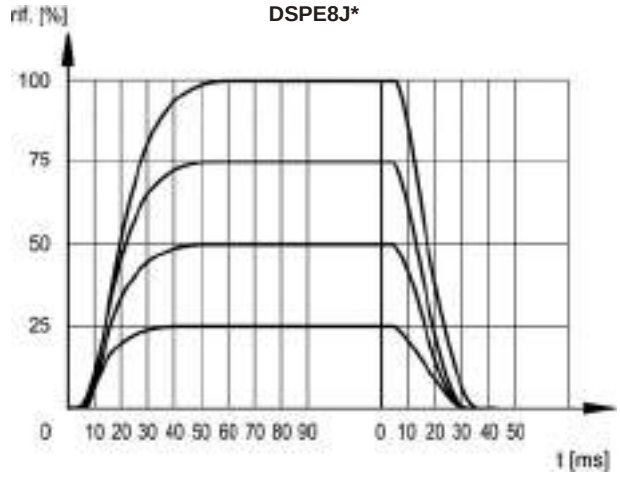


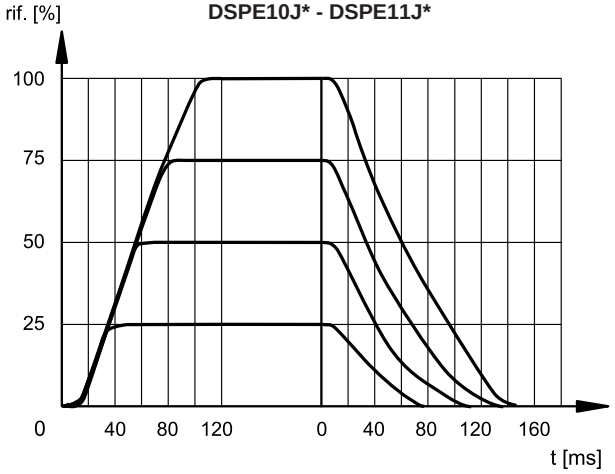
9 - STEP RESPONSE

(obtained with mineral oil with viscosity of 36 cSt at 50°C and static pressure 100 bar)









10 - HYDRAULIC CHARACTERISTICS

(with mineral oil with viscosity of 36 cSt at 50°C)

FLOW RATES		DSPE5J* DSPE5RJ*	DSPE7J*	DSPE8J*	DSPE10J*	DSPE11J*
Max flow rate	l/min	180	450	800	1800	2000
Pilot supply flow requested with operation 0 →100%	l/min	3.5	6.4	15.7	14.5	14.5
Pilot supply volume requested with operation 0 →100%	cm^3	1.7	3.2	9.2	21.6	21.6

PRESSURES (bar)	MIN	MAX
Pilot supply pressure on X port	30	210 (**NOTE**)
Pressure on T port with interal drain	–	10
Pressure on T port with external drain	–	250

NOTE: if the valve operates with higher pressures it is necessary to use the version with external pilot and reduced pressure.

Otherwise, the valve with internal pilot and pressure reducing valve with 30 bar fixed adjustment can be ordered (pilot supply type: Z, see section 1).

10.1 - Pilot and drain

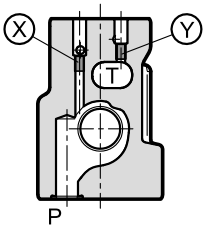
DSPE*J* valves are available with pilot and drain both internal or external. The version with external drain allows a higher back pressure on the unloading. The version with external pilot with reduced pressure must be used when higher pressures are needed.

The pilot supply Z type consists of an arrangement with internal pilot supply and 30 bar supply pressure for the pilot stage by means of a fixed adjustment pressure reducing valve.

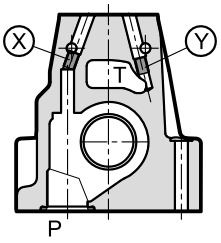
NOTE: The configuration of pilot and drain must be chosen when ordering. Subsequent modifications are allowed only to specialized operators with authorization and in factory.

TYPE OF VALVE		Plug assembly	
		X	Y
IE	internal pilot and external drain	NO	YES
II	internal pilot and internal drain	NO	NO
EE	external pilot and external drain	YES	YES
EI	external pilot and internal drain	YES	NO

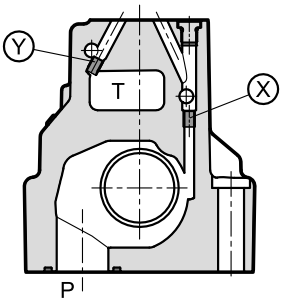
DSPE5J / DSPE5RJ



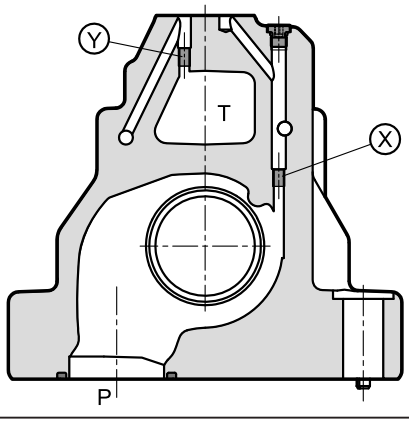
DSPE7J



DSPE8J



DSPE10J / DSPE11J

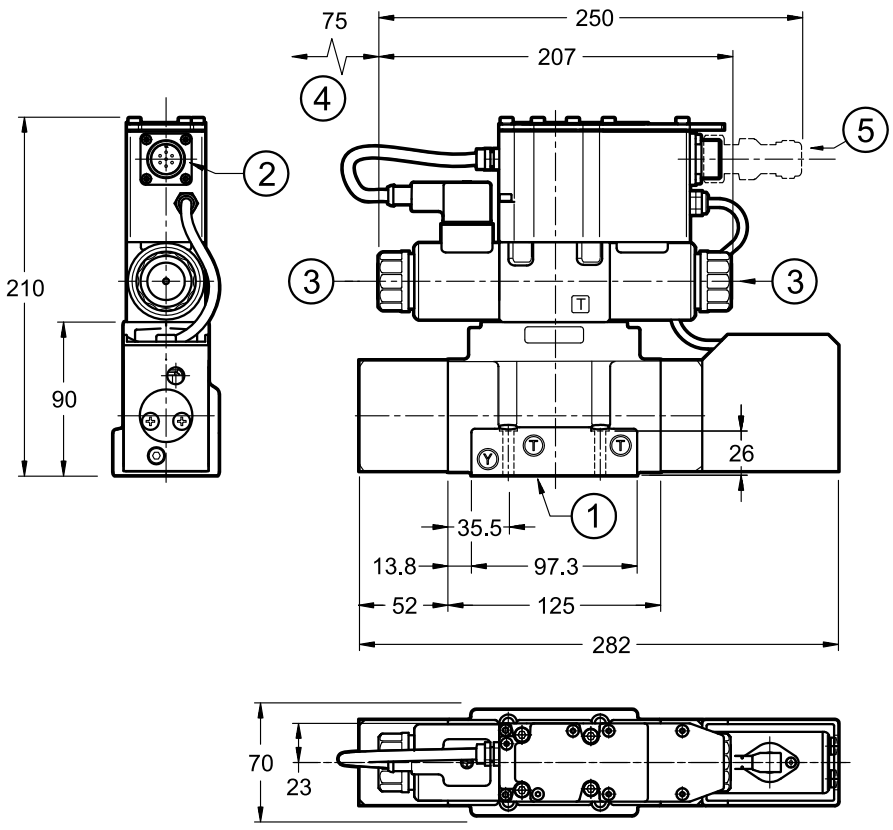


X: plug M5x6 for external pilot
Y: plug M5x6 for external drain

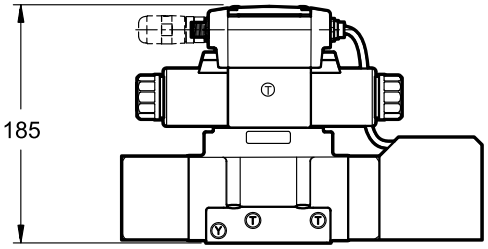
X: plug M6x8 for external pilot
Y: plug M6x8 for external drain

11 - DSPE5J* AND DSPE5RJ* - OVERALL AND MOUNTING DIMENSIONS

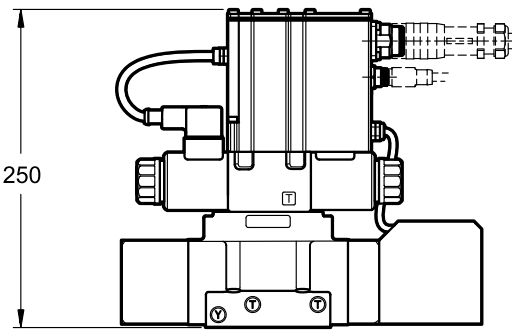
dimensions in mm



DSPE5JL



DSPE5JH



NOTES:

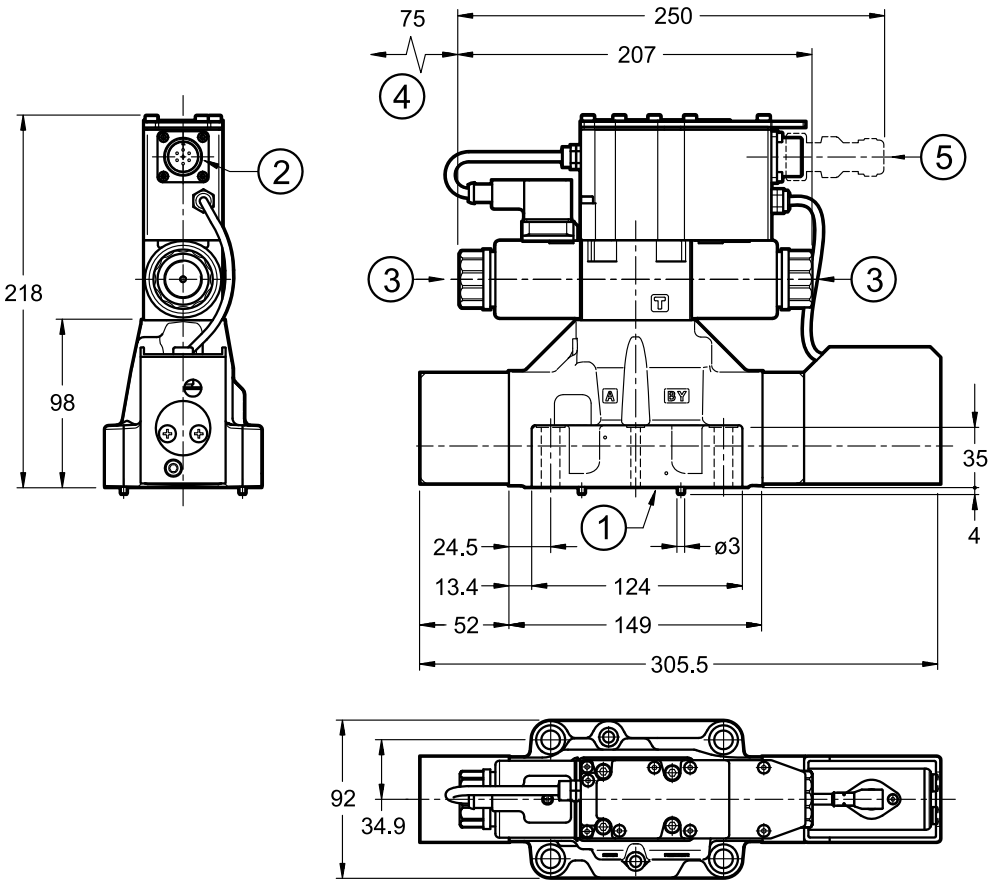
- Overall dimensions with Z option (fixed adjustment pressure reducing valve) at point 15.
- Mounting surface at point 16.
- Do not dismantle the transducer.

1	Mounting surface with sealing rings: 5 OR type 2050 (12.42x1.78) - 90 Shore 2 OR type 2037 (9.25x1.78) - 90 Shore
2	Main connection 6 pin + PE
3	Manual override embedded in the solenoid tube
4	Coil removal space
5	Mating connector **To be ordered separately.** See catalogue 89 000

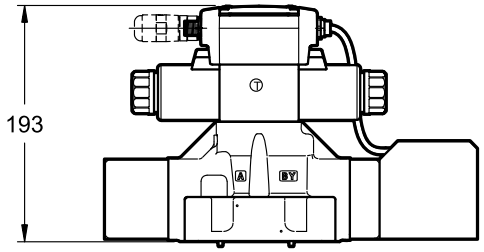
Valve fastening: 4 SHC screws M6x35 ISO 4762
Tightening torque: 8 Nm (A8.8 screws)
Threads of mounting holes: M6x10

12 - DSPE7J* - OVERALL AND MOUNTING DIMENSIONS

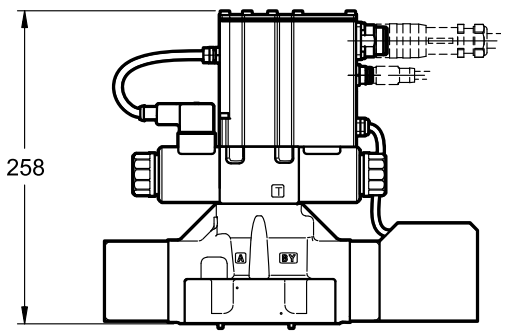
dimensions in mm



DSPE7JL



DSPE7JH



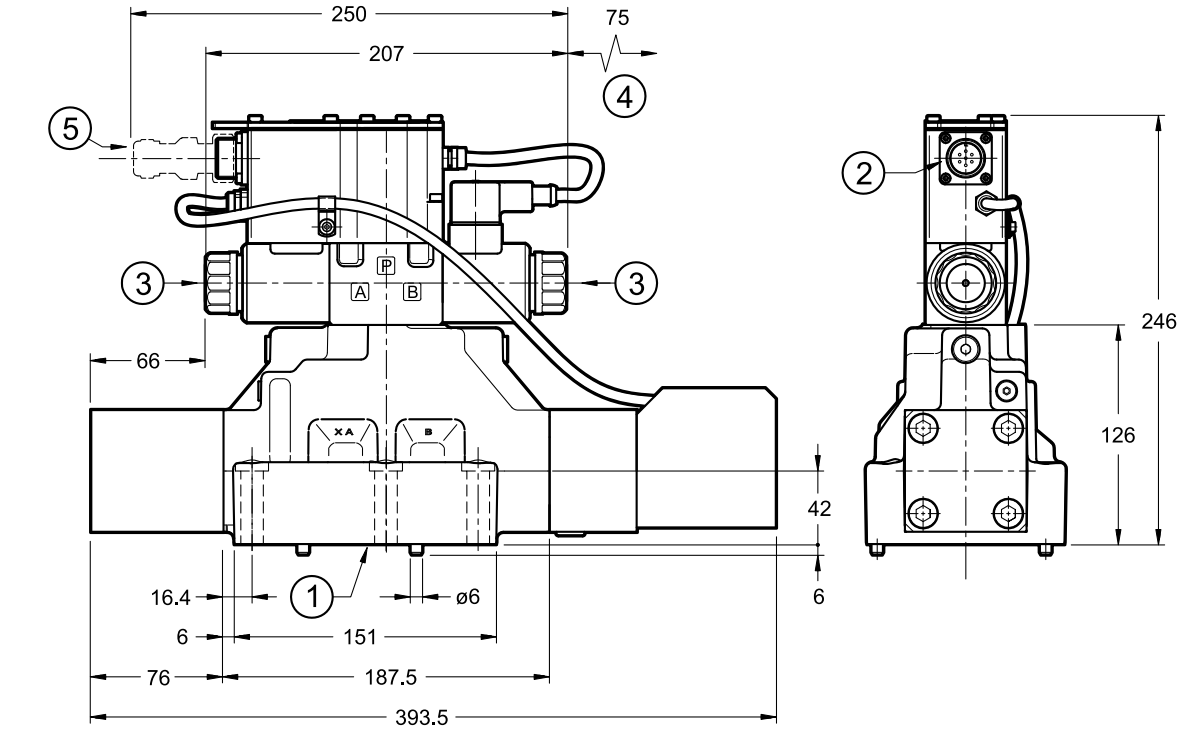
NOTES:
- Overall dimensions with Z option (fixed adjustment pressure reducing valve) at point 15.
- Mounting surface at point 16.
- Do not dismantle the transducer.

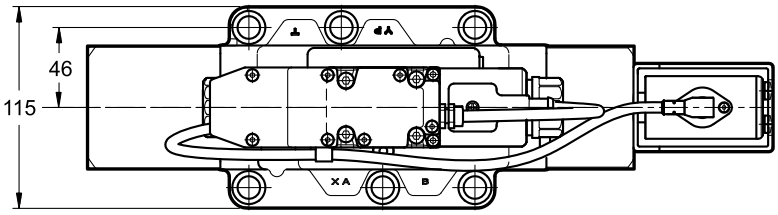
1	Mounting surface with sealing rings: 4 OR type 130 (22.22x2.62) - 90 Shore 2 OR type 2043 (10.82x1.78) - 90 Shore
2	Main connection 6 pin + PE
3	Manual override embedded in the solenoid tube
4	Coil removal space
5	Mating connector. **To be ordered separately.** See catalogue 89 000

Valve fastening: 4 SHC screws M10x50 ISO 4762 2 SHC screws M6x50 ISO 4762
Tightening torque: M10x50: 40 Nm (A8.8 screws) M6x50: 8 Nm (A8.8 screws)
Threads of mounting holes: M6x18; M10x18

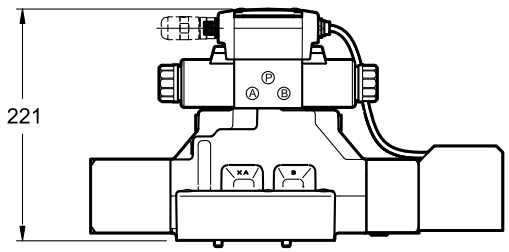
13 - DSPE8J* - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

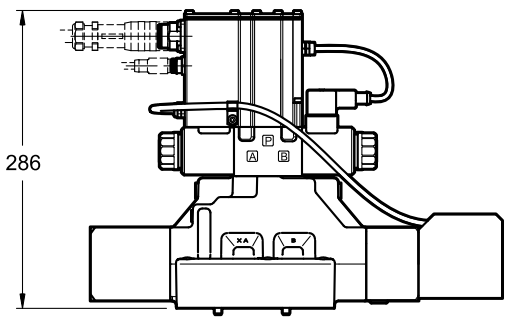




DSPE8JL



DSPE8JH



NOTES:

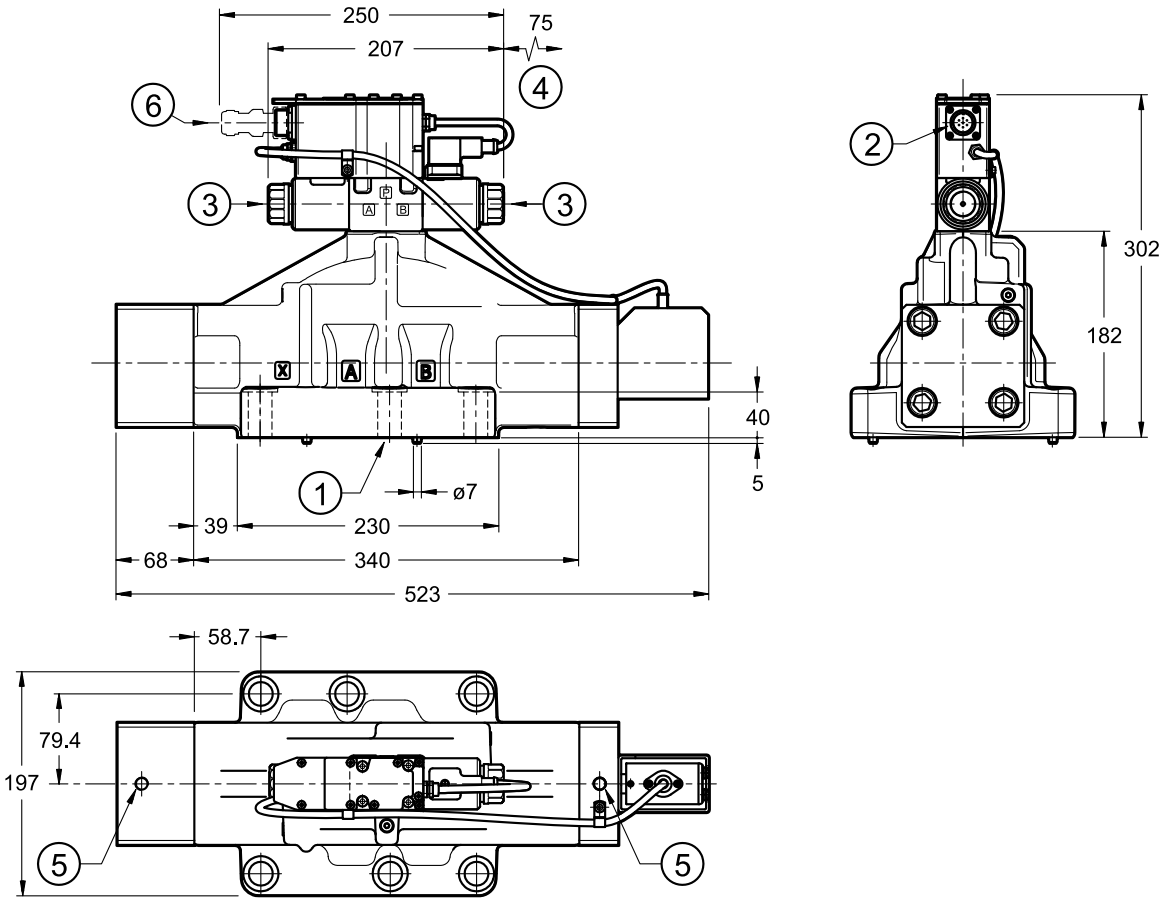
- Overall dimensions with Z option (fixed adjustment pressure reducing valve) at point 15.
- Mounting surface at point 16.
- Do not dismantle the transducer.

1	Mounting surface with sealing rings: 4 OR type 3131 (32.99x2.62) - 90 Shore 2 OR type 3087 (21.89x2.62) - 90 Shore
2	Main connection 6 pin + PE
3	Manual override embedded in the solenoid tube
4	Coil removal space
5	Mating connector. **To be ordered separately.** See catalogue 89 000

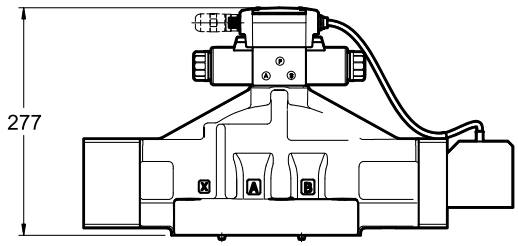
Valve fastening: 6 SHC screws M12x60 ISO 4762
Tightening torque: 69 Nm (A8.8 screws)
Threads of mounting holes: M12x20

14 - DSPE10J* / DSPE11J* - OVERALL AND MOUNTING DIMENSIONS

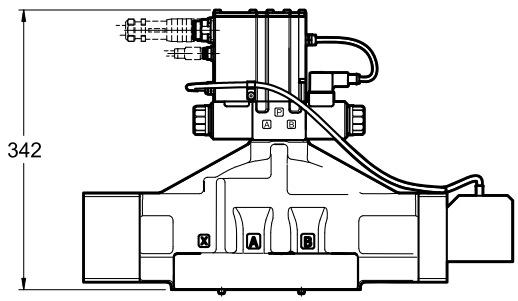
dimensions in mm



DSPE1*JL



DSPE1*JH



NOTES:
- Overall dimensions with Z option (fixed adjustment pressure reducing valve) at point 15.
- Mounting surface at point 16.
- Do not dismantle the transducer.

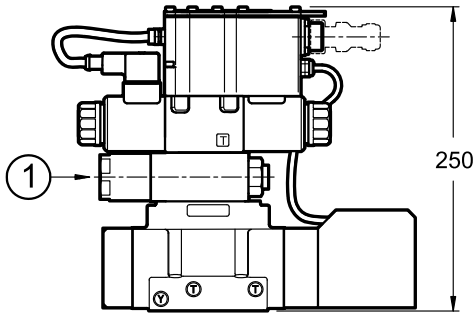
1	Mounting surface with sealing rings: **DSPE10J*** 4 OR type 4162 (40.86x3.53) - 90 Shore 2 OR type 3081 (20.24x2.62) - 90 Shore **DSPE11J*** 4 OR type 4212 (53.57x3.53) - 90 Shore 2 OR type 3081 (20.24x2.62) - 90 Shore
2	Main connection 6 pin + PE
3	Manual override embedded in the solenoid tube
4	Coil removal space
5	M12 eyebolt seat for safe lift
6	Mating connector. **To be ordered separately.** See catalogue 89 000

Valve fastening: 6 SHC screws M20x70 ISO 4762 (supplied)
Tightening torque: 470 Nm (A10.9 screws)
Threads of mounting holes: M20x40

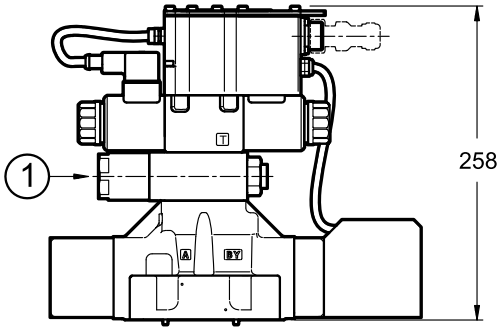
15 - OVERALL AND MOUNTING DIMENSIONS - PILOT SUPPLY TYPE Z

dimensions in mm

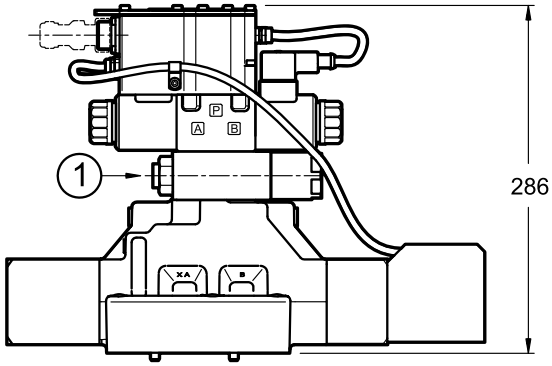
DSPE5J*



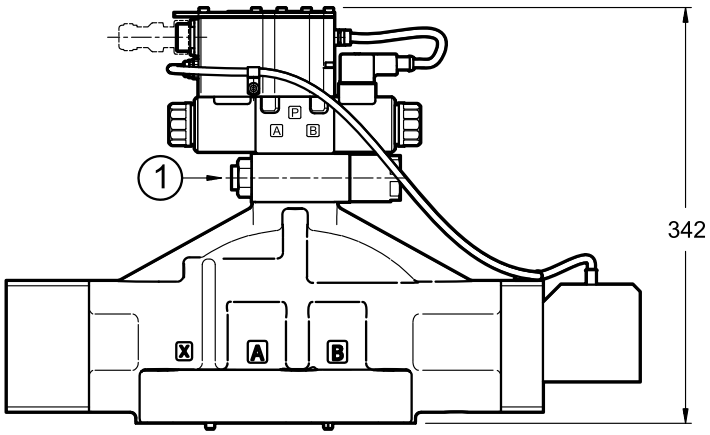
DSPE7J*



DSPE8J*



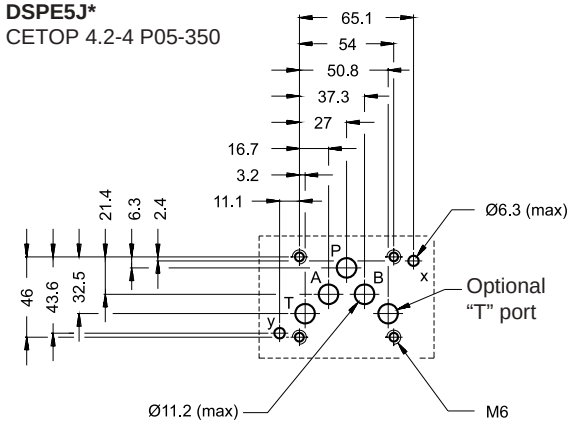
DSPE10J* / DSPE11J*



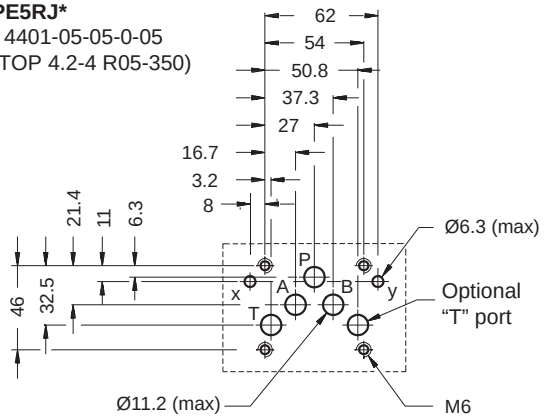
1	30 bar fixed adjustment pressure reducing valve

16 - MOUNTING SURFACES

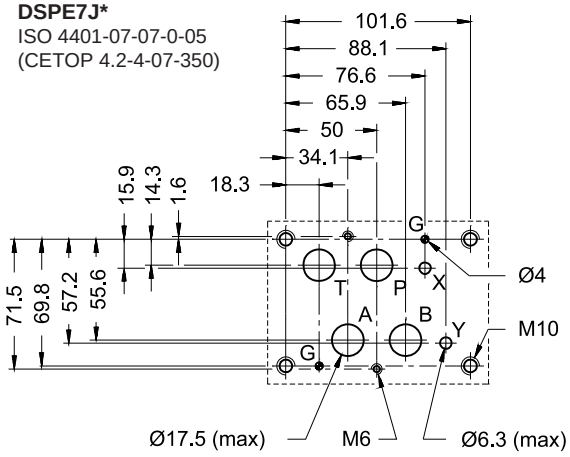
DSPE5J*
CETOP 4.2-4 P05-350



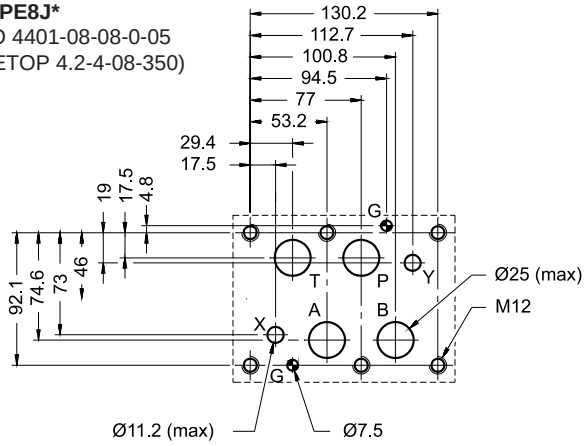
DSPE5RJ*
ISO 4401-05-05-0-05
(CETOP 4.2-4 R05-350)



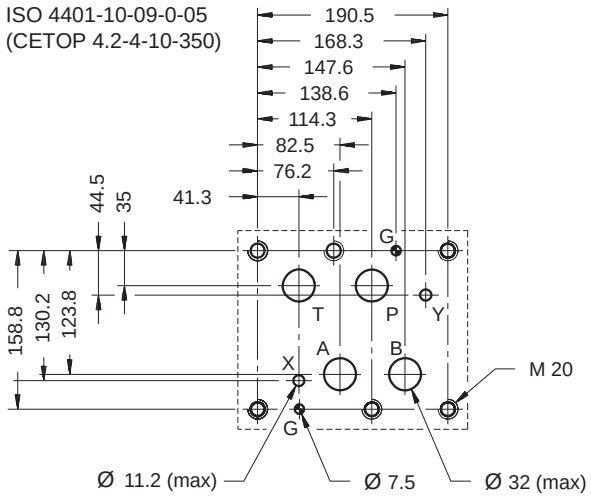
DSPE7J*
ISO 4401-07-07-0-05
(CETOP 4.2-4-07-350)



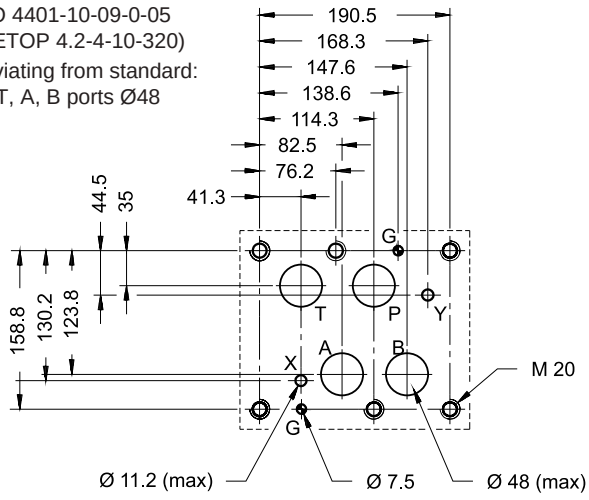
DSPE8J*
ISO 4401-08-08-0-05
(CETOP 4.2-4-08-350)



DSPE10J*
ISO 4401-10-09-0-05
(CETOP 4.2-4-10-350)



DSPE11J*
ISO 4401-10-09-0-05
(CETOP 4.2-4-10-320)
deviating from standard:
P, T, A, B ports Ø48



17 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

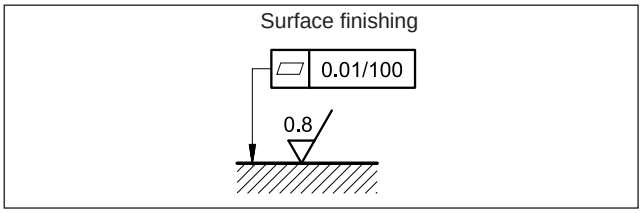
The fluid must be preserved in its physical and chemical characteristics.

18 - INSTALLATION

The valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.



19 - ACCESSORIES

(to be ordered separately)

19.1 - Mating connectors

Mating connectors must be ordered separately. See catalogue 89 000.

For K11 and K16 versions we recommend the choice of a metal connector to avoid electromagnetic disturbances and to comply with EMC regulations on electromagnetic compatibility. If you opt for a plastic connector, make sure that it guarantees and maintains the IP and EMC protection characteristics of the valve.

19.2 - Mating connectors and caps for fieldbus communication

Duplomatic offers spare parts to be wired and also ready-to-use cord sets. Please refer to cat. 89 000.

19.3 - Connection cable

The optimal wiring provides for 7 isolated conductors, with separate screen for the signal wires (command, monitor) and an overall screen.

Cross section for power supply:
- up to 20 m cable length : 1,0 mm^2
- up to 40 m cable length : 1,5 mm^2 (IO-Link excluded)

Cross section for signals (command, monitor):
- 0,50 mm^2

19.4 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic, available for valves with K11 and K16 connections. See catalogue 89 850.

20 - SUBPLATES

(see catalogue 51 000)

No subplates are available for DSPE5RJ*, DSPE10J* and DSPE11J*.

	DSPE5J*	DSPE7J*	DSPE8J*
Type with rear ports	PME4-AI5G	PME07-AI6G	-
Type with side ports	PME4-AL5G	PME07-AL6G	PME5-AL8G
P, T, A, B ports dimensions X, Y ports dimensions	3/4” BSP 1/4” BSP	1” BSP 1/4” BSP	1 ½” BSP 1/4” BSP

DUPLOMATIC MOTION SOLUTIONS
a member of DAIKIN group

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duplomaticmotionsolutions.com

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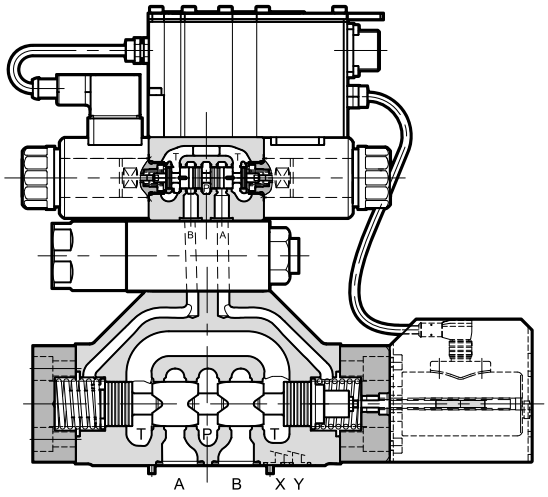
DDPE*J*

PROPORTIONAL DIRECTIONAL CONTROL VALVES WITH FEEDBACK AND INTEGRATED ELECTRONICS

SUBPLATE MOUNTING

DDPE5RJ* **ISO 4401-05**
DDPE7J* **ISO 4401-07**
DDPE8J* **ISO 4401-08**
DDPE9J* **ISO 4401-08** oversize ports
DDPE10J* **ISO 4401-10**
DDPE11J* **ISO 4401-10** oversize ports

OPERATING PRINCIPLE



— The DDPE*J* are pilot-operated proportional directional control valves with feedback, integrated electronics, and an ISO 4401-compliant mounting interface.

— Controlled by an integrated digital amplifier, the transducer and digital card enable precise spool positioning, minimizing hysteresis and response times.

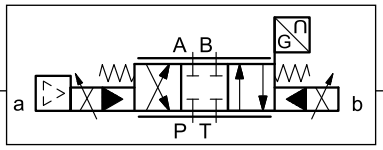
— The DDPE*J* valves are always equipped with a pressure reducing valve set to 30 bar for the pilot stage supply.

— They are available with different types of electronics, with analogue or fieldbus interfaces.

— A monitoring signal of the main spool position is provided.

— The valves are easy to install. The driver manages digital settings directly.

HYDRAULIC SYMBOL (typical)



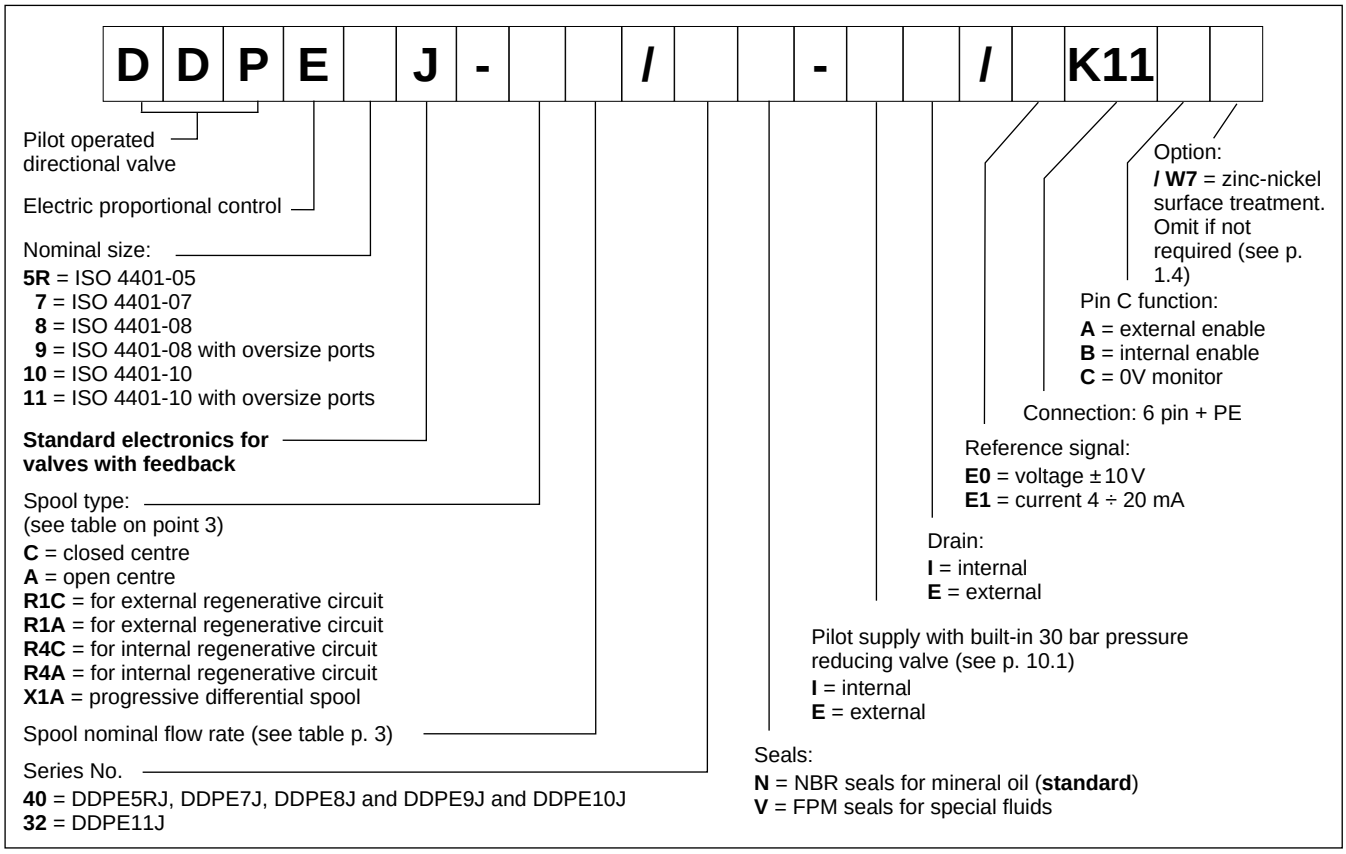
PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

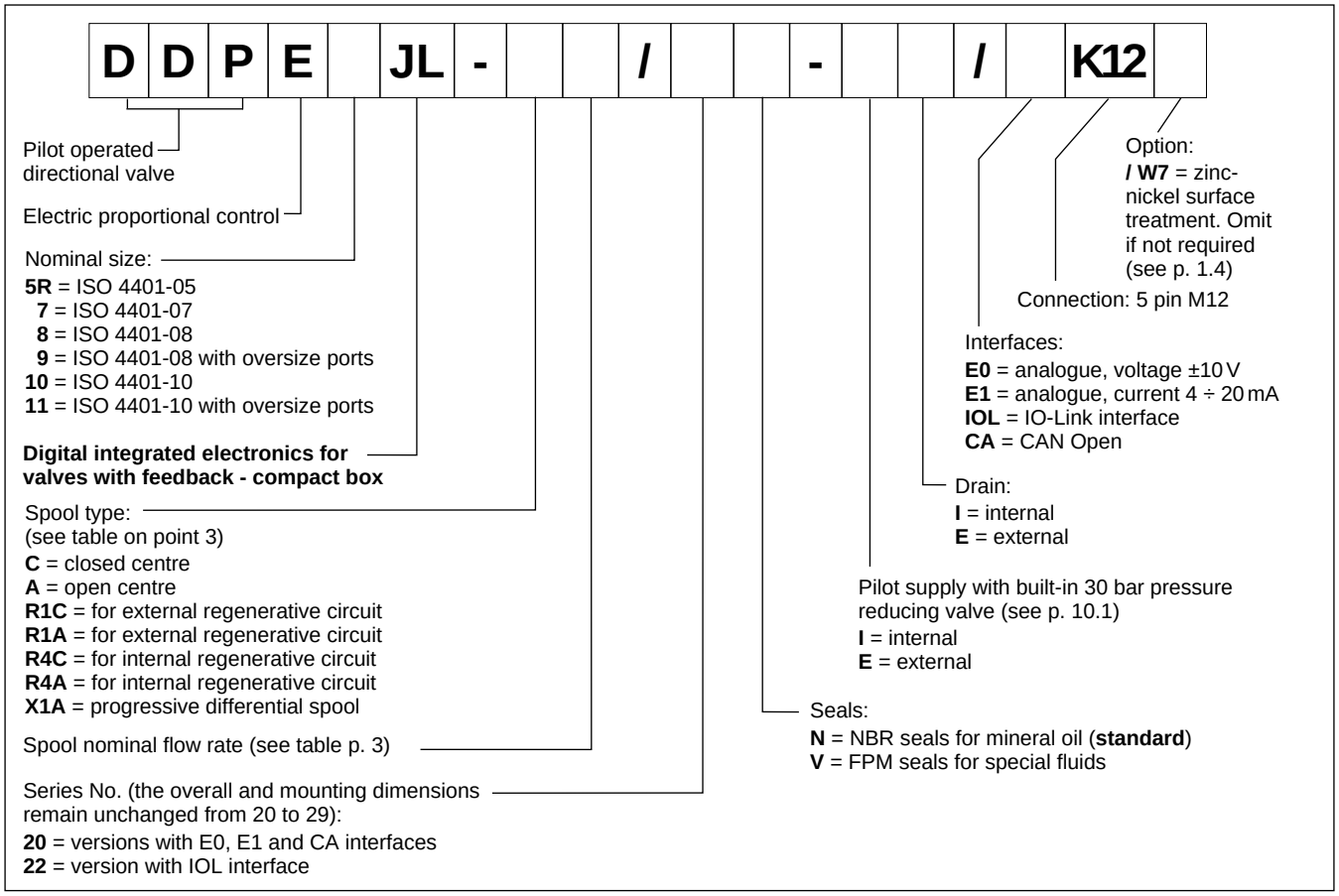
		DDPE5RJ*	DDPE7J*	DDPE8J*	DDPE9J*	DDPE10J*	DDPE11J*
Max operating pressure: P - A - B ports T port	bar	350 250			300 250	350 250	320 250
Rated flow at Δp 10 bar	l/min	100	220	400	480	800	1000
Hysteresis	% Q_{max}	< 0.5%					
Repeatability	% Q_{max}	< ± 0.2%					
Electrical characteristics		see point 4					
Ambient temperature range	°C	-20 / +60					
Fluid temperature range	°C	-20 / +80					
Fluid viscosity range	cSt	10 ÷ 400					
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13						
Recommended viscosity	cSt	25					
Mass	kg	5.7	10.3	16.2	15.9	55	53

1 - IDENTIFICATION CODE

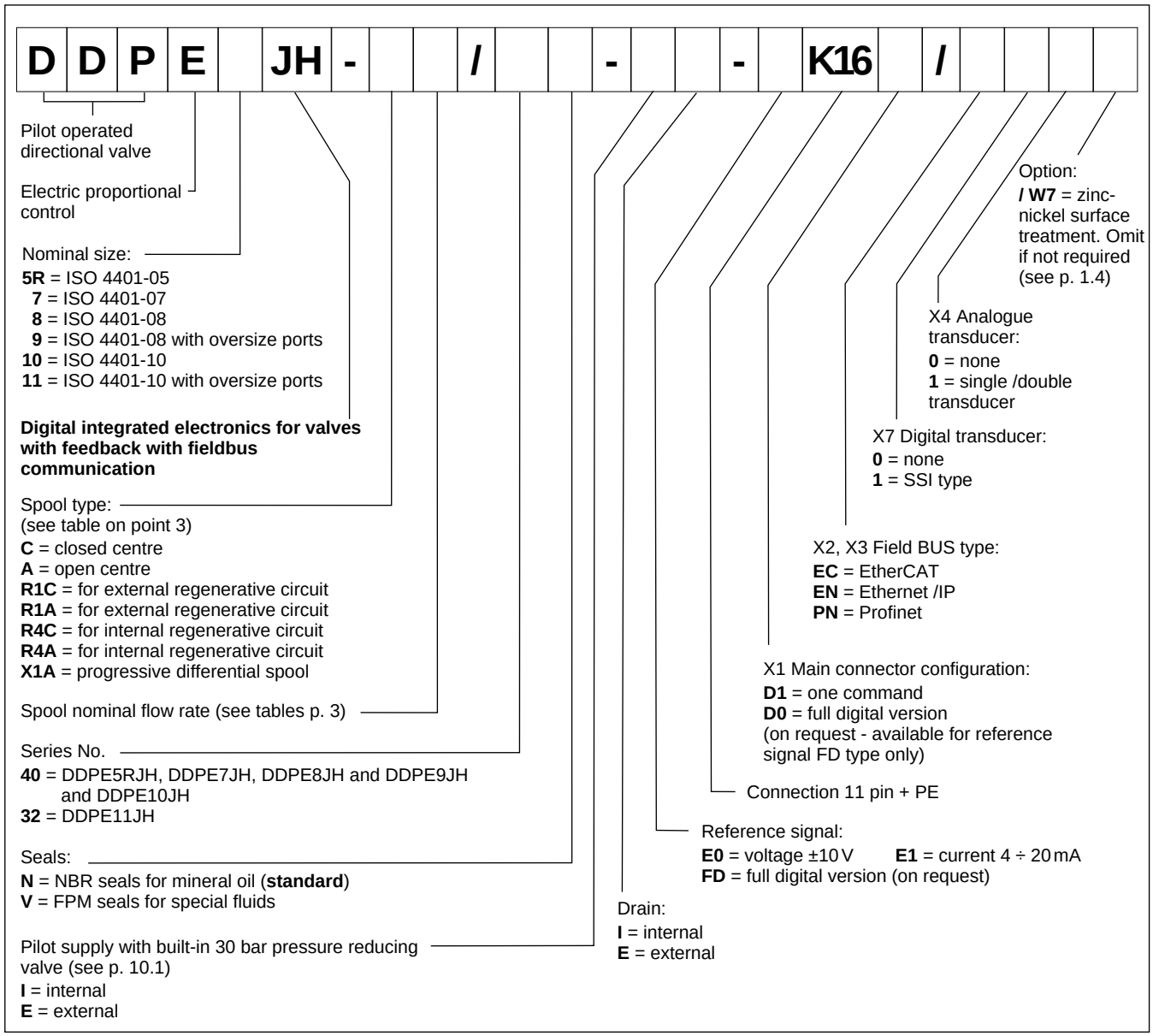
1.1 - Standard electronics



1.2 - Compact electronics



1.3 - Electronics with fieldbus communication

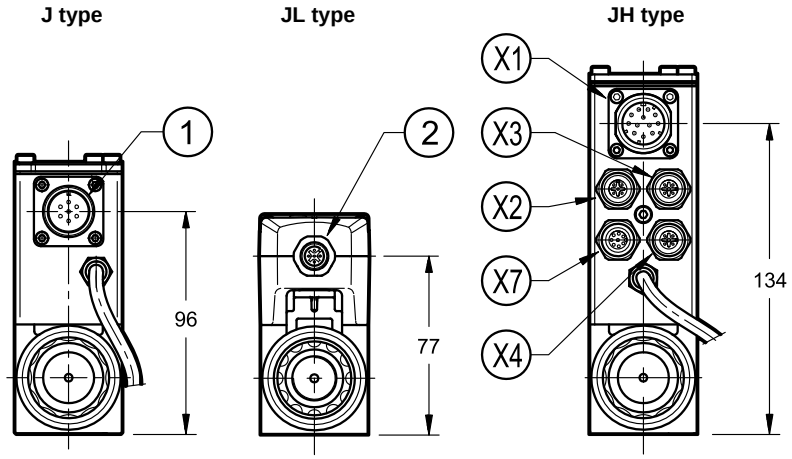


1.4 - Surface treatments

The standard valve is supplied with surface treatment of phosphating black. The zinc-nickel finishing makes the valve suitable to ensure a salt spray resistance up to 240 hours. (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

2 - COMPARISON AMONG INTEGRATED ELECTRONICS

dimensions in mm



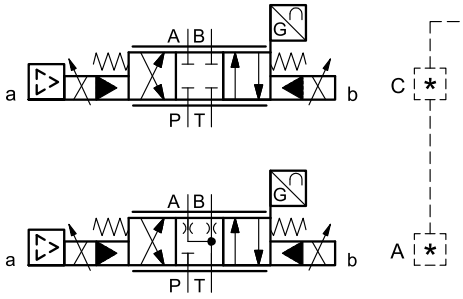
1	Connection 6 pin + PE
2	Connection M12 5 pin, code A, male
X1	Main connection 11 pin + PE
X2	Fieldbus communication (IN)
X3	Fieldbus communication (OUT)
X4	Connection for analogue transducer
X7	Connection for digital transducer

NOTE 1: Depending on the chosen version, X4 and X7 connections may not be present. Please refer to point 7 for connections descriptions and pinouts.
NOTE 2: Related mating connectors have to be ordered separately. See catalogue 89 000.

3 - AVAILABLE CONFIGURATIONS

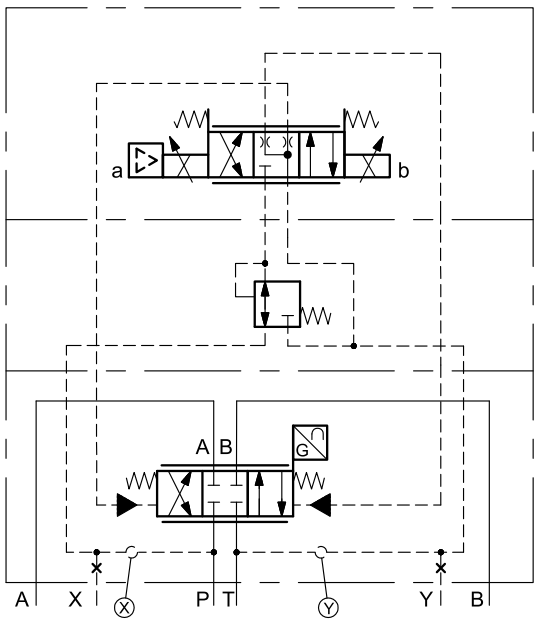
The valve configuration depends on the combination between spool type and rated flow.

3 positions with spring centreing



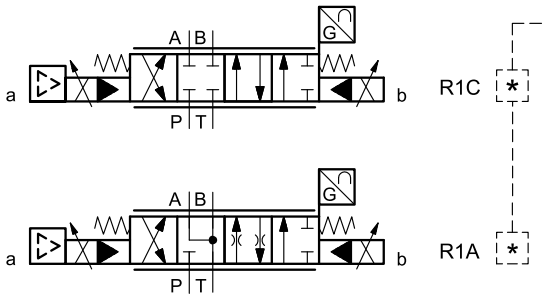
valve type	*	Nominal flow with Δp 10 bar P-T
DDPE5RJ	**100**	100 l/min
DDPE7J	**120**	120 l/min
	220	220 l/min
DDPE8J	**250**	250 l/min
	400	400 l/min
DDPE9J	**480**	480 l/min
DDPE10J	**800**	800 l/min
DDPE11J	**1000**	1000 l/min

detailed symbol (spool type C)



regenerative differential spools, external

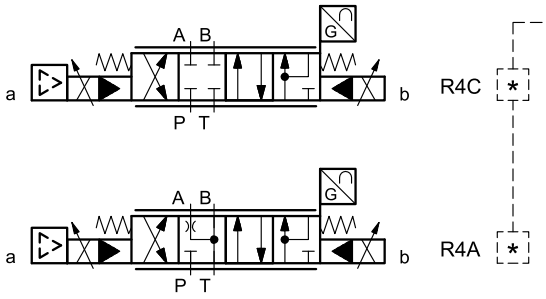
R1C and R1A spools are specific for regenerative circuits made by means of an additional external check valve.



valve type	*	Nominal flow with Δp 10 bar P-T
DDPE7J	**220**	220 l/min

regenerative differential spools, internal

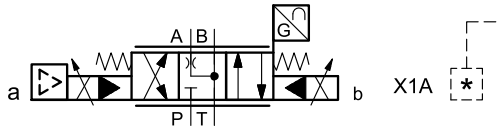
R4C and R4A spools are specific for regenerative circuits where the regenerative function is performed by the valve itself.



valve type	*	Nominal flow with Δp 10 bar P-T
DDPE7J	**220**	220 l/min
DDPE9J	**480**	480 l/min

progressive differential spool

The X1A spool is specific for alternate p/Q control, typical of plastic injection cycles.



valve type	*	Nominal flow with Δp 10 bar P-T
DDPE7J	**220**	220 l/min
DDPE8J	**430**	430 l/min

4 - ELECTRONICS COMMON DATA

Duty cycle		100% (continuous operation)
Protection class according to EN 60529 (**NOTE**): DDPE*J, DDPE*JH, DDPE*JL		 IP65/IP67 IP65
Supply voltage	V DC	24 (from 19 to 30 V DC), ripple max 3 Vpp
Power consumption	VA	25
Maximum solenoid current	A	1.88
Fuse protection, external	A	3
Managed breakdowns		Overload and electronics overheating, cable breakdown, supply voltage failures
Electromagnetic compatibility (EMC) emissions EN 61000-6-4, immunity EN 61000-6-2		According to 2014/30/EU standards

NOTE: The IP degree is guaranteed only with mating connector of equivalent IP degree, installed and tightened correctly. Moreover, on the JH versions it is necessary to protect any unused connections with caps.

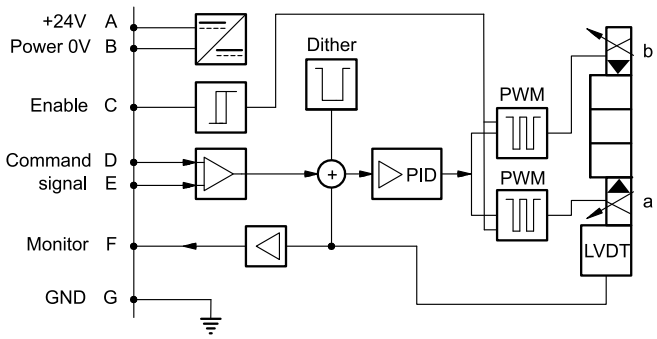
5 - DDPE*J - STANDARD ELECTRONICS

5.1 - Electrical characteristics

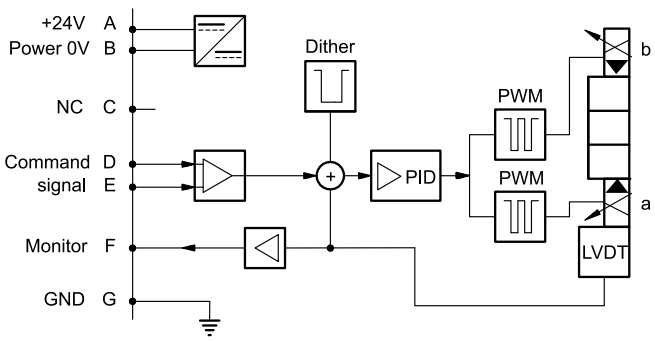
Command signal: voltage (E0) current (E1)	V DC mA	±10 (impedance Ri > 11 kOhm) 4 ÷ 20 (impedance Ri = 58 Ohm)
Monitor signal (current to solenoid): voltage (E0) current (E1)	V DC mA	 ±10 (impedance Ro > 1 kOhm) 4 ÷ 20 (impedance Ro = 500 Ohm)
Communication for diagnostic		LIN-bus Interface (by means of the optional kit)
Connection		6 pin + PE (MIL-C-5015-G - DIN EN 175201-804)

5.2 - On-board electronics diagrams

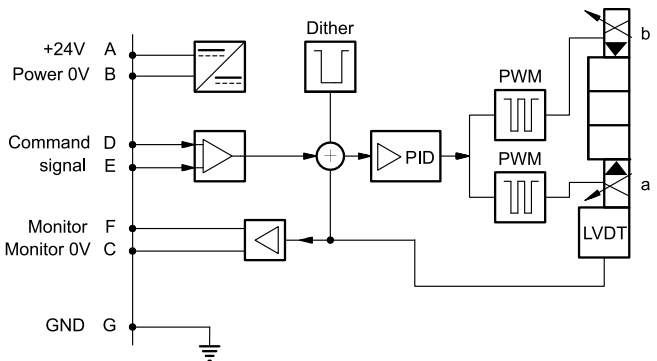
VERSION A - External Enable



VERSION B - Internal Enable

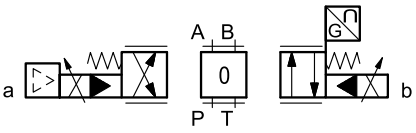


VERSION C - 0V Monitor

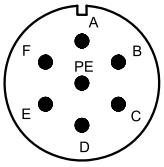


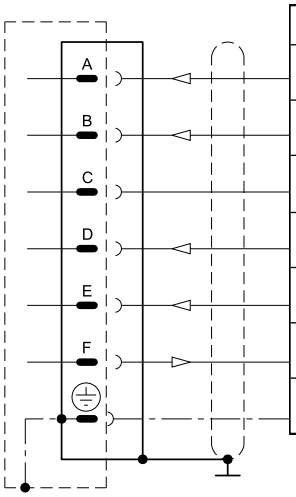
5.3 - Versions with voltage command (E0)

The reference signal is between -10V and +10V. The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**-10V**	**0V**	**+10V**
MONITOR	**-10V**	**0V**	**+10V**



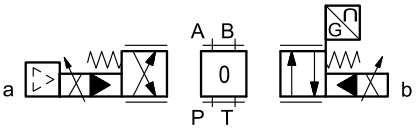


Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	± 10 V	Command		
E	0 V	Command reference		
F	± 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

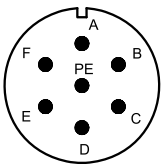
5.4 - Versions with current command (E1)

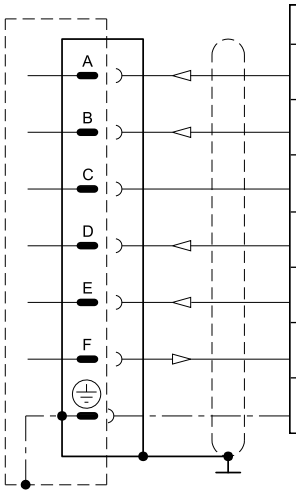
The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**4 mA**	**12 mA**	**20 mA**	
MONITOR	**4 mA**	**12 mA**	**20 mA**	





Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	Command reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

6 - DDPE*JL - COMPACT ELECTRONICS

In IO-Link networks, the length of the connecting cables is limited to 20 metres. In CA versions, pin 3 and pin 5 are galvanic isolated up to 100 V to avoid earth loops.

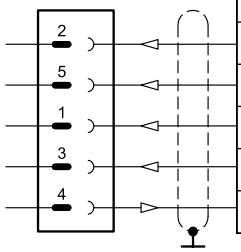
6.1 - Electrical characteristics

Command signal:	voltage (E0) current (E1)	V DC mA	±10 (impedance Ri > 11 kOhm) 4 ÷ 20 (impedance Ri = 58 Ohm)
Monitor signal :	voltage (E0) current (E1)	V DC mA	0 ÷ 5 (impedance Ro > 1 kOhm) 4 ÷ 20 (impedance Ro = 500 Ohm)
IO-Link communication (IOL): Data rate		kBaud	IO-Link Port Class B 38.4
Can Open communication (CA): Data rate		kbit	10 ÷ 1000
Data register (IOL and CA versions only)			card voltage supply, solenoid faults (shortcircuit, bad configuration), box temperature.
Connection			5-pin M12 code A (IEC 61076-2-101)

6.2 - Pin tables

'E0' connection

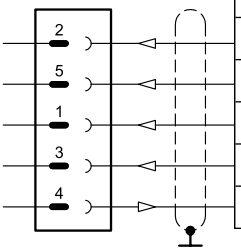




Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	± 10 V	Command
3	0V	Command reference
4	0 ÷ 5V	Monitor (0V reference: pin 5)

'E1' connection

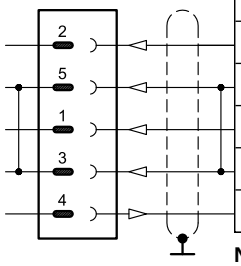




Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	4 ÷ 20 mA	Command
3	0V	Command reference
4	4 ÷ 20 mA	Monitor (0V reference: pin 5)

'IOL' connection



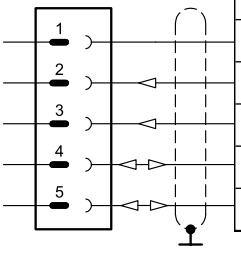


Pin	Values		Function
2	2L+	24 V DC	Solenoid supply voltage
5	2L-	0 V (GND)	
1	1L+	+24 V DC	Logic and IO-Link supply voltage
3	1L-	0V (GND)	
4	C/Q		IO-Link Communication

NOTE: Pin 3 and pin 5 are linked with each other in the valve electronics. The reference potentials 1L- and 2L- of the two supply voltages must also be linked with each other on the customer side.

'CA' connection





Pin	Values	Function
1	CAN_SH	Shield
2	24 V DC	Supply voltage
3	0 V (GND)	
4	CAN H	Bus line (high)
5	CAN_L	Bus line (low)

7 - DDPE*JH - FIELDBUS ELECTRONICS

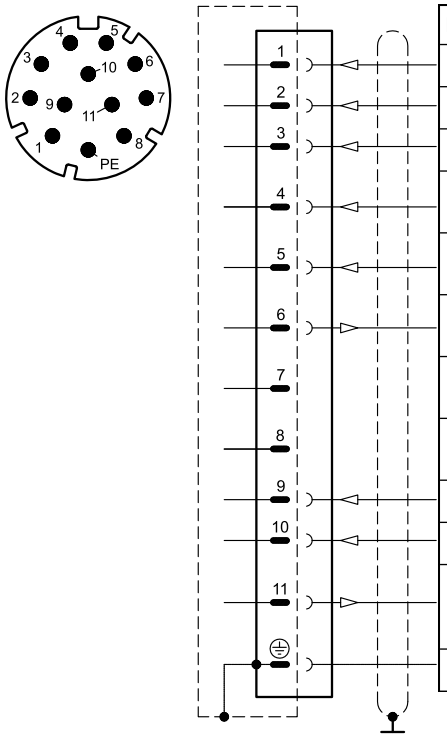
The 11+ PE pin connection allows separate supply voltage for electronics and solenoids.

Command - valve position schemes as for the basic electronics. Please refer to pictures in p. 5.3 and 5.4.

7.1 - Electrical characteristics

Command signal: voltage (E0) current (E1) digital (FD)	 V DC mA	 ±10 (impedance Ri > 11 kOhm) 4 ÷ 20 (impedance Ri = 58 Ohm) via fieldbus
Monitor signal (main spool position): voltage (E0) current (E1)	 V DC mA	 ±10 (impedance Ro > 1 kOhm) 4 ÷ 20 (impedance Ro = 500 Ohm)
Communication / diagnostic		via Bus register
Communication interface standards		IEC 61158
Communication physical layer		fast ethernet, insulated 100 Base TX
Power connection		11 pin + PE (DIN 43651)

7.2 - X1 Main connection pin table



D1: one command

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	± 10 V (E0) 4 ÷ 20 (E1)	Command
5	0 V	Command reference signal
6	± 10 V (E0) 4 ÷ 20 (E1)	Monitor (0V reference pin 10)
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V reference pin 2)
12	GND	Ground (Earth)

D0: full digital

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	NC	do not connect
5	NC	do not connect
6	NC	do not connect
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V ref. pin 2)
12	GND	Ground (Earth)

7.3 - FIELDBUS connections

Please wire following guidelines provided by the related standards communication protocol. Any connections present and not used must be protected with special caps so as not to nullify the protection against atmospheric agents.

X2 (IN) connection: M12 D 4 pin female



Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

X3 (OUT) connection: M12 D 4 pin female



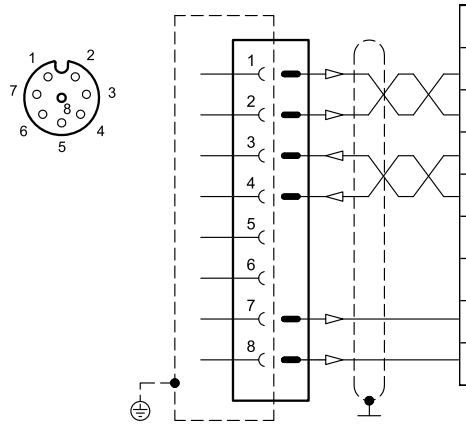
Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

NOTE: Shield connection on connector housing is recommended.

7.4 - Digital transducer connection

X7 connection: M12 A 8 pin female

VERSION 1: SSI type



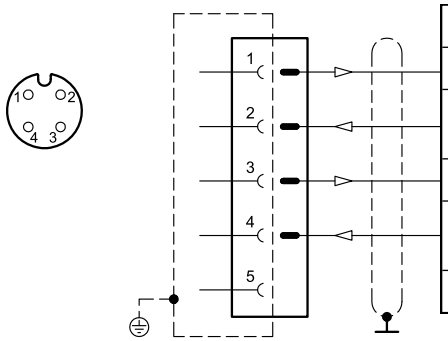
Pin	SSI Values	Function	Notes
1	CLK+	Serial synchronous clock (+)	Input - digital signal
2	CLK-	Serial synchronous clock (-)	
3	MIS0+	Serial position data (+)	
4	MIS0-	Serial position data (-)	
5	NC	-	do not connect
6	NC	-	
7	+24 V	transducer power supply	Output power supply
8	0 V	-	Common GND

7.5 - Analogue transducer connection

X4 connection: M12 A 4 pin female

VERSION 1: single / double transducer

(single or double is a software-selectable option)



Pin	Values	Notes
1	+24 V	Remote transducer power supply (out) 100 mA
2	±10 V 4 ÷20 mA	Input signal of transducer 1 (range software selectable)
3	0 V	Common reference signal for transducer power and signals
4	±10 V 4 ÷20 mA	Input signal of transducer 2 (range software selectable)
5	-	

8 - CHARACTERISTIC CURVES

(with mineral oil with viscosity of 36 cSt at 50 °C)

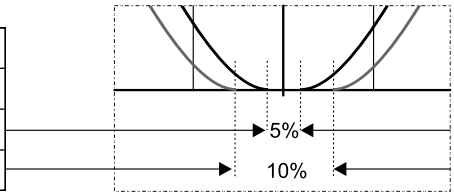
Typical flow rate curves at constant Δp (**5 bar** per control edge), related to the reference signal.

DDPE*J, spools types C, A and R*:

Valves with spools types C, A and R* are configured to start opening at a given percentage of the reference signal. This percentage varies depending on the version: 5% for DDPE*J...E*K11C and 10% for DDPE*J...E*K11A and DDPE*J...E*K11B.

See table below.

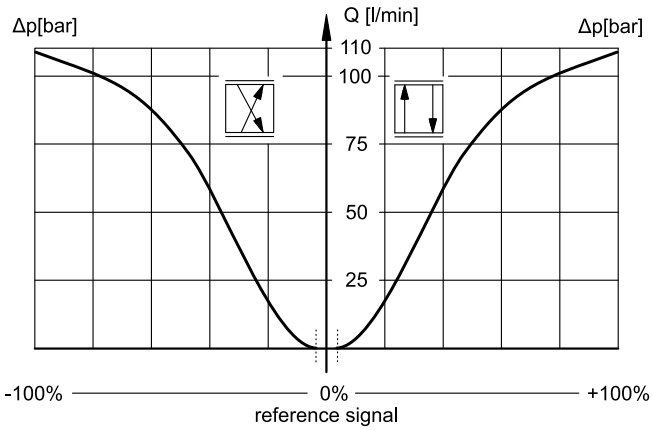
		opening values	
valve type		**E0** [±10 V]	**E1** [4 ÷ 20 mA]
DDPE*J...**E*K11C**	5% ref.	-0.5...0...+0.5	11.6 ...12...12.4
DDPE*J...**E*K11A**, ...**E*K11B**	10% ref	-1...0...+1	11.2...12...12.8



DDPE*JH, spools types C, A and R*: the start opening percentage is 10%.

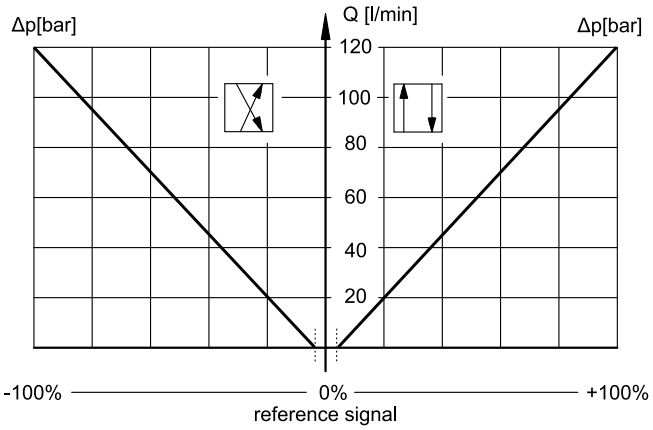
8.1 - Characteristic curves DDPE5RJ *

SPOOL C100 / A100

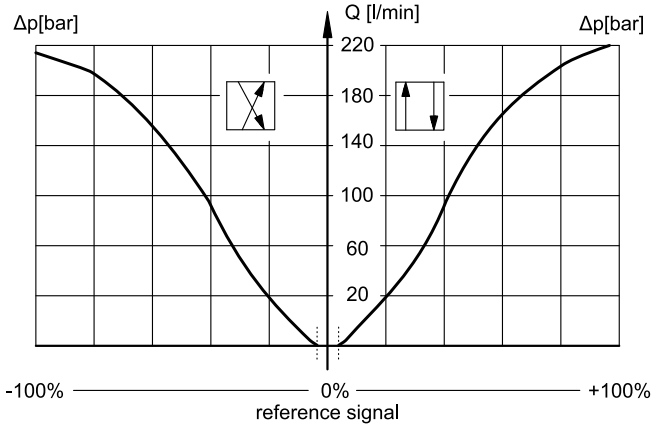


8.2 - Characteristic curves DDPE7J*

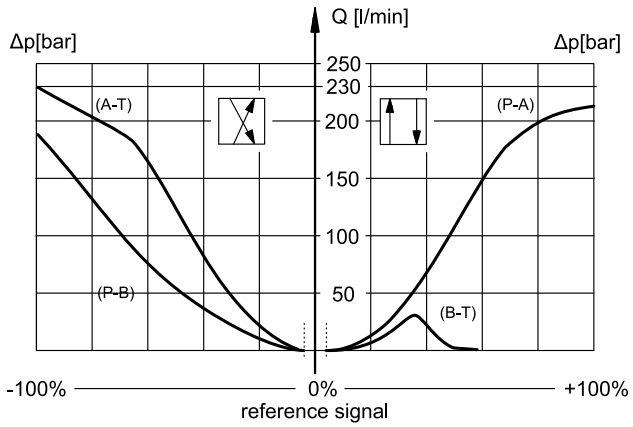
SPOOL C120 / A120



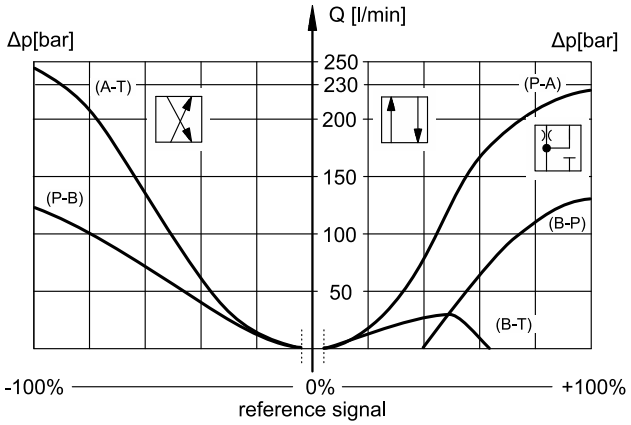
SPOOL C220 / A220



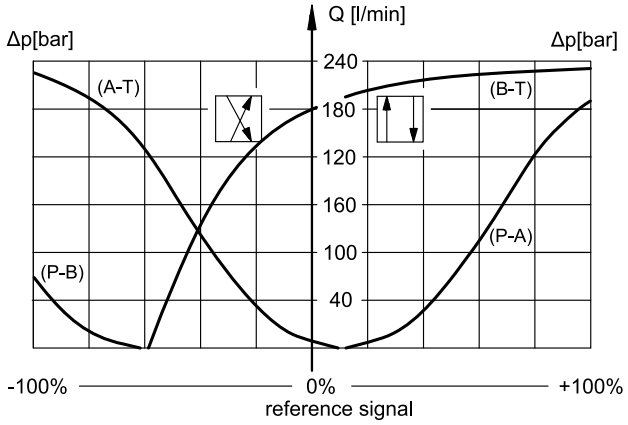
SPOOL R1C220 / R1A220



SPOOL R4C220 / R4A220

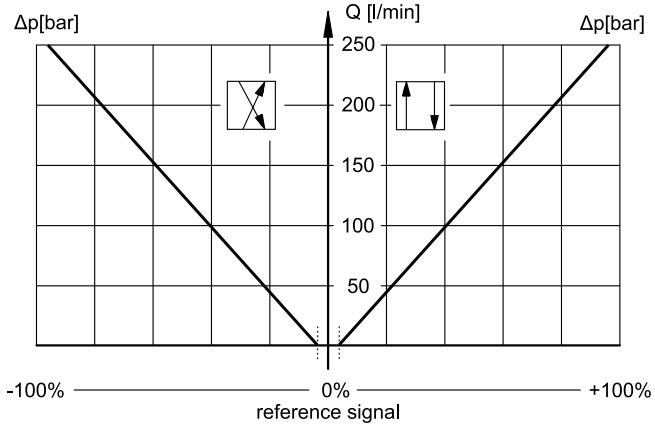


SPOOL X1A220

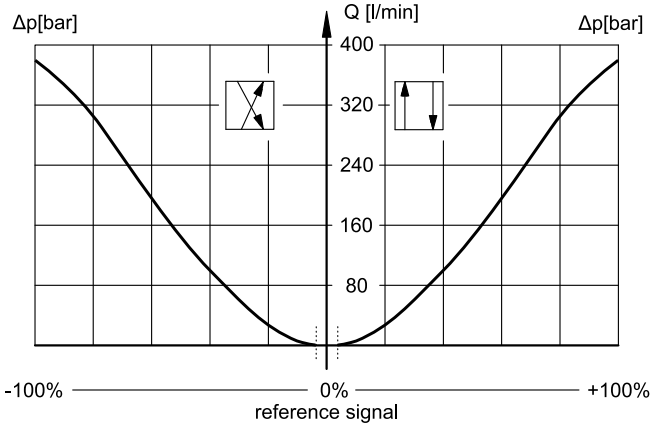


8.3 - Characteristic curves DDPE8J*

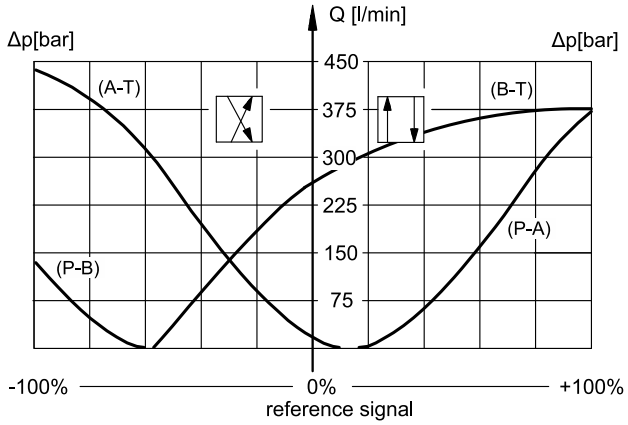
SPOOL C250 / A250



SPOOL C400 / A400

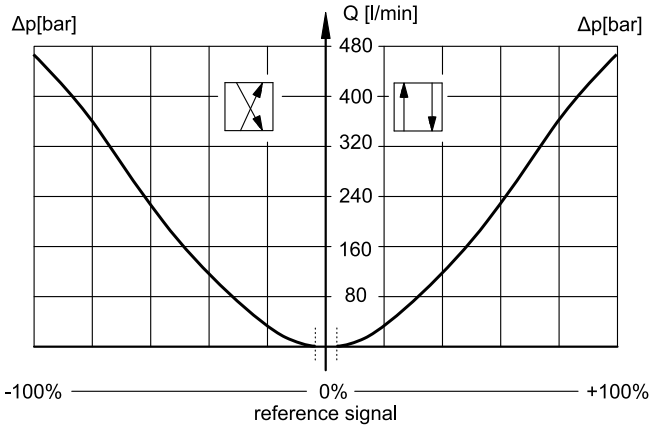


SPOOL X1A430

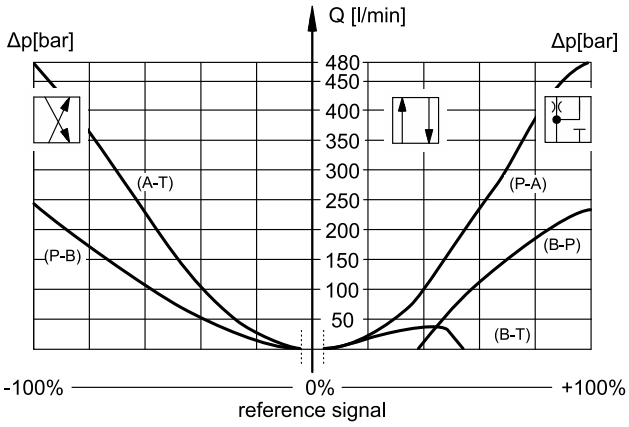


8.4 - Characteristic curves DDPE9J*

SPOOL C480 / A480

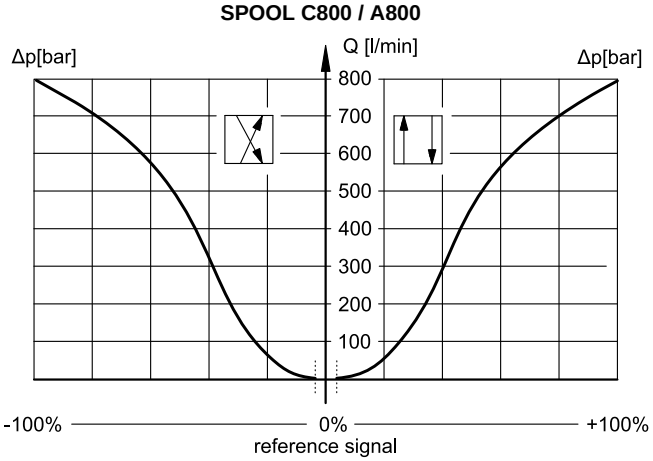


SPOOL R4C480 / R4A480



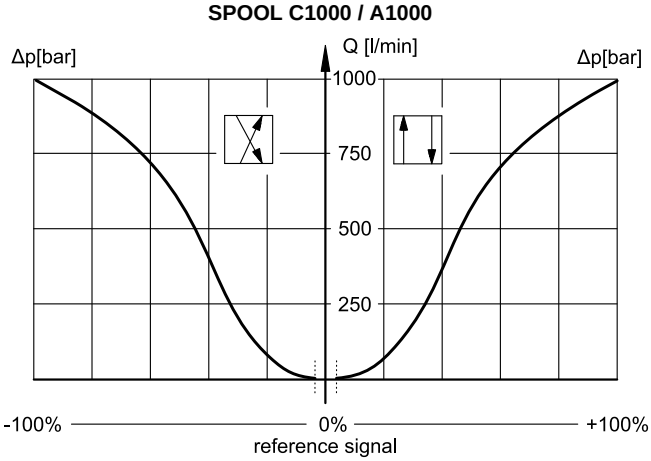
8.5 - Characteristic curves DDPE10J*

SPOOL C800 / A800



8.6 - Characteristic curves DDPE11J*

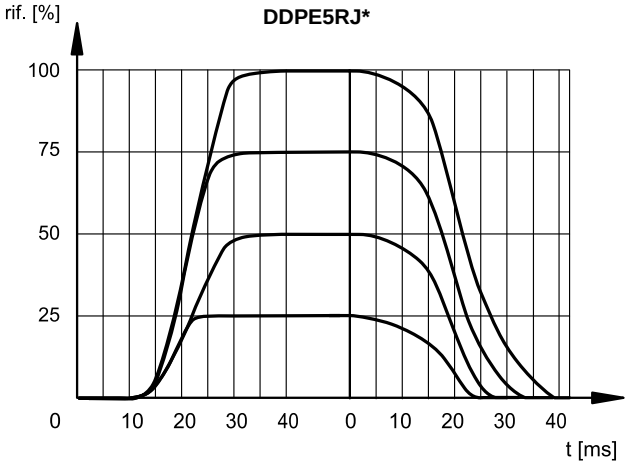
SPOOL C1000 / A1000



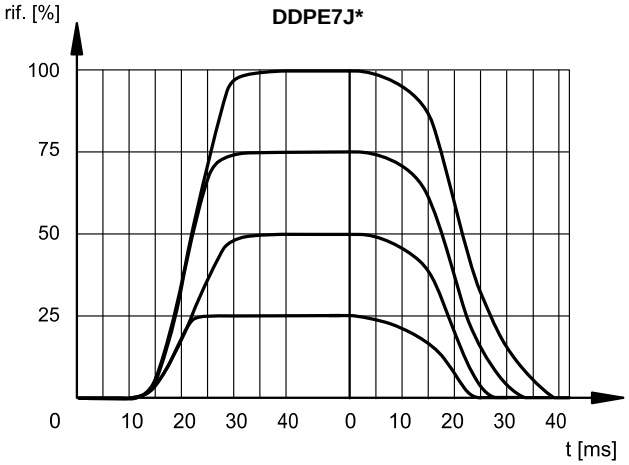
9 - STEP RESPONSE

(obtained with mineral oil with viscosity of 36 cSt at 50°C and static pressure 100 bar)

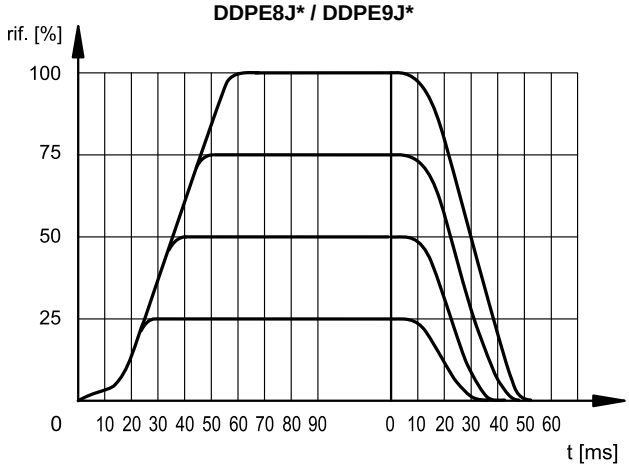
DDPE5RJ*



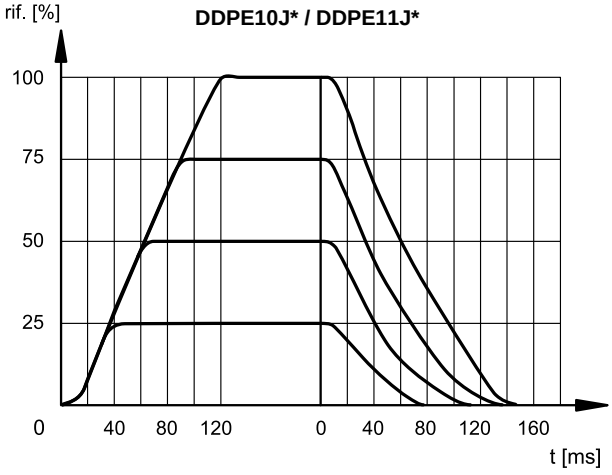
DDPE7J*



DDPE8J* / DDPE9J*



DDPE10J* / DDPE11J*



10 - HYDRAULIC CHARACTERISTICS

(with mineral oil with viscosity of 36 cSt at 50°C)

		DDPE5RJ*	DDPE7J*	DDPE8J*	DDPE9J*	DDPE10J*	DDPE11J*
Max flow rate	l/min	180	450	900	1000	1600	3500
Piloting flow requested with operation 0 →100%	l/min	7	13	28	28	35	35
Piloting volume requested with operation 0 →100%	cm^3	1.7	3.2	10	10	22	22

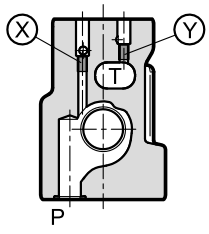
10.1 - Pilot supply and drain

The DDPE*J* valves are available with internal or external pilot supply and are always equipped with a 30 bar pressure reducing valve. Drain can be internal or external. The version with external drain allows a higher back pressure on the T line.

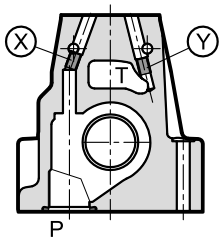
NOTE: The configuration of pilots and drains must be chosen when ordering. Subsequent modifications are allowed only to specialized operators with authorization and in factory.

TYPE OF VALVE		Plug assembly	
		X	Y
IE	internal pilot and external drain	NO	YES
II	internal pilot and internal drain	NO	NO
EE	external pilot and external drain	YES	YES
EI	external pilot and internal drain	YES	NO

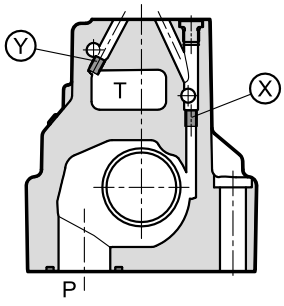
DDPE5RJ



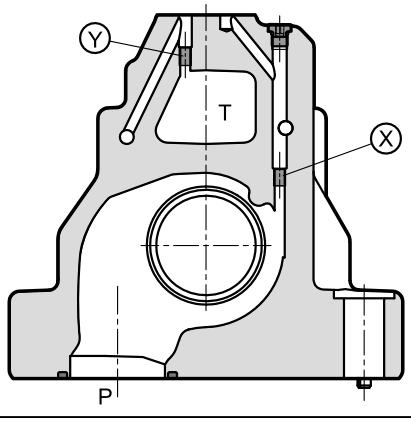
DDPE7J



DDPE8J / DDPE9J



DDPE10J / DDPE11J



X: plug M5x6 for external pilot
Y: plug M5x6 for external drain

X: plug M6x8 for external pilot
Y: plug M6x8 for external drain

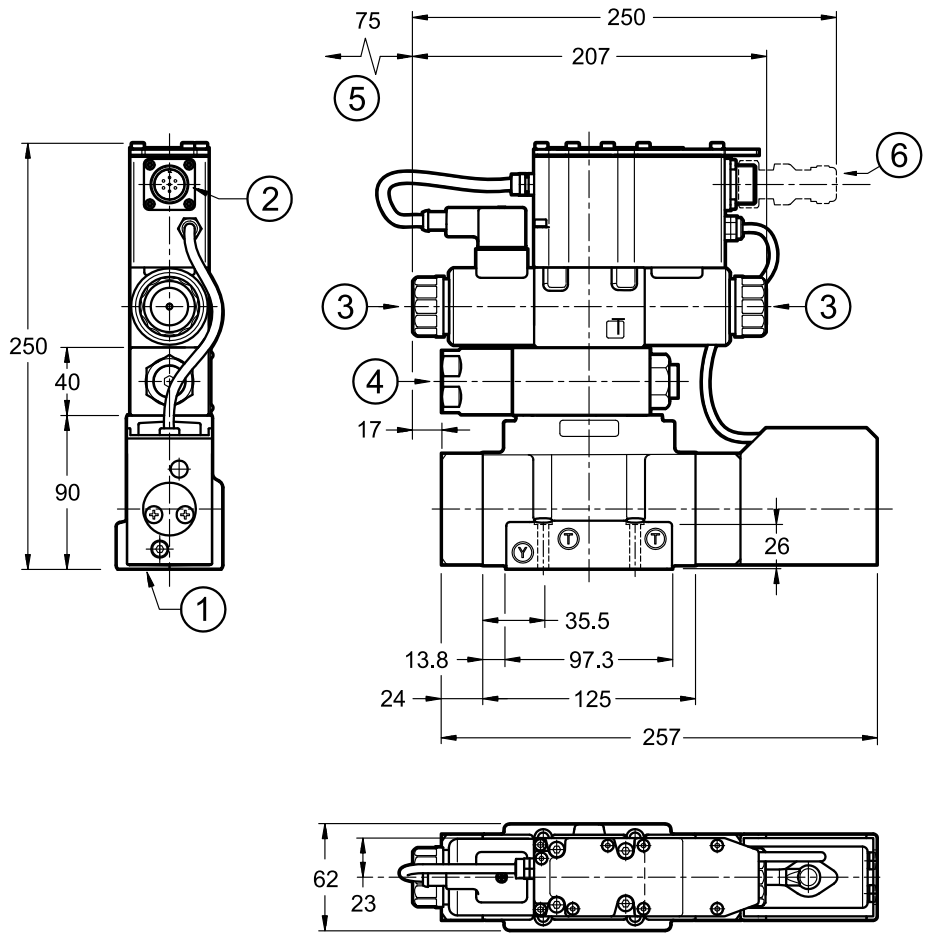
PRESSURES (bar)

Pressure	MIN	MAX
Pilot pressure on X port	30 (**NOTE**)	350
Pressure on T port with internal drain	-	10
Pressure on T port with external drain	-	250

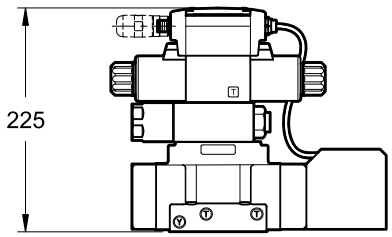
NOTE: The valve works well also with inlet pressure, starting from 10 bar. Low pressure affects response times, that will be slower.

11 - DDPE5RJ* - OVERALL AND MOUNTING DIMENSIONS

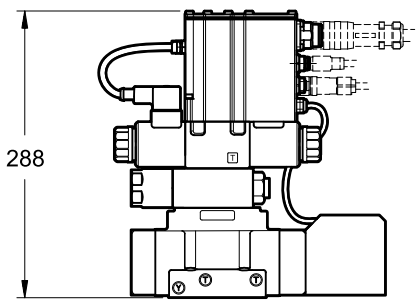
dimensions in mm



DDPE5RJL



DDPE5RJH



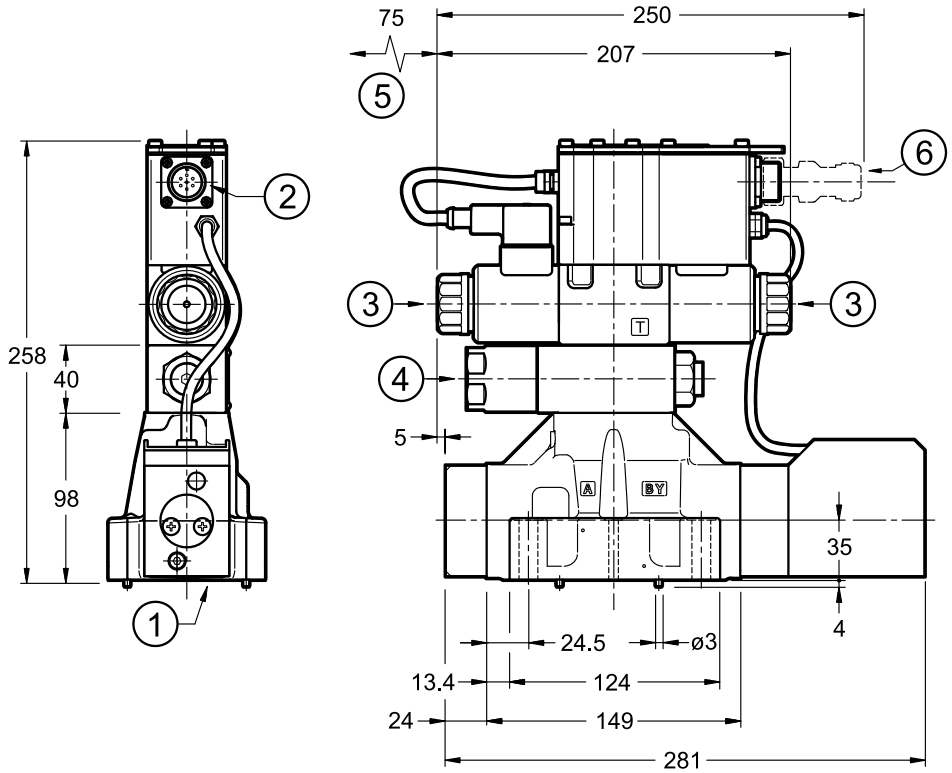
NOTES:
- See mounting surface at point 15.
- Do not dismantle the transducer.

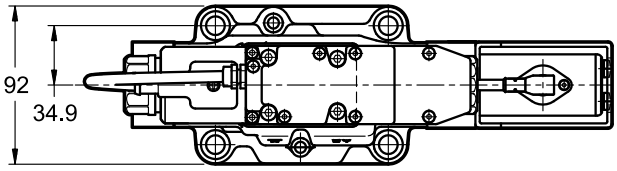
1	Mounting surface with sealing rings: 5 OR type 2050 (12.42x1.78) - 90 Shore 2 OR type 2037 (9.25x1.78) - 90 Shore
2	Main connection 6 pin + PE
3	Manual override embedded in the solenoid tube
4	Pressure reducing valve
5	Coil removal space
6	Mating connector. **To be ordered separately.** See catalogue 89 000

Valve fastening: 4 SHC screws ISO 4762 M6x35
Tightening torque: 8 Nm (A8.8 screws)
Threads of mounting holes: M6x10

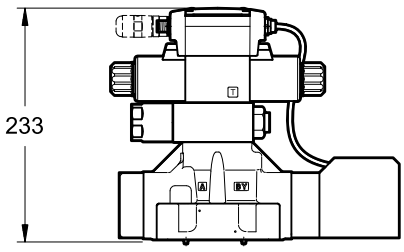
12 - DDPE7J* - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

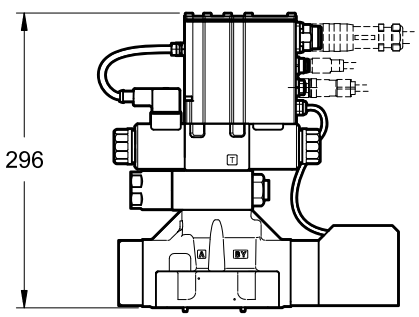




DDPE7JL



DDPE7JH



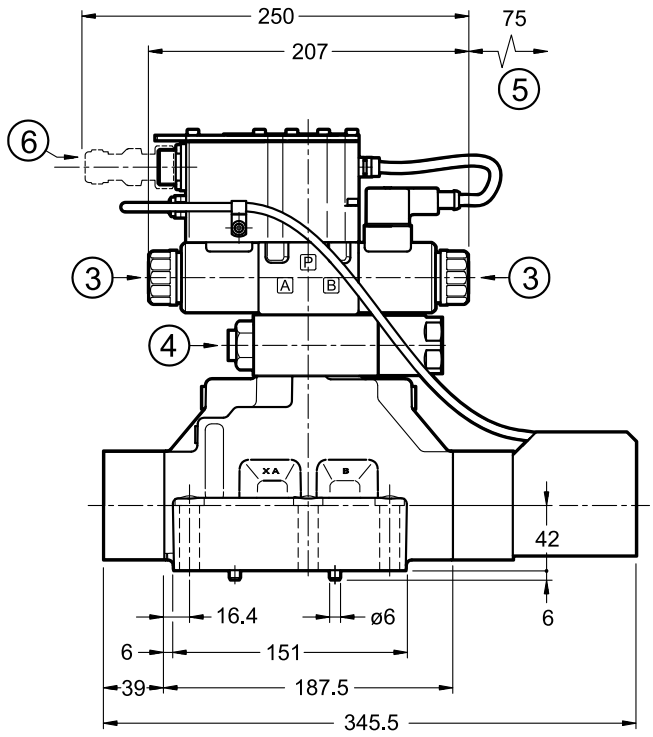
NOTES:
- See mounting surface at point 15.
- Do not dismantle the transducer.

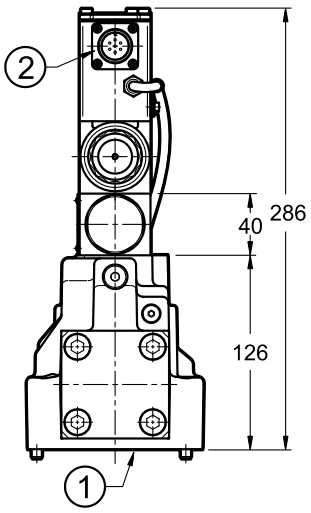
1	Mounting surface with sealing rings: 4 OR type 130 (22.22x2.62) - 90 Shore 2 OR type 2043 (10.82x1.78) - 90 Shore
2	Main connection 6 pin + PE
3	Manual override embedded in the solenoid tube
4	Pressure reducing valve
5	Coil removal space
6	Mating connector. **To be ordered separately.** See catalogue 89 000

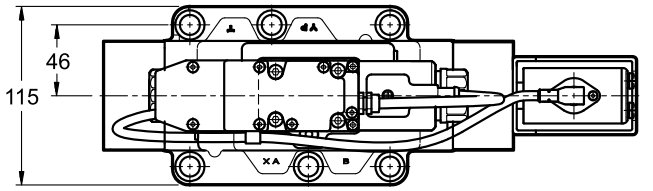
Valve fastening: 4 SHC screws ISO 4762 M10x50 2 SHC screws ISO 4762 M6x50
Tightening torque: M10x50: 40 Nm (A8.8 screws) M6x50: 8 Nm (A8.8 screws)
Threads of mounting holes: M6x18; M10x18

13 - DDPE8J*/DDPE9J* - OVERALL AND MOUNTING DIMENSIONS

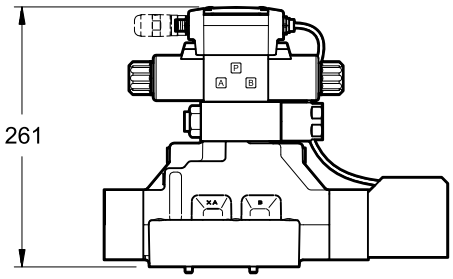
dimensions in mm



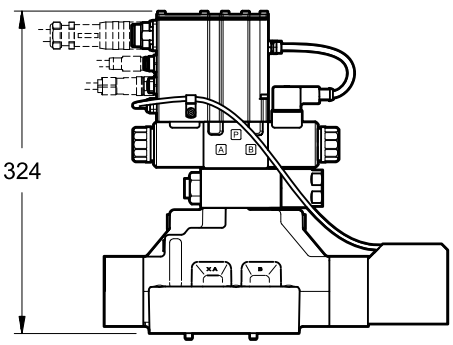




DDPE8JL / DDPE9JL



DDPE8JH / DDPE9JH



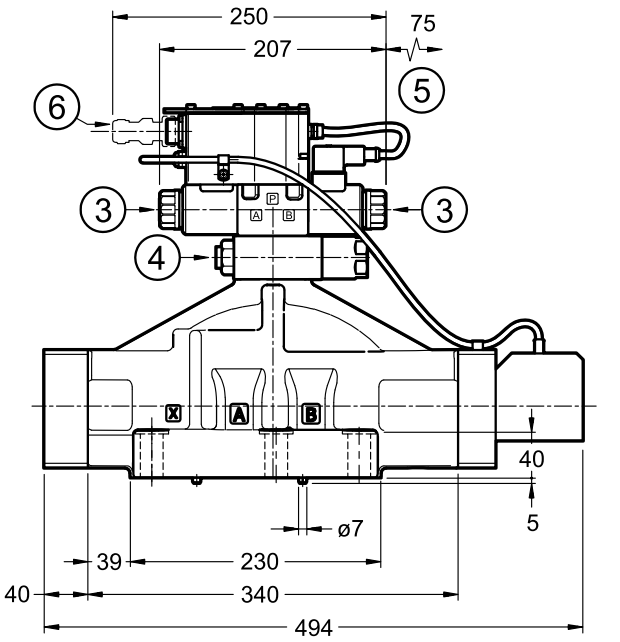
NOTES:
- See mounting surface at point 15.
- Do not dismantle the transducer.

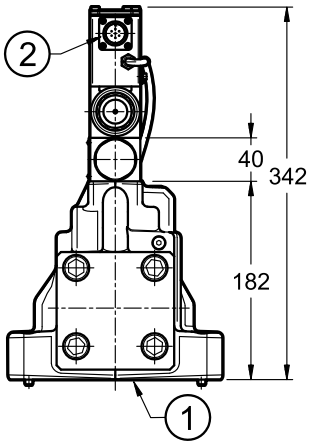
1	Mounting surface with sealing rings: **DDPE8J*** 4 OR type 3131 (32.99x2.62) - 90 Shore 2 OR type 3087 (21.89x2.62) - 90 Shore **DDPE9J*** 4 OR type 3150 (37.77x2.62) - 90 Shore 2 OR type 3087 (20.24x2.62) - 90 Shore
2	Main connection 6 pin + PE
3	Manual override embedded in the solenoid tube
4	Pressure reducing valve
5	Coil removal space
6	Mating connector. **To be ordered separately.** See catalogue 89 000

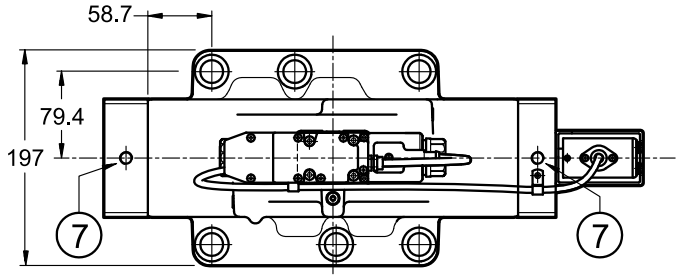
Valve fastening: 6 SHC screws ISO 4762 M12x60
Tightening torque: 69 Nm (A8.8 screws)
Threads of mounting holes: M12x20

14 - DDPE10J* / DDPE11J* - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

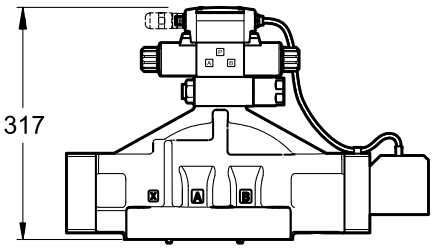




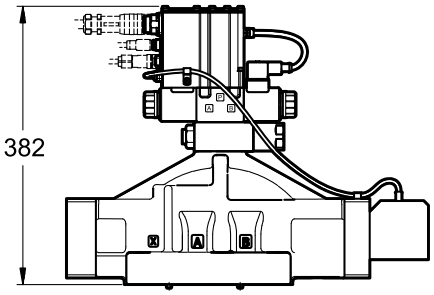


NOTES:
- See mounting surface at point 15.
- Do not dismantle the transducer.

DDPE10JL / DDPE11JL



DDPE10JH / DDPE11JH

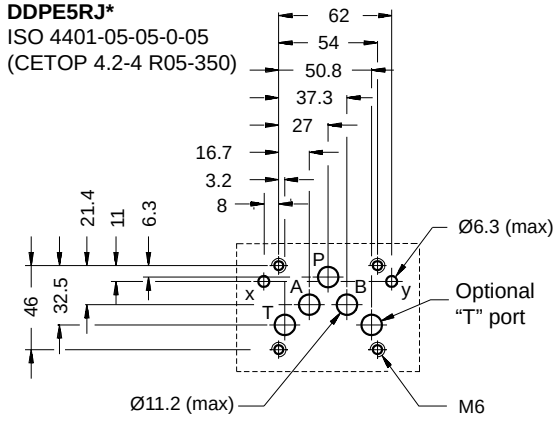


1	Mounting surface with sealing rings: **DDPE10J*** 4 OR type 4162 (40.86x3.53) - 90 Shore 2 OR type 3081 (20.24x2.62) - 90 Shore **DDPE11J*** 4 OR type 4212 (53.57x3.53) - 90 Shore 2 OR type 3081 (20.24x2.62) - 90 Shore
2	Main connection 6 pin + PE
3	Manual override embedded in the solenoid tube
4	Pressure reducing valve
5	Coil removal space
6	Mating connector. **To be ordered separately.** See catalogue 89 000
7	M12 eyebolt seat for safe lift

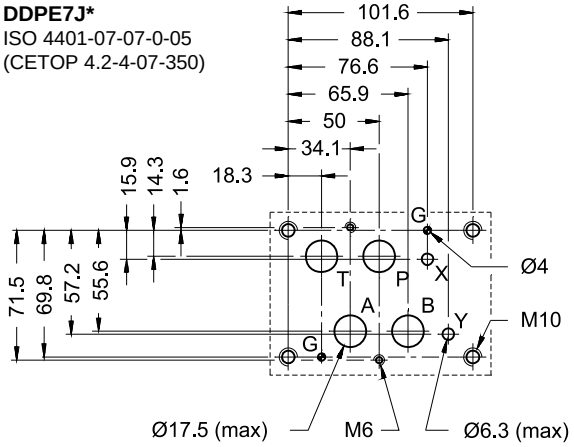
Valve fastening: 6 SHC screws ISO 4762 M20x70 (supplied)
Tightening torque: 470 Nm (A10.9 screws)
Threads of mounting holes: M20x40

15 - MOUNTING SURFACES

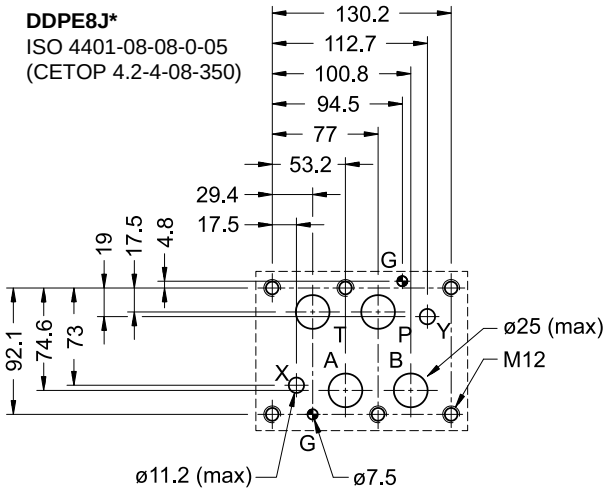
DDPE5RJ*
ISO 4401-05-05-0-05
(CETOP 4.2-4 R05-350)



DDPE7J*
ISO 4401-07-07-0-05
(CETOP 4.2-4-07-350)

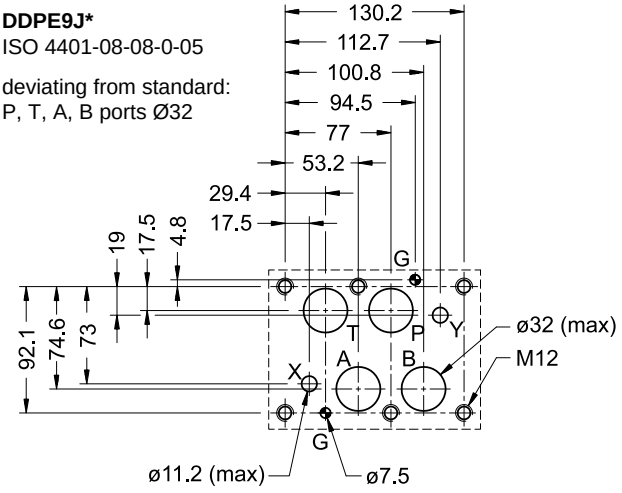


DDPE8J*
ISO 4401-08-08-0-05
(CETOP 4.2-4-08-350)

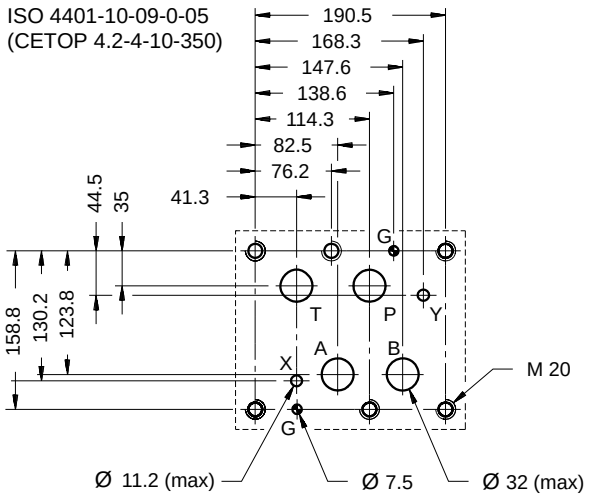


DDPE9J*
ISO 4401-08-08-0-05

deviating from standard:
P, T, A, B ports Ø32

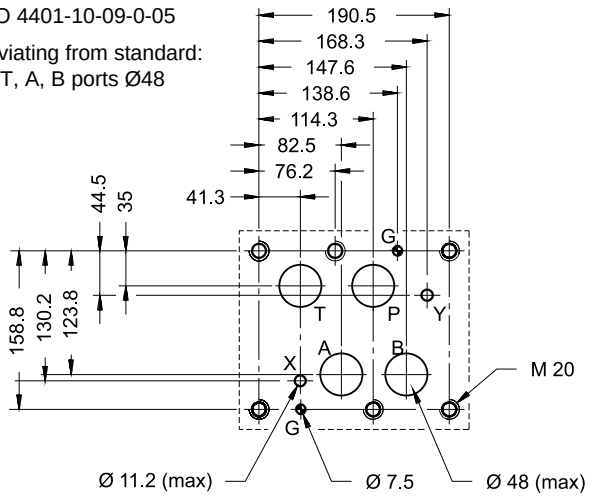


DDPE10J*
ISO 4401-10-09-0-05
(CETOP 4.2-4-10-350)



DDPE11J*
ISO 4401-10-09-0-05

deviating from standard:
P, T, A, B ports Ø48



16 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

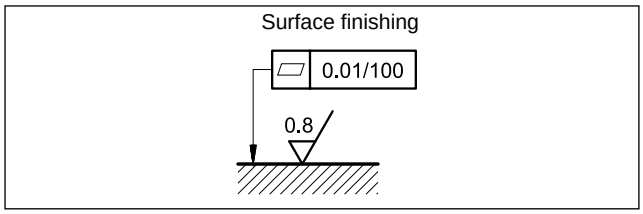
The fluid must be preserved in its physical and chemical characteristics.

17 - INSTALLATION

The valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.



18 - ACCESSORIES

(to be ordered separately)

18.1 - Mating connectors

Mating connectors must be ordered separately. See catalogue 89 000.

For K11 and K16 versions we recommend the choice of a metal connector to avoid electromagnetic disturbances and to comply with EMC regulations on electromagnetic compatibility. If you opt for a plastic connector, make sure that it guarantees and maintains the IP and EMC protection characteristics of the valve.

18.2 - Mating connectors for fieldbus communication and for sensors.

Duplomatic offers spare parts to be wired and also ready-to-use cord sets. Please refer to cat. 89 000.

18.3 - Connection cable

The optimal wiring provides for 7 isolated conductors, with separate screen for the signal wires (command, monitor) and an overall screen.

Cross section for power supply:
- up to 20 m cable length: 1,0 mm^2
- up to 40 m cable length: 1,5 mm^2 (IO-Link excluded)

Cross section for signals (command, monitor):
- 0,50 mm^2

18.4 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic, available for valves with K11 and K16 connections. See catalogue 89 850.

19 - SUBPLATES

(see catalogue 51 000)

No subplates are available for DDPE5RJ*, DDPE9J*, DDPE10J* and DDPE11J*.

	DDPE7J*	**DDPE8J***
Type with rear ports	PME07-AI6G	-
Type with side ports	PME07-AL6G	PME5-AL8G
P, T, A, B ports dimensions X, Y ports dimensions	1” BSP 1/4” BSP	1 1/2” BSP 1/4” BSP

DUPLOMATIC MOTION SOLUTIONS
a member of DAIKIN group

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T +39 0331 895111 | E vendite.ita@duplomatic.com | sales.exp@duplomatic.com
duplomaticmotionsolutions.com

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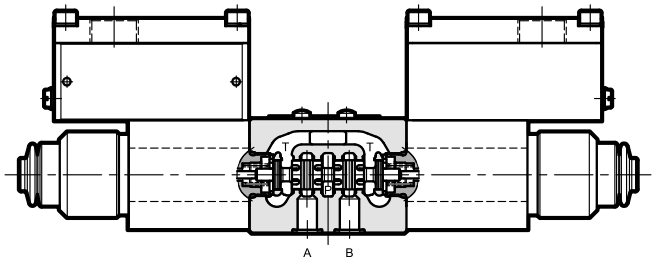


DS(P)E*K*

EXPLOSION-PROOF PROPORTIONAL DIRECTIONAL VALVES ATEX, IECEx, PESO

DSE3K* **ISO 4401-03**
DSPE5K* **CETOP P05**
DSPE5RK* **ISO 4401-05**
DSPE7K* **ISO 4401-07**
DSPE8K* **ISO 4401-08**
DSPE10K* **ISO 4401-10**
DSPE11K* **ISO 4401-10** oversize ports

OPERATING PRINCIPLE



— These explosion-proof directional valves are available in size ISO 4401-03 for direct operated type. Pilot operated valves are available in CETOP P05, ISO 4401-05, ISO 4401-07, ISO 4401-08, ISO 4401-10 sizes and ISO 4401-10 size with oversize ports.

— They are compliant with ATEX, IECEx or PESO requirements and are suitable for use in potentially explosive atmospheres, for surface plants or mines.

— A low temperature version (up to -40 °C) is also available.

— The valves can be controlled directly by a current power supply or by means of an electronic control unit, to exploit valve performance to the full (see p. 20).

— The DSE3K* valves are supplied with a finishing surface treatment (zinc-nickel) suitable to ensure a salt spray resistance up to 600 hours; for DSPE*K* valves, this finishing is available upon request.

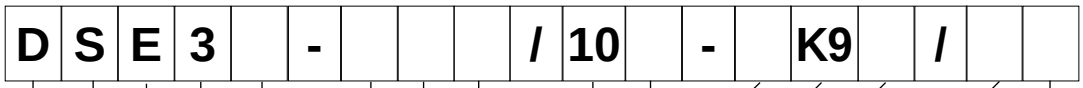
— Details for classification, operating temperatures and electrical characteristics are in the technical data sheet 02 500 ‘Explosion proof classification’.

PERFORMANCES

(obtained with viscosity of 36 cSt at 50 °C and electronic control card)

		DSE3K*	DSPE5K* DSPE5RK*	DSPE7K*	DSPE8K*	DSPE10K*	DSPE11K*
Max operating pressure: P - A - B ports T ports	bar	350 210	350 see point 8				320 see p. 8
Rated flow rate Δp 10 bar P-T	l/min	26	80	150	300	800	1000
Step response		see point 7					
Hysteresis	% of Q max	<6% (PWM 200 Hz)	< 4% (PWM 100 Hz)				
Repeatability	% of Q max	< ±1.5%	< ±2%				
Electrical characteristics		see point 3					
Temperature ranges (ambient and fluid)		see data sheet 02 500					
Fluid viscosity range	cSt	10 ÷ 400					
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13						
Recommended viscosity	cSt	25					
Mass single solenoid valve double solenoid valve	kg	1.9 3.2	6.6 7.8	8.2 9.3	15.7 16.7	43.1 44.3	40.4 41.5

1 - IDENTIFICATION OF DIRECT OPERATED VALVES



Direct operated solenoid valve

Electric proportional control

Size: ISO 4401-03

Explosion-proof certification:
See table 1.1

Spool type:
C = closed center
A = open center

Spool nominal flow rate (see table p. 1.2)

Solenoid position
(omit for double solenoid version):
SA = 1 solenoid for cross configuration
SB = 1 solenoid for parallel configuration

Series No.:
(the overall and mounting dimensions do not change from 10 to 19)

Seals:
For temperature range -20 / +80 °C
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids
For temperature range - 40 / +80 °C
NL = seal for low temperatures (for mineral oil)

Nominal solenoid voltage:
D12 = 12V DC
D24 = 24V DC

Coil electrical connection: junction box

Connection type for cable gland
upper connection:
T01 = M20x1.5 - ISO 261
T02 = Gk 1/2 - UNI EN 10226-2
T03 = 1/2" NPT - ANSI B1.20.1
(ex ANSI B2.1)
side connection:
S01 = M20x1.5 - ISO 261
S02 = Gk 1/2 - UNI EN 10226-2
S03 = 1/2" NPT - ANSI B1.20.1
(ex ANSI B2.1)
S04 = M16x1.5 - ISO 261

Manual override:
CM = boot protected
standard for both N and V seals
not available for NL seals
CB = blind ring nut
standard for NL seals
available upon request for both N and V seals
CK = knob manual override
CH = lever manual override.
Dimensions for CB and CH at p. 18

Option: **/T5**
version in T5 temperature class.
Omit if not required.

NOTE: Valves are supplied with zinc-nickel surface treatment, that is suitable to ensure a salt spray resistance up to 600 h (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

Version with monobloc steel coil

Standard coils are made of zinc-nickel steel, with anodized aluminium junction box on it.

Monobloc coils **MD24K9S01** completely made of steel are available upon request. They have zinc-nickel treatment, power supply voltage D24 and cable gland connection type S01. Other variants for voltage and cable gland connection are available, always on request.

1.1 - Names of valves per certification

	ATEX		IECEx		PESO	
for gases for dusts	**KD2**	II 2GD	**KXD2**	IECEx Gb IECEx Db	**KPD2**	PESO Gb not applicable for dust
for mines	**KDM2**	I M2	**KXDM2**	IECEx Mb	not applicable for mines	

NOTE: Refer to the technical data sheet 02 500 for marking, operating temperatures and available versions.

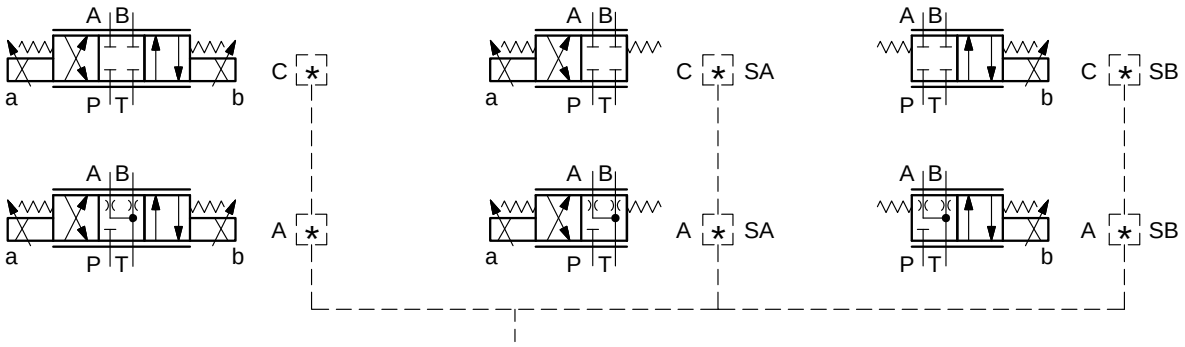
1.2 - Available configurations

Valve configuration depends on the combination of the following elements:
number of proportional solenoids, spool type, nominal flow rate.

2 solenoids configuration:
3 positions with spring centering

"**SA**" configuration: 1 solenoid on side A.
2 positions (central + external) with return spring

"**SB**" configuration: 1 solenoid on side B.
2 positions (central + external) with return spring



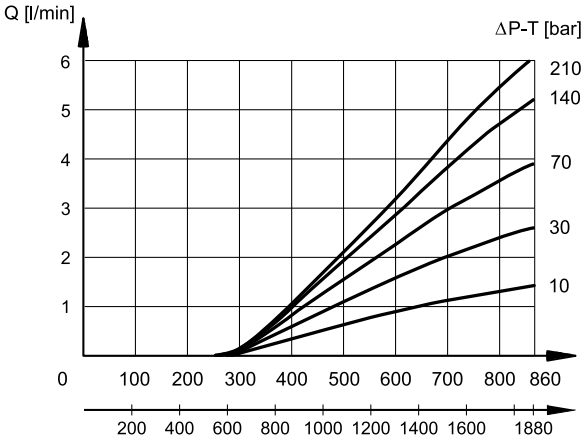
*	Nominal flow with Δp10 bar P→T
01	1 l/min
04	4 l/min
08	8 l/min
16	16 l/min
16/08	16 (P→A) / 08 (B→T) l/min
26	26 l/min
26/13	26 (P→A) / 13 (B→T) l/min

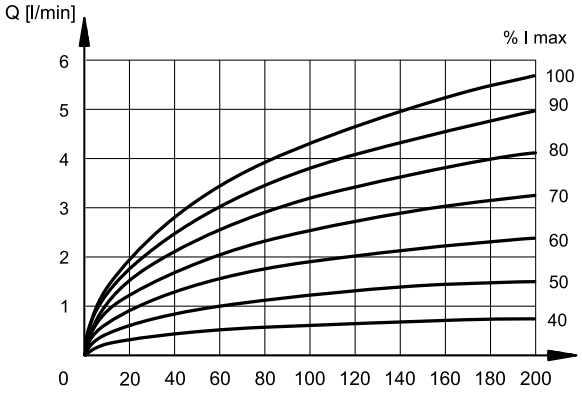
2 - CHARACTERISTIC CURVES OF DIRECT OPERATED VALVES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

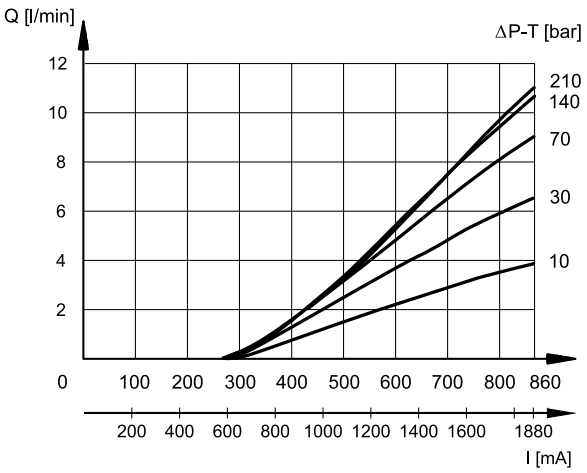
Typical flow control characteristics, according to current supply to the solenoid.
The reference Δp values are measured between ports P and T on the valve.

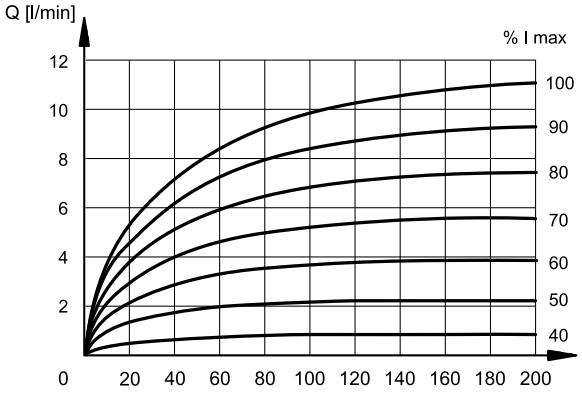
C01 / A01



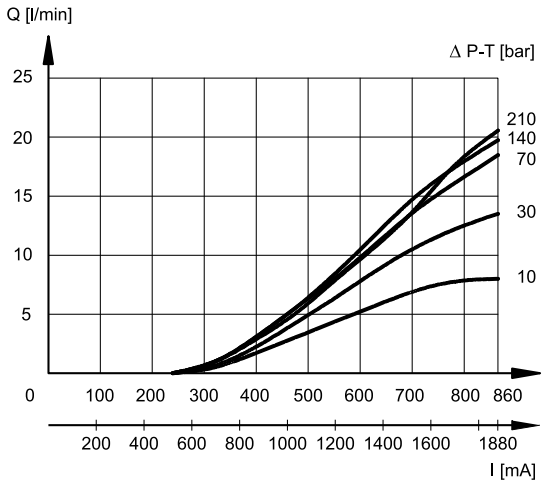


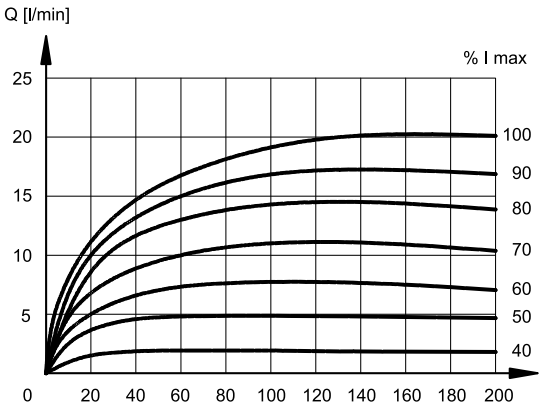
C04 / A04



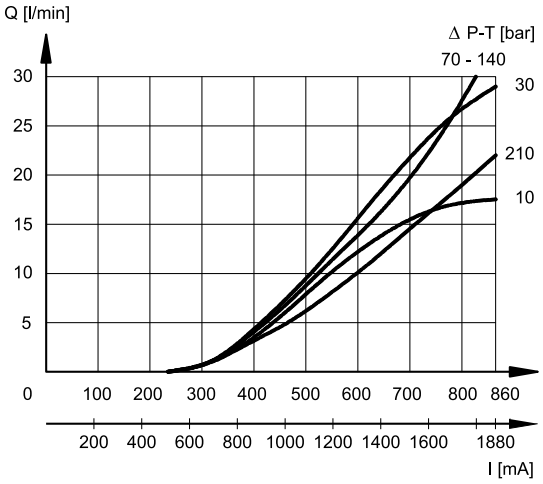


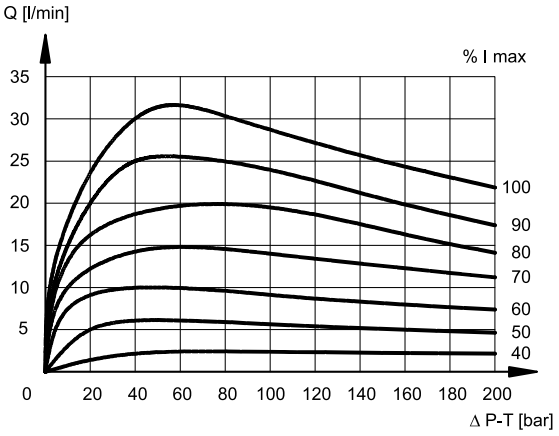
C08 / A08



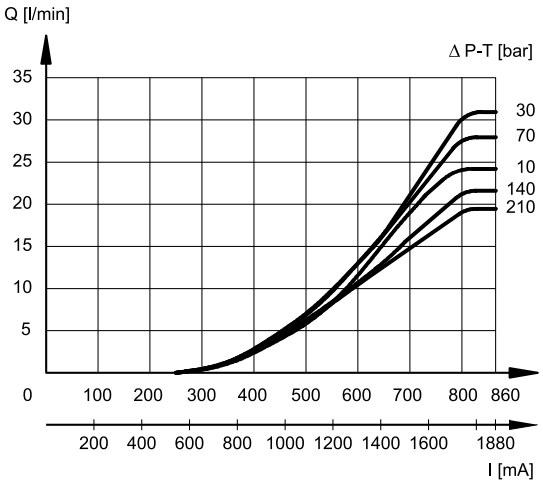


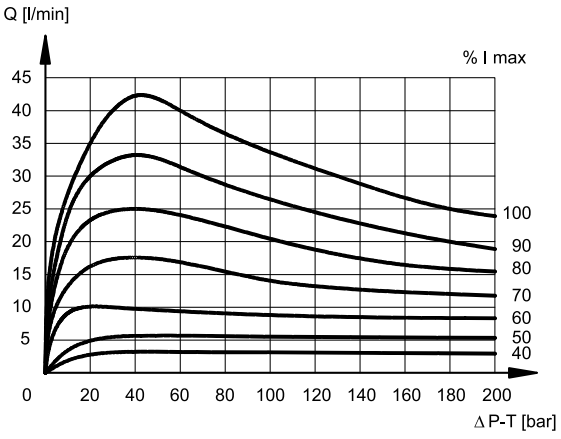
C16 / A16





C26 / A26





3 - ELECTRICAL CHARACTERISTICS

(values ± 5%)

NOMINAL VOLTAGE	V DC	12	24
RESISTANCE (AT 20°C)	Ω	3.8	15.6
NOMINAL CURRENT	A	1.88	0.86

DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2014/30/EU
CLASS OF PROTECTION: Atmospheric agents Coil insulation (VDE 0580)	 IP66/IP68 class H

3.1 - Wiring

In order to realise the electrical connection of the coil, it is necessary to access the terminal block (1) unscrewing the 4 screws (2) that fasten the cover (3) with the box (4) that contains the terminal block.

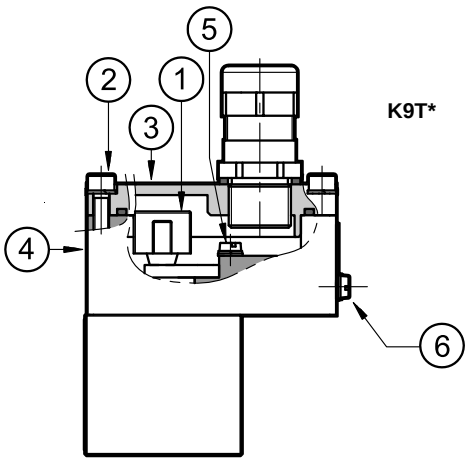
The electrical connection is polarity-independent.

By doing electrical connection, it is important to connect also the grounding point (5) in the terminal block box (M4 screws), through suitable conductors with the general grounding line of the system.

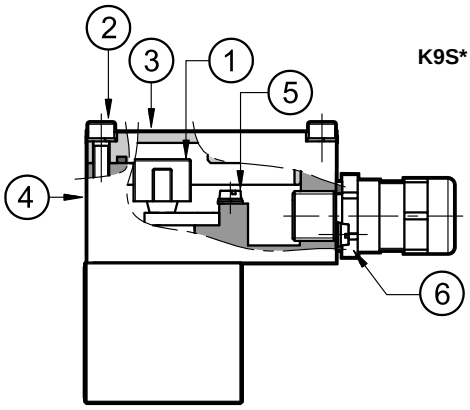
On the external body of the coil, there is a grounding point (6) (M4 screw) that makes it possible to ensure equipotentiality between the valve and the general grounding line of the system; connecting this point, the regulation of the EN 13463-1 standard that requires verifying the equipotentiality of the elements included in a potentially explosive environment (the maximum resistance between the elements must be 100 Ω) is guaranteed.

At the end of the electrical wiring, it is necessary to reassemble the cover (3) on the box (4), checking the correct positioning of the seal located in the cover seat and fastening the 4 M5 screws with a torque of 4.9÷6 Nm.

Electrical wiring must be done in compliance with standards about protection against explosion hazards.



K9T*



K9S*

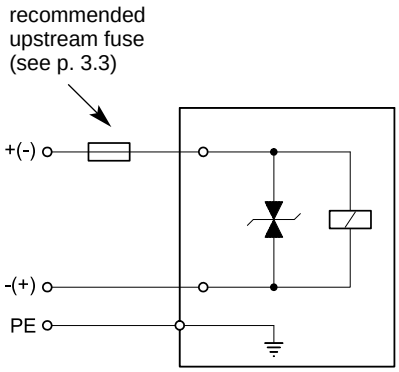
Characteristics of the cables connectable for wiring are indicated in the table below:

Function	Cable section
Operating voltage cables connection	max 2.5 mm²
Connection for internal grounding point	max 2.5 mm²
Connection for external equipotential grounding point	max 6 mm²

Cables for wiring must be non-armoured cables, with external covering sheath and must be suitable for use in environments with temperatures from - 20 °C to +110 °C (for valves either with N or V seals) or from - 40 °C to +110 °C (for valves with NL seals).

Cable glands (which must be ordered separately, see point 19) make it possible to use cables with external diameter between 8 and 10 mm.

3.2 - Electrical diagrams



3.3 - Overcurrent fuse and switch-off voltage peak

Upstream of each valve, an appropriate fuse (max 3 x In according to IEC 60127) or a protective motor switch with short-circuit and thermal instantaneous tripping, as short-circuit protection, must be connected. The cut-off power of the fuse must correspond or exceed the short circuit current of the supply source. The breaking capacity of the fuse link shall be the same as or higher than the maximum short-circuit current expected to occur at the place of installation (normally 1500 A).

The fuse or the protective motor must be placed outside the dangerous area or they must be protected with an explosion-proof covering.

In order to safeguard the electronic device to which the valve is connected, there is a protection circuit in the coil that reduces voltage peaks, which can occur when inductances are switched off.

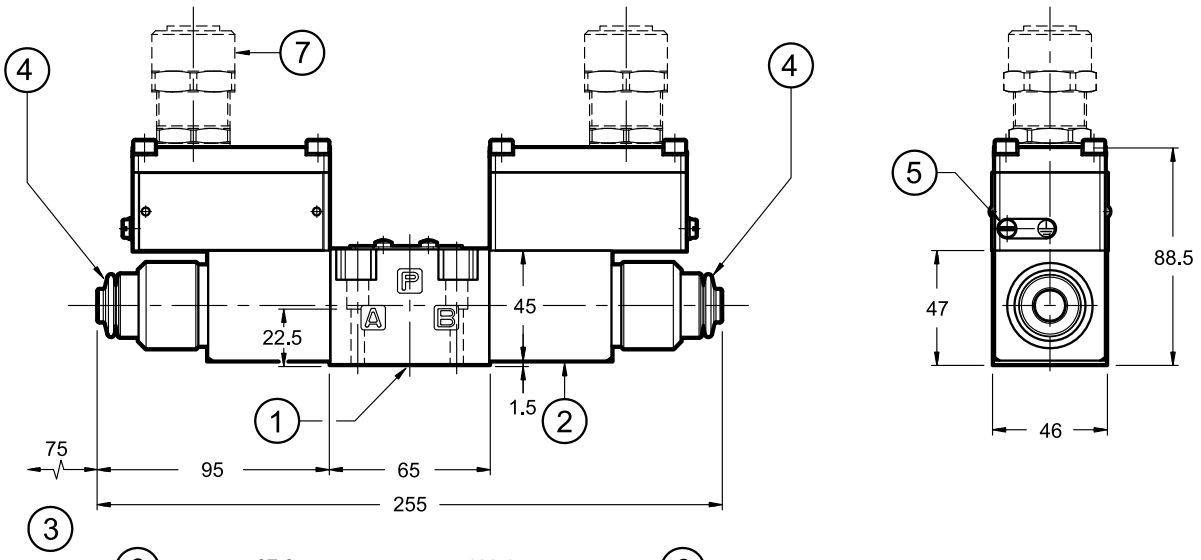
The table shows the type of fuse recommended according to the nominal voltage of the valve and to the value of the voltage peaks reduction.

Coil type	Nominal voltage [V]	Rated current [A]	**Recommended pre-fuse characteristics medium time-lag according to DIN 41571 [A]**	Maximum voltage value upon switch off [V]	Suppressor circuit
D12	12	1.88	2.5	- 49	Transient voltage suppressor bidirectional
D24	24	0.86	1.25	- 49	

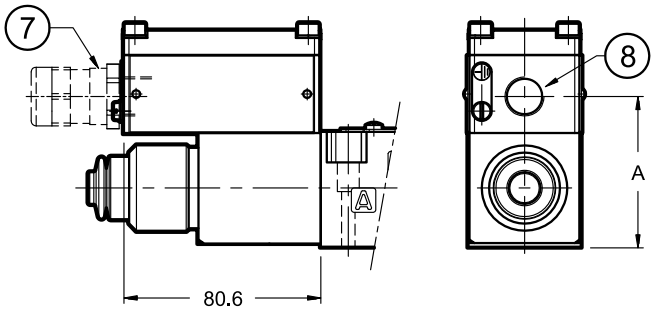
4 - DSE3K* WITH UPPER CONNECTION - OVERALL AND MOUNTING DIMENSIONS

DSE3K*-A*/10*-*K9T*/CM
DSE3K*-C*/10*-*K9T*/CM

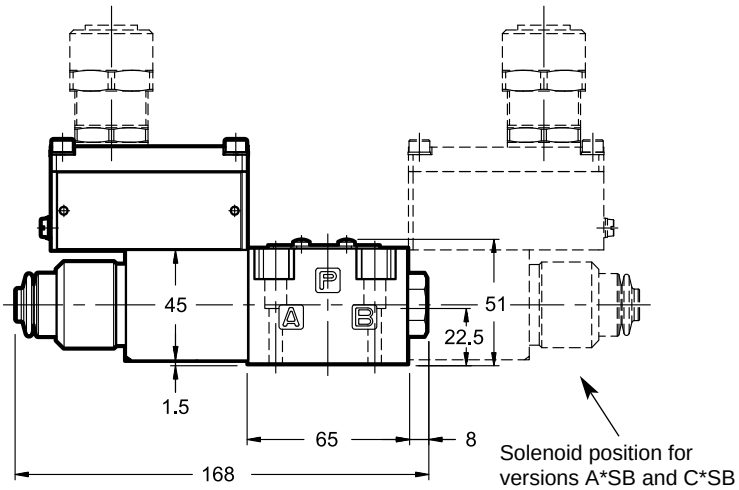
dimensions in mm



DSE3K*-*/10*-*K9S*/CM



DSE3K*-A*SA/10*-*K9T*/CM
DSE3K*-C*SA/10*-*K9T*/CM



Side port type	Dimension A
S01, S04	60.5
S02, S03	60

1	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) - 90 Shore
2	Explosion-proof coil
3	Minimum clearance required
4	Manual override, boot protected (**standard for both N and V seals**) for blind ring nut dimensions (standard for NL seals) see point 18
5	Terminal for supplementary GND connection
6	Upper port for cable gland
7	Cable gland. To be ordered separately, see point 19
8	Side port for cable gland

Valve fastening: 4 SHC screws ISO 4762 M5x30
Tightening torque: 5 Nm (A8.8 screws)
Threads of mounting holes: M5x10

5 - IDENTIFICATION OF PILOT OPERATED VALVES



Pilot operated directional valve

Electric proportional control

Size:
5 = CETOP P05
5R = ISO 4401-05
7 = ISO 4401-07
8 = ISO 4401-08
10 = ISO 4401-10
11 = ISO 4401-10 oversize ports

Explosion-proof certification:
See table 1.1

Spool type:
C = closed center
A = open center
RC = regenerative closed center
RA = regenerative open center

Spool nominal flow rate (see table p. 5.1)

Configurations for single solenoid version (omit for double solenoid version):
SA = 1 solenoid for cross configuration
SB = 1 solenoid for parallel configuration

Series No.:
20 = DSPE5K*, DSPE5RK*, DSPE7K*, DSPE8K* and DSPE10K*
12 = DSPE11K*

Seals:
For temperature range -20 / +80 °C
N = NBR seals for mineral oil (standard)
V = FPM seals for special fluids
For temperature range - 40 / +80 °C
NL = seal for low temperatures (for mineral oil)

Pilot supply:
I = internal
E = external
Z = internal pilot supply with 30 bar pressure reducing valve, fixed adjustment

Drain:
I = internal
E = external

Nominal solenoid voltage:
D12 = 12V DC
D24 = 24V DC

Coil electrical connection: junction box

Connection type for cable gland
upper connection:
T01 = M20x1.5 - ISO 261
T02 = Gk 1/2 - UNI EN 10226-2
T03 = 1/2” NPT - ANSI B1.20.1 (ex ANSI B2.1)
side connection:
S01 = M20x1.5 - ISO 261
S02 = Gk 1/2 - UNI EN 10226-2
S03 = 1/2” NPT - ANSI B1.20.1 (ex ANSI B2.1)
S04 = M16x1.5 - ISO 261

Manual override:
CM = boot protected
standard for both N and V seals
not available for NL seals
CB = blind ring nut
standard for NL seals
available upon request for both N and V seals
see dimensions at point 18

Option: **/T5**
version in T5 temperature class.
Omit if not required.

Option: surface treatment not standard.
Omit if not required (see **NOTE**)

NOTE: Valves are supplied with standard surface treatment of phosphating black for the main body and zinc-nickel for the pilot body.

The full zinc-nickel surface treatment is available upon request. It is suitable to ensure a salt spray resistance up to 600 h (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

For full zinc-nickel surface treatment add the suffix **/W7** at the end of the identification code.

A version with monobloc coils made of steel is available. Please refer to details in page 2.

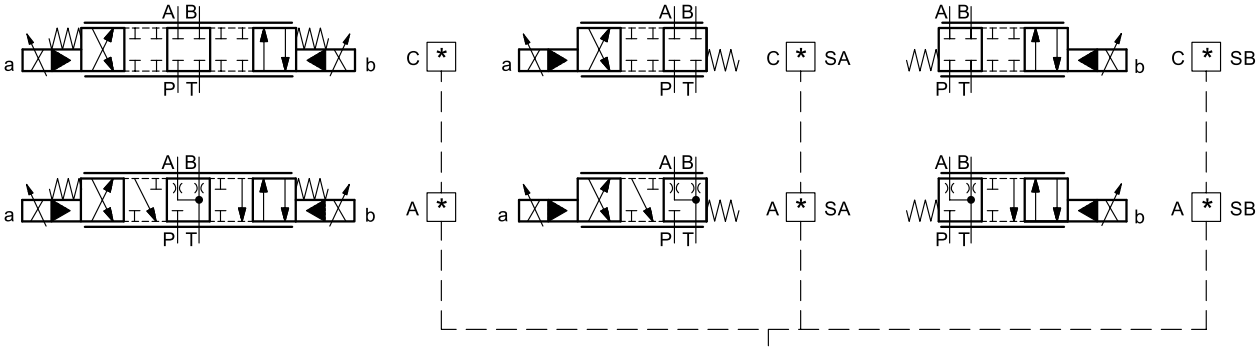
5.1 - Configurations

The valve configuration depends on the combination of the following elements: number of proportional solenoids, spool type, rated flow.

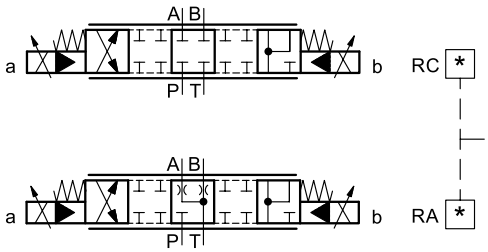
Configuration 2 solenoids:
3 positions with spring centering

1 solenoid for cross configuration "**SA**":
2 positions (central + external)
with return spring

1 solenoid for parallel configuration "**SB**":
2 positions (central + external)
with return spring



valve type	*	nominal flow rate with Δp 10 bar P-T
DSPE5K* DSPE5RK*	**80**	80 l/min
	80/40	80 (P-A) / 40 (B-T) l/min
DSPE7K*	**100**	100 l/min
	150	150 l/min
	150/75	150 (P-A) / 75 (B-T) l/min
DSPE8K*	**200**	200 l/min
	300	300 l/min
	300/150	300 (P-A) / 150 (B-T) l/min
DSPE10K*	**350**	350 l/min
	500	500 l/min
	500/250	500 (P-A) / 250 (B-T) l/min
	800	800 l/min
DSPE11K*	**1000**	1000 l/min



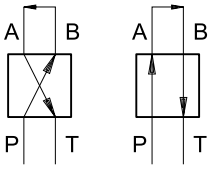
valve type	*	nominal flow rate with Δp 10 bar P-T
DSPE7K*	**150/75**	150 (P-A, A-T) / 75 (P-B, B-P) l/min
DSPE8K*	**300/150**	300 (P-A, A-T) / 150 (P-B, B-P) l/min
DSPE10K*	**500/250**	500 (P-A, A-T) / 250 (P-B, B-P) l/min

6 - CHARACTERISTIC CURVES OF PILOT OPERATED SOLENOID VALVES

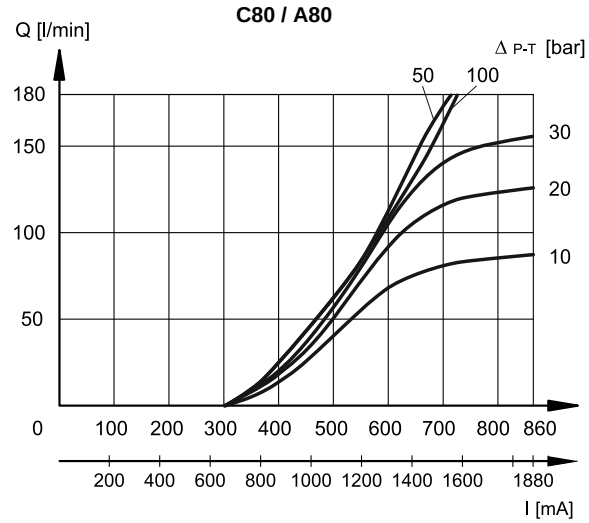
(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Typical flow rate control curves at constant Δp according to current supply to the solenoid, measured for the available spool types.

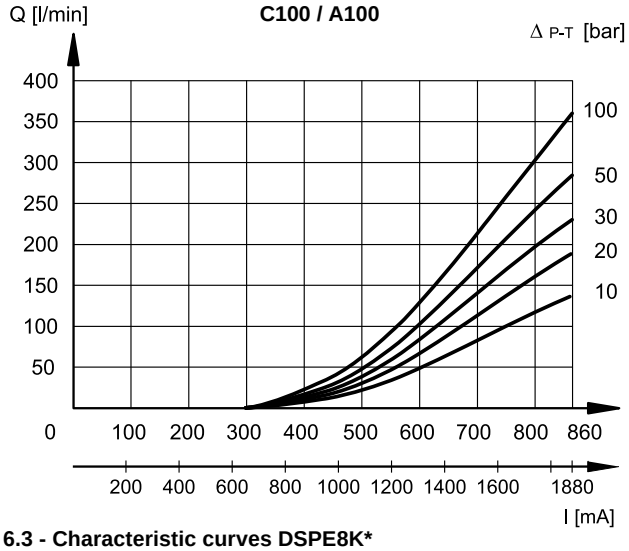
The reference Δp values are measured between valve ports P and T.

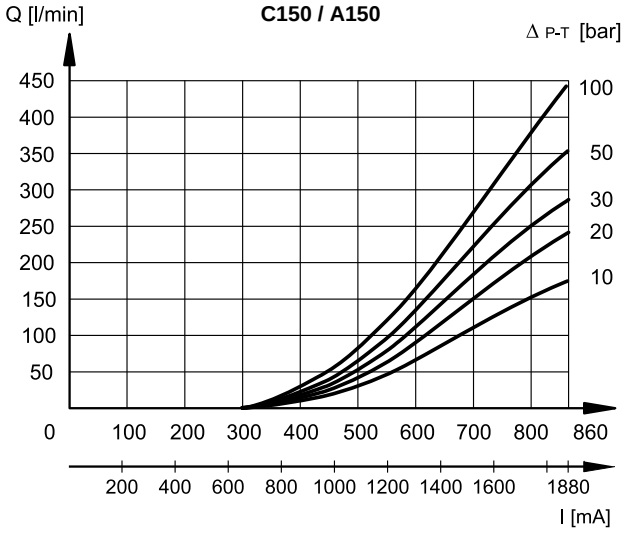


6.1 - Characteristic curves DSPE5K* and DSPE5RK

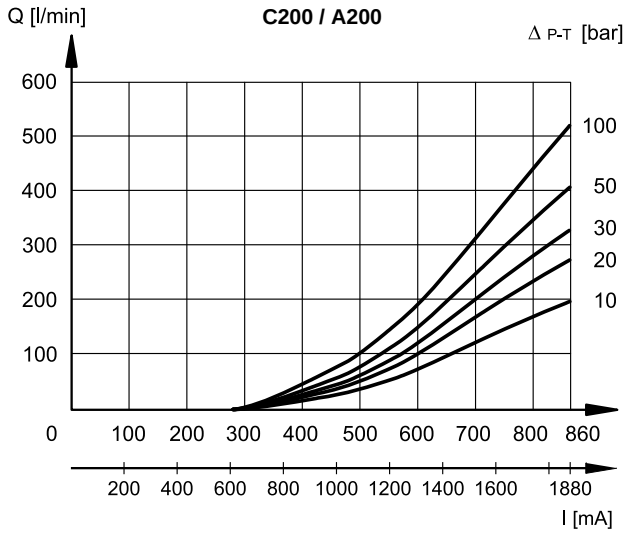


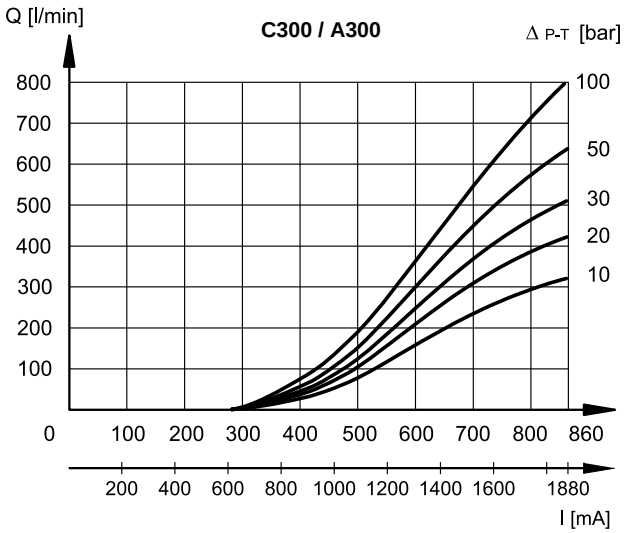
6.2 - Characteristic curves DSPE7K*



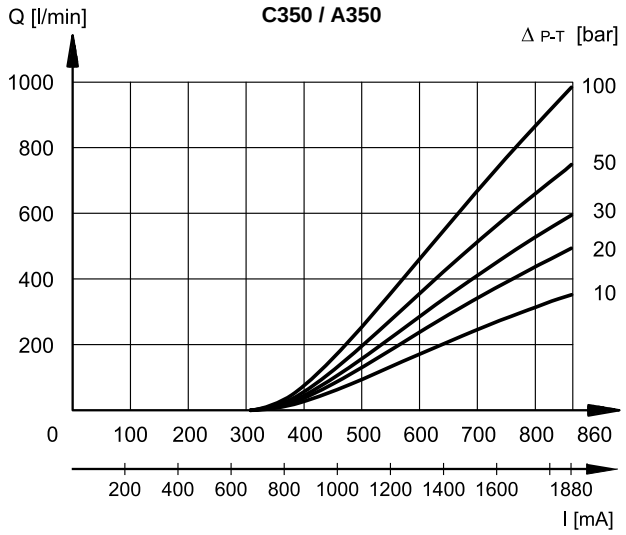


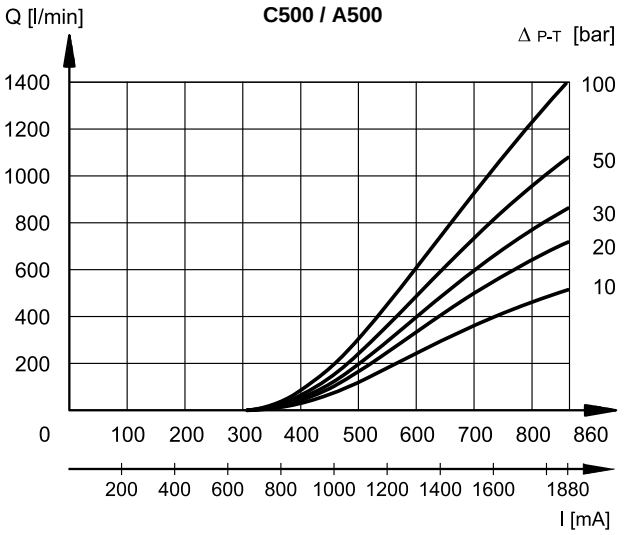
6.3 - Characteristic curves DSPE8K*

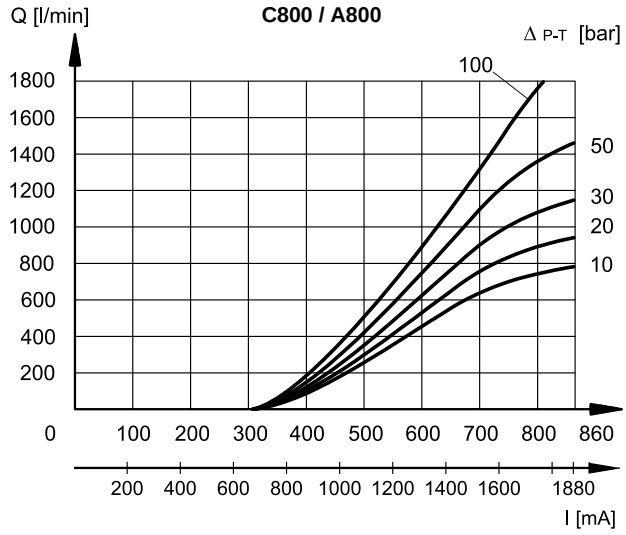




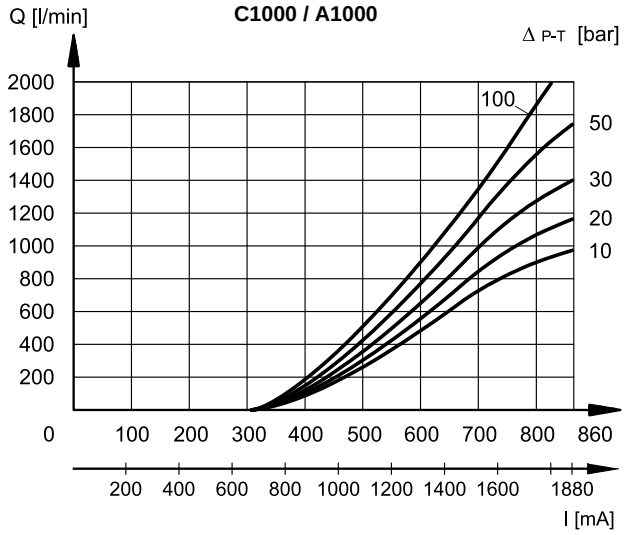
6.4 - Characteristic curves DSPE10K*







6.5 - Characteristic curves DSPE11K*



7 - STEP RESPONSE

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

The table shows the typical step response tested with static pressure 100 bar.

REFERENCE SIGNAL	0 → 100%	100 → 0%
	Step response [ms]	
DSE3K*	50	40
DSPE5K* and DSPE5RK*	50	40
DSPE7K*	80	50
DSPE8K*	100	70
DSPE10K*	200	120

8 - HYDRAULICS CHARACTERISTICS

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

		DSPE5K* DSPE5RK*	**DSPE7K***	**DSPE8K***	**DSPE10K***	**DSPE11K***
Max flow rate	l/min	180	450	800	1800	2000
Pilot supply flow requested with operation 0 →100%	l/min	2.1	2.4	5.5	6.5	6.5
Pilot supply volume requested with operation 0 →100%	cm^3	1.7	3.2	9.2	21.6	21.6

PRESSURES	MIN	MAX
Piloting pressure on X port	30	210 (**NOTE**)
Pressure on T port with interal drain	–	10
Pressure on T port with external drain	–	250

NOTE: if the valve operates with higher pressures it is necessary to use the version with external pilot and reduced pressure. Otherwise, the valve with internal pilot and pressure reducing valve with 30 bar fixed adjustment can be ordered.

Add the letter **Z** to the identification code to order this option (see p. 5).

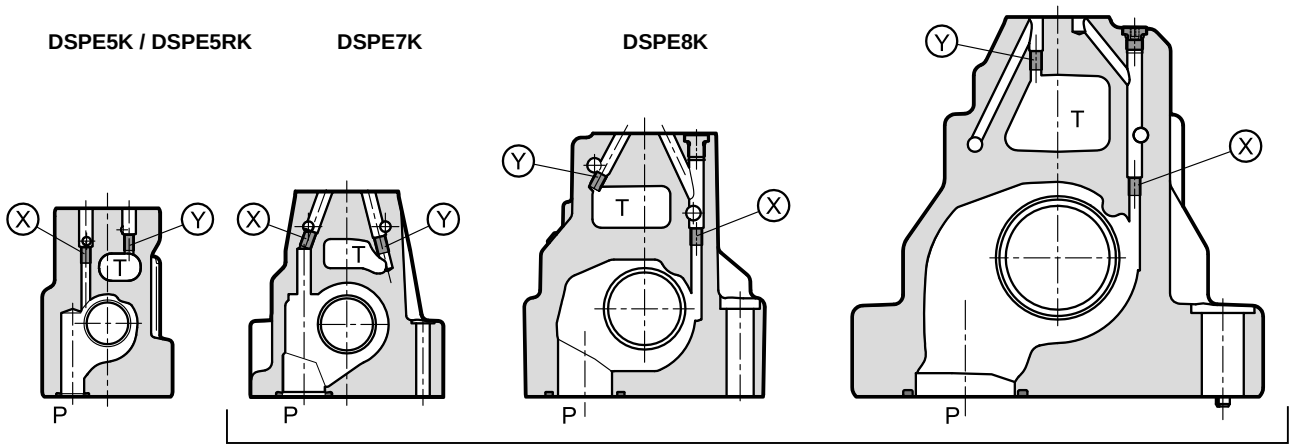
9 - PILOT AND DRAIN

DSPE* valves are available with pilot and drain both internal or external. The version with external drain allows a higher back pressure on the unloading. The version with external pilot with reduced pressure must be used when higher pressures are needed.

NOTE: The configuration of pilots and drains must be chosen when ordering. Subsequent modifications are allowed only to specialized operators with authorization and in factory.

TYPE OF VALVE		Plug assembly	
		X	Y
IE	internal pilot and external drain	NO	YES
II	internal pilot and internal drain	NO	NO
EE	external pilot and external drain	YES	YES
EI	external pilot and internal drain	YES	NO

DSPE5K / DSPE5RK **DSPE7K** **DSPE8K** **DSPE10K/11K**



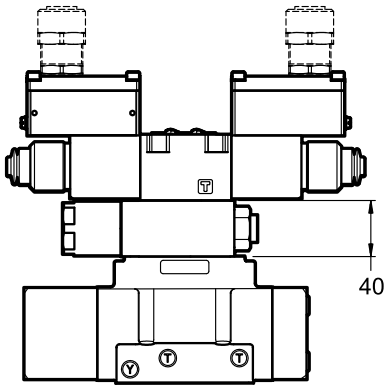
X: plug M5x6 for external pilot
Y: plug M5x6 for external drain

X: plug M6x8 for external pilot
Y: plug M6x8 for external drain

9.1 - Z type pilot supply: internal pilot supply with pressure reducing valve

The Z type pilot supply consists of an arrangement with internal pilot and 30 bar supply pressure to the pilot stage, by means of a fixed adjustment pressure reducing valve placed between the main stage and the pilot valve.

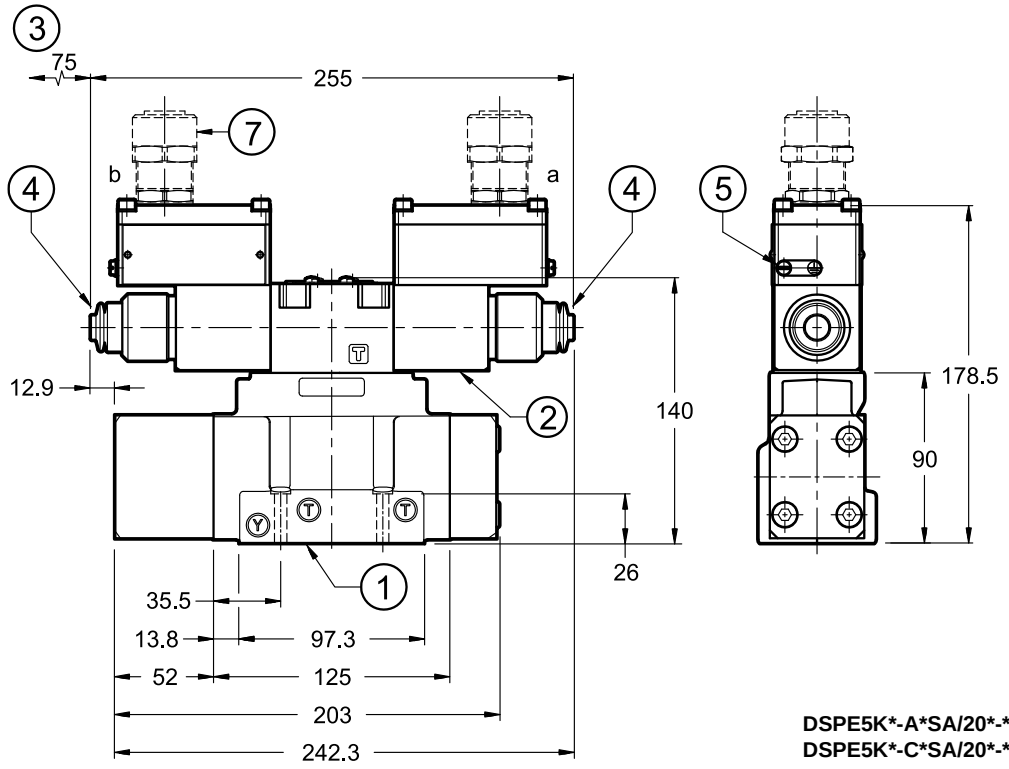
Consider an increase of 40 mm in height for valves ordered with Z option.



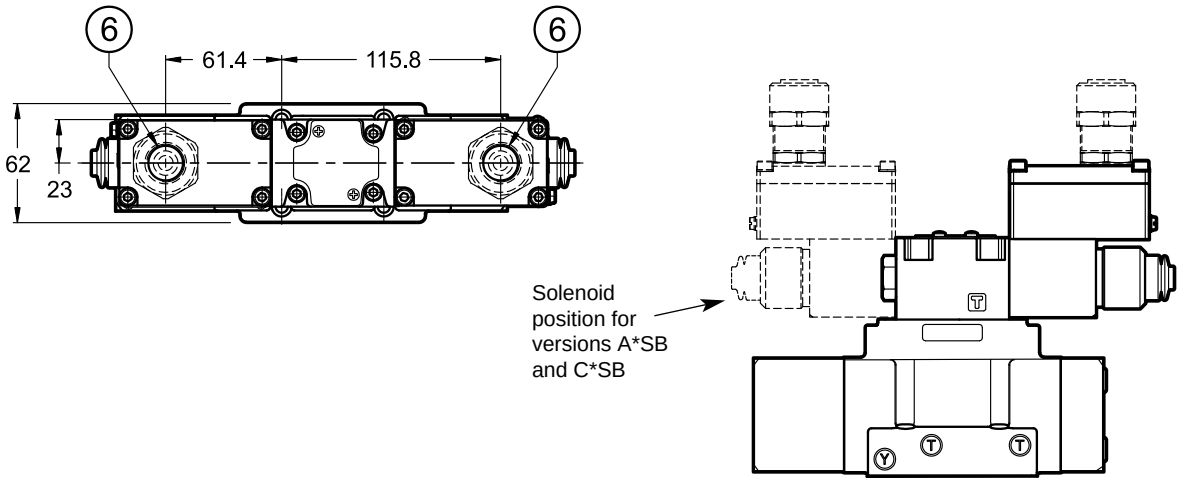
10 - DSPE5K* / DSPE5RK* WITH UPPER CONNECTION - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

DSPE5K*-A*/20*-*/*K9T*/CM
DSPE5K*-C*/20*-*/*K9T*/CM



DSPE5K*-A*SA/20*-*/*K9T*/CM
DSPE5K*-C*SA/20*-*/*K9T*/CM



1	Mounting surface with sealing rings: 5 OR type 2050 (12.42x1.78) - 90 Shore 2 OR type 2037 (9.25x1.78) - 90 Shore
2	Explosion-proof coil
3	Minimum clearance required
4	Manual override, boot protected (**standard for both N and V seals**) - for blind ring nut dimensions (standard for NL seals) see point 18
5	Terminal for supplementary GND connection
6	Upper port for cable gland
7	Cable gland. To be ordered separately, see point 19

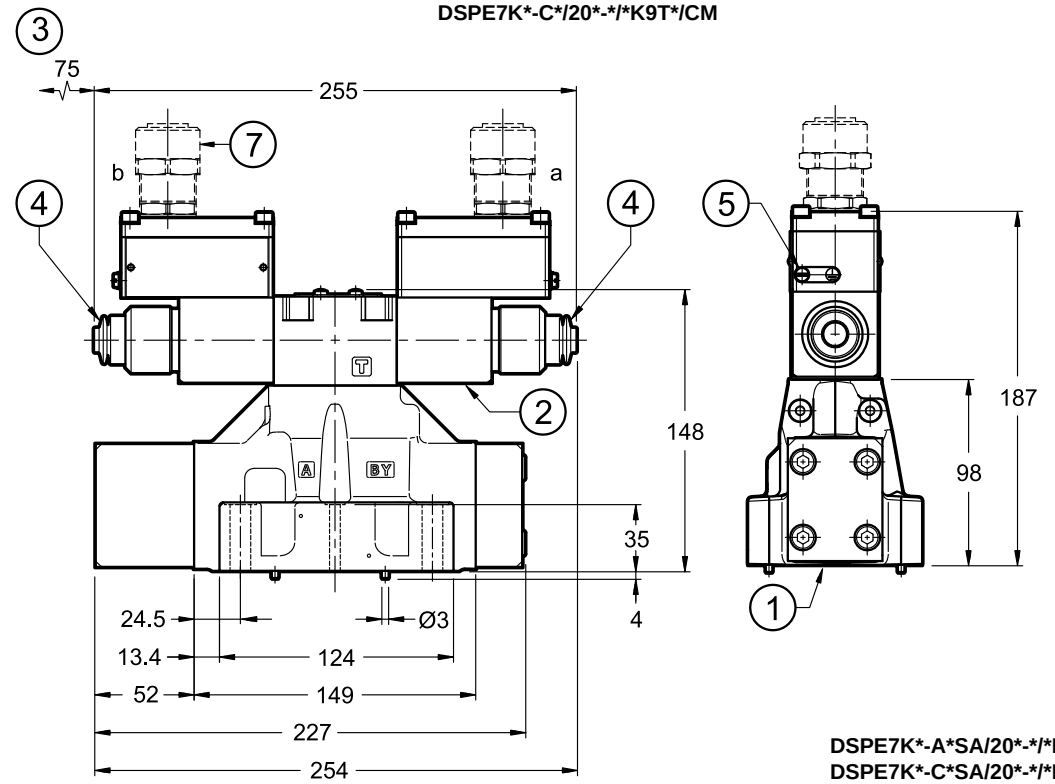
NOTE: for side port cable gland see point 14.

Valve fastening: 4 SHC ISO 4762 screws M6x35
Tightening torque: 8 Nm (A8.8 screws)
Threads of mounting holes: M6x10

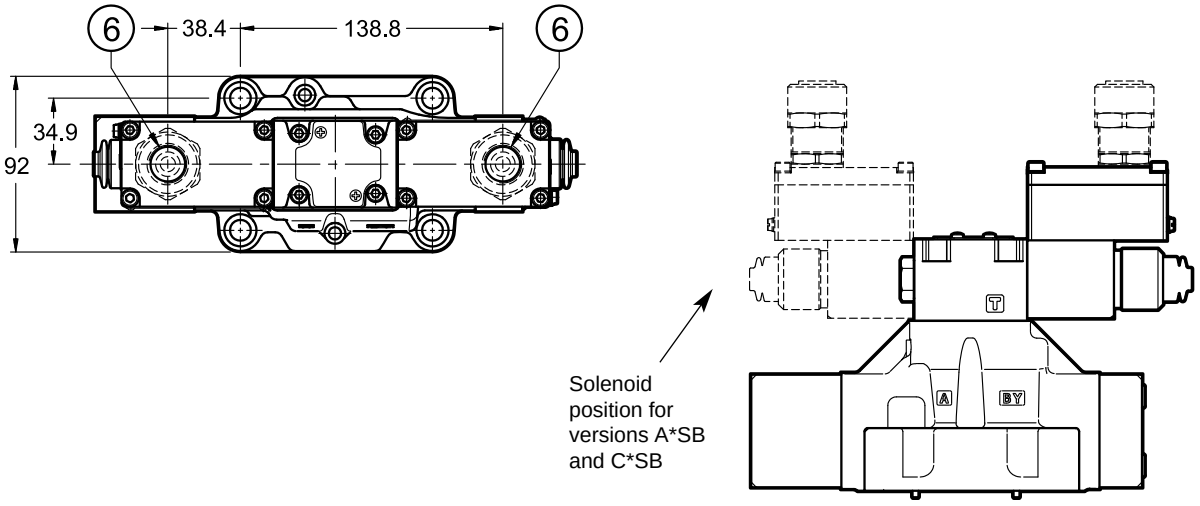
11 - DSPE7K* WITH UPPER CONNECTION - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

DSPE7K*-A*/20*-*/*K9T*/CM
DSPE7K*-C*/20*-*/*K9T*/CM



DSPE7K*-A*SA/20*-*/*K9T*/CM
DSPE7K*-C*SA/20*-*/*K9T*/CM



Solenoid position for versions A*SB and C*SB

1	Mounting surface with sealing rings: 4 OR type 130 (22.22x2.62) - 90 Shore 2 OR type 2043 (10.82x1.78) - 90 Shore
2	Explosion-proof coil
3	Minimum clearance required
4	Manual override, boot protected (**standard for both N and V seals**) - for blind ring nut dimensions (standard for NL seals) see point 18
5	Terminal for supplementary GND connection
6	Upper port for cable gland
7	Cable gland. To be ordered separately, see point 19

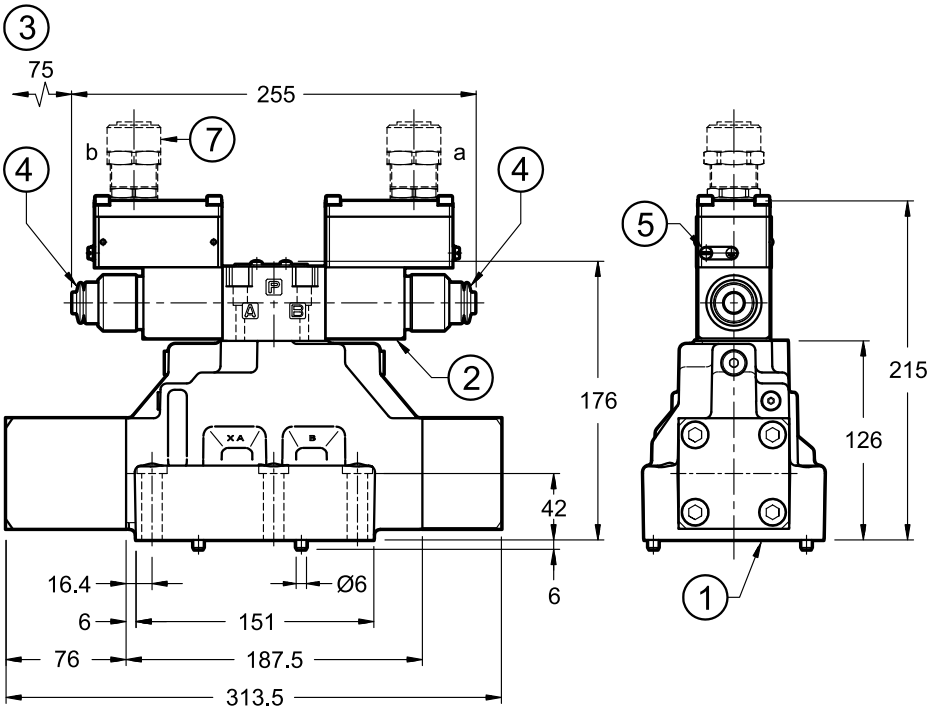
NOTE: for side port cable gland see point 14.

Valve fastening:	4 SHC screws ISO 4762 M10x50 2 SHC screws ISO 4762 M6x50
Tightening torque:	M10x50: 40 Nm (A8.8 screws) M6x50: 8 Nm (A8.8 screws)
Threads of mounting holes: M6x18; M10x18	

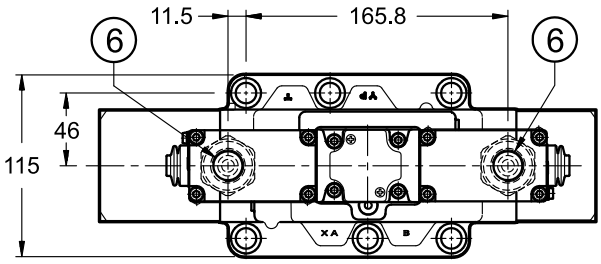
12 - DSPE8K* WITH UPPER CONNECTION - OVERALL AND MOUNTING DIMENSIONS

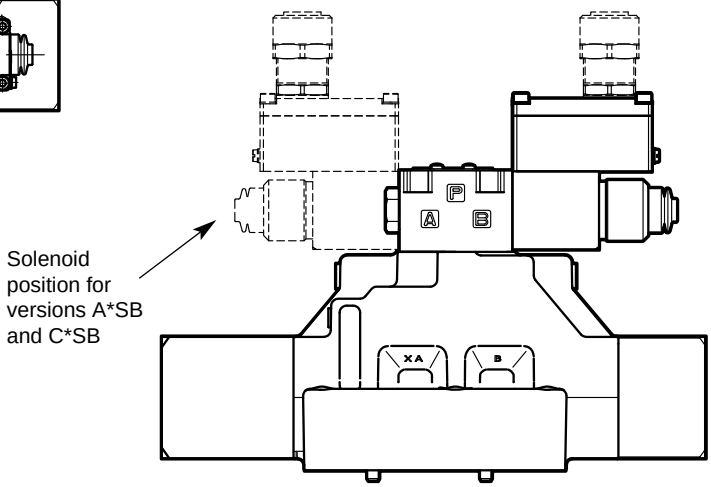
dimensions in mm

DSPE8K*-A*/20*-*/*K9T*/CM
DSPE8K*-C*/20*-*/*K9T*/CM



DSPE8K*-A*SA/20*-*/*K9T*/CM
DSPE8K*-C*SA/20*-*/*K9T*/CM





1	Mounting surface with sealing rings: 4 OR type 3131 (32.99x2.62) - 90 Shore 2 OR type 3087 (21.89x2.62) - 90 Shore
2	Explosion-proof coil
3	Minimum clearance required
4	Manual override, boot protected (**standard for both N and V seals**) - for blind ring nut dimensions (standard for NL seals) see point 18
5	Terminal for supplementary GND connection
6	Upper port for cable gland
7	Cable gland. To be ordered separately, see point 19

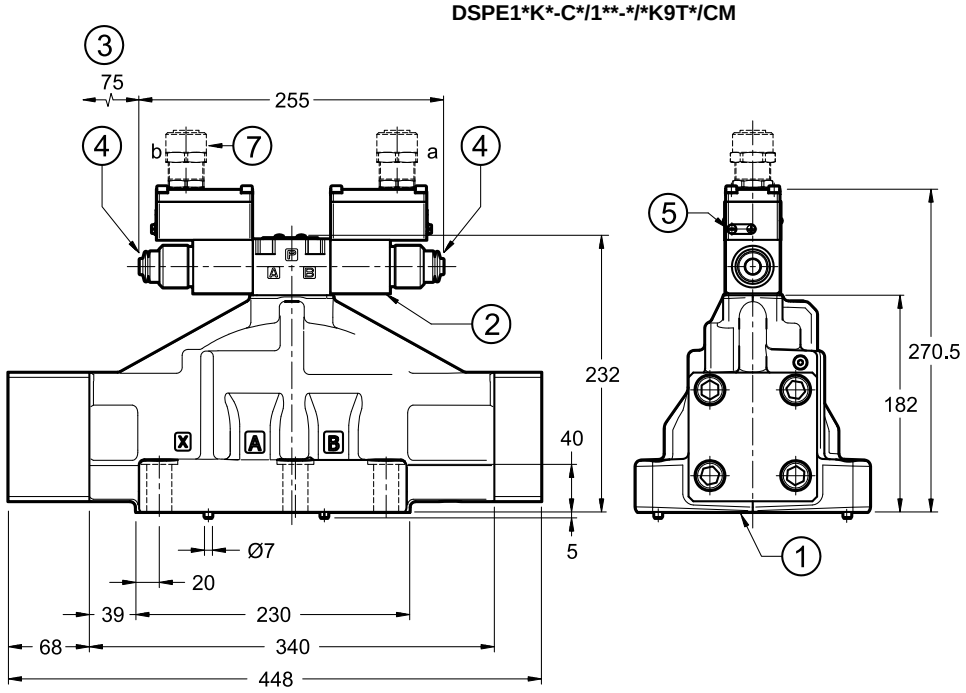
NOTE: for side port cable gland see point 14.

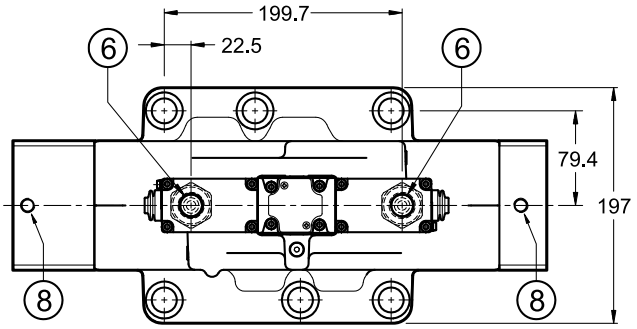
Valve fastening: 6 SHC ISO 4762 screws M12x60
Tightening torque: 69 Nm (A8.8 screws)
Threads of mounting holes: M12x20

13 - DSPE10K* / DSPE11K* WITH UPPER CONNECTION - OVERALL AND MOUNTING DIMENSIONS

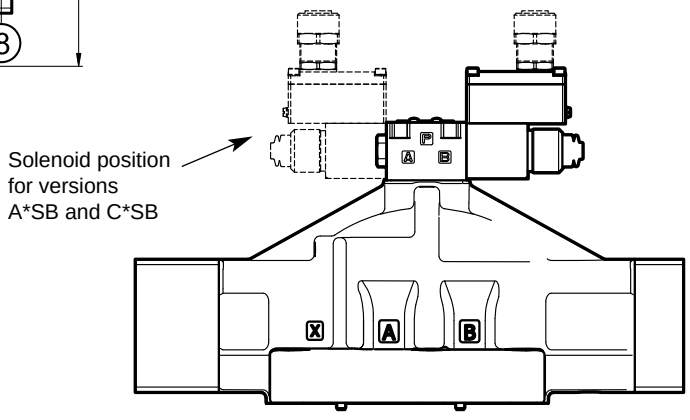
dimensions in mm

DSPE1*K*-A*/1-*/*K9T*/CM**
DSPE1*K*-C*/1-*/*K9T*/CM**





DSPE1*K*-A*SA/1-*/*K9T*/CM**
DSPE1*K*-C*SA/1-*/*K9T*/CM**



1	Mounting surface with sealing rings: **DSPE10K** N. 4 OR type 4162 (40.86x3.53) - 90 Shore N. 2 OR type 3081 (20.24x2.62) - 90 Shore **DSPE11K** N. 4 OR type 4212 (53.57x3.53) - 90 Shore N. 2 OR type 3081 (20.24x2.62) - 90 Shore
2	Explosion-proof coil
3	Minimum clearance required
4	Manual override, boot protected (**standard for both N and V seals**) - for blind ring nut dimensions (standard for NL seals) see point 18
5	Terminal for supplementary GND connection
6	Upper port for cable gland
7	Cable gland. To be ordered separately, see point 19
8	M12 eyebolt hole for safe lift

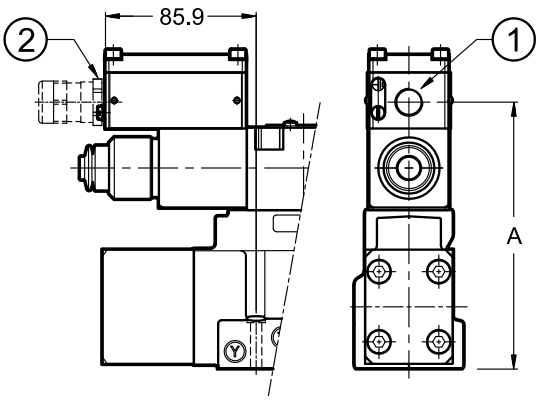
NOTE: for side port cable gland see point 14.

Valve fastening: 6 SHC screws ISO 4762 M20x70 (supplied)
Tightening torque: 470 Nm (A10.9 screws)
Threads of mounting holes: M20x40

14 - DSPE*K*-*K9S* WITH SIDE CONNECTION - OVERALL AND MOUNTING DIMENSIONS

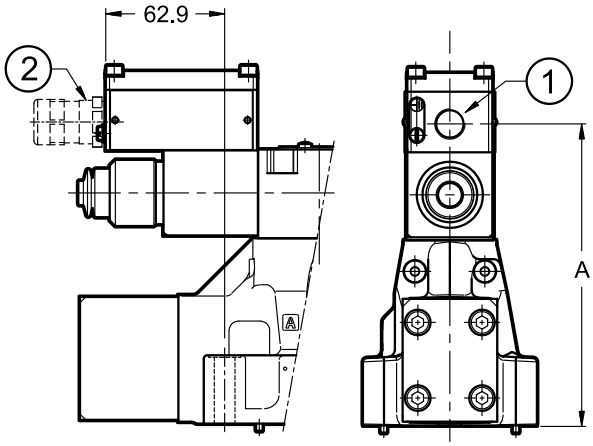
dimensions in mm

DSPE5K*-*K9S*
DSPE5RK*-*K9S*



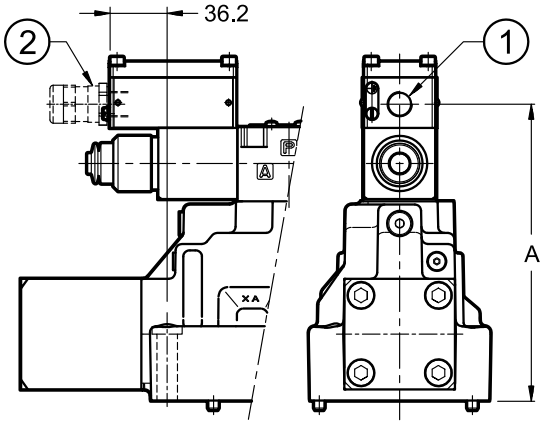
Side port type	Dimension A
S01, S04	150.5
S02, S03	150

DSPE7K*-*K9S*



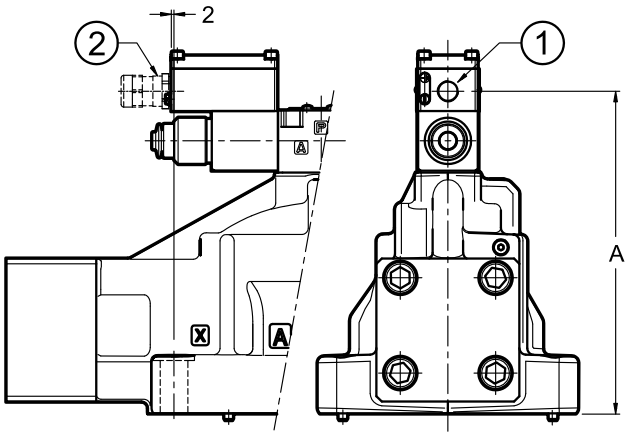
Side port type	Dimension A
S01, S04	158.5
S02, S03	158

DSPE8K*-*K9S*



Side port type	Dimension A
S01, S04	186.5
S02, S03	186

DSPE10K*-*K9S*



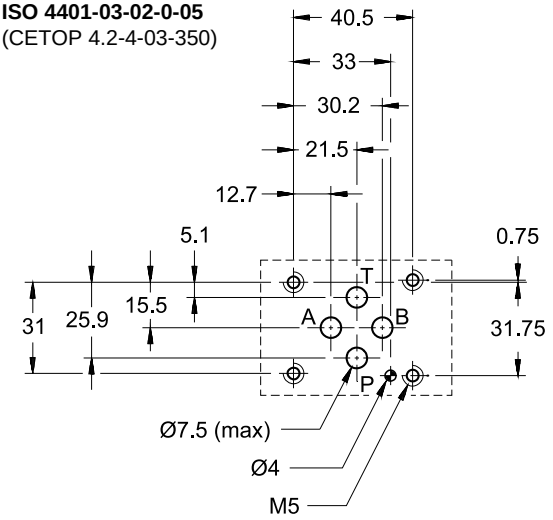
Side port type	Dimension A
S01, S04	242.5
S02, S03	242

1	Side port for cable gland
2	Cable gland. To be ordered separately, see point 19

15 - MOUNTING SURFACES

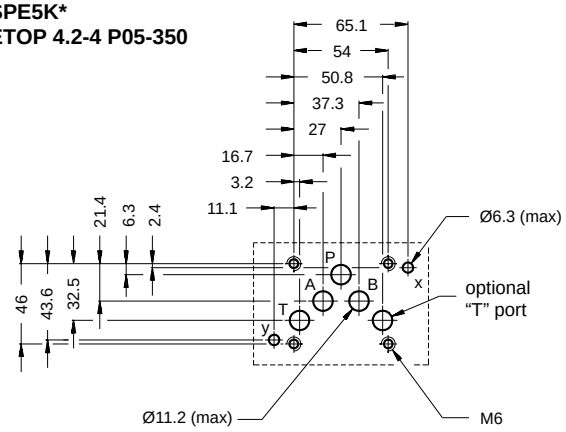
15.1 - Direct operated valves

DSE3K*
ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)

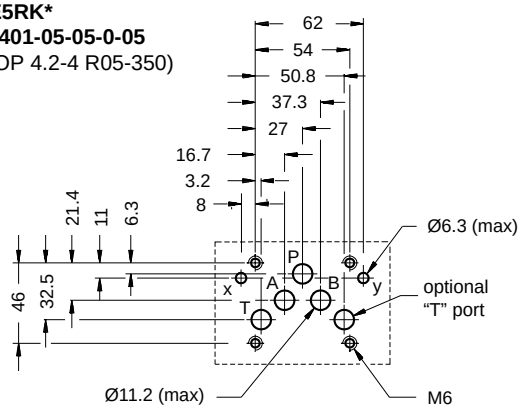


15.2 - Pilot operated valves

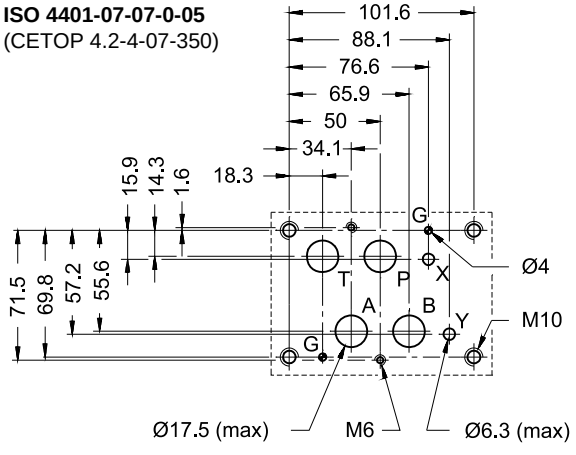
DSPE5K*
CETOP 4.2-4 P05-350



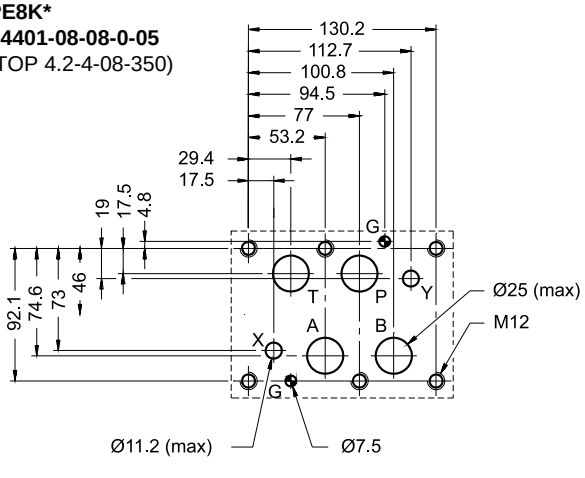
DSPE5RK*
ISO 4401-05-05-0-05
(CETOP 4.2-4 R05-350)



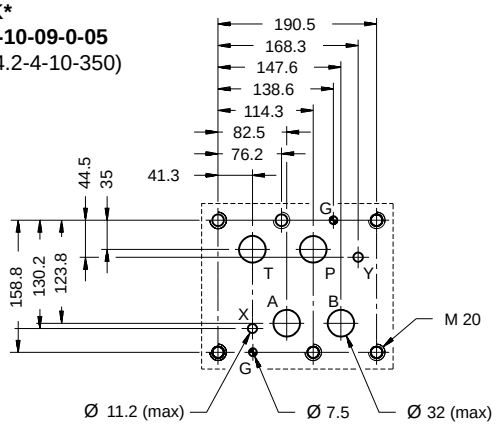
DSPE7K*
ISO 4401-07-07-0-05
(CETOP 4.2-4-07-350)



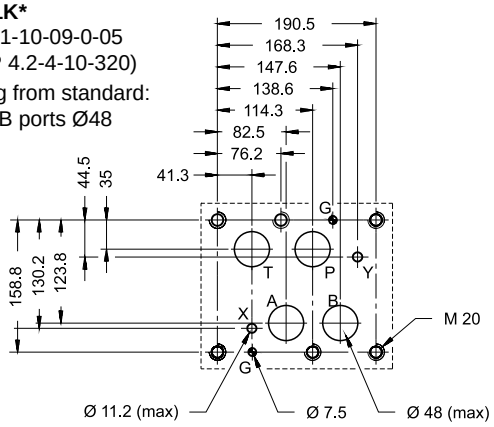
DSPE8K*
ISO 4401-08-08-0-05
(CETOP 4.2-4-08-350)



DSPE10K*
ISO 4401-10-09-0-05
(CETOP 4.2-4-10-350)



DSPE11K*
ISO 4401-10-09-0-05
(CETOP 4.2-4-10-320)
deviating from standard:
P, T, A, B ports Ø48



16 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

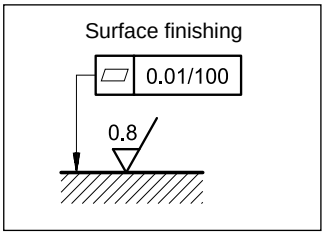
17 - INSTALLATION

Installation must adhere to instructions reported in the *Use and Maintenance manual*, always attached to the valve. Unauthorized interventions can be harmful to people and goods because of the explosion hazards present in potentially explosive atmospheres.

The valves can be installed in any position without impairing correct operation.

Valve fastening takes place by means of screws or tie rods, laying the valve on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing.

If the minimum values of planarity or smoothness are not met, fluid leakages between valve and mounting surface can easily occur.



18 - MANUAL OVERRIDES

18.1 - CB - Blind ring nut

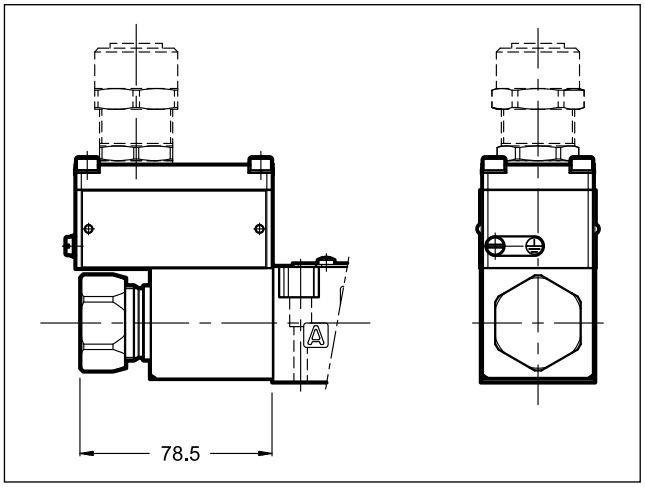
The metal ring nut protects the solenoid tube from atmospheric agents and isolates the manual override from accidental operations. The ring nut is tightened on a threaded fastener that keeps the coil in its position even without the ring nut.

To access the manual override loose the ring nut and remove it; then reassemble hand tightening, until it stops.

Activate the manual override always and only with non-sparking tools suitable for use in potentially explosive atmospheres.

More information on safe use of explosion-proof components is provided in the instruction manual, always supplied with the valve.

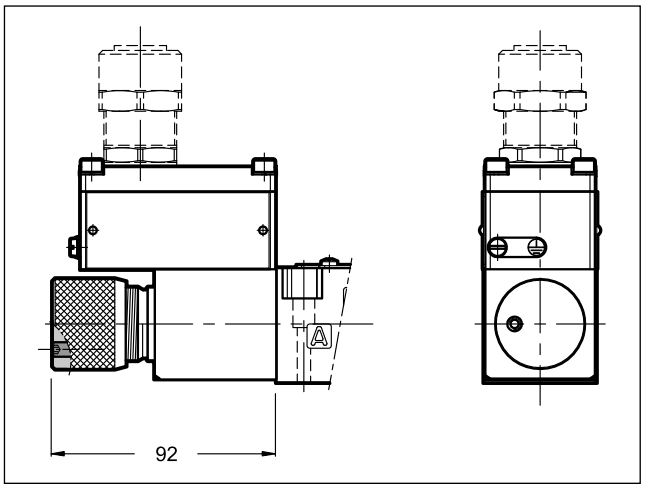
CAUTION!: The manual override doesn't allow any proportional regulation; indeed using this kind of override, the main stage spool will open completely and the whole inlet pressure will pass through A or B line.



18.2 - CK Knob manual override

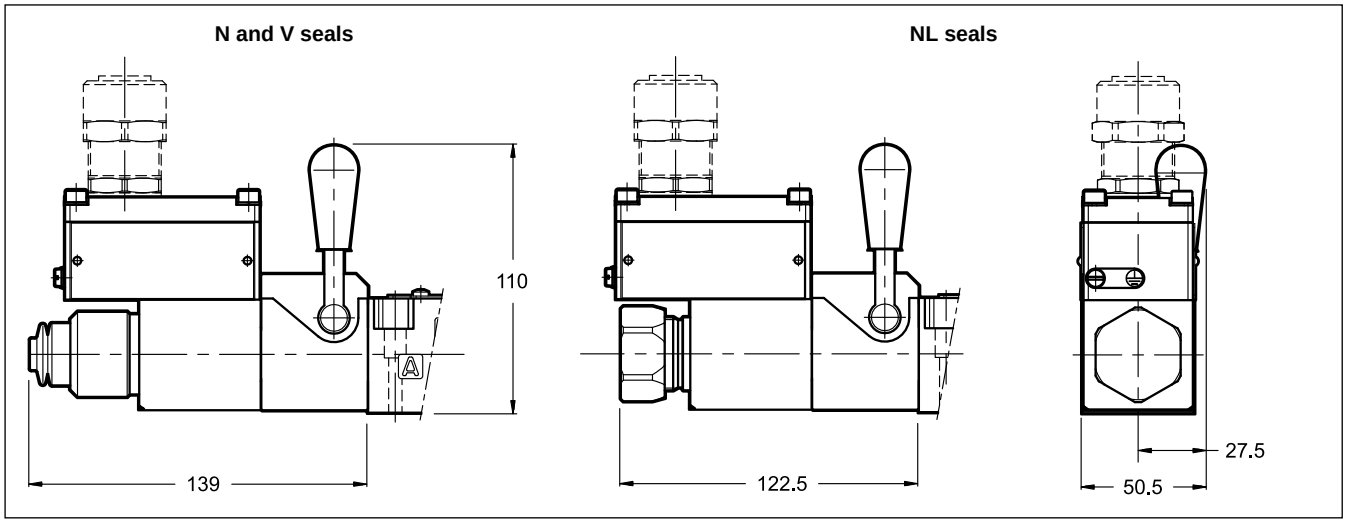
When the set screw is screwed and its point is aligned with the edge of the knob, tighten the knob till it touches the spool: in this position the override is not engaged and the valve is de-energized. After adjusting the override, tighten the set screw in order to avoid the knob loosing. Available for DC valves only.

Spanner: 3 mm



18.3 - CH - Lever manual override

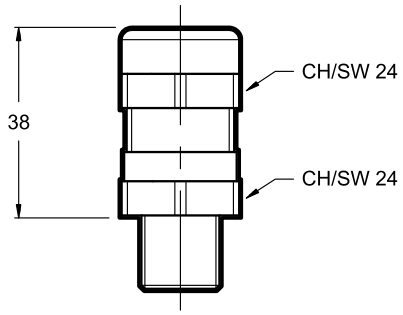
The seals choice leads the type of the standard ring nut to be mounted. The lever device is always placed at valve side A.



19 - CABLE GLANDS

Cable glands must be ordered separately; Duplomatic offers some types of cable glands with the following features:

- version for non-armoured cable, external seal on the cable (suitable for Ø 8÷10 mm cables);
- ATEX II 2GD, I M2; IECEx Gb, Db, Mb;
- cable gland material: nickel brass
- inner rubber tip material: silicone
- ambient temperature range: -65 ºC ÷ +220 ºC
- protection degree: IP66/IP68



To order the desired cable glands, specify description, code and quantity.

Description: CGK2/NB-01/10

Code: 3908108001

M20x1.5 - ISO 261 male thread, suitable for coils with T01 and S01 connections. It is supplied equipped with copper washer, that must be assembled between the cable gland and the coil, so as to ensure IP66/IP68 protection degree.

Tightening torque: 45 ÷ 50 Nm

Description: CGK2/NB-02/10

Code: 3908108002

Gk 1/2 - UNI EN 10226-2 male thread, suitable for coils with T02 and S02 connections. The customer must apply LOCTITE® 243™ threadlocker or similar between the cable gland connection thread and the coil in order to ensure IP66/IP68 protection degree.

Tightening torque: 20 ÷ 25 Nm

Description: CGK2/NB-03/10

Code: 3908108003

1/2" NPT - ANSI B1.20.1 (ex ANSI B2.1), suitable for coils with T03 and S03 connections. The customer must apply LOCTITE® 243™ threadlocker or similar between the cable gland connection thread and the coil in order to ensure IP66/IP68 protection degree.

Tightening torque: 20 ÷ 25 Nm

Description: CGK2/NB-04/10

Code: 3908108004

M16x1.5 - ISO 261 male thread, suitable for coils with S04 connection. It is supplied equipped with copper washer, that must be assembled between the cable gland and the coil, so as to ensure IP66/IP68 protection degree.

Tightening torque: 45 ÷ 50 Nm

20 - ELECTRONIC CONTROL UNITS

DSE3K*-**SA, DSE3K*-**SB

EDM-M112	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 252
EDM-M142	for solenoid 12V DC		

NOTE: electronic control units offered are not explosion proof certified; therefore, they must be installed outside the classified area.

DSE3K*-A*, DSE3K*-C*

EDM-M212	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 252
EDM-M242	for solenoid 12V DC		

DSPE*K*-**SA, DSPE*K*-**SB

EDM-M111	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 252
EDM-M141	for solenoid 12V DC		

DSPE*K*-A*, DSPE*K*-C*

EDM-M211	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 252
EDM-M241	for solenoid 12V DC		

21 - SUBPLATES

(see catalogue 51 000)

No subplates are available for DSPE5RK*, DSPE10K* and DSPE11K*.

	DS3K*	DSP5K*	DSP7K*	DSP8K*
Type with rear ports	PMMD-AI3G	PME4-AI5G	PME07-AI6G	-
Type with side ports	PMMD-AL3G	PME4-AL5G	PME07-AL6G	PME5-AL8G
P, T, A, B ports dimensions X, Y ports dimensions	3/8” BSP -	3/4” BSP 1/4” BSP	1” BSP 1/4” BSP	1 ½” BSP 1/4” BSP

NOTE: Subplates (to be ordered separately) contain neither aluminium nor magnesium at a rate higher than the value allowed by norms according to ATEX directive for category II 2GD and I M2.

The user will bear to do the complete assessment of the ignition risk that can occur from the relative use in potentially explosive environments.

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duplomaticmotionsolutions.com

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EXPLOSION-PROOF CLASSIFICATION for

SOLENOID AND PROPORTIONAL VALVES

ref. catalogues:

pressure control valves

RQM*K*-P	**21 515**
P*E*K*	**81 316**
ZDE3K*	**81 515**
DZCE*K*	**81 606**

flow control valves

QDE3K*	**82 225**

directional valves

D*K*	**41 515**
DT3K*	**42 215**
DS(P)E*K*	**83 510**

GENERAL INFO

This informative technical datasheet displays information about **classification and marking** of Duplomatic explosion-proof valves range.

Duplomatic MS offers valves with the following certifications:

ATEX	**II 2G**	**II 2D**	**I M2**
IECEx	**Gb**	**Db**	**Mb**
PESO	**Gb**		

Instructions for use and maintenance can be found in the related manuals, always supplied toghether with valves.

1 - ATEX CLASSIFICATION AND TEMPERATURES

Duplomatic certificates the combination valve-coil for the valves suitable for application and installation in potentially explosive atmospheres, according to ATEX directive; the supply always includes the declaration of conformity to the directive and the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environments.

Coils assembled on these valves have been separately certified according to ATEX directive and so they are suitable for use in potentially explosive atmospheres.

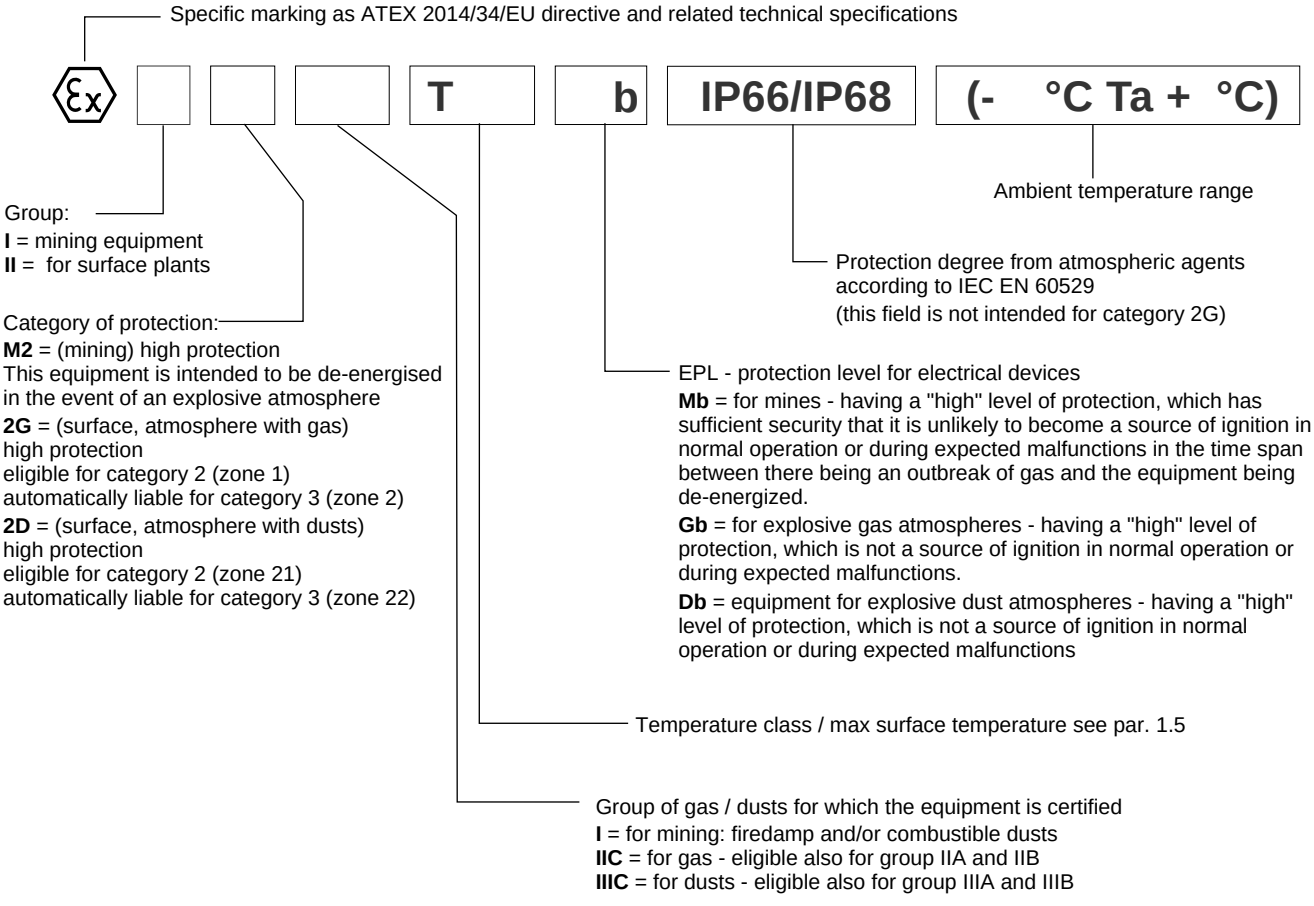
1.1 - ATEX classification for valves

Type examination certificate: AR18ATEX055
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

ATEX II 2G ATEX II 2D	***KD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur occasionally.The means of protection relating to equipment in this category ensure the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account.
ATEX I M2	***KDM2**	equipment intended for use in underground parts of mines as well as those parts of surface installations of such mines likely to be endangered by firedamp and/or combustible dust. This equipment is intended to be de-energised in the event of an explosive atmosphere.

1.2 - ATEX marking for valves

valve code		N and V seals	NL seals
***KD2**	for gas	Ex II 2G IIC T4 Gb (-20°C Ta +80°C)	Ex II 2G IIC T4 Gb (-40°C Ta +80°C)
	for dusts	Ex II 2D IIIC T154°C Db IP66/IP68 (-20°C Ta +80°C)	Ex II 2D IIIC T154°C Db IP66/IP68 (-40°C Ta +80°C)
***KD2 /T5**	for gas	Ex II 2G IIC T5 Gb (-20°C Ta +55°C)	Ex II 2G IIC T5 Gb (-40°C Ta +55°C)
	for dusts	Ex II 2D IIIC T129°C Db IP66/IP68 (-20°C Ta +55°C)	Ex II 2D IIIC T129°C Db IP66/IP68 (-40°C Ta +55°C)
***KDM2**	mining	Ex I M2 I T150°C Mb IP66/68 (-20°C Ta +75°C)	Ex I M2 I T150°C Mb IP66/68 (-40°C Ta +75°C)



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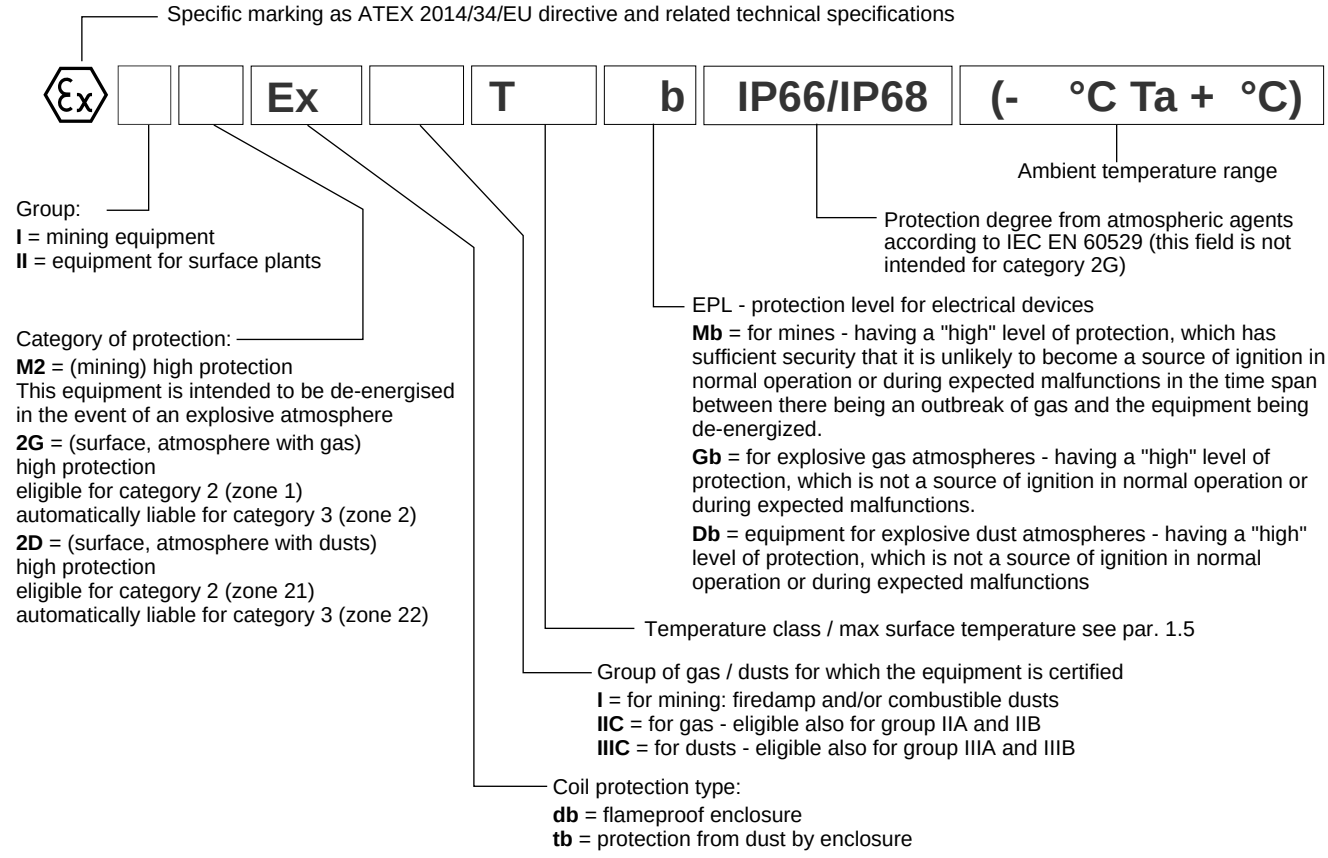
1.3 - ATEX classification of the coils

The coil of the explosion-proof valves is ATEX certified itself and, as such, is identified with its own tag, carries the relative ATEX marking. The mechanical construction of the coil housing is made in order to ensure its resistance to possible internal explosion and to avoid any explosion propagation to the outside environment, matching an “Ex db” type protection (explosion-proof coil).

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

1.4 - ATEX marking on coils

for valve type ***KD2**	for gas	II 2G Ex db IIC T4 Gb (-40°C Ta +80°C)
	for dusts	II 2D Ex tb IIIC T154°C Db IP66/IP68 (-40°C Ta +80°C)
for valve type ***KD2 /T5**	for gas	II 2G Ex db IIC T5 Gb (-40°C Ta +55°C)
	for dusts	II 2D Ex tb IIIC T129°C Db IP66/IP68 (-40°C Ta +55°C)
for valve type ***KDM2**	mining	I M2 Ex db I T150°C Mb IP66/IP68 (-40°C Ta +75°C)



1.5 - Operating temperatures

These valves are classified according to their maximum surface temperature (EN 13463-1), which must be lower than the ignition temperature of the gases, vapors and dusts for which the area in which they will be used is classified.

The valves in group II can also be used for less limiting temperature classes (surface temperature allowed higher).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
ATEX II 2G ATEX II 2D	***KD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas) T154°C (dusts)	T3, T2, T1 T200°C and higher
		of fluid				
	***KD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas) T129°C (dusts)	T4, T3, T2, T1 T135°C and higher
		of fluid	-20 / +60 °C	-40 / +60 °C		
ATEX I M2	***KDM2**	of ambient	-20 / +75 °C	-40 / +75 °C	T150°C	-
		of fluid				

2 - IECEX CLASSIFICATION AND TEMPERATURES

The IECEx certification requires the classification of the electrical equipment only.

Duplomatic supplies valves with IECEx certified coils, suitable for application and installation in potentially explosive atmospheres. The mechanical construction of the coil housing is made in order to ensure its resistance to possible internal explosion and to avoid any explosion propagation to the outside environment, matching an “Ex db” type protection (explosion-proof coil).

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

The supply always includes the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environment.

2.1 - IECEx classification

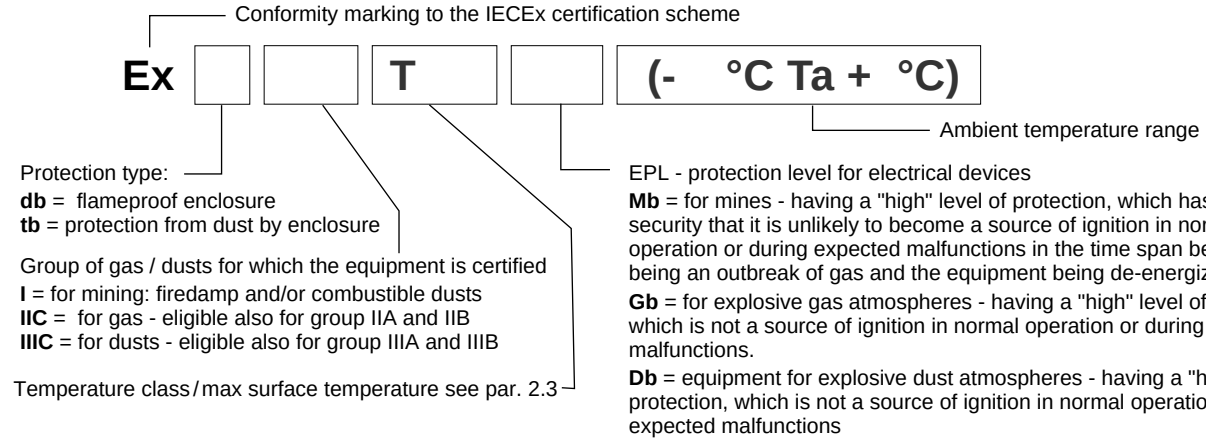
Certificate of conformity (CoC): IECEx TUN 15.0028X
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

IECEx Gb IECEx Db	***KXD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur occasionally.The means of protection relating to equipment in this category ensure the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account.
IECEx Mb	***KXDM2**	equipment intended for use in underground parts of mines as well as those parts of surface installations of such mines likely to be endangered by firedamp and/or combustible dust. This equipment is intended to be de-energised in the event of an explosive atmosphere.

2.2 - IECEx marking

There is a plate with the IECEx mark on each coil.

***KXD2** valves	for gas for dusts	Ex db IIC T4 Gb (-40°C Ta +80°C) Ex tb IIIC T135°C Db (-40°C Ta +80°C)
***KXD2 /T5** valves	for gas for dusts	Ex db IIC T5 Gb (-40°C Ta +55°C) Ex tb IIIC T100°C Db (-40°C Ta +55°C)
***KDM2** valves	mining	Ex db I Mb (-40°C Ta +80°C)



2.3 - Operating temperatures

These valves are classified according to their maximum surface temperature (EN 13463-1), which must be lower than the ignition temperature of the gases, vapors and dusts for which the area in which they will be used is classified.

Valves for surface plants can also be used for less limiting temperature classes (higher surface temperature allowed).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
IECEx Gb IECEx Db	***KXD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas) T135°C (dusts)	T3, T2, T1 T200°C and higher
		of fluid				
	***KXD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas) T100°C (dusts)	T4, T3, T2, T1 T135°C and higher
		of fluid	-20 / +60 °C	-40 / +60 °C		
IECEx Mb	***KXDM2**	of ambient	-20 / +80 °C	-40 / +80 °C	-	-
		of fluid				

2.4 - Protection degree from atmospheric agents (IEC EN 60529)

Protection degree from atmospheric agents according to IEC EN 60529 is IP66/IP68.

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3 - PESO CLASSIFICATION AND TEMPERATURES

The PESO certification requires the classification of the electrical equipment only.

Duplomatic supplies valves with PESO certified coils, suitable for application and installation in potentially explosive atmospheres. The mechanical construction of the coil housing is made in order to ensure its resistance to possible internal explosion and to avoid any explosion propagation to the outside environment, matching an “Ex db” type protection (explosion-proof coil).

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

The supply always includes the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environment.

3.1 - PESO classification

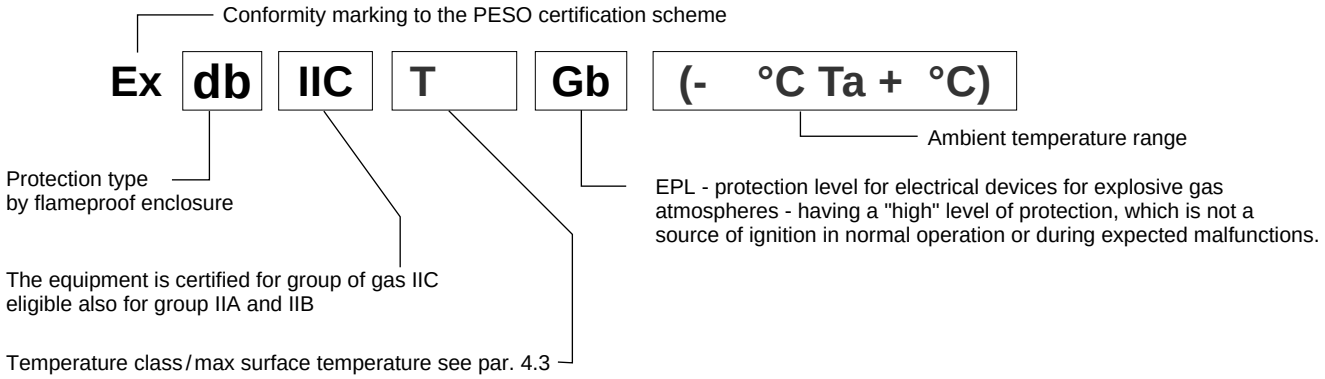
Certificate of conformity: P480801
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

PESO Gb	***KPD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists are likely to occur occasionally.The means of protection relating to equipment in this category ensure the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account.

3.2 - PESO marking

There is a plate with the PESO mark on each coil.

***KPD2** valves	for gas	Ex db IIC T4 Gb (-40°C Ta +80°C)
***KPD2 /T5** valves	for gas	Ex db IIC T5 Gb (-40°C Ta +55°C)



3.3 - Operating temperatures

These valves are classified according to their maximum surface temperature (EN 13463-1), which must be lower than the ignition temperature of the gases, vapors and dusts for which the area in which they will be used is classified.

Valves for surface plants can also be used for less limiting temperature classes (higher surface temperature allowed).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
PESO Gb	***KPD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas)	T3, T2, T1
		of fluid				
	***KPD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas)	T4, T3, T2, T1
		of fluid	-20 / +60 °C	-40 / +60 °C		

3.4 - Protection degree from atmospheric agents (IEC EN 60529)

Protection degree from atmospheric agents according to IEC EN 60529 is IP66/IP68.

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DXJ3

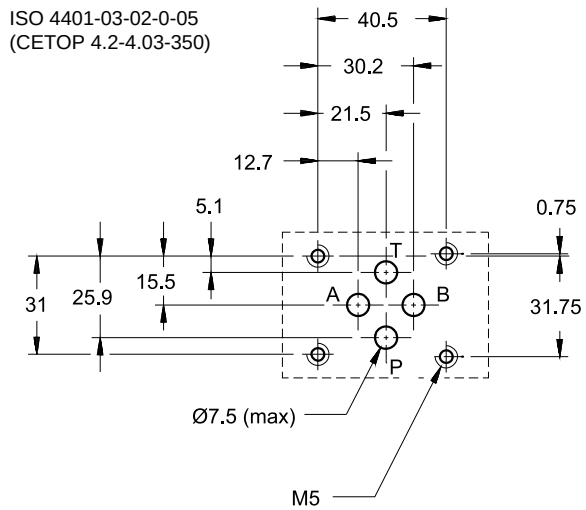
DIRECT DRIVE SERVOVALVE WITH INTEGRATED ELECTRONICS

SERIES 20

SUBPLATE MOUNTING ISO 4401-03

p max **350** bar
Q max see performance table

MOUNTING INTERFACE



OPERATING PRINCIPLE

— The DXJ3 valve is a four-port direct drive servo valve with integrated electronics. Its rotary-linear motor ensures high dynamic performance independent of system pressure.

— The advanced design minimises the overall dimensions without affecting the flow rate of the valve.

— DXJ3 valves are available in four flow rate control ranges up to 40 l/min, zero overlap spool and a mounting surface compliant with the ISO 4401-03 standards.

— They are suitable for control applications with closed loop of position, velocity and pressure.

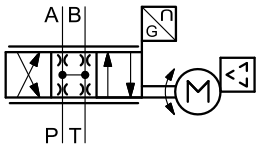
— In case of power loss or missing enable signal, the spool moves towards the center position. For applications requiring a safety function, an external cut-off solenoid valve must be installed.

PERFORMANCES

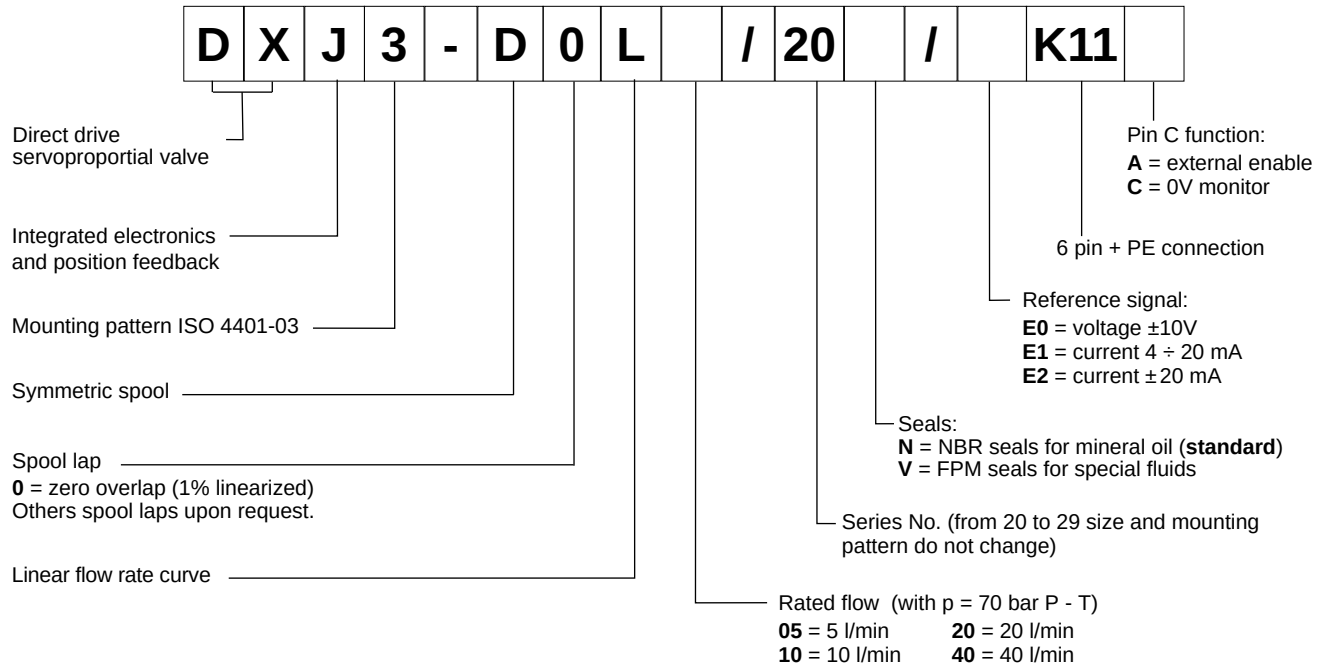
(with mineral oil of viscosity 32 cSt at 40 °C)

Maximum operating pressure Ports P - A - B Port T	bar	 350 250
Rated flow Q nom (with Δp 70 bar P - T)	l/min	5 - 10 - 20 - 40
Hysteresis	%	< 0.2
Threshold	%	< 0.05
Thermal drift (with ΔT= 40 °C)	%	< 1%
Response time (0 to 100%)	ms	≤ 12
Vibration on all axes	g	30
Ambient temperature range	°C	-20 / +60
Power consumption	W	< 5
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	5 ÷ 500
Fluid contamination degree	according to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass	kg	1

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

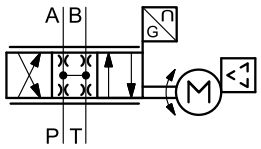


1.1 - Available versions

POWER OFF POSITION

When a power failure occurs, the spool moves towards the center position, but the position is not determined.

For applications requiring a safety function, an external cut-off solenoid valve must be installed.



	leakage flow according to ISO 10770-1 at 100 bar [l/min]
rated flow	center position
05	< 0,1
10	< 0,3
20	< 0,5
40	< 0,5

2 - ELECTRONICS DATA

Duty cycle		100% (continuous operation)
Protection class according to IEC EN 60529		IP65 (**NOTE 1**)
Supply voltage	V DC	24 (22 to 30 V DC)
Power consumption: max typical	A	5 >1
Fuse protection, external	A	(timed), max current 5A
Command signal: voltage (E0) current (E1) current (E2)	V DC mA mA	±10 (Impedance Ri = 200 kohm) 4 ÷ 20 (Impedance Ri = 392 ohm) (**NOTE 2**) ±20 (Impedance Ri = 392 ohm) (**NOTE 3**)
Output signal: voltage (E0) current (E1) current (E2)	 V DC mA mA	 ±10 (Impedance Ro > 750 ohm) 4 ÷ 20 (Impedance Ro < 650 ohm) (**NOTE 3**) ±20 (Impedance Ro < 650 ohm)
Enabling / disabling (Pin C function = A) (**NOTE 4)**: min / max voltage for drive enable min / max voltage for drive disable	V DC	 9 / 28 (Impedance Ri >10 kohm) 0 / 4 (Impedance Ri >10 kohm)
Connection		6 pin + PE (MIL-C-5015-G - DIN EN 175201-804)
Electromagnetic compatibility (EMC) emissions EN55011:1998+A1 immunity EN 61000-6-2		According to 2014/30/EU standards

NOTE 1: The IP degree is guaranteed only with mating connector of equivalent IP degree, installed and tightened correctly.

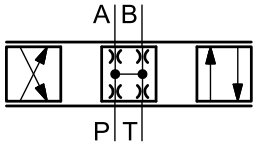
NOTE 2: Valves with a current command signal (E1, E2 versions) use a 0.1% tolerance shunt resistor to measure demand current.

NOTE 3: The value of the shunt resistor to measure output current should not exceed stated maximum value.

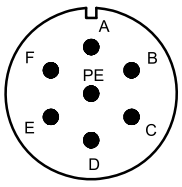
NOTE 4: This function is available only for codes ending with K11A. Valves with a code E1 command type can also be enabled or disabled using the command signal; see the corresponding table at point 2.2 for further details.

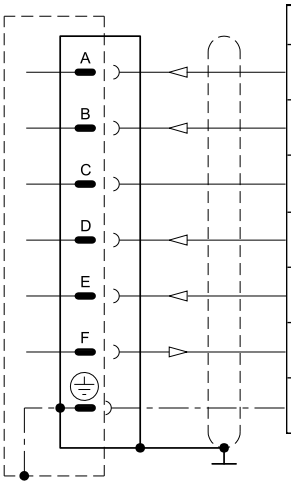
2.1 - Version with voltage command (E0)

The reference signal must be between -10 V and +10 V.



COMMAND	**-10 V**	**0V**	**+10 V**
MONITOR	**-10 V**	**0V**	**+10 V**



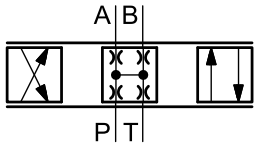


Pin	Values	A version	C version
A	24 V DC	Supply Voltage	
B	0 V		
C		Enable see table in point 2	PIN F reference 0 V
D	± 10 V	Command (differential input)	
E	0 V	Command reference	
F	± 10 V	Monitor signal (**NOTE 5**)	
PE	GND	Ground (Earth)	

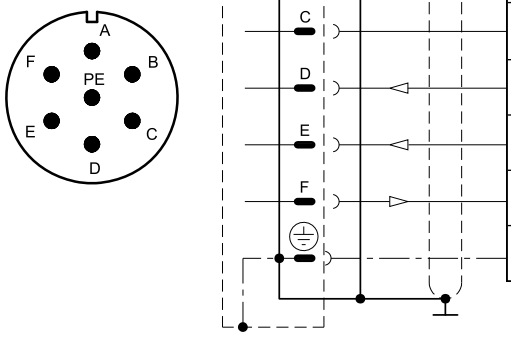
NOTE 5: The monitor signal is unaffected by variations resulting from null shift adjustment via the adjustment screw.

2.2 - Versions with current command (E1)

The reference signal is supplied in current 4 ÷ 20 mA. A current value in the range -20 ÷ 2 mA will disable the motor drive until a current inside the range 4÷ 20 mA is received at the command input.



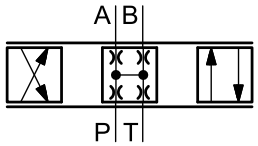
COMMAND	**4 mA**	**12 mA**	**20 mA**
MONITOR	**4 mA**	**12 mA**	**20 mA**



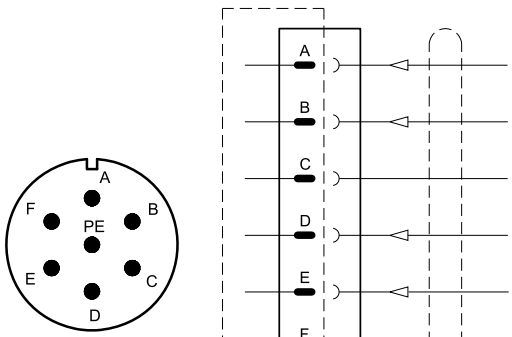
Pin	Values	A version	C version
A	24 V DC	Supply Voltage	
B	0 V		
C		Enable see table in point 2	PIN F reference 0 V
D	4 ÷ 20 mA	Command	
E	0 V	Command reference	
F	4 ÷ 20 mA	Monitor signal (**NOTE 5**, page 3)	
PE	GND	Ground (Earth)	

2.3 - Versions with current command (E2)

The reference signal is supplied in current -20 ÷ 20 mA.



COMMAND	**-20 mA**	**0 mA**	**20 mA**
MONITOR	**-20 mA**	**0 mA**	**20 mA**

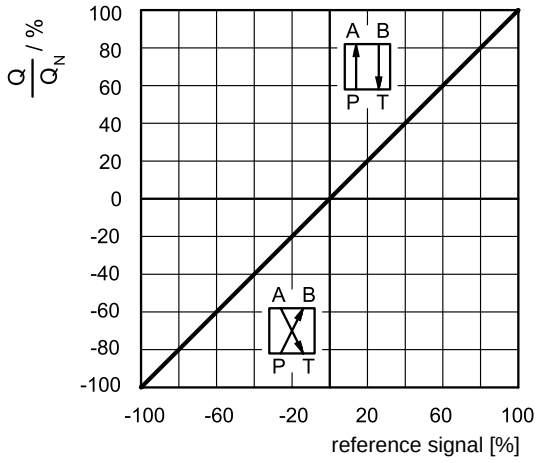


Pin	Values	version A	version C
A	24 V DC	Supply Voltage	
B	0 V		
C		Enable see table in point 2	PIN F reference 0 V
D	-20 ÷ 20 mA	Command	
E	0 V	Command reference	
F	-20 ÷ 20 mA	Monitor signal (**NOTE 5**, page 3)	
PE	GND	Ground (Earth)	

3 - CHARACTERISTIC CURVES

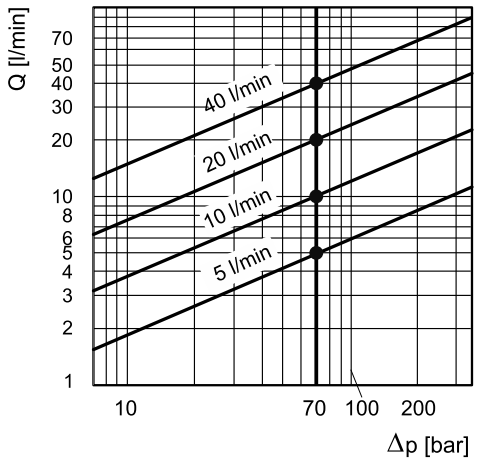
(measured with viscosity of 36 cSt at 50 °C)

REFERENCE / FLOW RATE CURVE



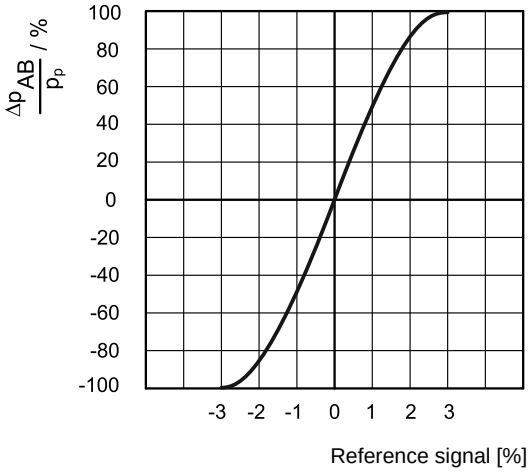
Typical flow rate curves at constant Δp = 70 bar P-T according to the reference signal.
NOTE: with positive reference signal connected to pin D the valve regulates P - A / B - T.

FLOW RATE CURVE ACCORDING TO Δp



The diagram states the maximum valve controlled flow rate according to the pressure drop between the P and T ports.

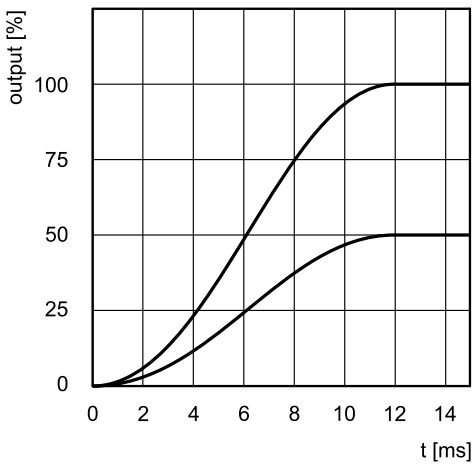
PRESSURE GAIN



The diagram states the valve pressure gain, expressed as % of the ratio between the port pressure variation in A or B (Δp AB) and the P system pressure, according to the reference signal.

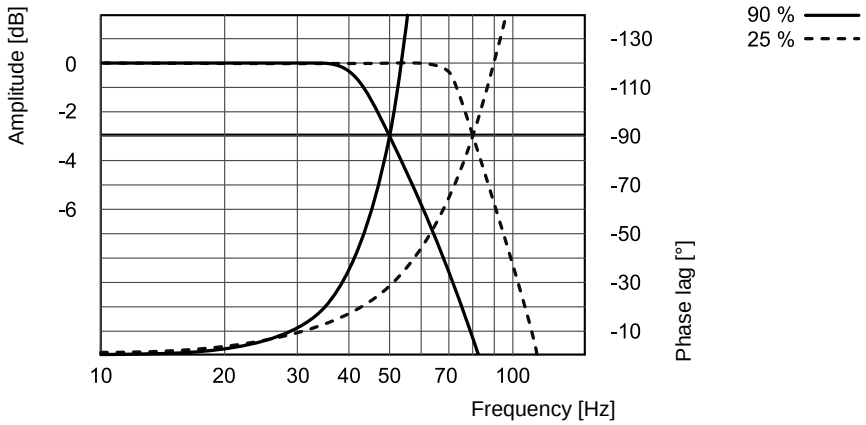
In practice, the pressure gain states the valve reaction to external disturbances aimed at changing the actuator position.

RESPONSE TIME



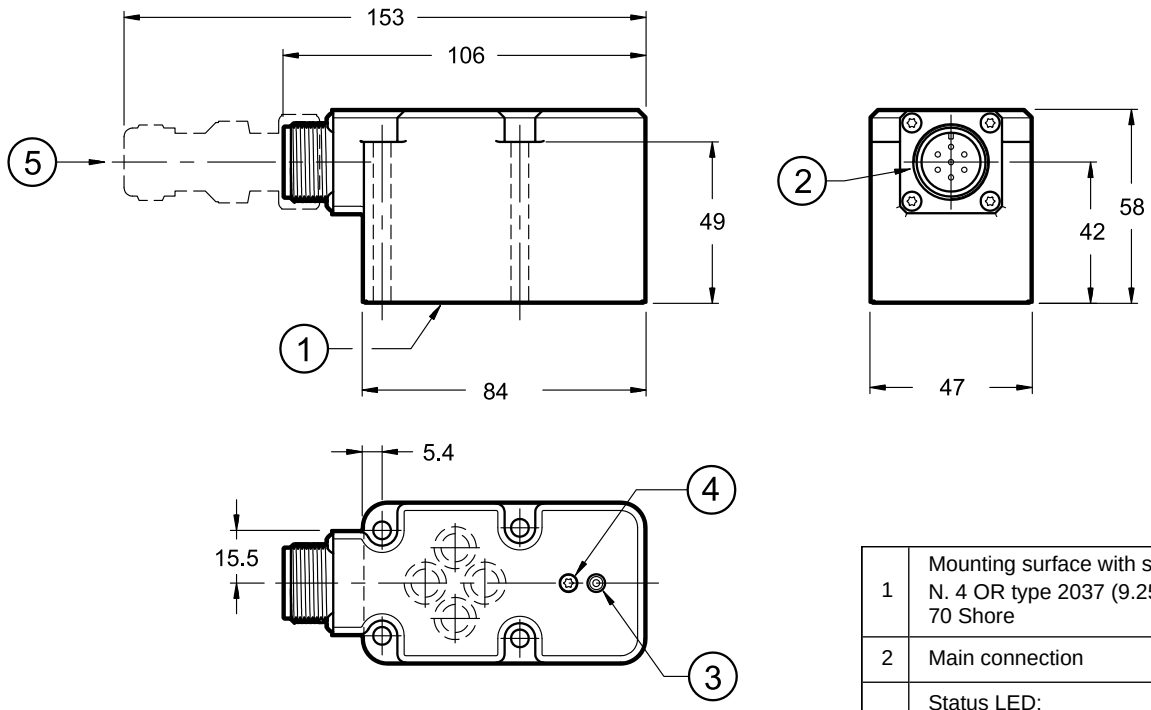
Δp = 70 bar

FREQUENCY RESPONSE



4 - DXJ3 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



Fastening bolts: 4 SHC screws M5x60
Torque: 7.5 Nm ±10% (A10.9)
Threads of mounting holes: M5x12

NOTE: The potentiometer's angular adjustment range is 270°; adjusting ±3% of the maximum flow.
Clockwise rotation to increase flow P→A
Counterclockwise rotation to increase flow P→B (**NOTE 5**, page 3)

Proceed with the adjustment gently. Excessive force may damage the potentiometer.

1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 70 Shore
2	Main connection
3	Status LED: Solid green: valve okay, drive On Solid red: valve okay, drive Off Flashing red: fault
4	Null adjustment: 1.7 mm (0.067 in.) cross-slot tool.
5	Mating connector 6 poles + PE, female type MIL-5015-G To be ordered separately. See catalogue 89 000

5 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

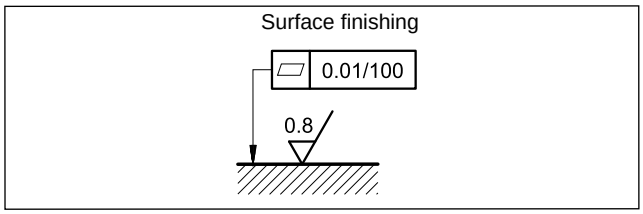
The fluid must be preserved in its physical and chemical characteristics.

6 - INSTALLATION

The valves can be installed in any position without impairing correct operation. Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols.

If minimum values are not observed, fluid can easily leak between the valve and support surface.

Take care to the cleanliness of the mounting surfaces and surrounding environment upon installation.



7 - ACCESSORIES

(to be ordered separately)

7.1 - Mating connector

Mating connector must be ordered separately. See catalogue 89 000.

The use of a metal connector is recommended to avoid electromagnetic disturbances and to ensure compliance with EMC regulations on electromagnetic compatibility. If a plastic connector is used, it must guarantee and maintain the IP rating and the EMC protection characteristics of the valve.

Duplomatic offers spare parts to be wired and also ready-to-use cord sets. Please refer to cat. 89 000.

7.2 - Connection cable

The optimal wiring provides for 7 isolated conductors, with separate screen for the signal wires (command, monitor) and an overall screen.

Cross section for power supply:
- up to 20 m cable length: 1.0 mm²
- up to 40 m cable length: 1.5 mm²

Cross section for signals (command, monitor):
- 0.50 mm²

8 - SUBPLATES

(see catalogue 51 000)

Type PMMD-AI3G ports on rear
Type PMMD-AL3G side ports
P, T, A, B port threading: 3/8” BSP

DUPLOMATIC MOTION SOLUTIONS
a member of DAIKIN group

DUPLOMATIC MS Spa
via Mario Re Depaolini, 24 | 20015 Parabiago (MI) | Italy
T +39 0331 895111 | E vendite.ita@duplomatic.com | sales.exp@duplomatic.com
duplomaticmotionsolutions.com

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DXE3J

HIGH RESPONSE SERVO-PROPORTIONAL VALVE WITH INTEGRATED ELECTRONICS

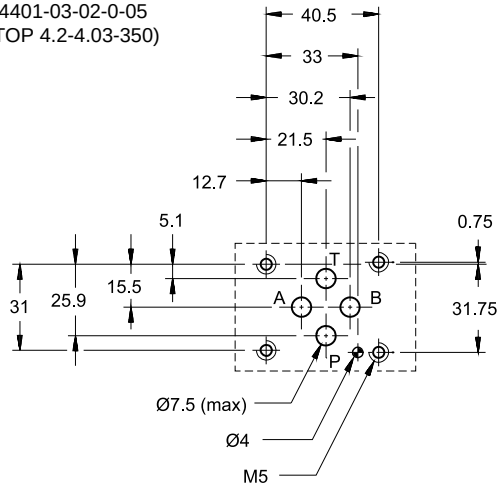
SERIES 31

SUBPLATE MOUNTING ISO 4401-03

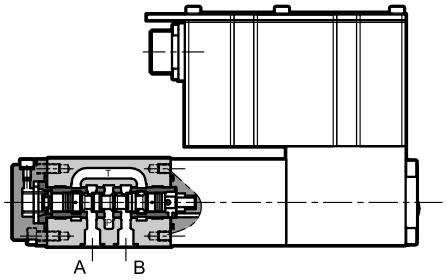
p max **350** bar
Q max **70** l/min

MOUNTING INTERFACE

ISO 4401-03-02-0-05
(CETOP 4.2-4.03-350)



OPERATING PRINCIPLE



— The DXE3J valve is a four-way (3 + fail-safe position) servo-proportional valve where the spool moves inside a sleeve. It is operated by a proportional solenoid highly dynamic, which achieves high performance and it not requires pilot pressure. The spool position is controlled by a linear transducer (LVDT) in closed loop which ensures high precision and repeatability.

— It is available in six different flow ranges up to 40 l/min, with spools with zero overlap.

— A version for potentially explosive atmospheres according to ATEX 2014/34/EU II 3GD is available.

— The valve is featured by integral electronic based on SMD technology which ensures standard regulations and simplifies the electric wiring. The unit doesn't require any adjustment other than the possible electronic regulation of the zero.

— Two types of integrated electronics are available, with analogue or fieldbus interfaces.

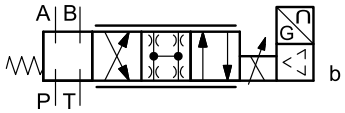
— Suitable for control applications with closed loop of position, velocity and pressure. With a power down or without the enable input, the spool moves itself at fail-safe position.

PERFORMANCES

(with mineral oil of viscosity 36 cSt at 50°C)

Maximum operating pressure Ports P - A - B Port T	bar	 350 250
Rated flow Q nom (with Δp 70 bar P - T)	l/min	1 - 2 - 5 - 10 - 20 - 40
Hysteresis	% In	< 0.2
Threshold	% In	< 0.1
Thermal drift (with ΔT= 40 °C)	% In	< 1.0
Response time (0-100%)	ms	≤ 10
Vibration on the three axes	g	30
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	5 ÷ 400
Fluid contamination degree	according to ISO 4406:1999 class 17/15/12 (16/14/11 for longer life)	
Recommended viscosity	cSt	25
Mass	kg	2.6

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

1.1 - Standard electronics

D	X	E	3	J		-	LZ			/	31		-		K11	

Servo-proportional valve with spool in sleeve

Electric proportional control

Size ISO 4401-03

Standard electronics for closed loop

K3 = Version for potentially explosive atmospheres compliant with ATEX 2014/34/EU II 3GD (p. 2).
Omit if not required.

Spool with linear flow rate curve and zero overlap, low leakage

Rated flow (with Δp = 70 bar P - T)
01 = 1 l/min **10** = 10 l/min
02 = 2 l/min **20** = 20 l/min
05 = 5 l/min **40** = 40 l/min

Fail safe type
F1 = closed centre
F3 = float
FC = cross centre

Series No.
(from 30 to 39 sizes and mounting dimensions remain unchanged)

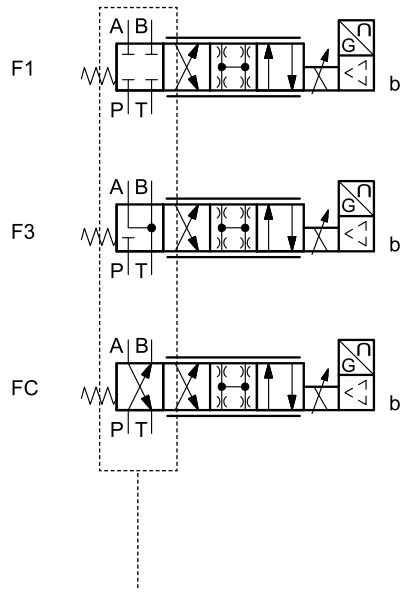
Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Command value:
E0 = voltage ±10 V
E1 = current 4 ÷ 20 mA

6 + PE pole connection

Pin C function:
A = external enable
B = internal enable
C = 0V monitor

1.2 - Available versions



leakage flow in fail safe position at 100 bar [cm³/min]		
F1	P → A	20
	P → B	30
	A → T	30
	B → T	30
F3	P → A	20
	P → B	30

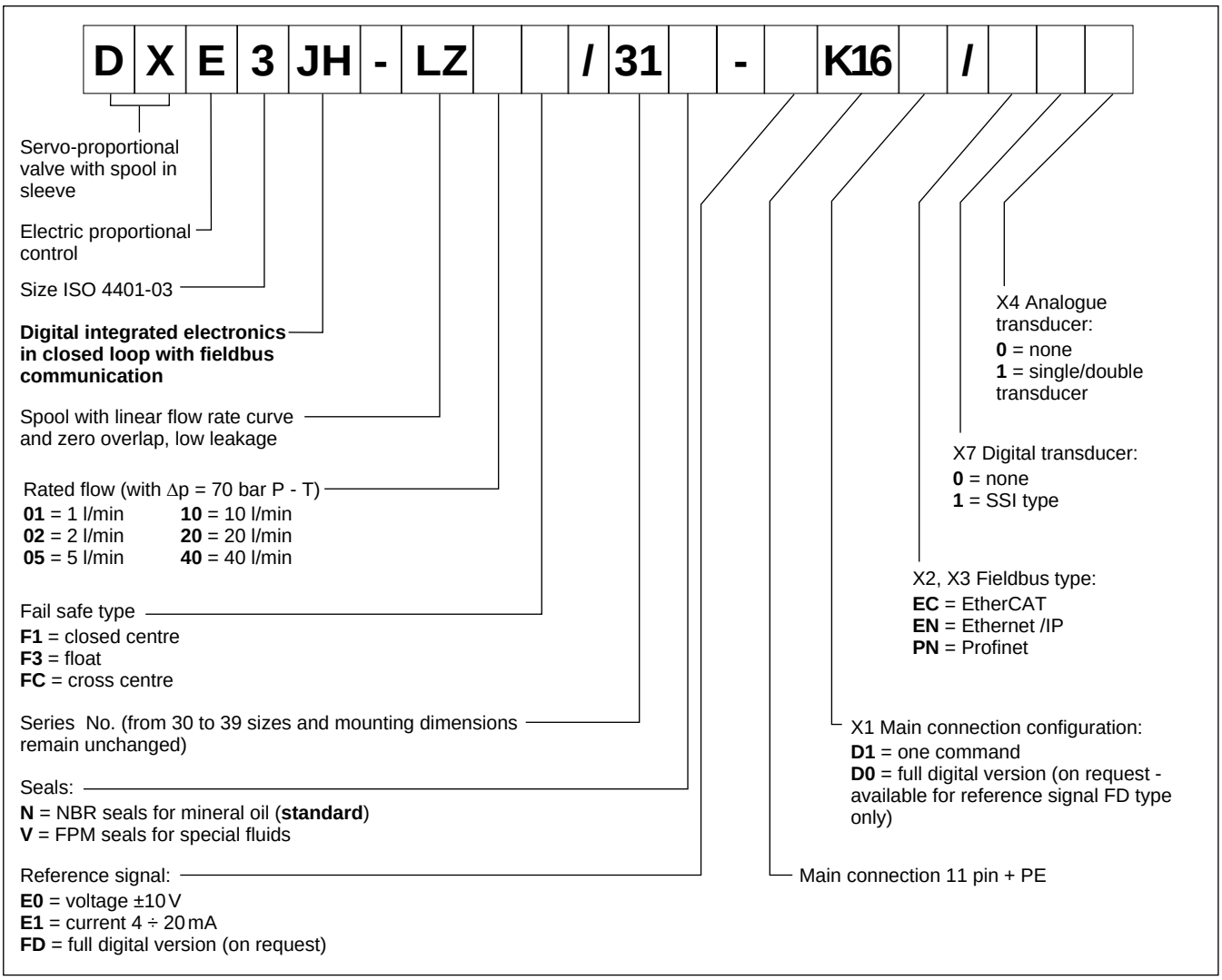
flow rate	fail safe type		
	F1	F3	FC
01	■	-	-
02	■	-	-
05	■	■	■
10	■	■	■
20	■	■	■
40	■	■	■

■ available - not available

FAIL SAFE POSITION

When a power failure occurs, the electronics de-energizes the solenoid and the spool will take the fail safe position by spring return.

1.3 - Electronics with fieldbus communication



2 - ATEX 2014/34/EU RATED VERSION

Valves suitable for use in potentially explosive atmospheres certified according to ATEX 2014/34/EU classified under ATEX II 3GD are now available.

The electrical and technical characteristics and dimensions of ATEX certified valves are identical to those of standard valves.

The supply is always delivered together with the ATEX declaration of conformity and the operating and maintenance user manual, where are described all the information for the proper use of valves in potentially explosive atmospheres.

TYPE EXAMINATION CERTIFICATE N°: **AR20ATEX046**

2.1 - Identification code

To order the ATEX-rated version, simply insert letters K3 in the initial part of the identification code. The description becomes DXE3JK3. Please use the identification code shown at p. 1.1 to order.

Example:

- DXE3J**K3**-LZ40F1/31N-E0K11A

2.2 - Classification

The valves DXE3JK3 are ATEX marked as below:

MARKING FOR GASES, VAPOURS AND MISTS:

 II 3G Ex ec IIC T4 Gc

EX: Specific marking of explosion protection as ATEX 2014/34/EU directive and related technical specification requests
II: Group II for surface plants
3: Category 3 normal protection, eligible for zone 2
G: for use in areas in which explosive atmospheres caused by gases, vapours, mists
Ex ec: "ec" protection type, increased safety
IIC: Gas group
(automatically eligible for group IIA and IIB)
T4: Temperature class (max surface temperature)
Gc: Protection level for electrical devices (EPL)
Equipment for explosive gas atmospheres, having an “enhanced’ level of protection, which is not a source of ignition in normal operation and which may have some additional protection to ensure that it remains inactive as an ignition source in the case of regular expected occurrences.

MARKING FOR DUSTS:

 II 3D Ex tc IIIC T135°C Dc

EX: Specific marking of explosion protection as ATEX 2014/34/EU directive and related technical specification requests
II: Group II for surface plants
3: Category 3 normal protection, eligible for zone 22
D: for use in areas in which explosive atmospheres are caused by explosive dusts
Ex tc: "tc" protection type, protected by enclosures
IIIC: Dusts group
(automatically eligible for group IIIA and IIIB)
T135°C: Temperature class (max surface temperature)
Dc: Protection level for electrical devices (EPL)
Equipment for explosive dust atmospheres, having an “enhanced’ level of protection, which is not a source of ignition in normal operation and which may have some additional protection to ensure that it remains inactive as an ignition source in the case of regular expected occurrences.

2.3 - IP protection degree

The IP protection degree of the valve is IP66/IP68 according to IEC EN 60529.

NOTE: the test carried out to reach IP68 is: duration 1 h, depth 1 m.

The IP degree is guaranteed only with mating connector of equivalent IP degree, installed and tightened correctly.

2.4 - Operating temperatures

The operating ambient temperature must be between -20 °C and +60 °C.

The fluid temperature must be between -20 °C and +80 °C.

The valves are T4 (T135 °C) class temperature classified, so they are eligible for operation also at higher class temperature (T3, T2, T1 (T200 °C).

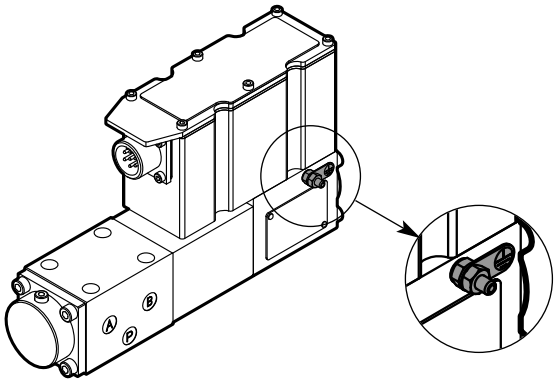
2.5 - Connectors

The connector is not supplied with the valve, but can be ordered separately. **The connector must be suitable for the intended conditions of use.**

Duplomatic can provide 7-pin connectors to wire, metal type, suitable for use with DXE3JK3 valves (see catalogue 89 000, connectors type EX7S).

2.6 - Grounding points

The ATEX certified valves are supplied with a grounding point with M4 screw.



The grounding point must always be wired with the general earthing system by means of a suitable conductive line.

3 - ELECTRONICS COMMON DATA

Duty cycle		100% (continuous operation)
Protection class according to IEC EN 60529		IP66/IP68 (**NOTE**)
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	35
Maximum solenoid current	A	2.6
Fuse protection, external	A	(fast), max current 4A
Managed breakdowns		Overload and electronics overheating, LVDT sensor error, cable breakdown, supply voltage failures
Electromagnetic compatibility (EMC) emissions EN 61000-6-4, immunity EN 61000-6-2		According to 2014/30/EU standards

NOTE: The IP degree is guaranteed only with mating connector of equivalent IP degree, installed and tightened correctly. Furthermore, on the JH versions it is necessary to protect any unused connections with caps. The test carried out to reach IP68 is: duration 1 h, depth 1 m.

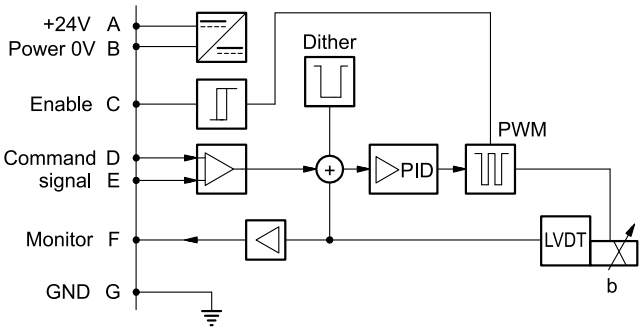
4 - DXE3J - STANDARD ELECTRONICS

4.1 - Electrical characteristics

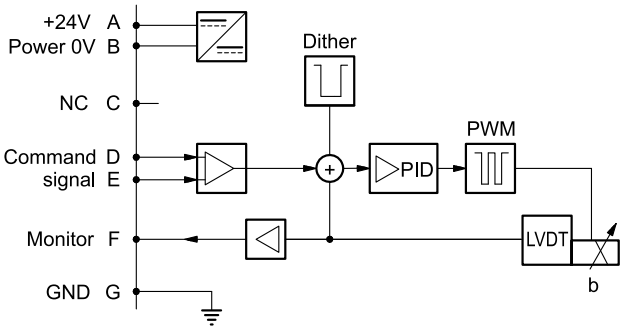
Command signal: voltage (E0) current (E1)	V DC mA	±10 (Impedance Ri = 11 kohm) 4 ÷ 20 (Impedance Ri = 58 ohm)
Monitor signal (current to solenoid): voltage (E0) current (E1)	 V DC mA	 ±10 (Impedance Ro > 1 kohm) 4 ÷ 20 (Impedance Ro = 500 ohm)
Communication for diagnostic		LIN-bus Interface (by means of the optional kit)
Connection		6 pin + PE (MIL-C-5015-G - DIN EN 175201-804)

4.2 - On-board electronics diagrams

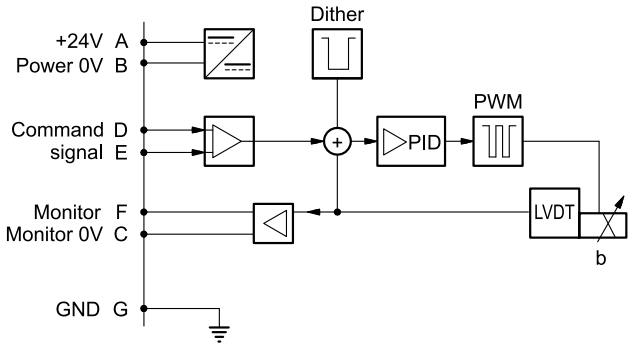
VERSION A - External Enable



VERSION B - Internal Enable

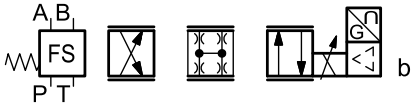


VERSION C - 0V Monitor

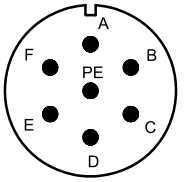


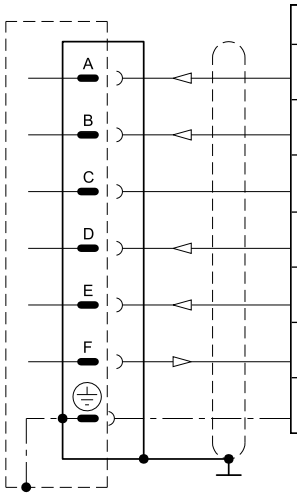
4.3 - Version with voltage command (E0)

The reference signal must be between -10V and +10V. The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**-10V**	**0V**	**+10V**
MONITOR	**-10V**	**0V**	**+10V**



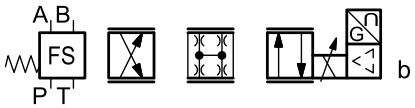


Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	± 10 V	Command (differential input)		
E	0 V	Command reference		
F	± 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

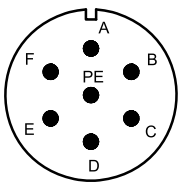
4.4 - Versions with current command (E1)

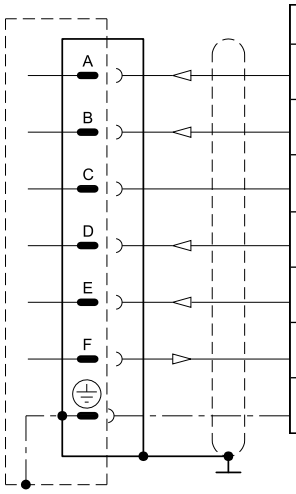
The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower, the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**4 mA**	**12 mA**	**20 mA**
MONITOR	**4 mA**	**12 mA**	**20 mA**





Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	Command reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

5 - DXE3JH - FIELDBUS ELECTRONICS

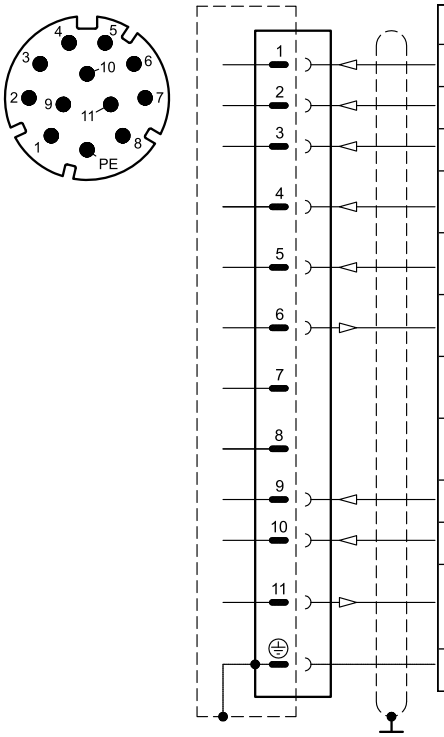
The 11+ PE pin connection allows separate supply voltage for electronics and solenoid.

Command - valve position schemes as for the standard electronics. Please refer to pictures in p. 4.3 and 4.4.

5.1 - Electrical characteristics

Command signal: voltage (E0) current (E1) digital (FD)	 V DC mA	 ±10 (Impedance Ri = 11 kohm) 4 ÷ 20 (Impedance Ri = 58 ohm) via fieldbus
Monitor signal (current to solenoid): voltage (E0) current (E1)	 V DC mA	 ±10 (Impedance Ro > 1 kohm) 4 ÷ 20 (Impedance Ro = 500 ohm)
Communication / diagnostic		via Bus register
Communication interface standards		IEC 61158
Communication physical layer		fast ethernet, insulated 100 Base TX
Power connection		11 pin + PE (DIN 43651)

5.2 - X1 Main connection pin table



D1: one command

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	± 10 V (E0) 4 ÷ 20 (E1)	Command
5	0 V	Command reference signal
6	± 10 V (E0) 4 ÷ 20 (E1)	Monitor (0V reference pin 10)
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V reference pin 2)
12	GND	Ground (Earth)

D0: full digital

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	NC	do not connect
5	NC	do not connect
6	NC	do not connect
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V ref. pin 2)
12	GND	Ground (Earth)

5.3 - FIELDBUS connections

Please wire following guidelines provided by the related standards communication protocol. Any connections present and not used must be protected with special caps so as not to nullify the protection against atmospheric agents.

X2 (IN) connection M12 D 4 pin female



Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

X3 (OUT) connection: M12 D 4 pin female

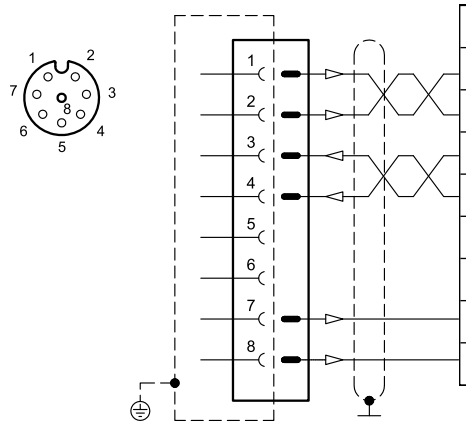


Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

NOTE: Shield connection on connector housing is recommended.

5.4 - Digital transducer connection
X7 connection: M12 A 8 pin female

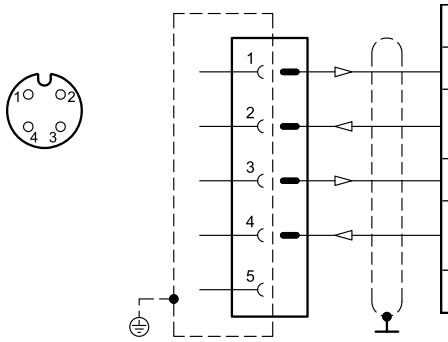
VERSION 1: SSI type



Pin	SSI Values	Function	Notes
1	CLK+	Serial synchronous clock (+)	Input - digital signal
2	CLK-	Serial synchronous clock (-)	
3	MIS0+	Serial position data (+)	
4	MIS0-	Serial position data (-)	
5	NC	-	do not connect
6	NC	-	
7	+24 V	transducer power supply	Output power supply
8	0 V	-	Common GND

5.5 - Analogue transducer connection
X4 connection: M12 A 4 pin female

VERSION 1: single / double transducer
(single or double is a software-selectable option)

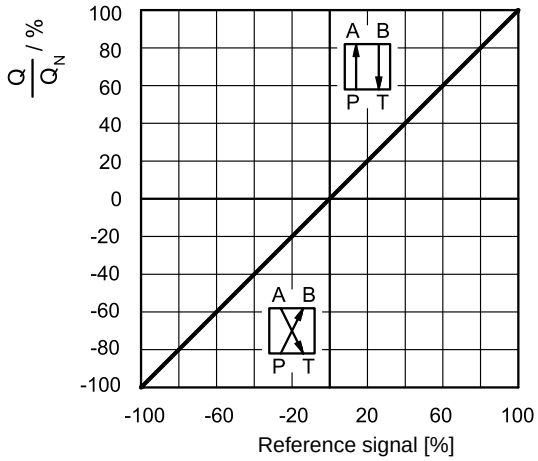


Pin	Values	Notes
1	+24 V	Remote transducer power supply (out) 100 mA
2	±10 V 4 ÷20 mA	Input signal of transducer 1 (range software selectable)
3	0 V	Common reference signal for transducer power and signals
4	±10 V 4 ÷20 mA	Input signal of transducer 2 (range software selectable)
5	-	

6 - CHARACTERISTIC CURVES

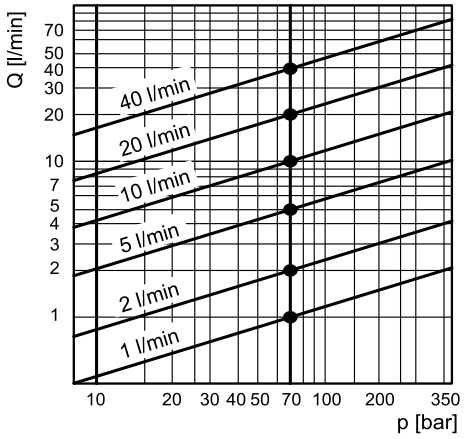
(measured with viscosity of 36 cSt at 50°C)

REFERENCE / FLOW RATE CURVE



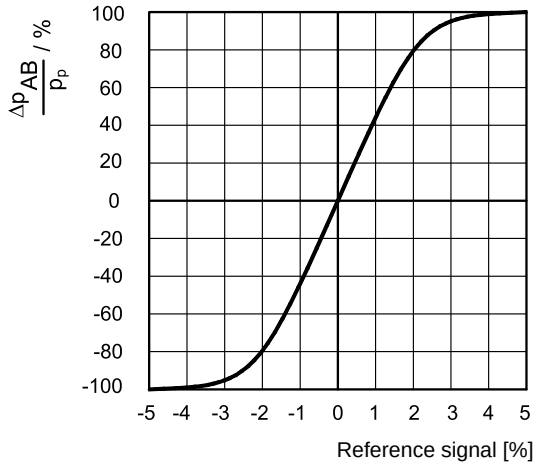
Typical flow rate curves at constant Δp = 70 bar P-T according to the reference signal.
NOTE: with positive reference signal connected to pin D the valve regulates P - A / B - T.

FLOW RATE CURVE ACCORDING TO Δp



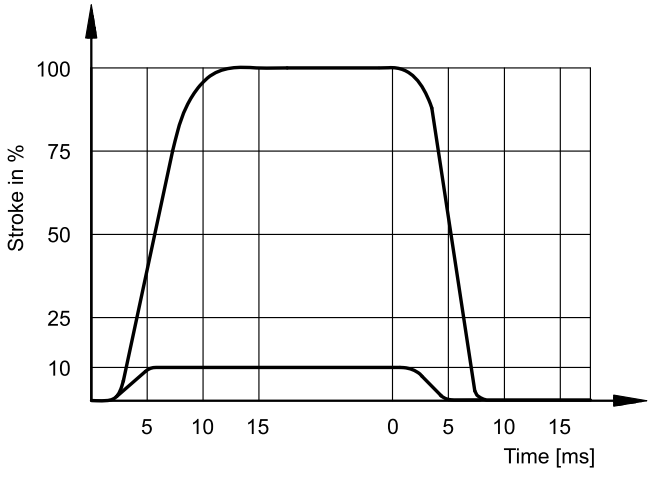
The diagram states the maximum valve controlled flow rate according to the pressure drop between the P and T ports.

PRESSURE GAIN

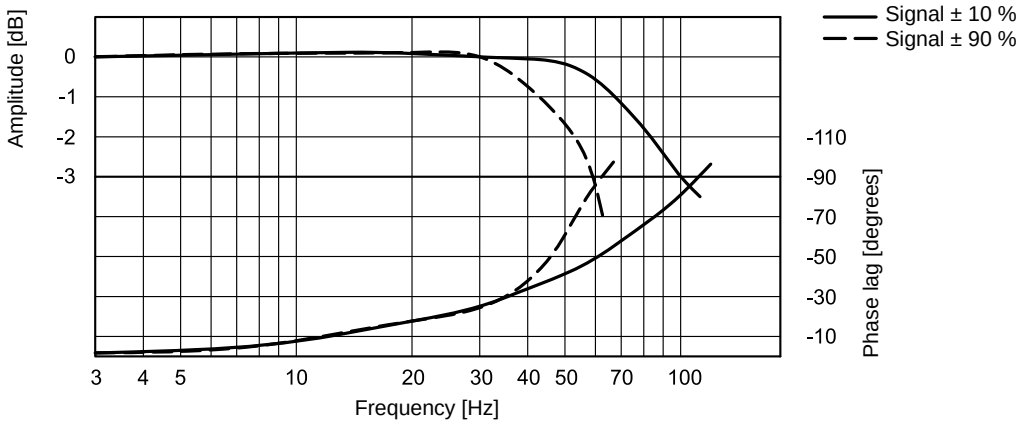


The diagram shows the valve pressure gain, expressed as % of the ratio between the port pressure variation in A or B (Δp AB) and the P system pressure, according to the reference signal. In practice, the pressure gain states the valve reaction towards external disturbances aimed at changing the actuator position.

RESPONSE TIME

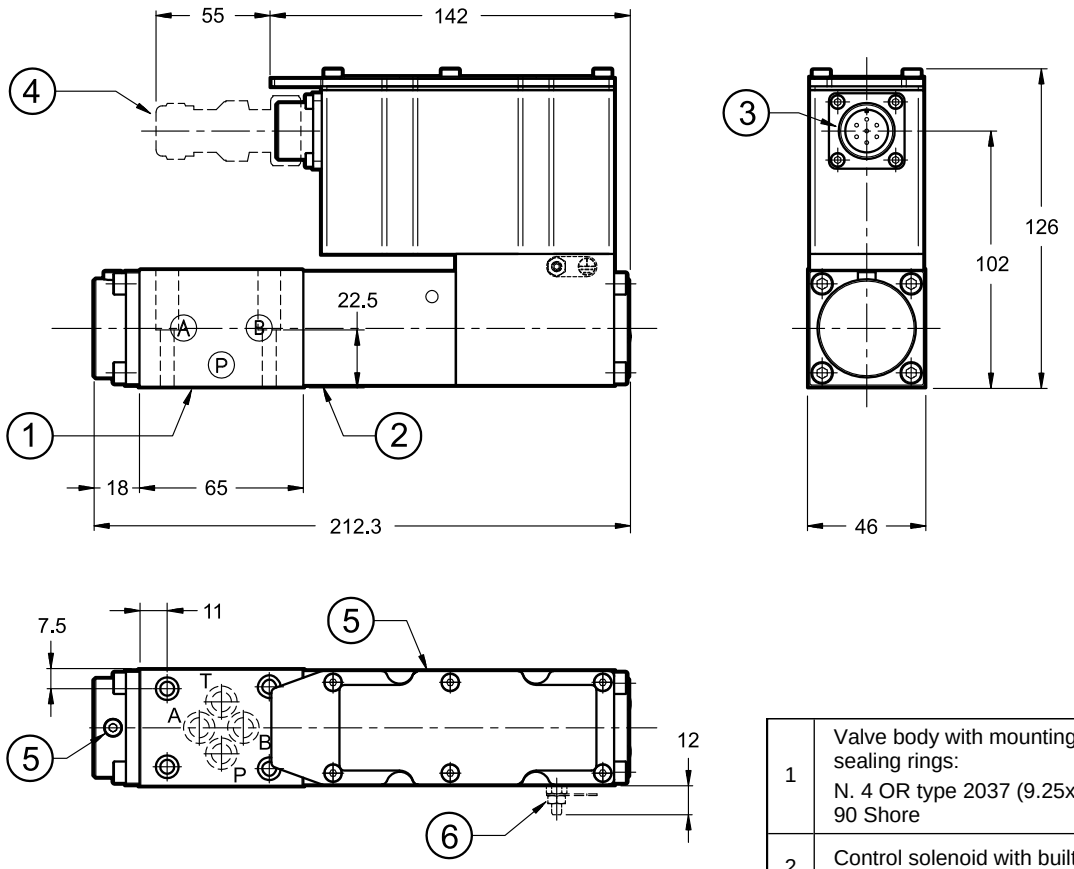


FREQUENCY RESPONSE



7 - DXE3J - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



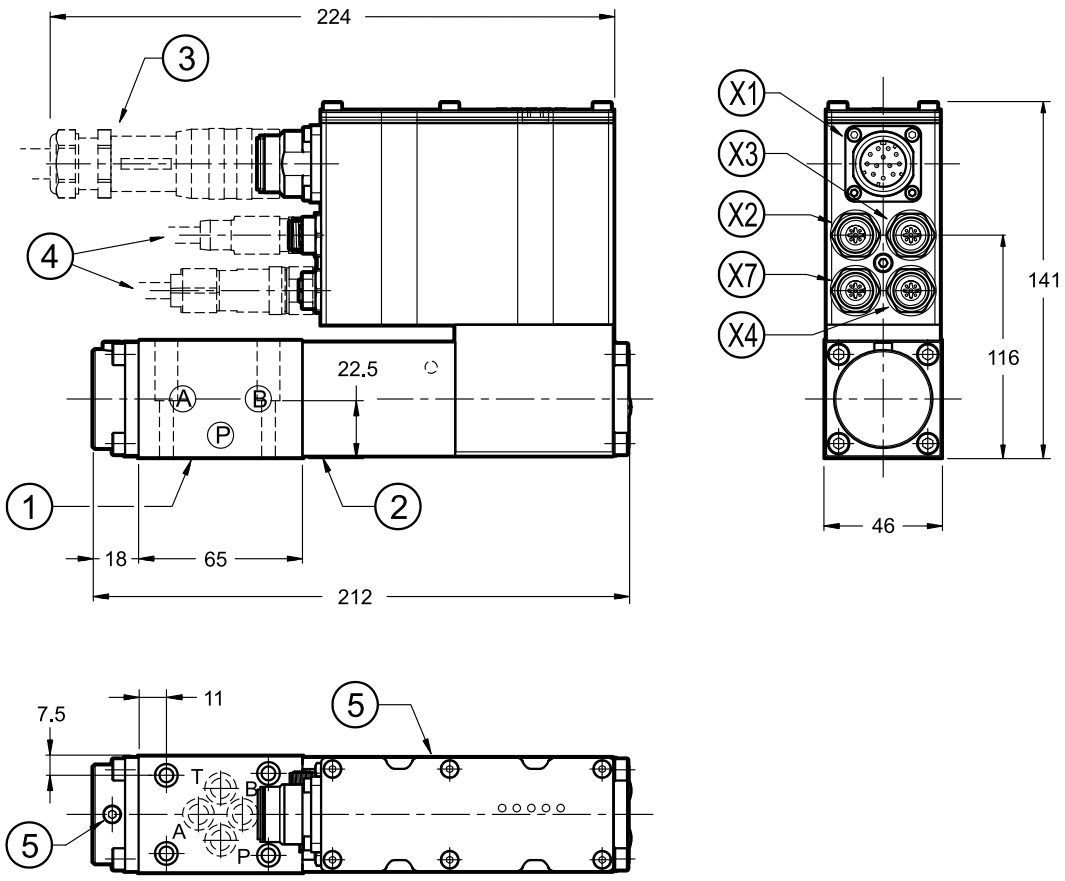
1	Valve body with mounting surface sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Control solenoid with built-in position transducer
3	Main connection
4	Mating connector 6 poles + PE, female type MIL-5015-G **To be ordered separately.** See catalogue 89 000
5	Air breather. Sealed at the factory (**NOTE**)
6	DXE3JK3 only: grounding point

Fastening bolts: 4 SHC screws M5x30
Torque: 5 Nm ±10% (A8.8)
Threads of mounting holes: M5x10

NOTE: The valve is filled with mineral oil during testing, therefore the breather should not be used without specific authorization. Breaking the seals can cause the loss of the guarantee.

8 - DXE3JH - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



X1	Main connection 11 pin + PE
X2	Fieldbus communication (IN)
X3	Fieldbus communication (OUT)
X4	X4 connection for analogue transducer
X7	X7 connection for digital transducer

1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Control solenoid with built-in position transducer
3	Mating connector 11 poles + PE **To be ordered separately.** See catalogue 89 000
4	Mating connectors for fieldbus communication and signals **To be ordered separately.** See catalogue 89 000
5	Air breather. Sealed at the factory (**NOTE 2**)

NOTE 1: Depending on the chosen version, X4 and X7 connections may not be present.
Please refer to section 5 for connection descriptions and pinout.

NOTE 2: The valve is filled with mineral oil during testing, therefore the breather should not be used without specific authorization. Breaking the seals can cause the loss of the guarantee.

Fastening bolts: 4 SHC screws M5x30
Torque: 5 Nm ±10% (A8.8)
Threads of mounting holes: M5x10

9 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

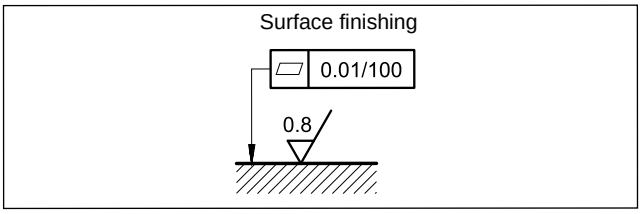
The fluid must be preserved in its physical and chemical characteristics.

10 - INSTALLATION

The valves can be installed in any position without impairing correct operation. Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols.

If minimum values are not observed, fluid can easily leaks between the valve and support surface.

Take care to the cleanliness of the mounting surfaces and surrounding environment upon installation.



11 - ACCESSORIES

(to be ordered separately)

11.1 - Mating connectors

Mating connectors must be ordered separately. See catalogue 89 000.

We recommend the choice of a metal connector to avoid electromagnetic disturbances and to comply with EMC regulations on electromagnetic compatibility. If you opt for a plastic connector, make sure that it guarantees and maintains the IP and EMC protection characteristics of the valve.

11.2 - Mating connectors and caps for fieldbus communication and for sensors.

Duplomatic offers spare parts to be wired and also ready-to-use cord sets. Please refer to cat. 89 000.

11.3 - Connection cable

The optimal wiring provides for 7 isolated conductors, with separate screen for the signal wires (command, monitor) and an overall screen.

Cross section for power supply:
- up to 20 m cable length : 1,0 mm²
- up to 40 m cable length : 1,5 mm²

Cross section for signals (command, monitor):
- 0,50 mm²

11.4 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic. See catalogue 89 850.

12 - SUBPLATES

(see catalogue 51 000)

PMMD-AI3G rear ports
PMMD-AL3G side ports
Ports dimensions: P, T, A, B: 3/8” BSP

DUPLOMATIC MOTION SOLUTIONS
a member of DAIKIN group

DUPLOMATIC MS Spa
via Mario Re Depaolini, 24 | 20015 Parabiago (MI) | Italy
T +39 0331 895111 | E vendite.ita@duplomatic.com | sales.exp@duplomatic.com
duplomaticmotionsolutions.com

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DXJ5

DIRECT DRIVE SERVOVALVE WITH INTEGRATED ELECTRONICS

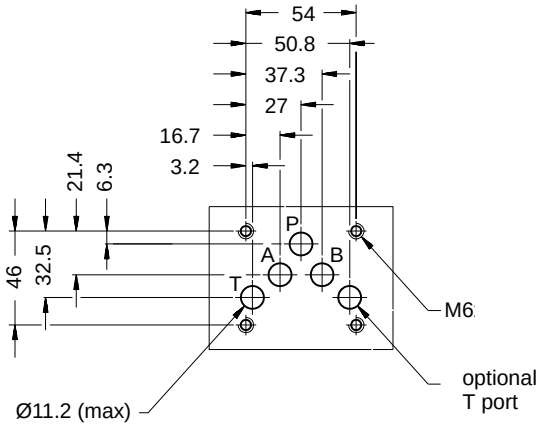
SERIES 20

SUBPLATE MOUNTING ISO 4401-05

p max **350** bar
Q max **200** l/min

MOUNTING INTERFACE

ISO 4401-05-04-0-05
(CETOP 4.2-4-05-350)



OPERATING PRINCIPLE

— The DXJ5 valve is a four-port direct drive servo valve with integrated electronics. Its rotary-linear motor ensures high dynamic performance independent of system pressure.

— The advanced design minimises the overall dimensions without affecting the flow rate of the valve.

— DXJ5 valves are available in three flow rate control ranges up to 160 l/min, zero overlap spool and a mounting surface compliant with the ISO 4401-05 standards.

— They are suitable for control applications with closed loop of position, velocity and pressure.

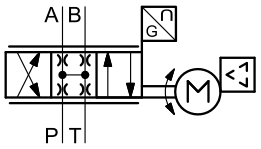
— In case of power loss or missing enable signal, the spool moves towards the center position. For applications requiring a safety function, an external cut-off solenoid valve must be installed.

PERFORMANCES

(with mineral oil of viscosity 36 cSt at 50 °C)

Maximum operating pressure Ports P - A - B Port T	bar	 350 250
Rated flow Q nom (with Δp 70 bar P - T)	l/min	60 - 100 - 160
Hysteresis	%	< 0.2
Threshold	%	< 0.1
Thermal drift (with ΔT = 40 °C)	%	< 1.0
Response time (0 to 100%)	ms	≤ 20
Vibration on 3 axes	g	30
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	5 ÷ 500
Fluid contamination degree	according to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass	kg	4.2

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

D	X	J	5	-	D	0	L		/	20		/		K11	

Direct drive servo-proportional valve

Integrated electronics and position feedback

Mounting pattern ISO 4401-05

Symmetric spool

Spool lap :
0 = zero overlap (1% linearized)
Others spool laps upon request.

Linear flow rate curve

Rated flow (with Δp = 70 bar P > T)
060 = 60 l/min
100 = 100 l/min
160 = 160 l/min

Series No. (from 20 to 29 size and mounting pattern do not change)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Reference signal:
E0 = voltage ±10V
E1 = current 4 ÷ 20 mA
E2 = current ±20 mA

6 pin + PE connection

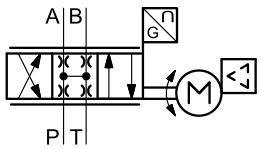
Pin C function:
A = external enable
C = 0V monitor

1.1 - Available versions

POWER OFF POSITION

When a power failure occurs, the spool moves towards the center position, but the position is not determined.

For applications requiring a safety function, an external cut-off solenoid valve must be installed.



	leakage flow according to ISO 10770-1 at 100 bar [l/min]
rated flow	center position
060	< 1
100	< 1
160	< 2

2 - ELECTRONICS DATA

Duty cycle		100% (continuous operation)
Protection class according to IEC EN 60529		IP65 (**NOTE 1**)
Supply voltage	V DC	24 (22 to 30 V DC)
Power consumption: max typical	A	5 >1
Fuse protection, external	A	(timed), max current 5A
Command signal: voltage (E0) current (E1) current (E2)	 V DC mA mA	 ±10 (Impedance Ri < 200 kohm) 4 ÷ 20 (Impedance Ri = 499 ohm) (**NOTE 2**) ±20 (Impedance Ri = 392 kohm) (**NOTE 3**)
Monitor signal (spool travel): voltage (E0) current (E1) current (E2)	 V DC mA mA	 ±10 (Impedance Ro > 750 ohm) 4 ÷ 20 (Impedance Ro < 650 ohm) (**NOTE 3**) ±20 (Impedance Ro < 650 ohm)
Enabling / disabling (Pin C function = A) (**NOTE 4**): min / max voltage for drive enable min / max voltage for drive disable	V DC	 9 / 60 (Impedance Ri <30 kohm) 0 / 4 (Impedance Ri <30 kohm)
Connection		6 pin + PE (MIL-C-5015-G - DIN EN 175201-804)
Electromagnetic compatibility (EMC) emissions EN55011:1998+A1 immunity EN 61000-6-2		According to 2014/30/EU standards

NOTE 1: The IP degree is guaranteed only with mating connector of equivalent IP degree, installed and tightened correctly.

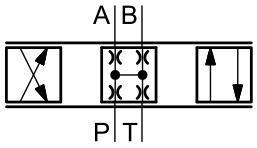
NOTE 2: Valves with a current command signal (E1, E2 versions) use a 0.1% tolerance shunt resistor to measure demand current.

NOTE 3: The value of the shunt resistor to measure output current should not exceed stated maximum value.

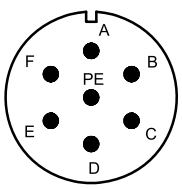
NOTE 4: This function is available only for codes ending with K11A. Valves with a code E1 command type can also be enabled or disabled using the command signal; see the corresponding table at point 2.2 for further details.

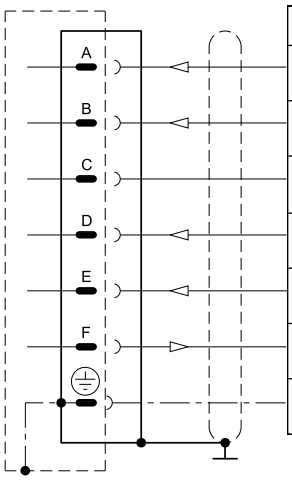
2.1 - Version with voltage command (E0)

The reference signal must be between -10 V and +10 V.



COMMAND	**-10 V**	**0V**	**+10 V**
MONITOR	**-10 V**	**0V**	**+10 V**



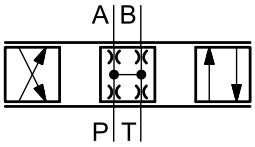


Pin	Values	A version	C version
A	24 V DC	Supply Voltage	
B	0 V		
C		Enable see table in point 2	PIN F reference 0 V
D	± 10 V	Command (differential input)	
E	0 V	Command reference	
F	± 10 V	Monitor signal (**NOTE 5**)	
PE	GND	Ground (Earth)	

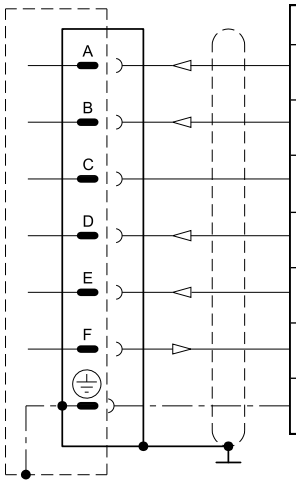
NOTE 5: The monitor signal is unaffected by variations resulting from null shift adjustment via the adjustment screw.

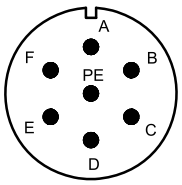
2.2 - Versions with current command (E1)

The reference signal is supplied in current 4 ÷ 20 mA. A current value in the range -20 ÷ 2 mA will disable the motor drive until a current inside the range 4÷ 20 mA is received at the command input.



COMMAND **4 mA** **12 mA** **20 mA**
MONITOR **4 mA** **12 mA** **20 mA**

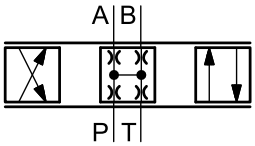




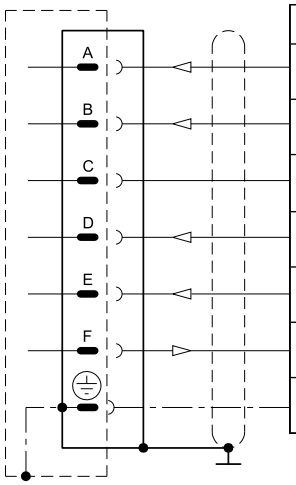
Pin	Values	A version	C version
A	24 V DC	Supply Voltage	
B	0 V		
C		Enable see table in point 2	PIN F reference 0 V
D	4 ÷ 20 mA	Command	
E	0 V	Command reference	
F	4 ÷ 20 mA	Monitor signal (**NOTE 5**, page 3)	
PE	GND	Ground (Earth)	

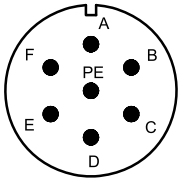
2.3 - Versions with current command (E2)

The reference signal is supplied in current -20 ÷ 20 mA.



COMMAND **-20 mA** **0 mA** **20 mA**
MONITOR **-20 mA** **0 mA** **20 mA**



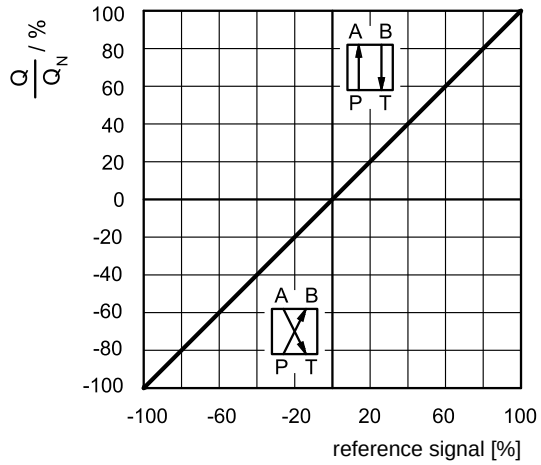


Pin	Values	version A	version C
A	24 V DC	Supply Voltage	
B	0 V		
C		Enable see table in point 2	PIN F reference 0 V
D	-20 ÷ 20 mA	Command	
E	0 V	Command reference	
F	-20 ÷ 20 mA	Monitor signal (**NOTE 5**, page 3)	
PE	GND	Ground (Earth)	

3 - CHARACTERISTIC CURVES

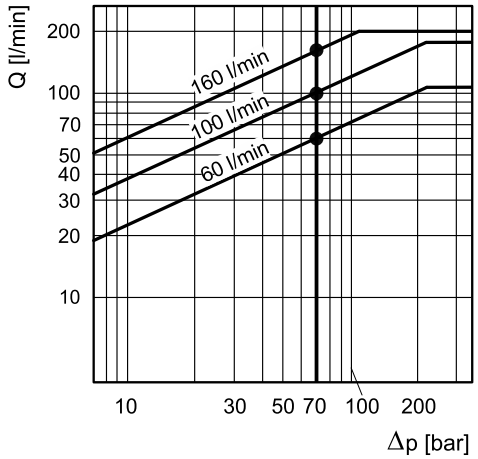
(measured with viscosity of 36 cSt at 50 °C)

REFERENCE / FLOW RATE CURVE



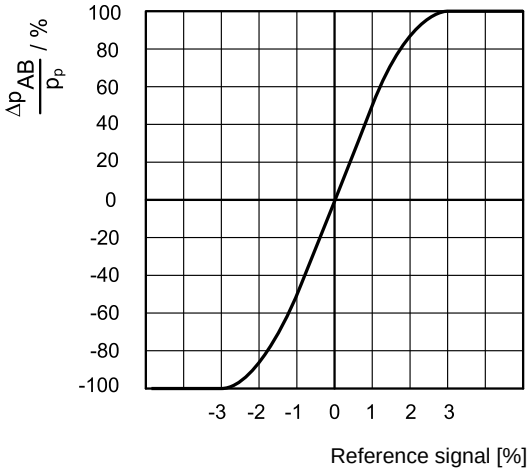
Typical flow rate curves at constant Δp = 70 bar P-T according to the reference signal.
NOTE: with positive reference signal connected to pin D the valve regulates P - A / B - T.

FLOW RATE CURVE ACCORDING TO Δp



The diagram states the maximum valve controlled flow rate according to the pressure drop between the P and T ports.

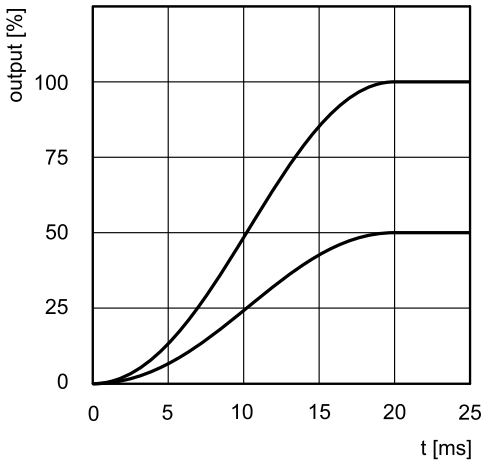
PRESSURE GAIN



The diagram states the valve pressure gain, expressed as % of the ratio between the port pressure variation in A or B (Δp AB) and the P system pressure, according to the reference signal.

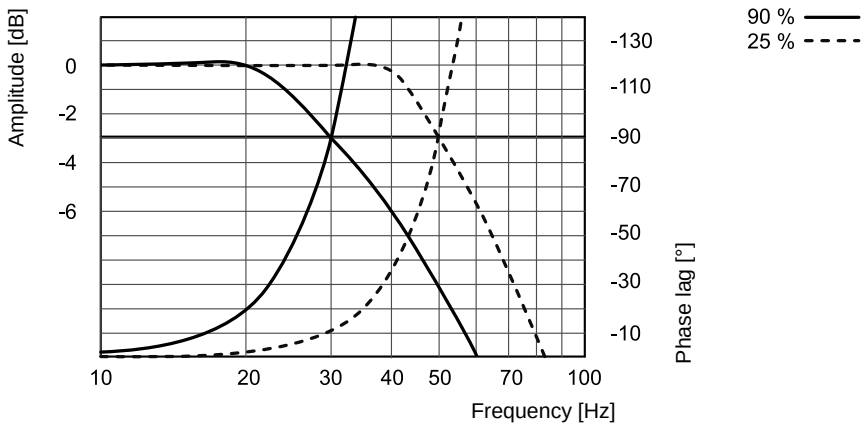
In practice, the pressure gain states the valve reaction towards external disturbances aimed at changing the actuator position.

RESPONSE TIME



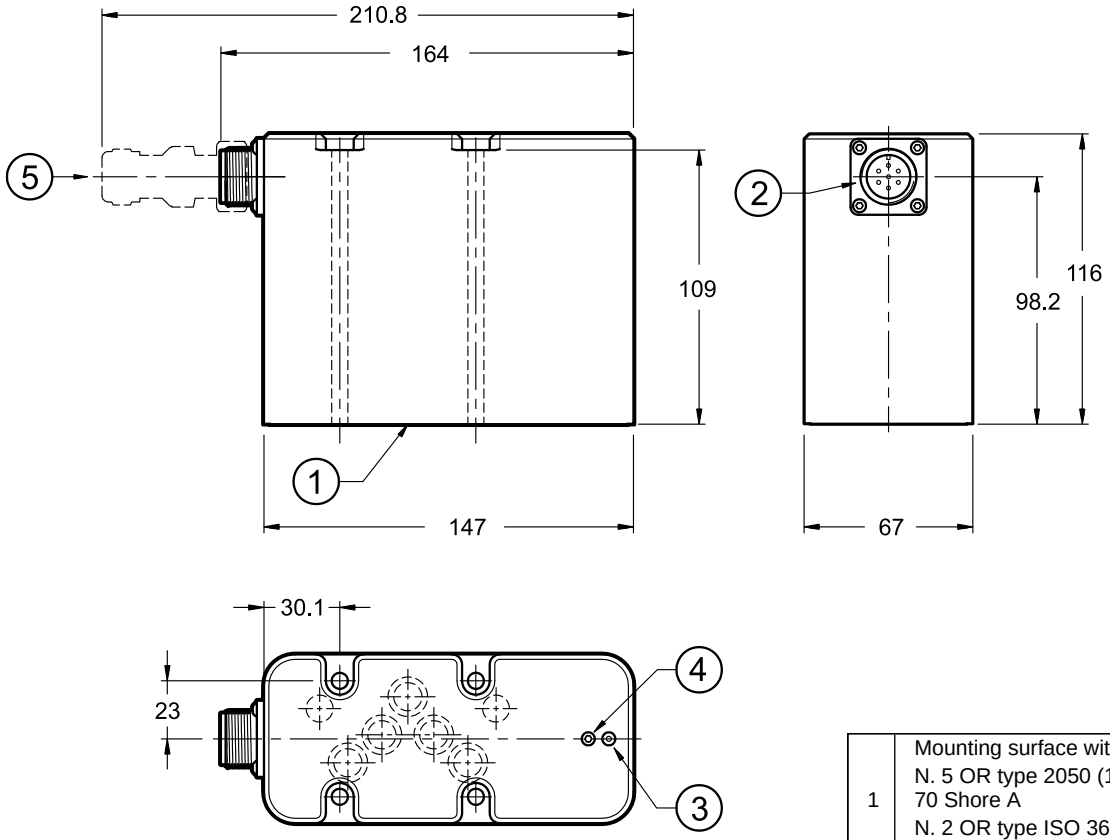
Δp = 70 bar

FREQUENCY RESPONSE



4 - DXJ5 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



Fastening bolts: 4 SHC screws M6x120
Torque: 13 Nm ±10% (A10.9)
Threads of mounting holes: M6x12

NOTE 1: Valve includes seal grooves for X and Y ports, for installation in existing systems – X and Y connections are NOT required for valve operation.

NOTE 2: The potentiometer's angular adjustment range is 270°; adjusting ±3% of the maximum flow.
Clockwise rotation to increase flow P→A
Counterclockwise rotation to increase flow P→B (**NOTE 5**, page 3)

Proceed with the adjustment gently. Excessive force may damage the potentiometer.

1	Mounting surface with sealing rings: N. 5 OR type 2050 (12.42 x 1.78) 70 Shore A N. 2 OR type ISO 3601-1-011 (7.65 x 1.78) 70 Shore A (**NOTE 1**)
2	Main connection
3	Status LED: Solid Green: valve okay, drive On Solid Red: valve okay, drive Off Flashing red: fault
4	Null adjustment: 1.7 mm (0.067 in.) cross-slot tool.
5	Mating connector 6 poles + PE, female type MIL-5015-G To be ordered separately. See catalogue 89 000

5 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

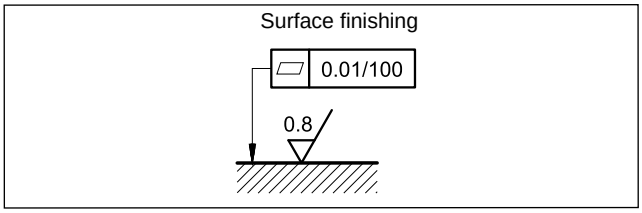
The fluid must be preserved in its physical and chemical characteristics.

6 - INSTALLATION

The valves can be installed in any position without impairing correct operation. Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols.

If minimum values are not observed, fluid can easily leaks between the valve and support surface.

Take care to the cleanliness of the mounting surfaces and surrounding environment upon installation.



7 - ACCESSORIES

(to be ordered separately)

7.1 - Mating connector

Mating connector must be ordered separately. See catalogue 89 000.

The use of a metal connector is recommended to avoid electromagnetic disturbances and to ensure compliance with EMC regulations on electromagnetic compatibility. If a plastic connector is used, it must guarantee and maintain the IP rating and the EMC protection characteristics of the valve.

Duplomatic offers spare parts to be wired and also ready-to-use cord sets. Please refer to cat. 89 000.

7.2 - Connection cable

The optimal wiring provides for 7 isolated conductors, with separate screen for the signal wires (command, monitor) and an overall screen.

Cross section for power supply:
- up to 20 m cable length: 1.0 mm²
- up to 40 m cable length: 1.5 mm²

Cross section for signals (command, monitor):
- 0.50 mm²

8 - SUBPLATES

(see catalogue 51 000)

PMD4-AI4G rear ports 3/4” BSP
PMD4-AL4G side ports 1/2” BSP

DUPLOMATIC
MOTION SOLUTIONS
a member of DAIKIN group

DUPLOMATIC MS Spa
via Mario Re Depaolini, 24 | 20015 Parabiago (MI) | Italy
T +39 0331 895111 | E vendite.ita@duplomatic.com | sales.exp@duplomatic.com
duplomaticmotionsolutions.com

REPRODUCTION IS FORBIDDEN. THE COMPANY RESERVES THE RIGHT TO APPLY ANY MODIFICATIONS.



DXE5J

HIGH RESPONSE SERVO-PROPORTIONAL VALVE WITH FEEDBACK AND INTEGRATED ELECTRONICS

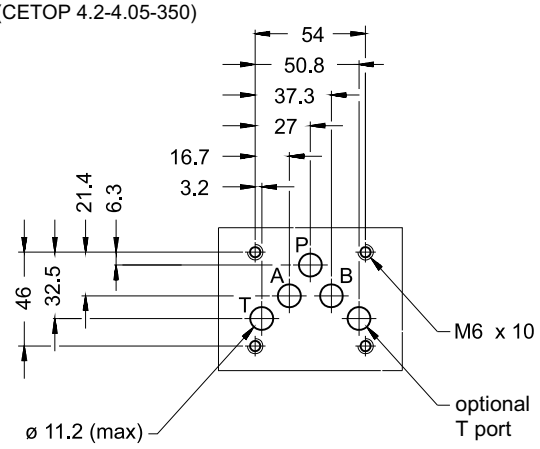
SERIES 31

SUBPLATE MOUNTING ISO 4401-05

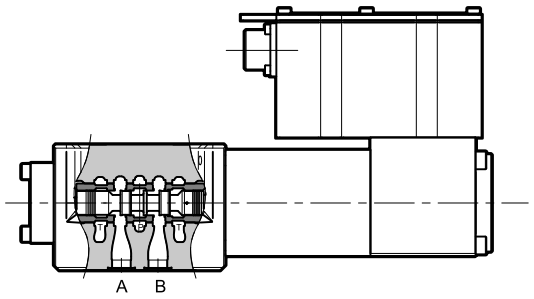
p max **350** bar
Q max **100** l/min

MOUNTING INTERFACE

ISO 4401-05-04-0-05
(CETOP 4.2-4.05-350)



OPERATING PRINCIPLE



— The DXE5J valve is a four-way (3 + fail-safe position) servo-proportional valve where the spool moves inside a sleeve. It is operated by a proportional solenoid highly dynamic, which achieves high performance and not requires pilot pressure. The spool position is controlled by a linear transducer (LVDT) in closed loop, which ensures high precision and repeatability.

— It is available with two flow ranges up to 100 l/min with spools with zero overlap.

— The valve is featured by integral electronic based on SMD technology which ensures standard regulations and simplifies the electric wiring. The unit does not require any adjustment other than the possible electronic regulation of the zero.

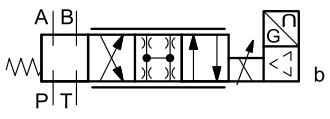
— Suitable for control applications with closed loop of position, velocity and pressure. if the valve is not powered or is without the enable input (Version A only), the spool moves automatically at fail-safe position.

PERFORMANCES

(with mineral oil of viscosity 36 cSt at 50°C)

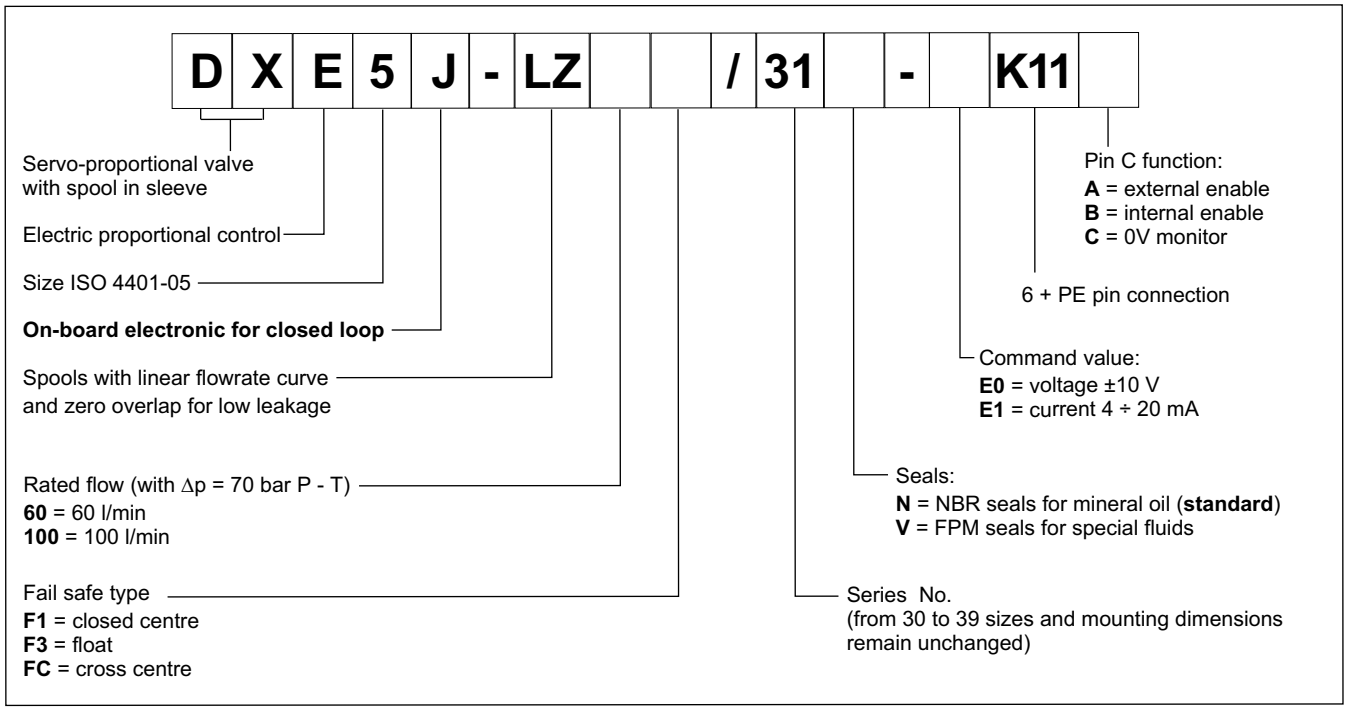
Maximum operating pressure Ports P - A - B Port T	bar	 350 250
Rated flow Q nom (with Δp 70 bar P - T)	l/min	60 - 100
Hysteresis	% In	< 0,2
Threshold	% In	< 0,1
Thermal drift (with ΔT= 40 °C)	% In	< 1,0
Response time (0-100%)	ms	≤ 20
Vibration on the three axes	g	30
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	5 ÷ 400
Fluid contamination degree	according to ISO 4406:1999 class 17/15/12 (16/14/11 for longer life)	
Recommended viscosity	cSt	25
Mass	kg	6

HYDRAULIC SYMBOL

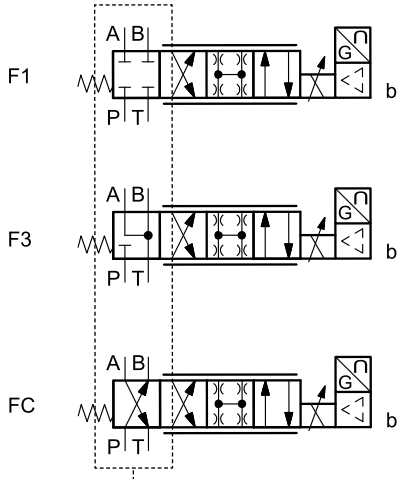


1 - IDENTIFICATION CODE

1.1 Standard electronics



1.2 Available versions



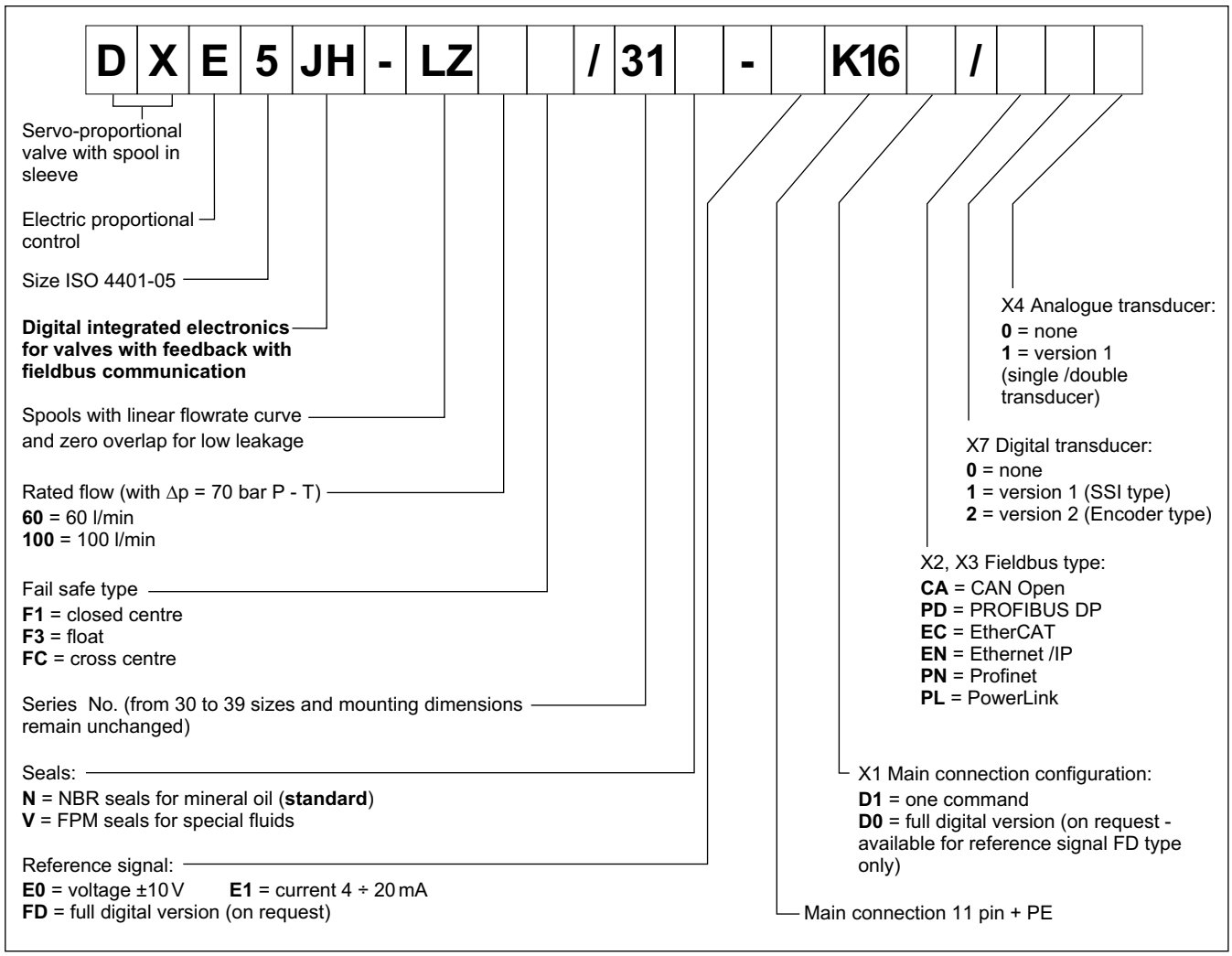
flow rate	fail safe type		
	F1	F3	FC
60	■	■	□
100	■	■	□

■ available □ on request

FAIL SAFE POSITION

When a power failure occurs, the electronics de/energize the solenoid and the spool will take the fail safe position by means of the centering springs.

1.3 - Electronics with fieldbus communication



2 - ELECTRONICS COMMON DATA

Duty cycle		100% (continuous operation)
Protection class according to EN 60529		IP65 / IP67
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	60
Maximum solenoid current	A	3.7
Fuse protection, external	A	(fast), max current 6A
Managed breakdowns		Overload and electronics overheating, LVDT sensor error, cable breakdown, supply voltage failures
Electromagnetic compatibility (EMC) emissions EN 61000-6-4, immunity EN 61000-6-2		According to 2014/30/EU standards

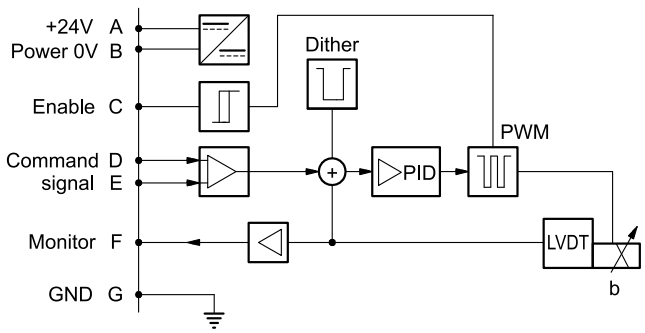
3 - DXE5J - STANDARD ELECTRONICS

3.1 - Electrical characteristics

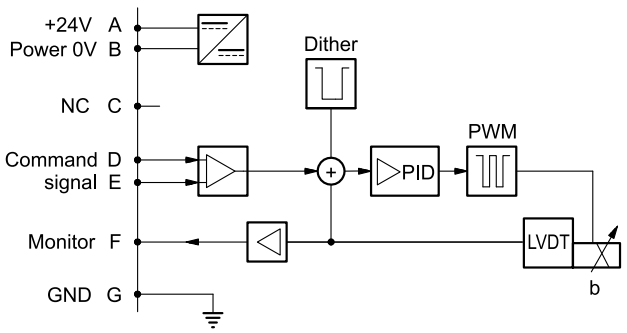
Command signal: voltage (E0) current (E1)	V DC mA	±10 (Impedance Ri = 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm)
Monitor signal (current to solenoid): voltage (E0) current (E1)	V DC mA	±10 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
Communication for diagnostic		LIN-bus Interface (by means of the optional kit)
Connection		6 pin + PE (MIL-C-5015-G - DIN EN 175201-804)

3.2 - On-board electronics diagrams

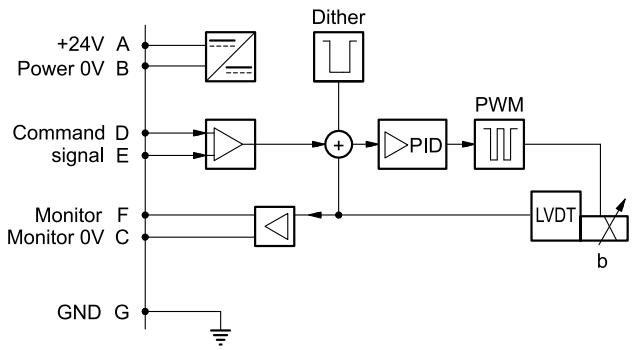
VERSION A - External Enable



VERSION B - Internal Enable

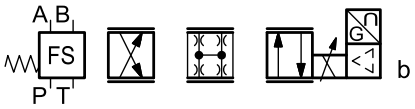


VERSION C - 0V Monitor

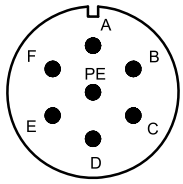


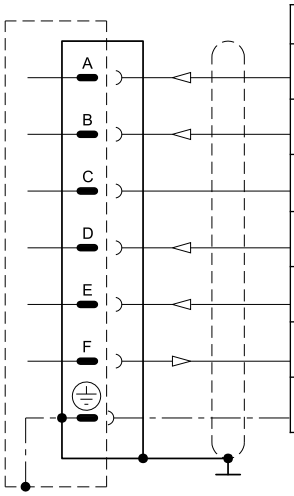
3.3 - Versions with voltage COMMAND (E0)

The reference signal must be between -10V and +10V. The monitor feature of versions B anc C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**-10V**	**0V**	**+10V**
MONITOR	**-10V**	**0V**	**+10V**



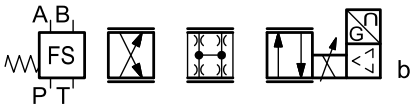


Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	± 10 V	Command (differential input)		
E	0 V	Command reference		
F	± 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

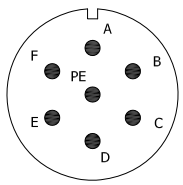
3.4 - Versions with CURRENT COMMAND (E1)

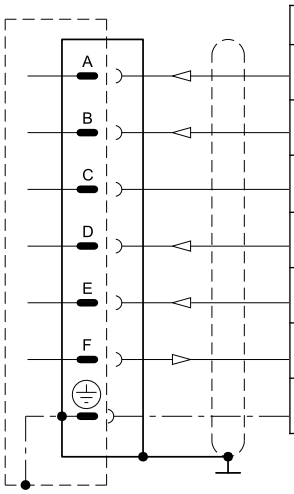
The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower, the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

The monitor feature of versions B anc C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**4 mA**	**12 mA**	**20 mA**	
MONITOR	**4 mA**	**12 mA**	**20 mA**	





Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	Command reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

4 - DXE5JH - FIELDBUS ELECTRONICS

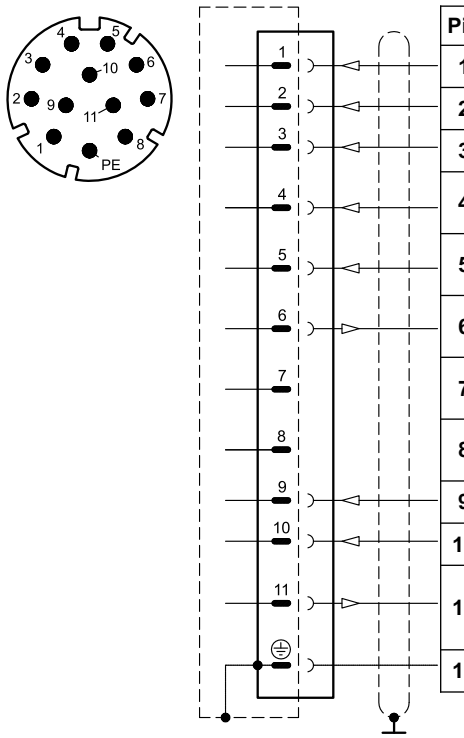
The 11+ PE pin connection allows separate supply voltage for electronics and solenoids.

Command - valve position schemes as for the standard electronics. Please refer to pictures in par. 3.3 and 3.4.

4.1 - Electrical characteristics

Command signal: voltage (E0) current (E1) digital (FD)	 V DC mA	 ±10 (Impedance Ri = 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm) via fieldbus
Monitor signal (current to solenoid): voltage (E0) current (E1)	 V DC mA	 ±10 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
Communication / diagnostic		via Bus register
Communication interface standards CAN Open PROFIBUS DP EtherCAT, Ethernet /IP, Profinet, PowerLink		 EN 50325-4 + DS408 EN 50170-2 / IEC 61158 IEC 61158
Communication physical layer CAN Open PROFIBUS DP EtherCAT, Ethernet /IP, Profinet, PowerLink		 optical insulated CAN ISO 11898 optical insulated RS485 fast ethernet, insulated 100 Base TX
Power connection		11 pin + PE (DIN 43651)

4.2 - X1 Main connection pin table



D1: one command

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	± 10 V (E0) 4 ÷ 20 (E1)	Command
5	0 V	Command reference signal
6	± 10 V (E0) 4 ÷ 20 (E1)	Monitor (0V reference pin 10)
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V reference pin 2)
12	GND	Ground (Earth)

D0: full digital

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	NC	do not connect
5	NC	do not connect
6	NC	do not connect
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V ref. pin 2)
12	GND	Ground (Earth)

4.3 - FIELDBUS connections

Please wire following guidelines provided by the relative standards communication protocol.

4.3.1 - Communication connection CA (CAN Open)

X2 (IN) connection: M12 A 5 pin female



Pin	Values	Function
1	CAN_SH	Shield
2	NC	Do not connect
3	GND	Signal zero data line
4	CAN_H	Bus line (high)
5	CAN_L	Bus line (low)

X3 (OUT) connection: M12 A 5 pin male



Pin	Values	Function
1	CAN_SH	Shield
2	NC	Do not connect
3	GND	Signal zero data line
4	CAN_H	Bus line (high)
5	CAN_L	Bus line (low)

4.3.2 - Communication connection PD (PROFIBUS DP)

X2 (IN) connection: M12 B 5 pin male (IN)



Pin	Values	Function
1	+5 V	Termination supply signal
2	PB_A	Bus line (high)
3	0 V	Data line and termination signal 0
4	PB_B	Bus line (low)
5	SHIELD	

X3 (OUT) connection: M12 B 5 pin female



Pin	Values	Function
1	+5 V	Termination supply signal
2	PB_A	Bus line (high)
3	0 V	Data line and termination signal 0
4	PB_B	Bus line (low)
5	SHIELD	

4.3.3 - Communication connections: EC (EtherCat), EN (Ethernet/IP), PN (PROFINET), PL (POWERLINK)

X2 (IN) connection M12 D 4 pin female



Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

NOTE: Shield connection on connector housing is recommended.

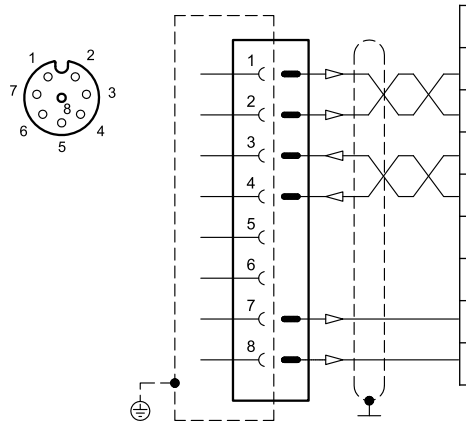
X3 (OUT) connection: M12 D 4 pin female



Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

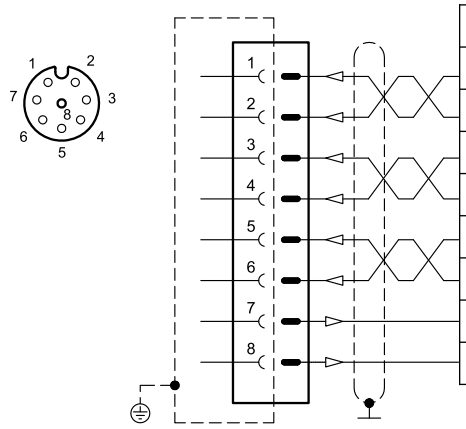
4.4 - Digital transducer connection
X7 connection: M12 A 8 pin female

VERSION 1: SSI type



Pin	SSI Values	Function	Notes
1	CLK+	Serial synchronous clock (+)	Input - digital signal
2	CLK-	Serial synchronous clock (-)	
3	MIS0+	Serial position data (+)	
4	MIS0-	Serial position data (-)	
5	NC	-	do not connect
6	NC	-	
7	+24 V	transducer power supply	Output power supply
8	0 V	-	Common GND

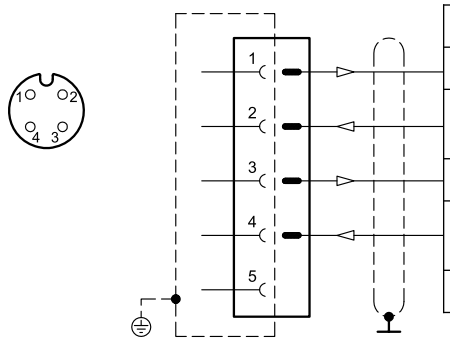
VERSION 2: ENCODER type



Pin	Values	Function	Notes
1	ENC_Z+	input channel Z+	Input - digital signal
2	ENC_Z-	input channel Z-	
3	ENC_A+	input channel A+	
4	ENC_A-	input channel A+	
5	ENC_B+	input channel B+	
6	ENC_B-	input channel B+	
7	+5 V	transducer power supply	Output power supply
8	0 V	-	Common GND

4.5 - Analogue transducer connection
X4 connection: M12 A 4 pin female

VERSION 1: single / double transducer
(single or double is a software-selectable option)

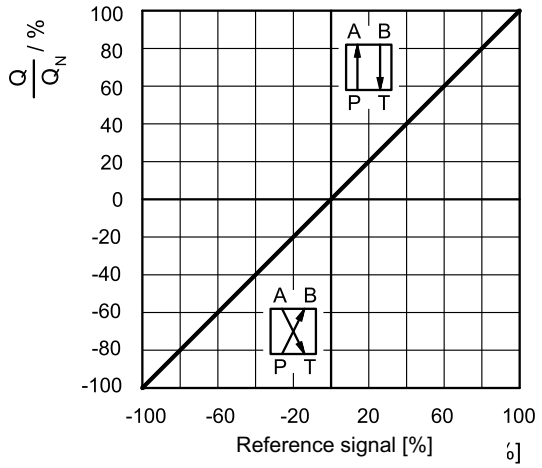


Pin	Values	Notes
1	+24 V	Remote transducer power supply (out) 100 mA
2	±10 V 4 ÷20 mA	Input signal of transducer 1 (range software selectable)
3	0 V	Common reference signal for transducer power and signals
4	±10 V 4 ÷20 mA	Input signal of transducer 2 (range software selectable)
5	-	

5 - CHARACTERISTIC CURVES

(measured with viscosity of 36 cSt at 50°C)

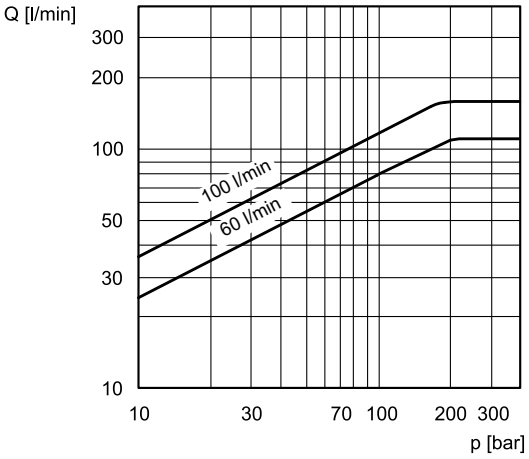
REFERENCE / FLOW RATE CURVE



Typical flow rate curves at constant Δp = 70 bar P-T according to the reference signal.

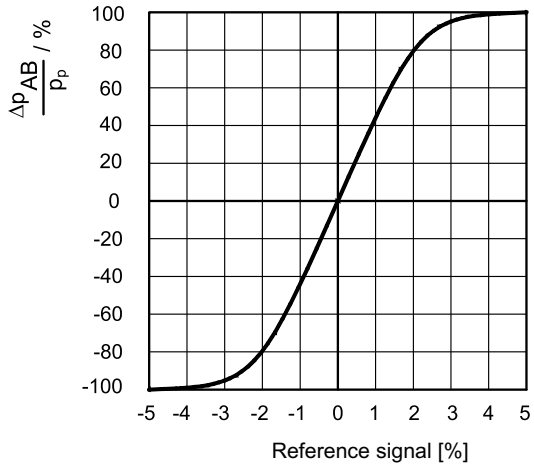
NOTE: with positive reference signal connected to pin D the valve regulates P - A / B - T.

FLOW RATE CURVE ACCORDING TO Δp



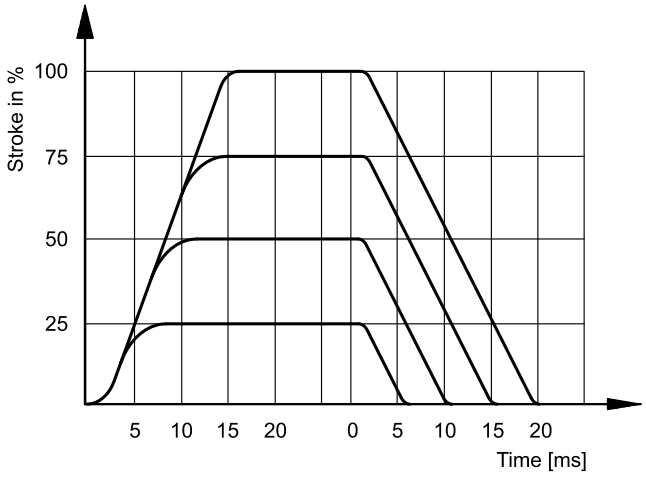
The diagram states the maximum valve controlled flow rate according to the pressure drop between the P and T ports.

PRESSURE GAIN

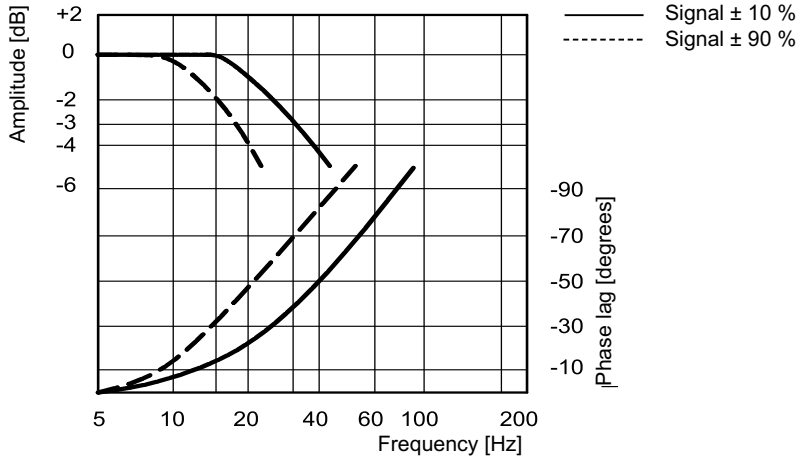


The diagram shows the valve pressure gain, expressed as % of the ratio between the port pressure variation in A or B (Δp AB) and the P system pressure, according to the reference signal. In practice, the pressure gain states the valve reaction towards external disturbances aimed at changing the actuator position.

RESPONSE TIME

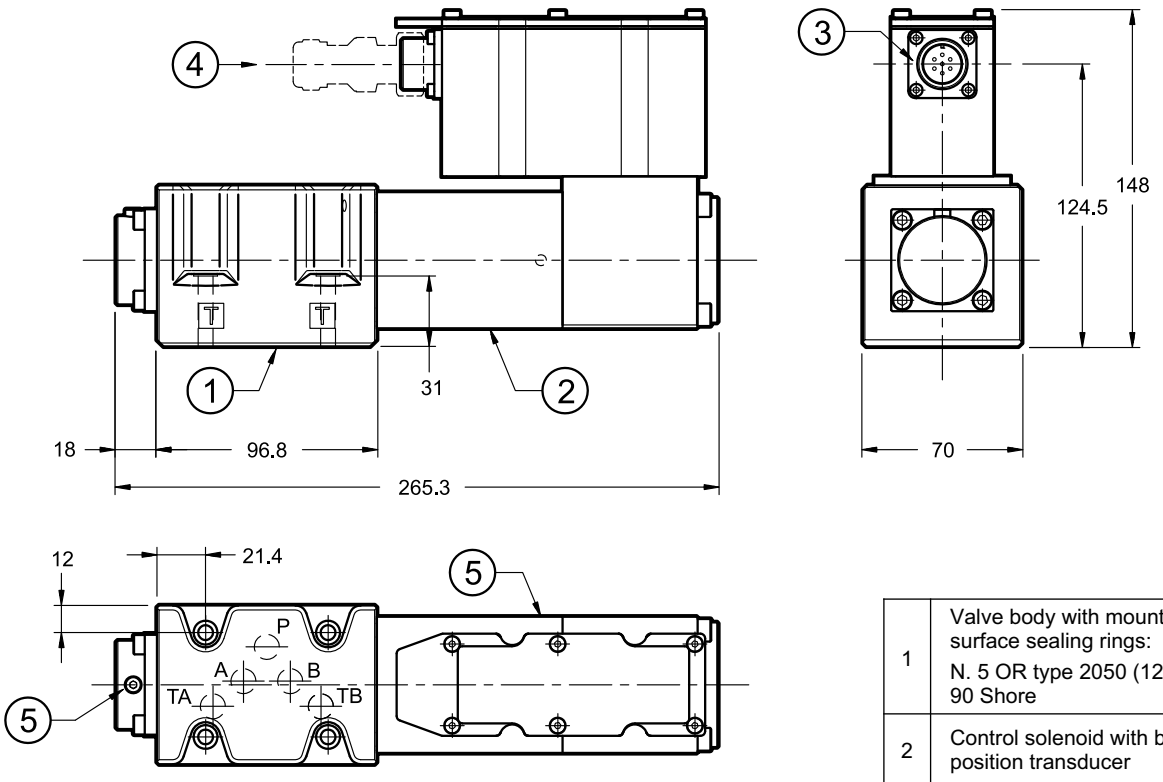


FREQUENCY RESPONSE



6 - DXE5J - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



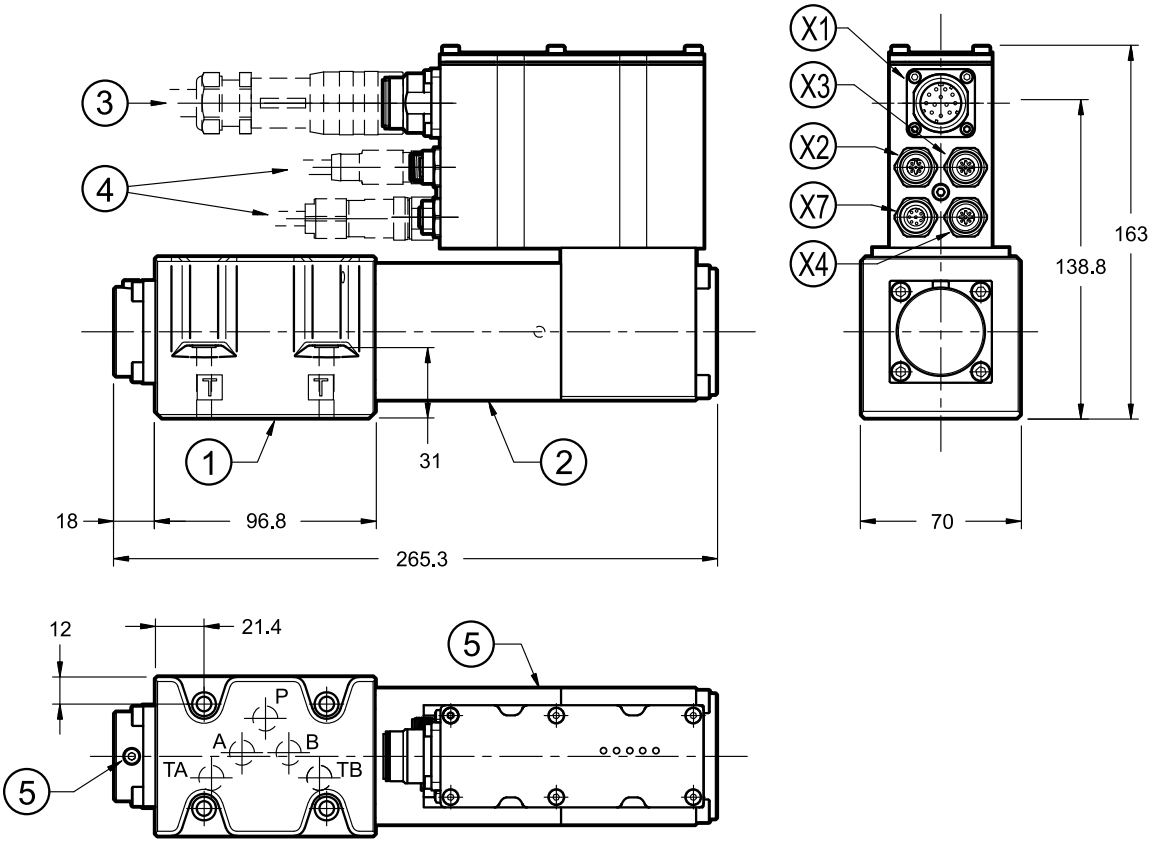
Fastening bolts: 4 SHC screws M6x40 - ISO 4762
Torque: 8 Nm ± 10% (A8.8)
Threading holes: M6x10

NOTE: The valve is filled with mineral oil during testing, therefore the breather should not be used without specific authorization. Breaking the seals can cause the loss of the guarantee.

1	Valve body with mounting surface sealing rings: N. 5 OR type 2050 (12.42x1.78) 90 Shore
2	Control solenoid with built-in position transducer
3	Main connection
4	Mating connector 6 poles + PE, female type MIL-5015-G **To be ordered separately.** See catalogue 89 000
5	Air breather. Sealed at the factory (**NOTE**)

7 - DXE5JH - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



X1	Main connection 11 pin + PE
X2	Fieldbus communication (IN)
X3	Fieldbus communication (OUT)
X4	X4 connection for analogue transducer
X7	X7 connection for digital transducer

1	Mounting surface with sealing rings: N. 5 OR type 2050 (12.42x1.78) 90 Shore
2	Control solenoid with built-in position transducer
3	Mating connector 11 poles + PE **To be ordered separately.** See catalogue 89 000
4	Mating connectors for fieldbus communication and signals **To be ordered separately.** See catalogue 89 000
5	Air breather. Sealed at the factory (**NOTE 2**)

NOTE 1: Depending on the chosen version, X4 and X7 connections may not be present.
Please refer to section 5 for connection descriptions and pinout.

NOTE 2: The valve is filled with mineral oil during testing, therefore the breather should not be used without specific authorization. Breaking the seals can cause the loss of the guarantee.

Fastening bolts: 4 bolts M6x40 - ISO 4762
Torque: 8 Nm ± 10% (A8.8)
Threading holes: M6x10

8 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

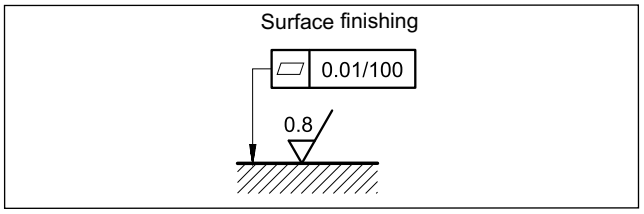
The fluid must be preserved in its physical and chemical characteristics.

9 - INSTALLATION

The valves can be installed in any position without impairing correct operation. Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols.

If minimum values are not observed, fluid can easily leaks between the valve and support surface.

Take care to the cleanliness of the mounting surfaces and surrounding environment upon installation.



10 - ACCESSORIES

(to be ordered separately)

10.1 - Mating connectors

Mating connectors must be ordered separately. See catalogue 89 000.

For K11 and K16 versions we recommend the choice of a metal connector to avoid electromagnetic disturbances and to comply with EMC regulations on electromagnetic compatibility. If you opt for a plastic connector, make sure that it guarantees and maintains the IP and EMC protection characteristics of the valve.

10.2 - Mating connectors for fieldbus communication and for sensors.

Duplomatic offers spare parts to be wired and also ready-to-use cord sets. Please refer to cat. 89 000.

10.3 - Connection cable

The optimal wiring provides for 7 isolated conductors, with separate screen for the signal wires (command, monitor) and an overall screen.

Cross section for power supply:
- up to 20 m cable length : 1,0 mm^2
- up to 40 m cable length : 1,5 mm^2 (IO-Link excluded)

Cross section for signals (command, monitor):
- 0,50 mm^2

10.4 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic, available for valves with K11 and K16 connections. See catalogue 89 850.

11 - SUBPLATES

(see catalogue 51 000)

PMD4-AI4G rear ports 3/4” BSP
PMD4-AL4G side ports 1/2” BSP

DUPLOMATIC MOTION SOLUTIONS

DUPLOMATIC MS S.p.A.
via M. Re Depaolini 24 • 20015 PARABIAGO (MI) • ITALY
tel. +39 0331.895.111 • www.duplomatic.com • e-mail: sales.exp@duplomatic.com

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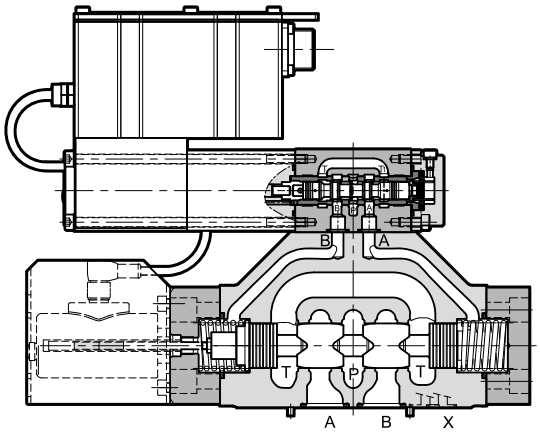
DXRE*J*

DIRECTIONAL CONTROL VALVES OPERATED BY HIGH RESPONSE VALVE, WITH OBE AND FEEDBACK

SUBPLATE MOUNTING

DXRE5RJ*	**ISO 4401-05**
DXRE7J*	**ISO 4401-07**
DXRE8J*	**ISO 4401-08**
DXRE9J*	**ISO 4401-08** oversize ports
DXRE10J*	**ISO 4401-10**
DXRE11J*	**ISO 4401-10** oversize ports

OPERATING PRINCIPLE



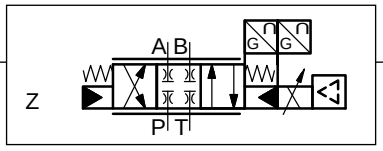
— DXRE*J* are directional control valves operated by a servo-proportional valve, with mounting surface compliant with ISO 4401 standards. The main spool position is controlled by a linear transducer LVDT in closed loop, which ensures high precision and repeatability.

— The valve is featured by integral electronic based on SMD technology which ensures standard regulations and simplifies the electric wiring. The valve doesn't require any adjustment other than the possible electronic set of the zero point.

— Two types of integrated electronics are available: for analogue signals or for fieldbus interfaces.

— These vales are suitable for applications in closed-loop position, speed and pressure control systems. Without power supply or enable input, the main stage spool is pushed and held in a fail-safe position by the centring springs.

HYDRAULIC SYMBOL (typical)



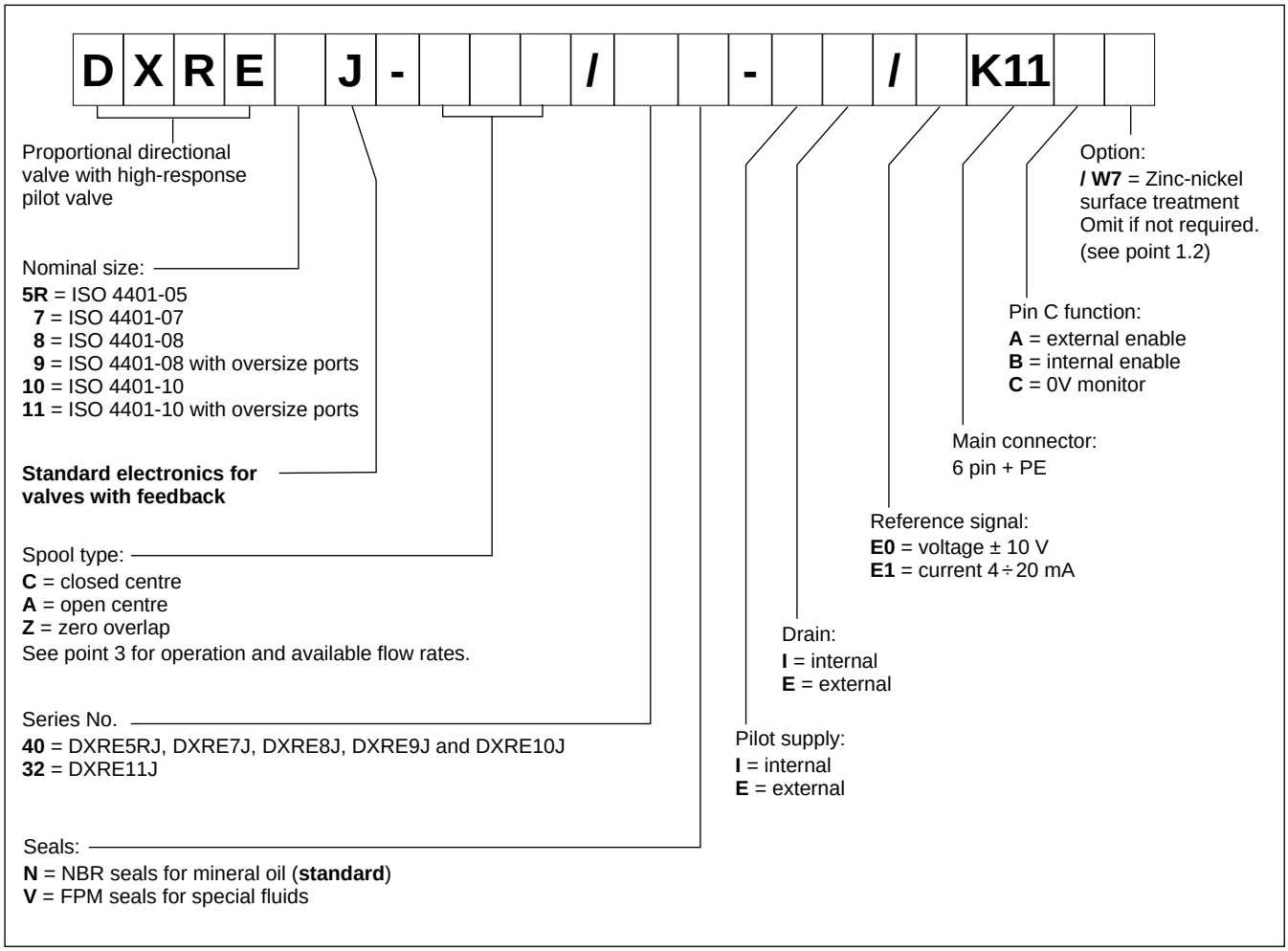
PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and p =140 bar)

		DXRE5RJ*	DXRE7J*	DXRE8J*	DXRE9J*	DXRE10J*	DXRE11J*
Max operating pressure: P - A - B ports T - X - Y ports	bar		350 250		300 250	350 250	320 250
Controlled flow with Δp 10 bar P-T	l/min	100	220	400	480	800	1000
Hysteresis	% Q_{max}	< 0.2%					
Repeatability	% Q_{max}	± 0.1%					
Electrical characteristics		see point 4					
Ambient temperature range	°C	-20 / +60					
Fluid temperature range	°C	-20 / +80					
Fluid viscosity range	cSt	10 ÷ 400					
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13 (16/14/11 for longer life)						
Recommended viscosity	cSt	25					
Mass	kg	7.4	8.9	15.2	15.0	41.6	39.5

1 - IDENTIFICATION CODE

1.1 - Standard electronics



1.2 - Surface treatments

The standard valve is supplied with surface treatment of phosphating black.

The zinc-nickel finishing makes the valve suitable to ensure a salt spray resistance up to **600** hours (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

1.3 - Electronics with fieldbus communication

D	X	R	E		JH	-				/			-			-		K16		/				

Proportional directional valve with high-response pilot valve

Nominal size:
5R = ISO 4401-05
7 = ISO 4401-07
8 = ISO 4401-08
9 = ISO 4401-08 with oversize ports
10 = ISO 4401-10
11 = ISO 4401-10 with oversize ports

Integrated electronics with fieldbus communication for valves with feedback

Spool type:
C = closed centre
A = open centre
Z = zero overlap
See point 2 for operation and available flow rates.

Series No.
40 = DXRE5RJH, DXRE7JH, DXRE8JH, DXRE9JH and DXRE10JH
32 = DXRE11JH

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Pilot supply:
I = internal
E = external

Drain:
I = internal
E = external

Reference signal:
E0 = voltage ±10 V
E1 = current 4 ÷ 20 mA
FD = full digital version (on request)

Main connection 11 pin + PE

X1 Main connection configuration:
D1 = one command
D0 = full digital version (on request - available for reference signal FD type only)

X2, X3 Fieldbus type:
EC = EtherCAT
EN = Ethernet /IP
PN = Profinet

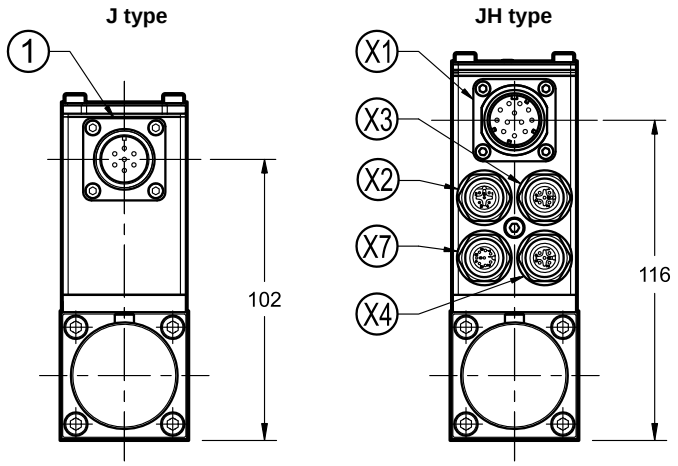
X7 Digital transducer:
0 = none
1 = SSI type

X4 Analogue transducer:
0 = none
1 = single /double transducer

Option:
/ W7 = Zinc-nickel surface treatment
Omit if not required.
(see point 1.2)

2 - COMPARISON AMONG INTEGRATED ELECTRONICS

dimensions in mm



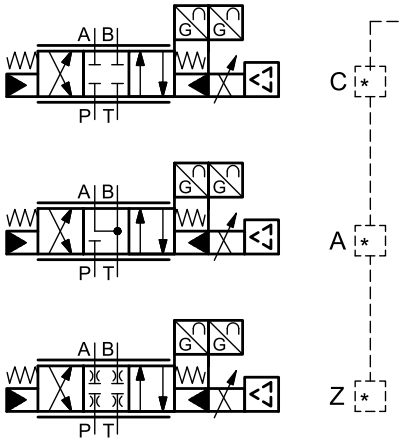
1	Connection 6 pin + PE
X1	Main connection 11 pin + PE
X2	Fieldbus communication (IN)
X3	Fieldbus communication (OUT)
X4	Connection for analogue transducer
X7	Connection for digital transducer

NOTE 1: Depending on the chosen version, X4 and X7 connections may not be present. Please refer to sections 5, 6 and 7 for connections descriptions and pinouts.
NOTE 2: Related mating connectors have to be ordered separately. See catalogue 89 000.

3 - AVAILABLE CONFIGURATIONS

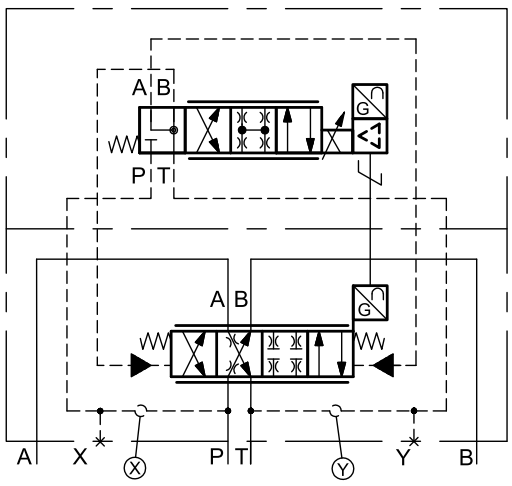
The valve configuration depends on the combination of spool type and rated flow.

3 positions with spring centering



valve type	*	Controlled flow with Δp 10 bar P-T
DXRE5RJ	**100**	100 l/min
DXRE7J	**120**	120 l/min
	220	220 l/min
DXRE8J	**250**	250 l/min
	400	400 l/min
DXRE9J	**480**	480 l/min
DXRE10J	**800**	800 l/min
DXRE11J	**1000**	1000 l/min

detailed symbol (spool Z)



FAIL SAFE POSITION for Z SPOOLS

When a power down occurs, or when there is no enable input (K11A version), the main spool is moved to the offset position by the springs, with limited opening (1%...6% of the main spool stroke in P-B / A-T direction).

4 - ELECTRONICS COMMON DATA

Duty cycle		100% (continuous operation)
Protection class according to EN 60529 (**NOTE**)		IP65/IP67
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	35
Maximum solenoid current	A	2.6
Fuse protection, external	A	(fast), max current 4A
Managed breakdowns		Overload and electronics overheating, LVDT sensor error, cable breakdown, supply voltage failures
Electromagnetic compatibility (EMC) emissions EN 61000-6-4, immunity EN 61000-6-2		According to 2014/30/EU standards

NOTE: The IP degree is guaranteed only with mating connector of equivalent IP degree, installed and tightened correctly. Moreover, on the JH versions it is necessary to protect any unused connections with caps.

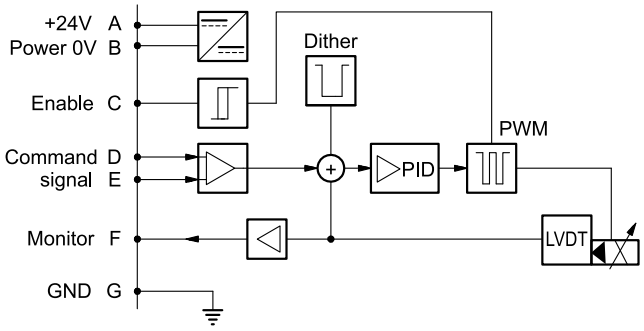
5 - DXRE*J - STANDARD ELECTRONICS

5.1 - Electrical characteristics

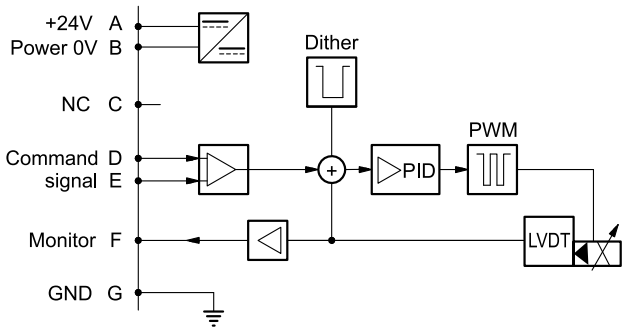
Command signal: voltage (E0) current (E1)	V DC mA	±10 (Impedance Ri > 11 kohm) 4 ÷ 20 (Impedance Ri = 58 ohm)
Monitor signal (main spool position): voltage (E0) current (E1)	 V DC mA	 ±10 (Impedance Ro > 1 kohm) 4 ÷ 20 (Impedance Ro = 500 ohm)
Communication for diagnostic		LIN-bus Interface (by means of the optional kit)
Connection		6 pin + PE (MIL-C-5015-G - DIN EN 175201-804)

5.2 - On-board electronics diagrams

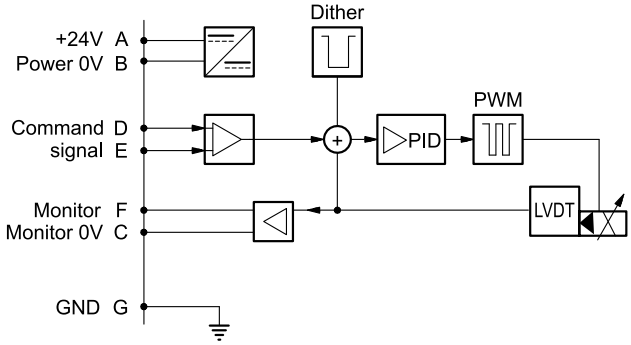
VERSION **A** - External Enable



VERSION **B** - Internal Enable

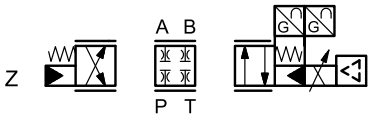


VERSION **C** - 0V Monitor

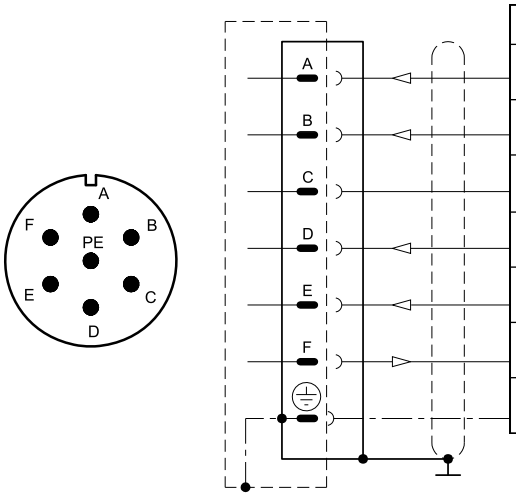


5.3 - Version with voltage command (E0)

The reference signal must be between -10V and +10V. The monitor feature of versions B and C becomes available with a delay of 0.5 sec from the power-on of the card.



COMMAND	**-10V**	**0V**	**+10V**
MONITOR	**-10V**	**0V**	**+10V**

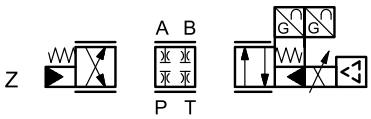


Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	± 10 V	Command (differential input)		
E	0 V	Command reference		
F	± 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

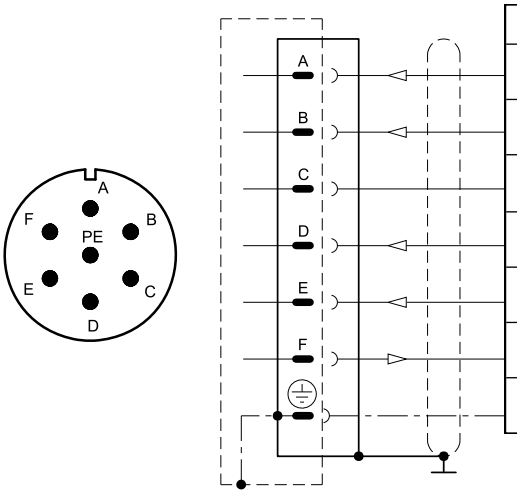
5.4 - Version with current command (E1)

The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower than 4 mA the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

The monitor feature of versions B and C becomes available with a delay of 0.5 sec from the power-on of the card.



COMMAND	**4 mA**	**12 mA**	**20 mA**
MONITOR	**4 mA**	**12 mA**	**20 mA**



Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	Command reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

6 - DXRE*JH - FIELDBUS ELECTRONICS

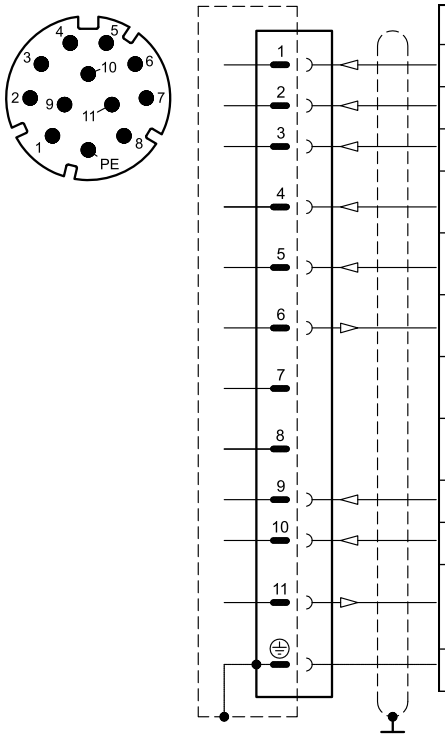
The 11+ PE pin connection allows separate supply voltage for electronics and solenoid.

Command - valve position schemes as for the standard electronics. Please refer to pictures in points 5.3 and 5.4.

6.1 - Electrical characteristics

Command signal: voltage (E0) current (E1) digital (FD)	 V DC mA	 ±10 (Impedance Ri > 11 kohm) 4 ÷ 20 (Impedance Ri = 58 ohm) via fieldbus
Monitor signal (main spool position): voltage (E0) current (E1)	 V DC mA	 ±10 (Impedance Ro > 1 kohm) 4 ÷ 20 (Impedance Ro = 500 ohm)
Communication / diagnostic		via Bus register
Communication interface standards		IEC 61158
Communication physical layer		fast ethernet, insulated 100 Base TX
Power connection		11 pin + PE (DIN 43651)

6.2 - X1 Main connection pin table



D1: one command

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	± 10 V (E0) 4 ÷ 20 (E1)	Command
5	0 V	Command reference signal
6	± 10 V (E0) 4 ÷ 20 (E1)	Monitor (0V reference pin 10)
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V reference pin 2)
12	GND	Ground (Earth)

D0: full digital

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	NC	do not connect
5	NC	do not connect
6	NC	do not connect
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V ref. pin 2)
12	GND	Ground (Earth)

6.3 - FIELDBUS connections

Please wire following guidelines provided by the related standards communication protocol. Any connections present and not used must be protected with special caps so as not to nullify the protection against atmospheric agents.

X2 (IN) connection M12 D 4 pin female



Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

X3 (OUT) connection: M12 D 4 pin female



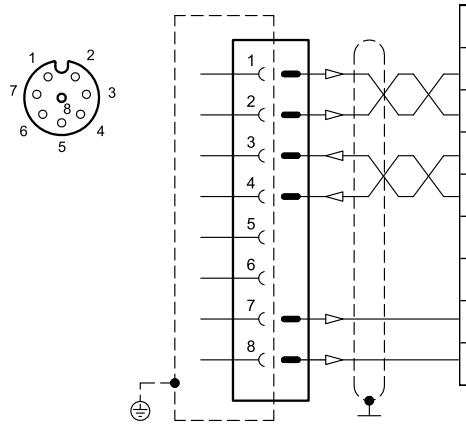
Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

NOTE: Shield connection on connector housing is recommended.

6.4 - Digital transducer connection

X7 connection: M12 A 8 pin female

VERSION 1: SSI type



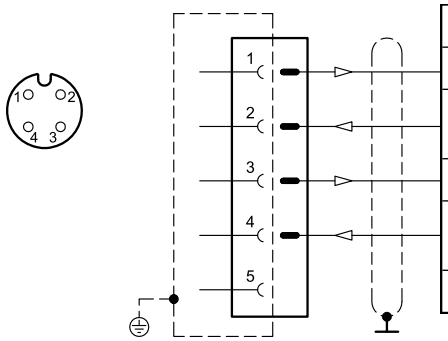
Pin	SSI Values	Function	Notes
1	CLK+	Serial synchronous clock (+)	Input - digital signal
2	CLK-	Serial synchronous clock (-)	
3	MIS0+	Serial position data (+)	
4	MIS0-	Serial position data (-)	
5	NC	-	do not connect
6	NC	-	
7	+24 V	transducer power supply	Output power supply
8	0 V	-	Common GND

6.5 - Analogue transducer connection

X4 connection: M12 A 4 pin female

VERSION 1: single / double transducer

(single or double is a software-selectable option)



Pin	Values	Notes
1	+24 V	Remote transducer power supply (out) 100 mA
2	±10 V 4 ÷20 mA	Input signal of transducer 1 (range software selectable)
3	0 V	Common reference signal for transducer power and signals
4	±10 V 4 ÷20 mA	Input signal of transducer 2 (range software selectable)
5	-	

7 - CHARACTERISTIC CURVES

(with mineral oil with viscosity of 36 cSt at 50 °C, DXRE*J-*****K11C valves)

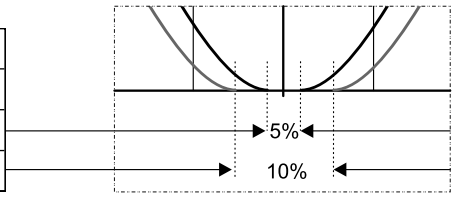
Typical flow rate curves at constant Δp (**5 bar** per control edge), related to the reference signal.

DXRE*J, spools types C and A:

Valves with spools type C and A are configured to start opening to a given percentage of the reference signal. This percentage differs depending on the versions. It is 5% for DXRE*J...E*K11C and 10% for DXRE*J...E*K11A and DXRE*J...E*K11B.

See table below.

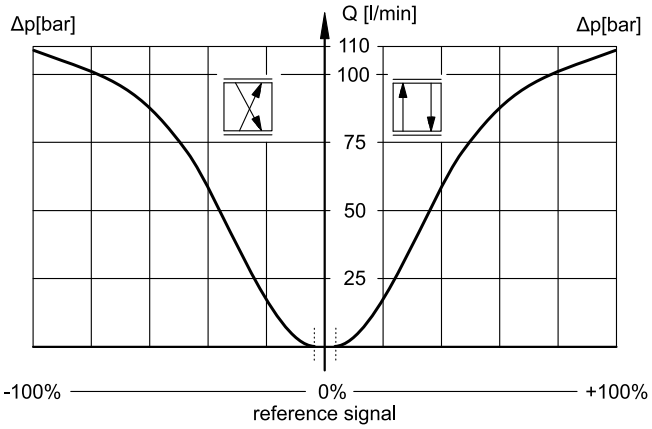
		opening values	
valve type		**E0** [±10 V]	**E1** [4 ÷ 20 mA]
DXRE*J...**E*K11C**	5% ref.	-0.5...0...+0.5	11.6 ...12...12.4
DXRE*J...**E*K11A**, ...**E*K11B**	10% ref	-1...0...+1	11.2...12...12.8



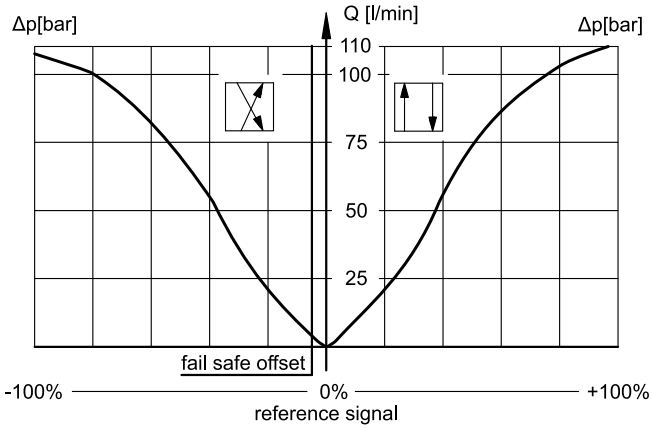
DXRE*JH, spools types C and A: the start opening percentage is 10%.

7.1 - DXRE5RJ* Characteristic curves

C100 / A100

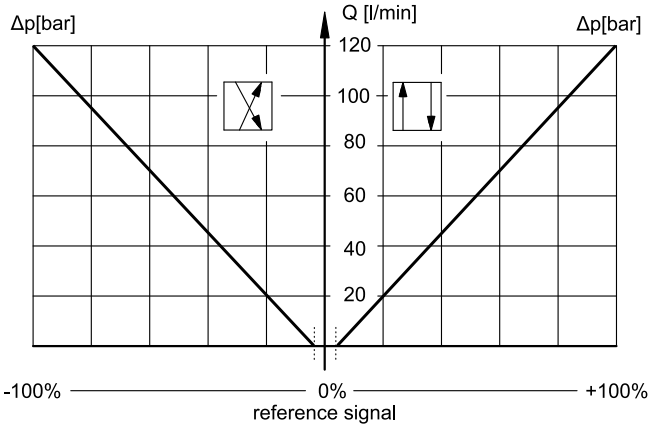


Z100

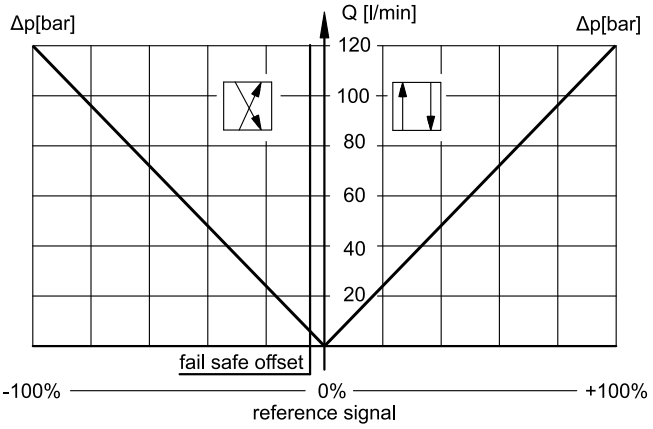


7.2 - DXRE7J* Characteristic curves

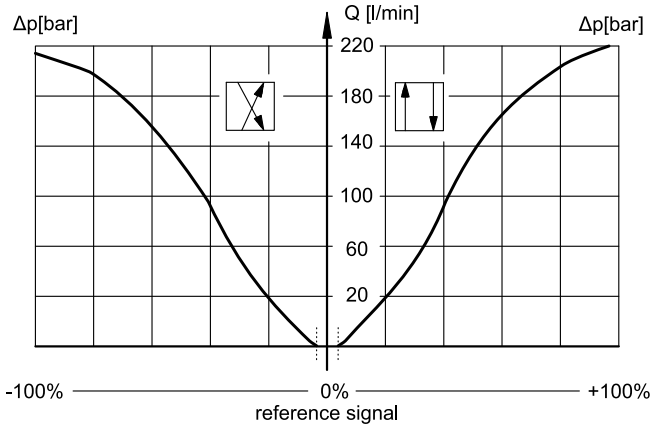
C120 / A120



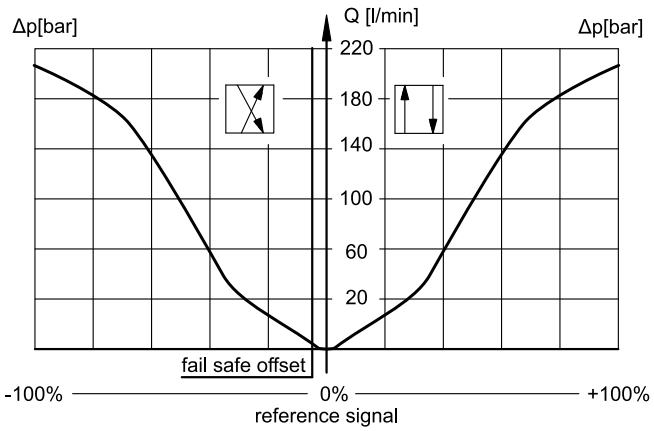
Z120



C220 / A220

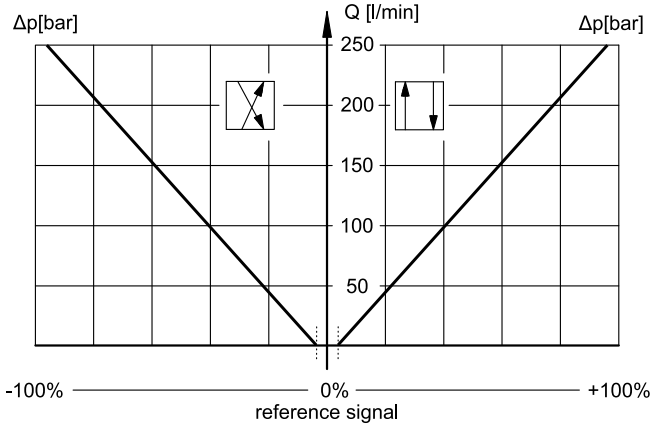


Z220

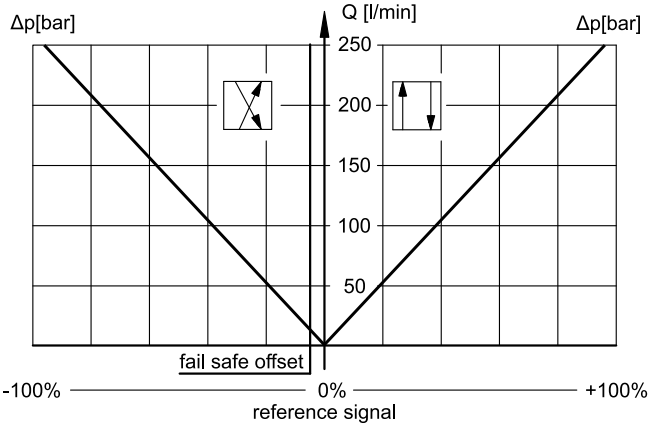


7.3 - DXRE8J* Characteristic curves

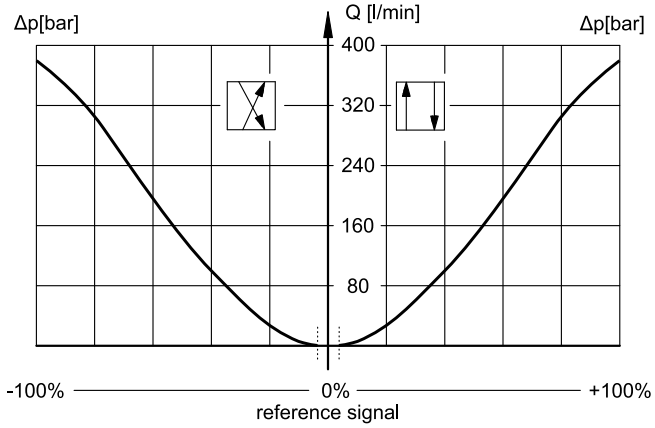
C250 / A250



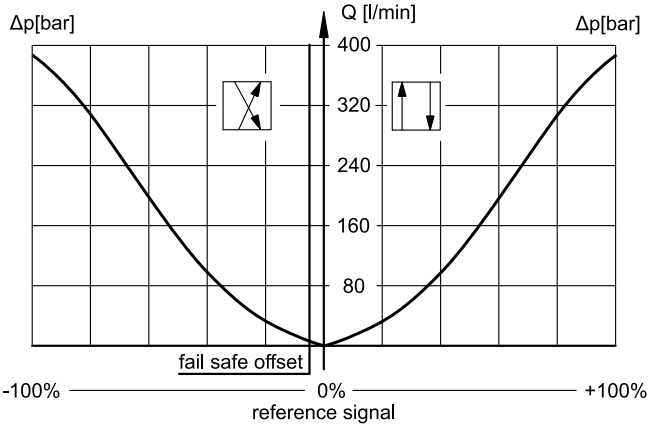
Z250



C400 / A400

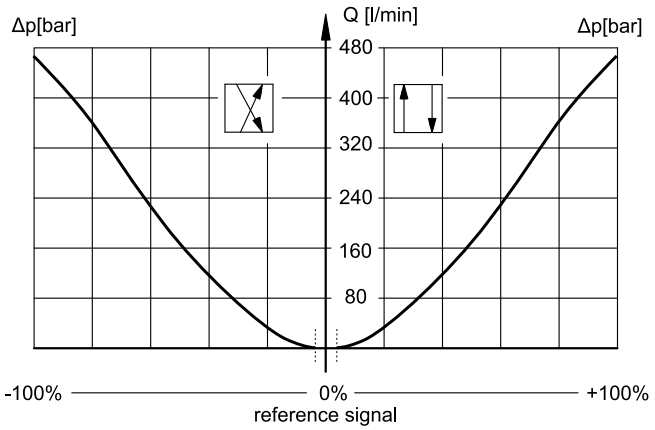


Z400

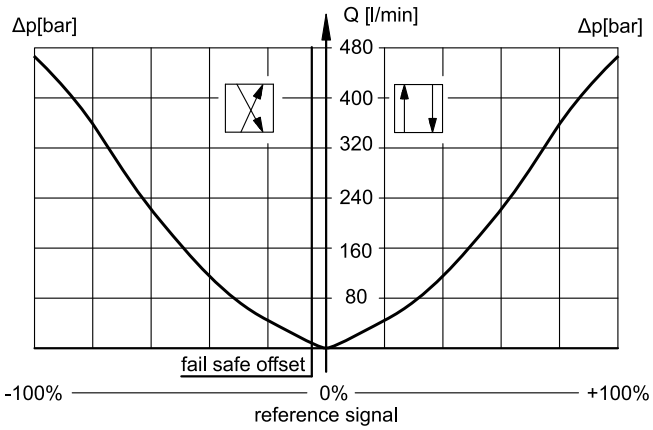


7.4 - DXRE9J* Characteristic curves

C480 / A480

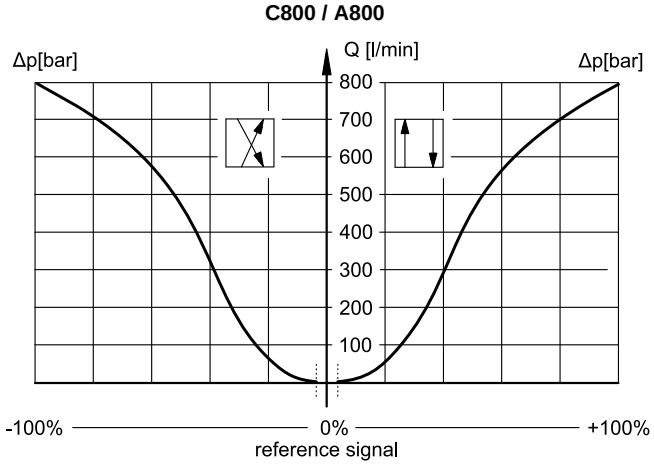


Z480

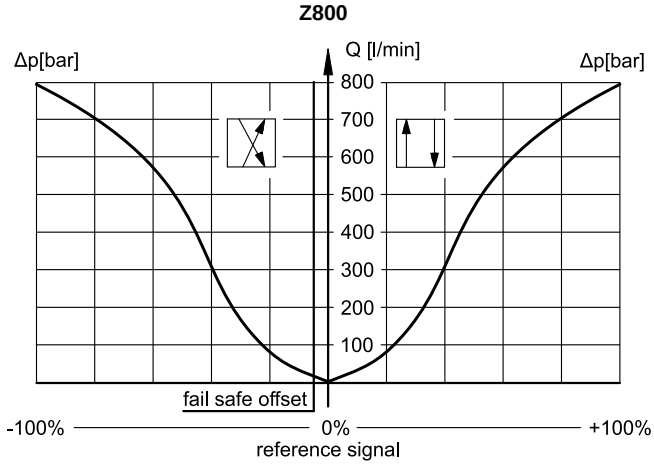


7.5 - DXRE10J* Characteristic curves

C800 / A800

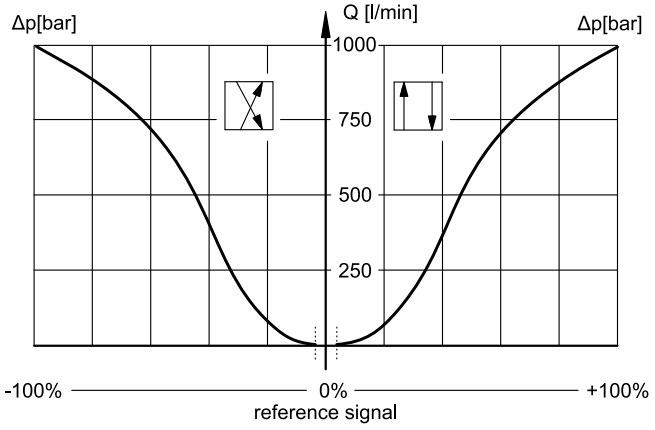


Z800

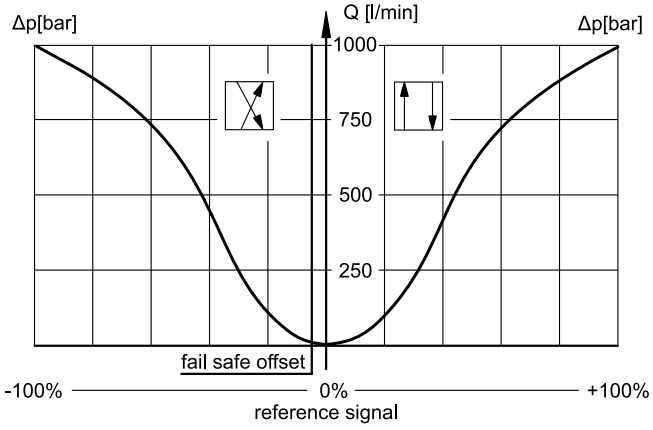


7.6 - DXRE11J* Characteristic curves

C1000 / A1000



Z1000



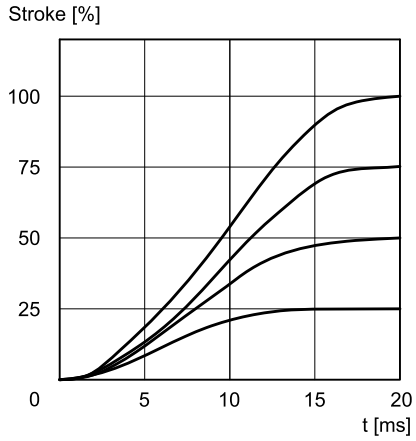
8 - RESPONSE TIMES

(obtained with mineral oil with viscosity of 36 cSt at 50 °C)

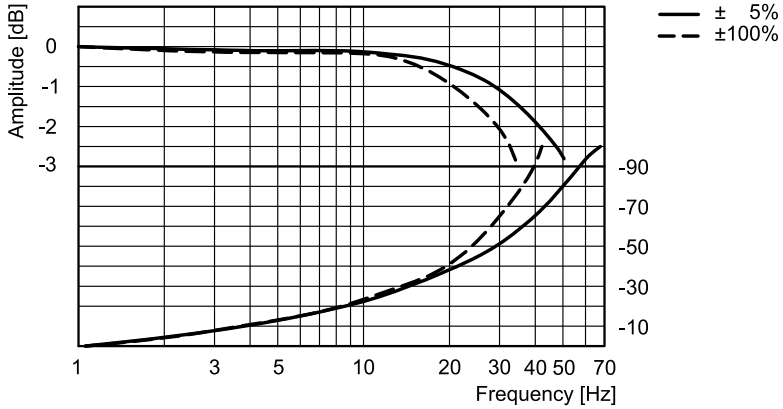
The tables shows the typical step response tested with static pressure 100 bar.

8.1 - DXRE5RJ*

RESPONSE TIME

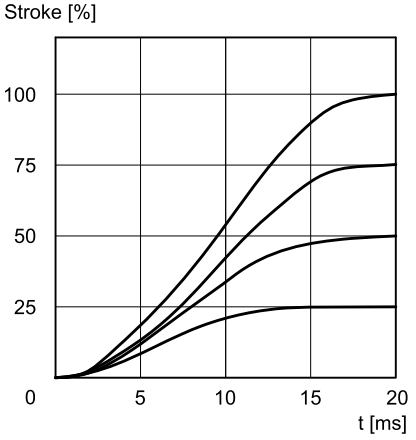


FREQUENCY RESPONSE (spools type Z)

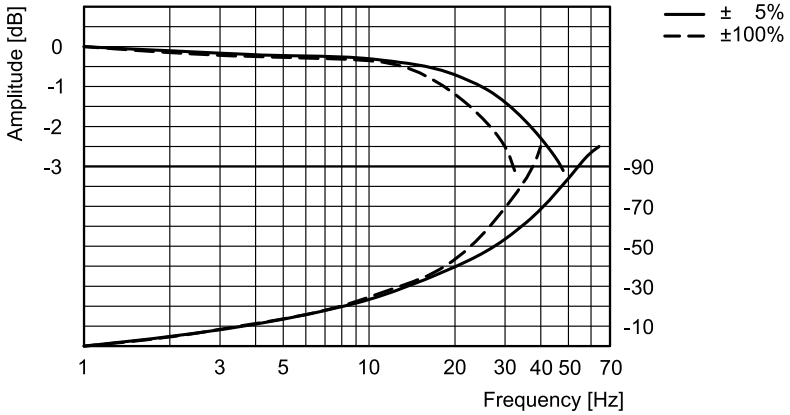


8.2 - DXRE7J*

RESPONSE TIME

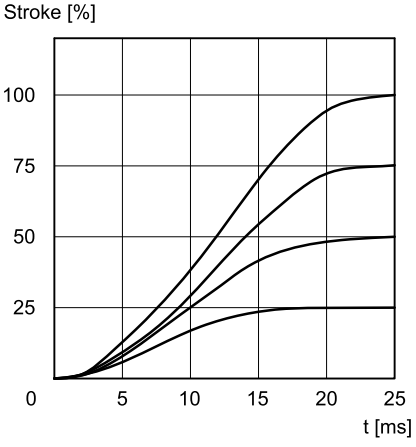


FREQUENCY RESPONSE (spools type Z)

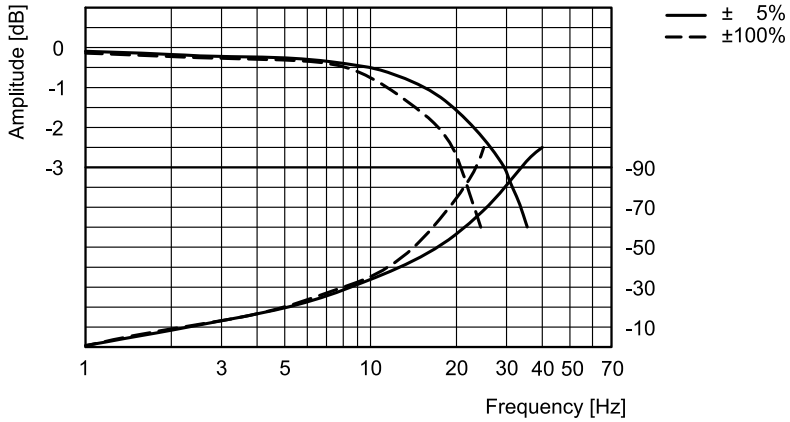


8.3 - DXRE8J* and DXRE9J*

RESPONSE TIME

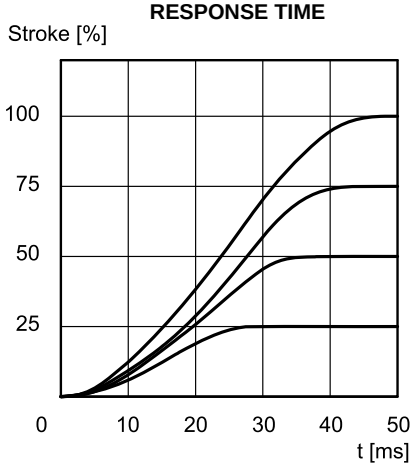


FREQUENCY RESPONSE (spools type Z)

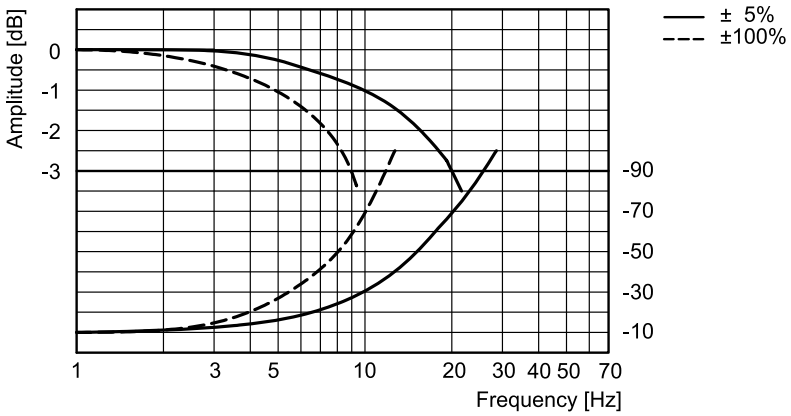


8.4 - DXRE10J* and DXRE11J*

RESPONSE TIME



FREQUENCY RESPONSE (spools type Z)



9 - HYDRAULIC CHARACTERISTICS

(with mineral oil with viscosity of 36 cSt at 50°C)

		DXRE5RJ*	DXRE7J*	DXRE8J*	DXRE9J*	DXRE10J*	DXRE11J*
Max flow rate	l/min	180	450	900	1000	1600	3500
Piloting flow required for operation 0 →100%	l/min	7	13	28	28	35	35
Piloting volume required for operation 0 →100%	cm^3	1.7	3.2	10	10	22	22

PRESSURES (bar)	MIN	MAX
Pilot supply pressure on X port	15	250
Pressure on T port with internal drain	-	30
Pressure on T port with external drain	-	250

9.1 - Pilot and drain

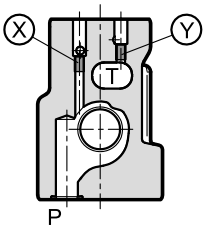
The DXRE*J* valves are available with pilot and drain both internal and external.

The version with external drain allows a higher back pressure on the discharge line.

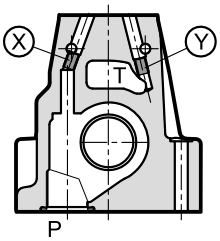
NOTE: The configuration of pilots and drains must be chosen when ordering. Subsequent modifications are allowed only to specialized operators with authorization and in factory.

TYPE OF VALVE		Plug assembly	
		X	Y
IE	internal pilot and external drain	NO	YES
II	internal pilot and internal drain	NO	NO
EE	external pilot and external drain	YES	YES
EI	external pilot and internal drain	YES	NO

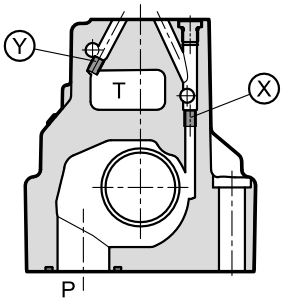
DXRE5RJ*



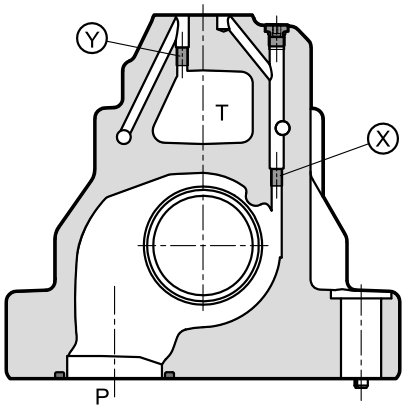
DXRE7J*



DXRE8J* / DXRE9J*



DXRE10J* / DXRE11J*

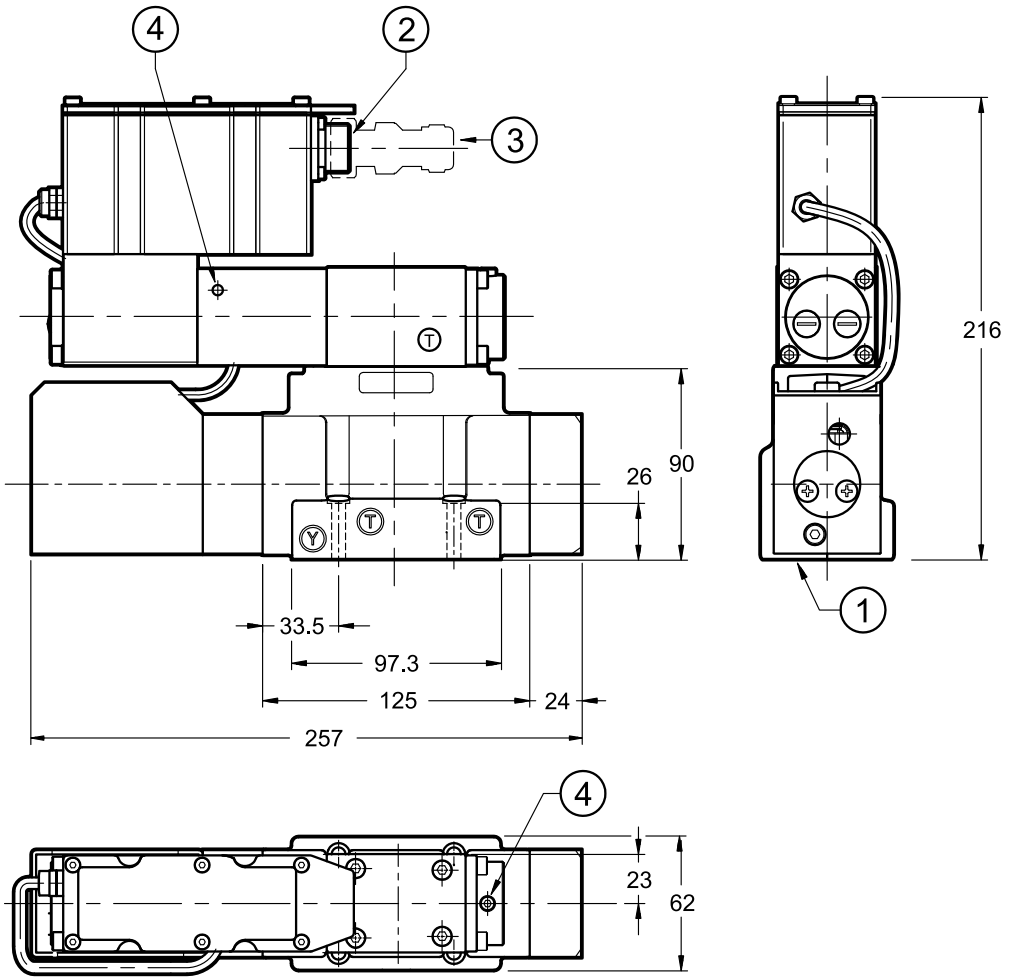


X: plug M5x6 for external pilot
Y: plug M5x6 for external drain

X: plug M6x8 for external pilot
Y: plug M6x8 for external drain

10 - DXRE5RJ* - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



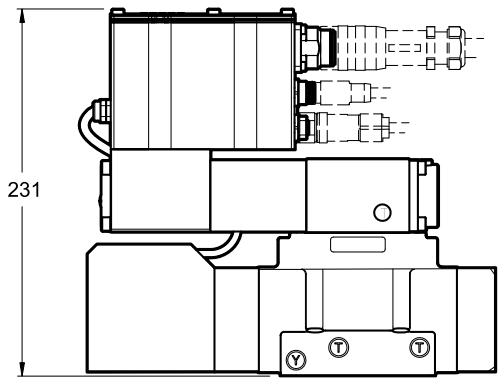
NOTES:

See mounting surface in point 14.

- Do not dismantle the transducer.
- The valve is filled with mineral oil during testing. The breathers on the pilot stage must not be opened without specific authorization.

Breaking the seals may cause the loss of the guarantee.

DXRE5RJH

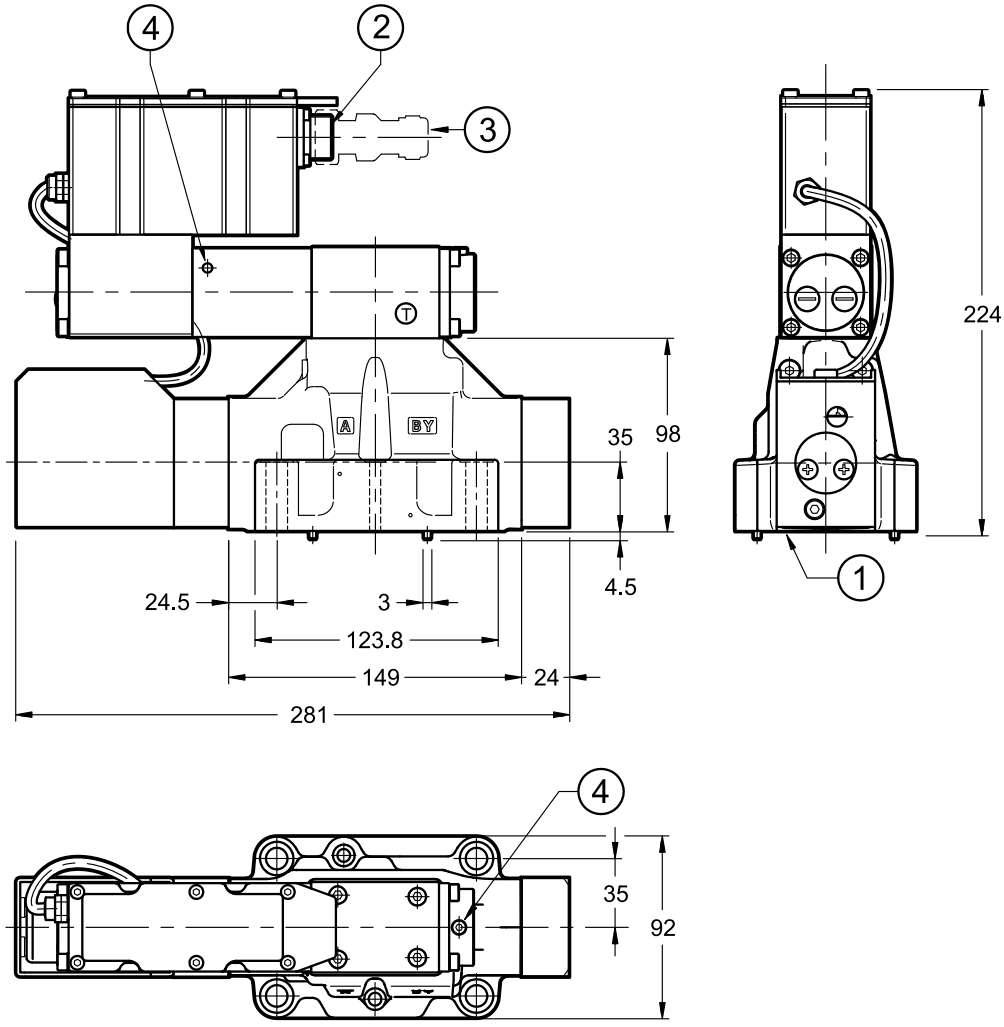


1	Mounting surface with sealing rings: 5 OR type 2050 (12.42x1.78) - 90 Shore 1 OR type 2037 (9.25x1.78) - 90 Shore
2	Main connection
3	Electrical connector (**to be ordered separately**). See point 17
4	Air breather. Sealed at the factory (**NOTE**)

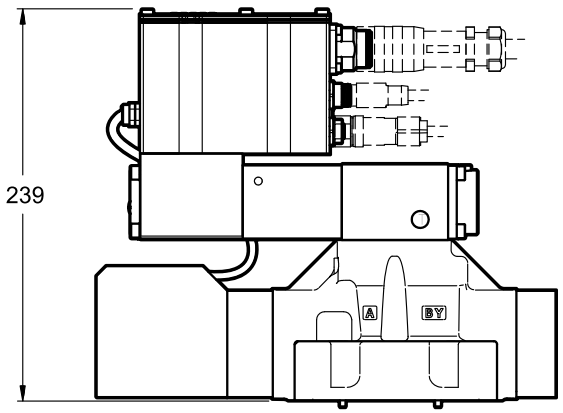
Valve fastening: 4 SHC screws ISO 4762 M6x35
Tightening torque: 8 Nm (A8.8 screws)
Threads of mounting holes: M6x10

11 - DXRE7J* - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



DXRE7JH



NOTES:

See mounting surface in point 14.

- Do not dismantle the transducer.
- The valve is filled with mineral oil during testing. The breathers on the pilot stage must not be opened without specific authorization.

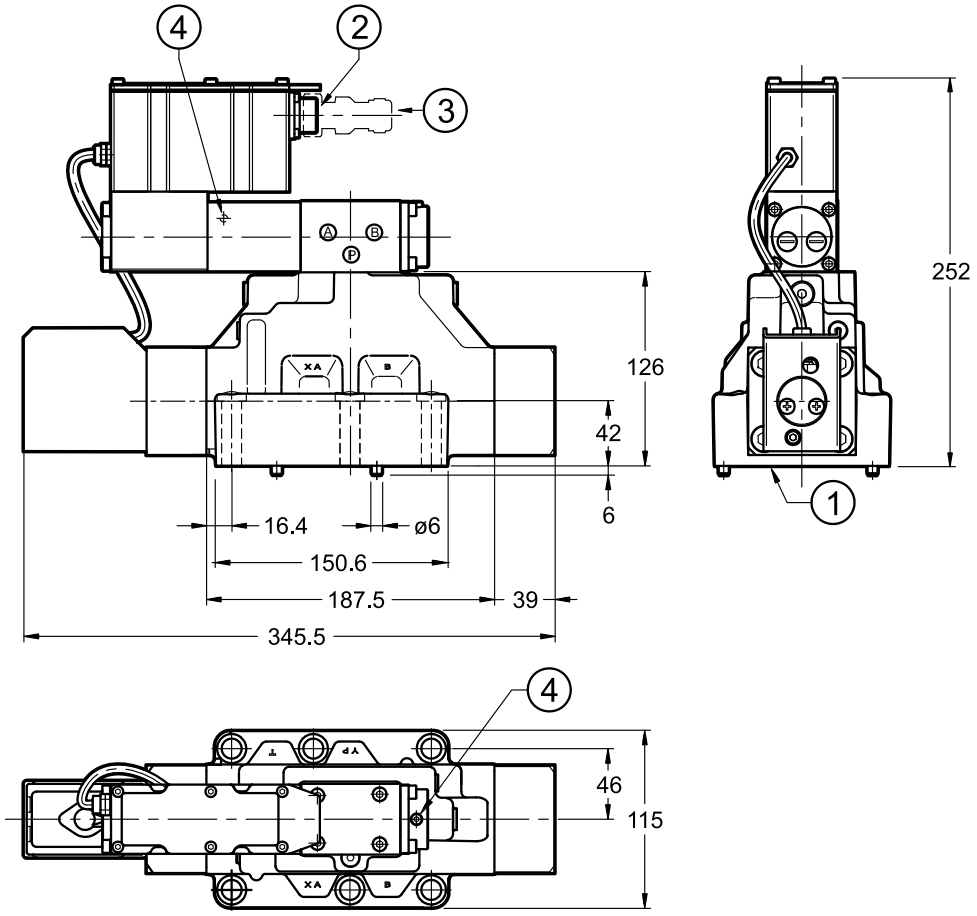
Breaking the seals may cause the loss of the guarantee.

1	Mounting surface with sealing rings: 4 OR type 130 (22.22x2.62) - 90 Shore 2 OR type 2043 (10.82x1.78) - 90 Shore
2	Main connection
3	Electrical connector (**to be ordered separately**). See point 17
4	Air breather. Sealed at the factory (**NOTE**)

Valve fastening:	4 SHC screws ISO 4762 M10x50 2 SHC screws ISO 4762 M6x50
Tightening torque	M10x50: 40 Nm (A8.8 screws) M6x50: 8 Nm (A8.8 screws)
Threads of mounting holes: M6x18; M10x18	

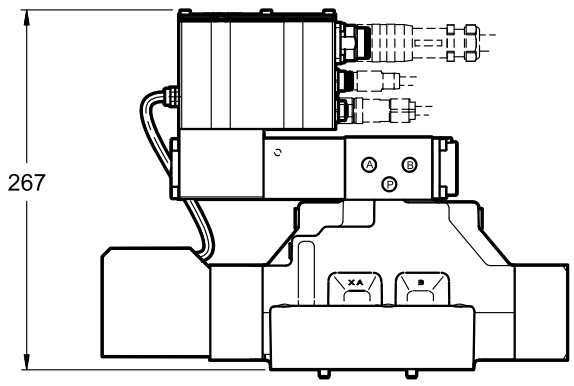
12 - DXRE8J* / DXRE9J* - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



NOTES:
See mounting surface in point 14.
- Do not dismantle the transducer.
- The valve is filled with mineral oil during testing. The breathers on the pilot stage must not be opened without specific authorization.
Breaking the seals may cause the loss of the guarantee.

DXRE8JH / DXRE9JH

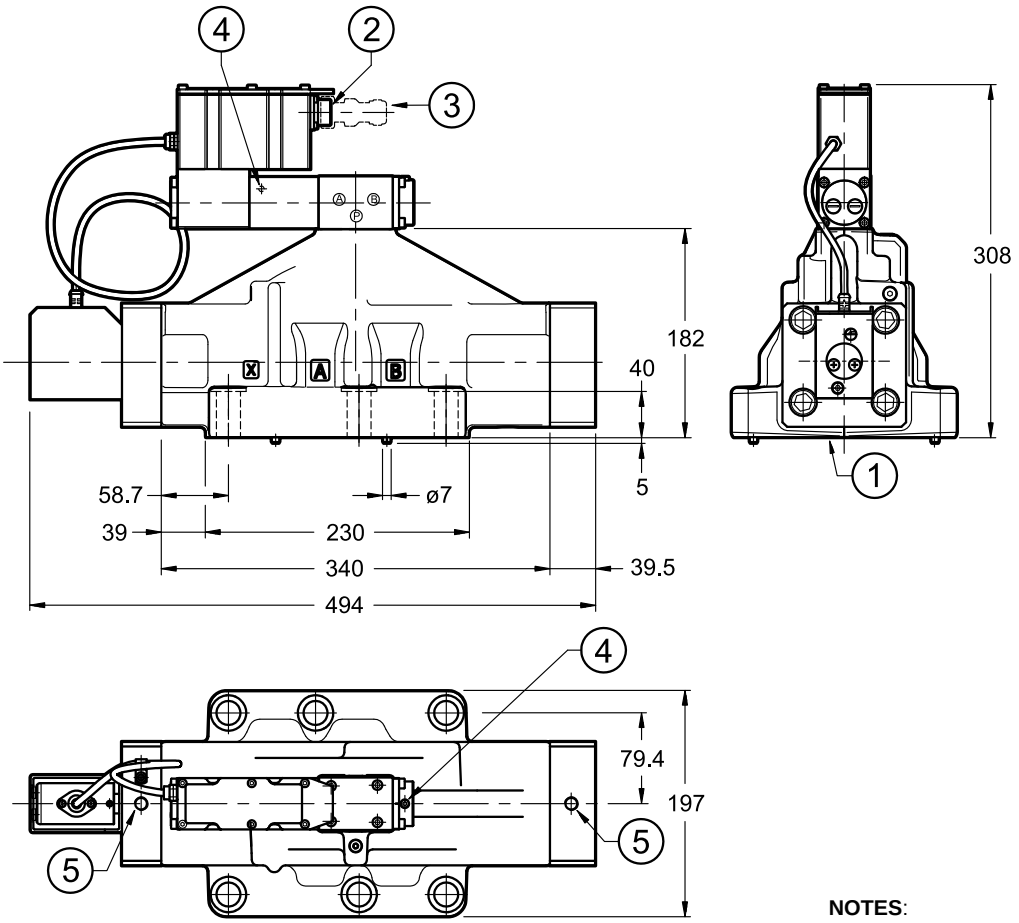


1	Mounting surface with sealing rings: **DXRE8J*** 4 OR type 3131 (32.99x2.62) - 90 Shore 2 OR type 3087 (21.89x2.62) - 90 Shore **DXRE9J*** 4 OR type 3150 (37.77x2.62) - 90 Shore 2 OR type 3087 (20.24x2.62) - 90 Shore
2	Main connection
3	Electrical connector (**to be ordered separately**). See point 17
4	Air breather. Sealed at the factory (**NOTE**)

Valve fastening: 6 SHC screws ISO 4762 M12x60
Tightening torque: 69 Nm (A8.8 screws)
Threads of mounting holes: M12X20

13 - DXRE10J* / DXRE11J* - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



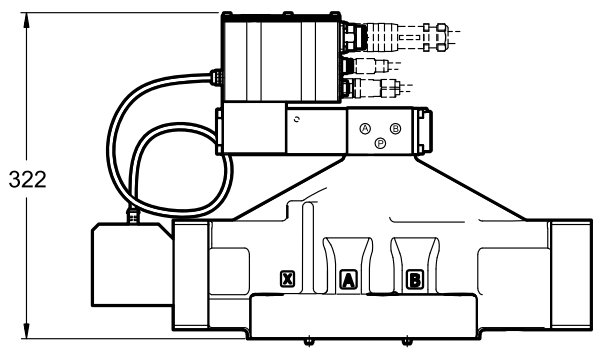
NOTES:

See mounting surface in point 14.

- Do not dismantle the transducer.
- The valve is filled with mineral oil during testing. The breathers on the pilot stage must not be opened without specific authorization.

Breaking the seals may cause the loss of the guarantee.

DXRE10JH / DXRE11JH

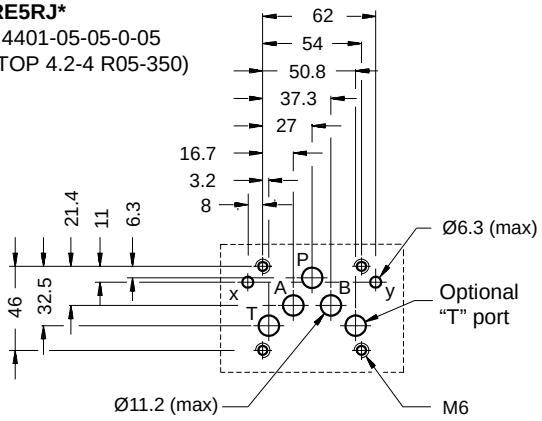


1	Mounting surface with sealing rings: **DXRE10J*** 4 OR type 4162 (40.86x3.53) - 90 Shore 2 OR type 3081 (20.24x2.62) - 90 Shore **DXRE11J*** 4 OR type 4212 (53.57x3.53) - 90 Shore 2 OR type 3081 (20.24x2.62) - 90 Shore
2	Main connection
3	Electrical connector (**to be ordered separately**). See point 17
4	Air breather. Sealed at the factory (**NOTE**)
5	M12 eyebolt seat for safe lift

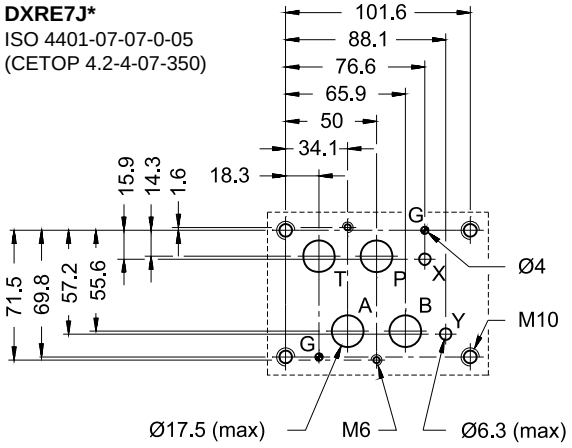
Valve fastening: 6 SHC screws ISO 4762 M20x70 (supplied)
Tightening torque: 330 Nm (A8.8 screws)
Threads of mounting holes: M20x40

14 - MOUNTING SURFACES

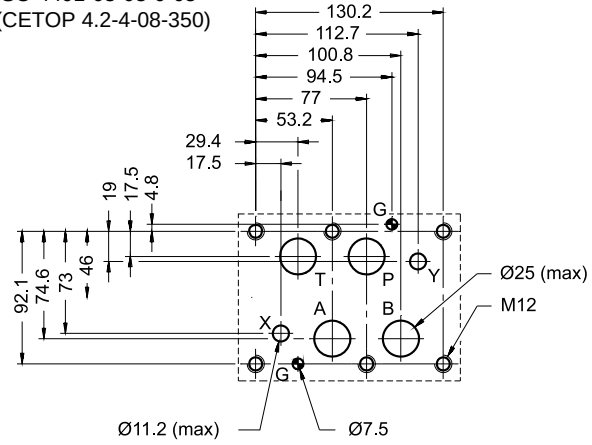
DXRE5RJ*
ISO 4401-05-05-0-05
(CETOP 4.2-4 R05-350)



DXRE7J*
ISO 4401-07-07-0-05
(CETOP 4.2-4-07-350)

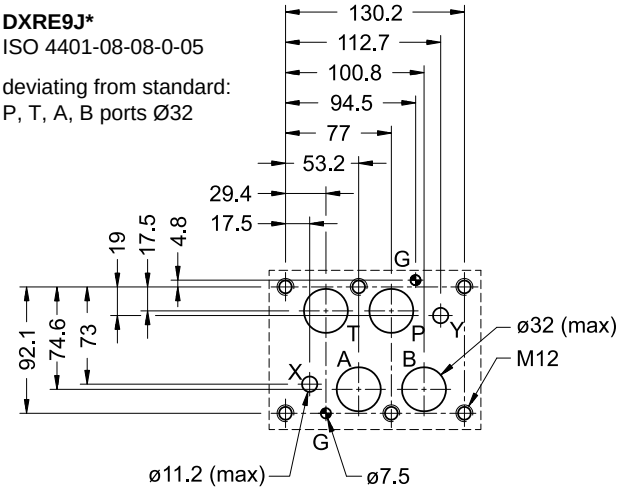


DXRE8J*
ISO 4401-08-08-0-05
(CETOP 4.2-4-08-350)

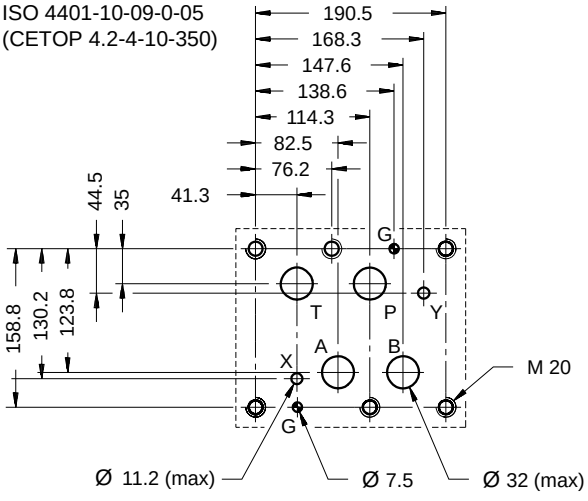


DXRE9J*
ISO 4401-08-08-0-05

deviating from standard:
P, T, A, B ports Ø32

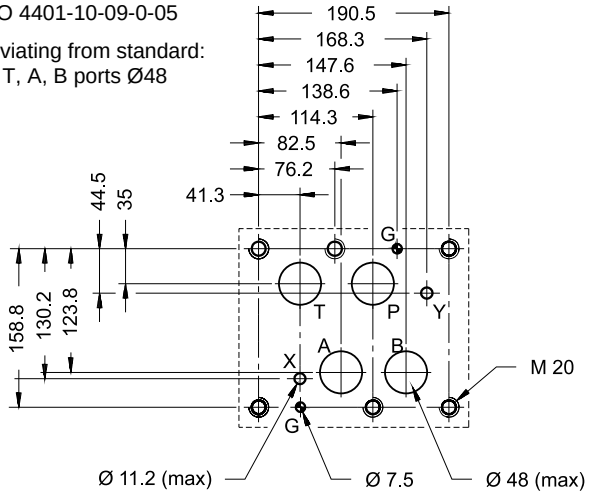


DXRE10J*
ISO 4401-10-09-0-05
(CETOP 4.2-4-10-350)



DXRE11J*
ISO 4401-10-09-0-05

deviating from standard:
P, T, A, B ports Ø48



15 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

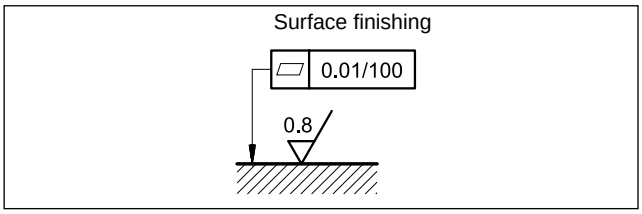
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

16 - INSTALLATION

The valves can be installed in any position without impairing correct operation. Make sure the hydraulic circuit is free of air.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.

Take care to the cleanliness of the mounting surfaces and surrounding environment upon installation.



17 - ACCESSORIES

(to be ordered separately)

17.1 - Mating connectors

Mating connectors must be ordered separately. See catalogue 89 000.

We recommend the choice of a metal connector to avoid electromagnetic disturbances and to comply with EMC regulations on electromagnetic compatibility. If you opt for a plastic connector, make sure that it guarantees and maintains the IP and EMC protection characteristics of the valve.

17.2 - Mating connectors for fieldbus communication and for sensors.

Duplomatic offers spare parts to be wired and also ready-to-use cord sets. Please refer to cat. 89 000.

17.3 - Connection cable

The optimal wiring provides for 7 isolated conductors, with separate screen for the signal wires (command, monitor) and an overall screen.

Cross section for power supply:
- up to 20 m cable length : 1,0 mm^2
- up to 40 m cable length : 1,5 mm^2

Cross section for signals (command, monitor):
- 0,50 mm^2

17.4 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic. See catalogue 89 850.

18 - SUBPLATES

(see catalogue 51 000)

Subplates are not available for DXRE5RJ, DXRE9J, DXRE10J and DXRE11J.

		DXRE7J*	DXRE8J*
with rear ports		PME07-AI6G	-
with side ports		PME07-AL6G	PME5-AL8G
thread of ports:	P - T - A - B X - Y	1” BSP 1/4” BSP	1½” BSP 1/4” BSP

DUPLOMATIC MOTION SOLUTIONS
a member of DAIKIN group

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duplomaticmotionsolutions.com

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09

INSTRUMENTATION / FILTRATION / POWER UNITS

14 catalogue documents | 90 original technical pages

3 instrumentation | 8 filtration | 3 hydraulic power-unit catalogues



M63
PRESSURE GAUGE

SERIES 10

according to EN 837-1

TECHNICAL CHARACTERISTICS

Nominal diameter	mm	63
Nominal pressure	bar	0 ÷ 6 0 ÷ 10 0 ÷ 16 0 ÷ 25 0 ÷ 60 0 ÷ 100 0 ÷ 160 0 ÷ 250 0 ÷ 400
Static pressure	3/4 of the end scale value	
Dynamic pressure	2/3 of the end scale value	
Limit pressure	end scale value for short period	
Precision class according to EN 837-1	1,6	
Thermal drift	± 0,4% / 10K in the measure range	
Protection class according to EN 60529 / IEC 60529	IP65	
Ports according to EN 837-1	1/4” BSP	
Ports material	copper alloy	
Sensible element: 0 ÷ 6, 0 ÷ 10, 0 ÷ 16, 0 ÷ 25, 0 ÷ 60. 0 ÷ 100, 0 ÷ 160, 0 ÷ 250, 0 ÷ 400.	copper alloy, type-C, braze welding spring copper alloy, helical, braze welding spring	
Movements	copper alloy	
Dial	white plastic with lock pins in black plastic	
Case	stainless steel with natural finishing, and OR between case and shank	
Display	transparent plastic	
Filling liquid	glycerin 85% + distilled water 15%	
CE Marking	in compliance with PED 2014/68/EU	
Working temperature range	°C	-20 / +60
Mass	kg	0,24

DESCRIPTION

— The pressure gauges M63 are pressure indicators used on hydraulic systems.

— They guarantee a correct pressure measurement also with pulsations and vibrations.

— They are available in 9 different pressure scales and with 2 connection types for mounting with radial port or rear port with flange connector.

— The case is made of stainless steel and the connection is made of copper alloy.

— The filling in liquid is made of 85% glycerin and 15% distilled water.

— The pressure gauges with a end scale of 250 bar and 400 bar are equipped with the CE mark on the dial for the fluid group 1 according to Annex II, scheme 1 of the PED directive 2014/68/EU.
All the others do not need the CE marking, as per art. 4, sec. 3 of the same directive.

— The construction and the realisation have been done according to EN 837-1.

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

M	63	-		/	10	

Pressure gauge

Dial nominal diameter
63 = 63 mm

Pressure gauge scale

006 = 0 ÷ 6 bar
010 = 0 ÷ 10 bar
016 = 0 ÷ 16 bar
025 = 0 ÷ 25 bar
060 = 0 ÷ 60 bar
100 = 0 ÷ 100 bar
160 = 0 ÷ 160 bar
250 = 0 ÷ 250 bar
400 = 0 ÷ 400 bar

Series No.
(the overall and mounting dimensions remain unchanged from 10 to 19)

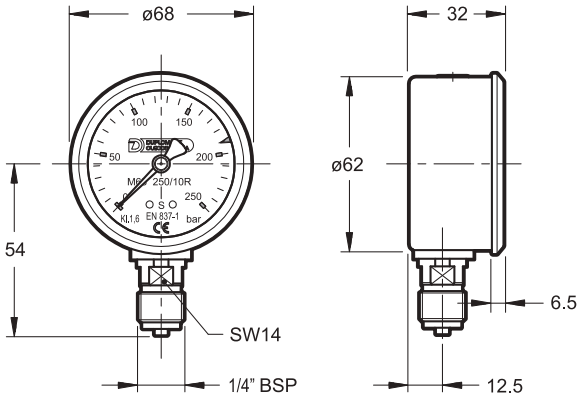
Connection type:
R = radial connector
PF = flange connector

NOTE: Models No. 006, 010, 016 and 025 are available with radial connector (**R**) only.

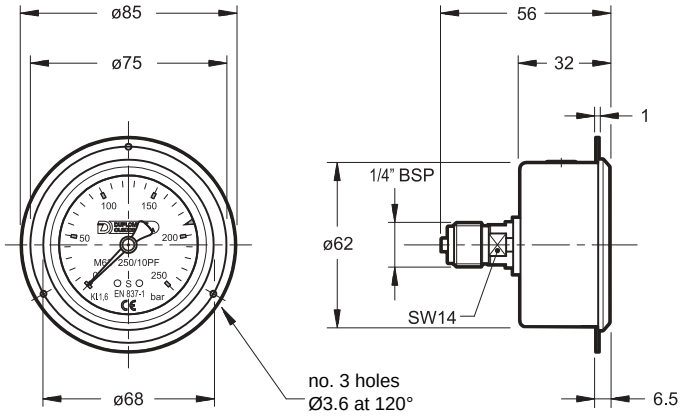
2 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

M63-*/10R



M63-*/10PF



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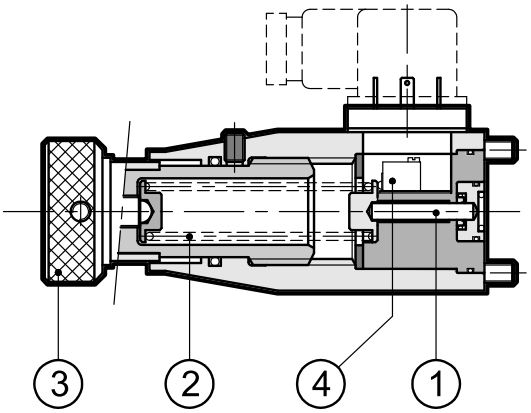
PS*

PISTON TYPE PRESSURE SWITCH

SERIES 21

p max **650** bar
max adjustable **p 35 - 140 - 350 - 630** bar

OPERATING PRINCIPLE



— PS* are piston type, hydro-electrical pressure switches.
The internal electrical contact is switched when the operating pressure reaches the set value.

— The line pressure acts on piston (1) which is directly loaded by a spring (2) on the opposite side. The spring load is adjustable by means of the knob (3). When the line pressure reaches the set valve, the piston (1) moves and switches the micro-contact (4).

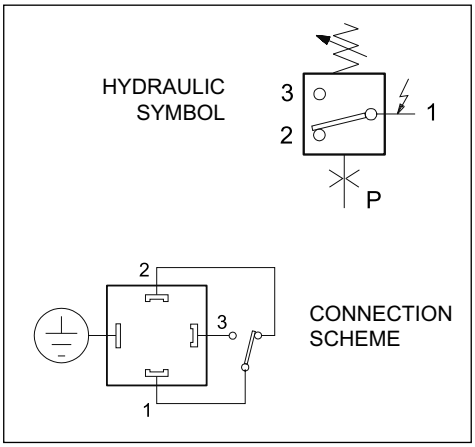
— The pressure switches are available in four pressure ranges, from 35 up to 630 bar, and they can be subplate mounting or 1/4" BSP threaded port type.

— Standard supply is with adjustment knob and with pressure scale.

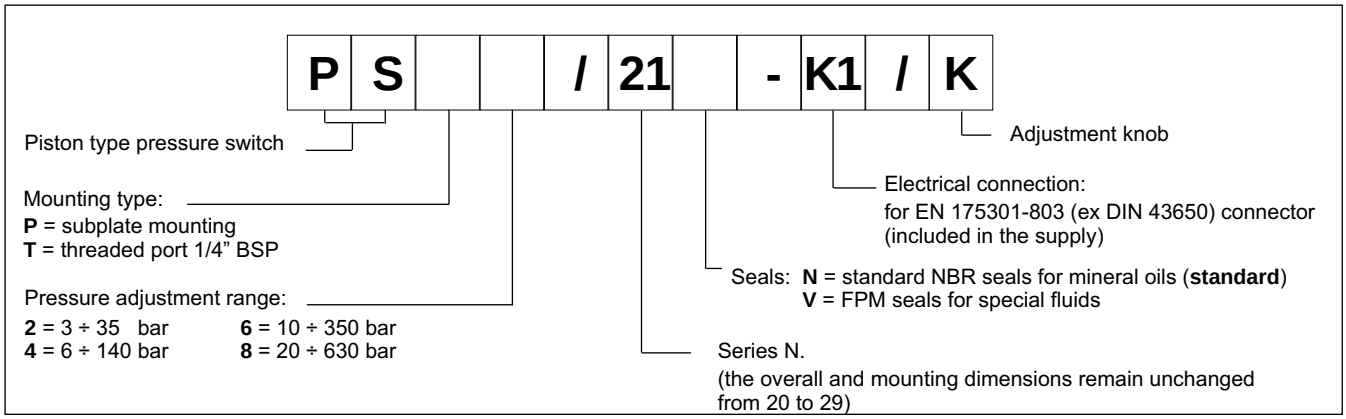
TECHNICAL CHARACTERISTICS

PRESSURE SWITCH		PS*2	PS*4	PS*6	PS*8
Pressure adjustment range	bar	3 ÷ 35	6 ÷ 140	10 ÷ 350	20 ÷ 630
Max operating pressure	bar	350	350	650	650
Hysteresis	see par. 5				
Repeatability	< ± 1 % of set pressure				
Electrical characteristics	see par. 3				
Ambient temperature range	°C	–20 / +50			
Fluid temperature range	°C	–20 / +80			
Fluid viscosity range	cSt	10 ÷ 400			
Recommended viscosity	cSt	25			
Fluid contamination degree	according to ISO 4406:1999 class 20/18/15				
Mass	kg	0,67			

SYMBOLS



1 - IDENTIFICATION CODE



2 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

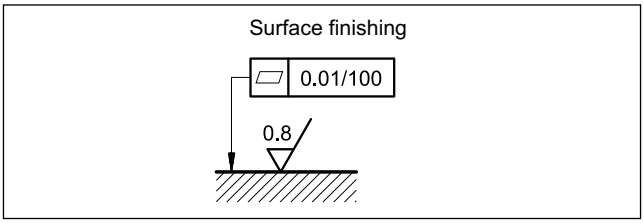
3 - ELECTRICAL CHARACTERISTICS

		AC		DC	
Power supply	V	125	250	30	250
Max load on contacts - resistive - inductive	A	 7 4	 5 2	 5 3	 0,2 0,02
Electrical insulation (according to CEI EN 60204)		> 1 M Ω at 500 Vdc			
Max switching rate	switches/min	120			
Protection class (according to CEI EN 60529)		IP 65			

4 - INSTALLATION

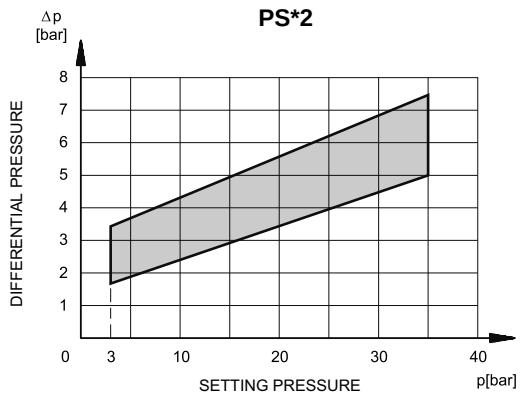
The pressure switches can be installed in any position without impairing its correct operation. Ensure that there is no air in the hydraulic circuit.

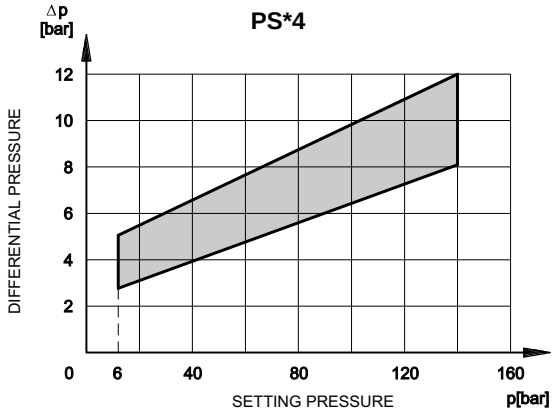
The subplate mounting pressure switch PSP type is fixed by means of screws on a flat surface with planarity and roughness values equal to or better than those indicated in the relative symbols. If the minimum values are not observed, the fluid can easily leak between the valve and the mounting surface.

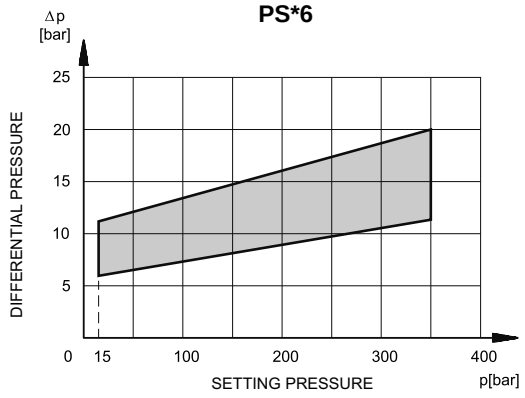


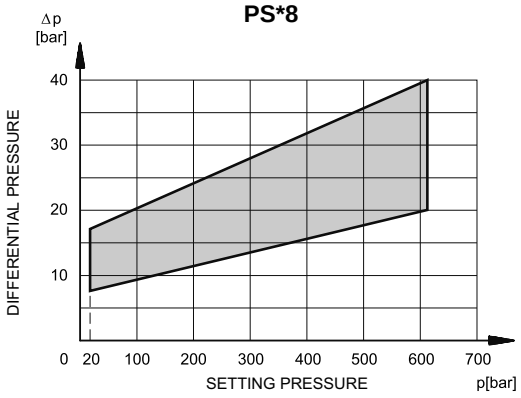
5 - HYSTERESIS CHARACTERISTICS

(values measured with viscosity of 36 cSt at 50°C)









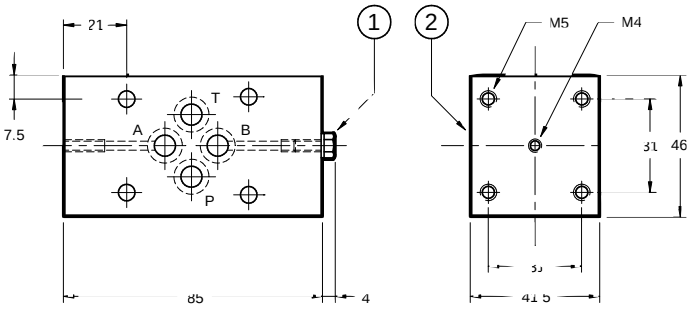
6 - SUBPLATES FOR STACK MOUNTING

The PSP pressure switches can be stack mounted by means of ISO 4401-03 (CETOP 03 subplates), code 1950611 and 1950621.

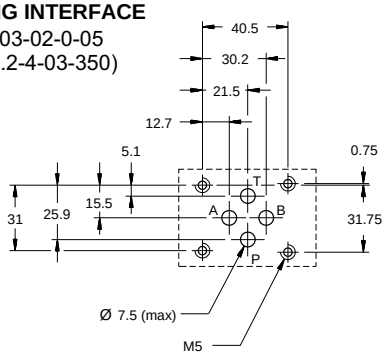
The subplate code 1950611 permits the connection between the pressure switch and A and/or B ports, depending on where the bolt (1) is installed. The subplate code 1950621 permits the connection between the pressure switch and the P port.

SUBPLATE CODE 1950611 (A and B ports connection)

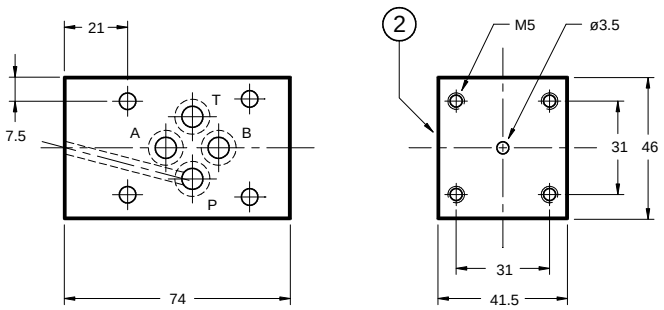
MAX PRESSURE 350 BAR



MOUNTING INTERFACE
ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)



SUBPLATE CODE 1950621 (P port connection)



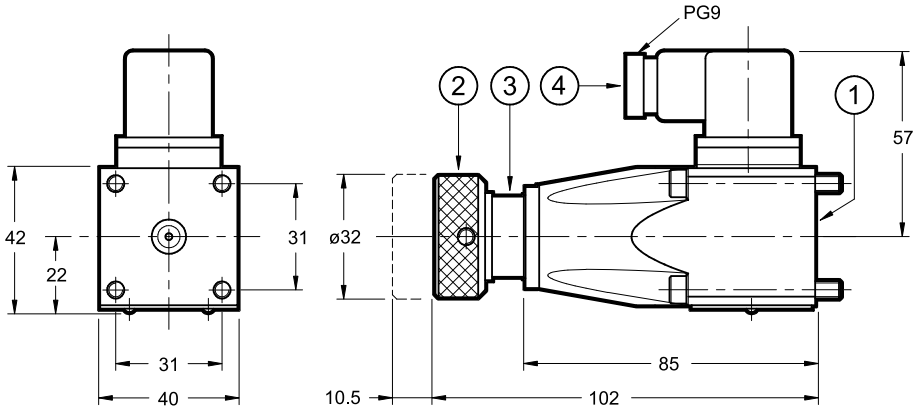
dimensions in mm

1	Hexagonal head M4x12 bolt with “bonded seal” type 400-002 (Dowty) Unscrew the bolt and its seal from the side where the switch is installed
2	Mounting surface with sealing rings 4 OR type 2037 (9.25x1.78) - 90 Shore

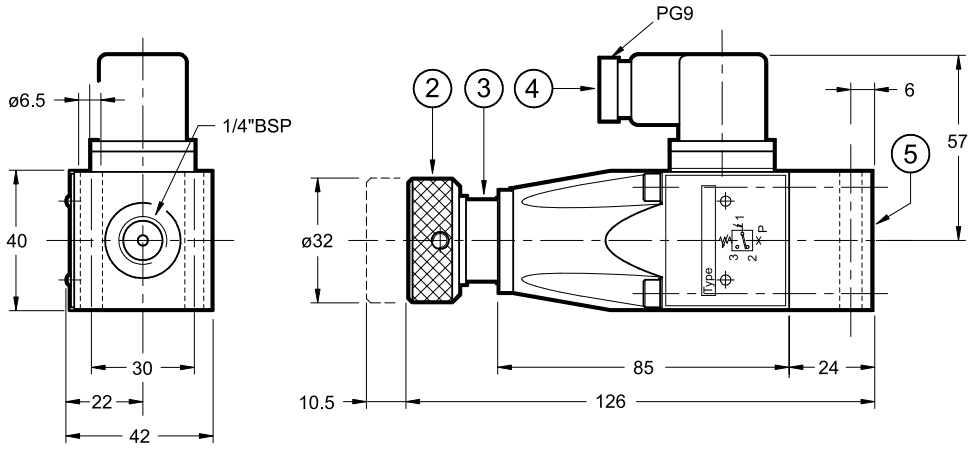
7 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

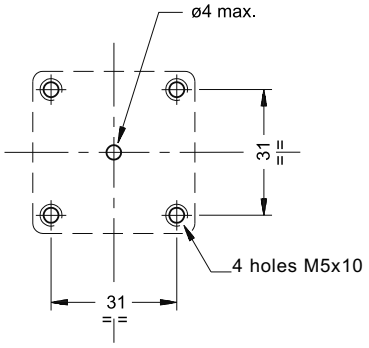
PSP



PST



MOUNTING INTERFACE (PSP version)



Fastening bolts (PSP version) N. 4 bolts M5x45 - ISO 4762 A12.9 (included in the supply)
Tightening torque: 8 Nm

1	Mounting surface with sealing rings: N. 1 OR type 2025 (6.07x1.78) - 90 shore (PSP version)
2	Adjustment knob Clockwise rotation to increase pressure
3	Graduated scale with indication of setting pressure in [bar]
4	EN 175301-803 (ex DIN 43650) electrical connector 3 poles + ground supplied with pressure switch
5	Interface plate for pipe connection: - 1/4” BSP threaded female connection - 2 clearance holes for possible fixing by means of bolts M5x50 **NOTE: the interface plate is already installed on the PST type pressure switch only.**

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DUPLOMATIC MOTION SOLUTIONS

WWW.SUMY.IR



PTH

PRESSURE TRANSMITTERS WITH ANALOGUE OR DIGITAL OUTPUT

p nom:
25 - 40 - 60 - 100 - 160 - 250 - 400 bar

DESCRIPTION

This series of pressure transmitters has been designed in order to be used for the main industrial applications and on moving machines.

The main feature of this transmitter is to ensure its functioning also in harsh environments, especially for what concerns the fluid temperature range which can vary from a minimum of - 40 °C up to a maximum of + 120 °C.

The basis of this transmitter is the strain-gauge, which is powered by an electric circuit developed according to the SMT technology which ensures a high reliability and maximum resistance to vibrations and mechanical stress.

Every component into contact with the fluid is made of stainless steel and the pressure sensor is completely fluid-proof.

It is available with current output signal 4 ÷ 20 mA or with voltage output signal 0÷10 V.

Versions also available upon request are 0÷5 V and 0.5÷4.5 V, ratiometric.

The series includes also a version with output PNP transistor with the function of pressure switch.

All the transmitters are reverse polarity protected.

The protection class of the electrical connection for the version with DIN connector is IP65, while the version with the M12 connector has a protection class IP67.

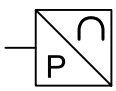
TECHNICAL SPECIFICATIONS

Nominal pressure P_N	bar	**25**	**40**	**60**	**100**	**160**	**250**	**400**
Overpressure	x P_N	x 3	x 3	x 3	x 3	x 3	x 3	x 2.5
Burst pressure	x P_N	x 12	x 7	x 6.5	x 5	x 4.7	x 4	x 5

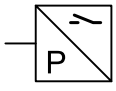
Accuracy (typical at 25 °C)		% P_N	± 0,5
Output signal:	current voltage switching PNP	mA V	4 ÷ 20 0÷10, 0÷5, 0.5÷4.5 1 output, 24 V
Sensor temperature range:		°C	-40 / +120
Ambient and fluid temperature range: sealing in	FPM (standard) NBR EPDM	°C	-20 / +120 -25 / +100 -40 / +125
Rise time (10%…90% of P_N)		ms	1
Hydraulic connection			1/4” BSP with seal
Housing and pressure connection			AISI 304
Mass		g	50

HYDRAULIC SYMBOLS

PTH*....*-E*



PTH*....*-1P



1 - IDENTIFICATION CODE

P	T	H	-		/			-		

Pressure transmitter

High-dynamic performance

Nominal pressure
025 = 25 bar **040** = 40 bar
060 = 60 bar **100** = 100 bar
160 = 160 bar **250** = 250 bar
400 = 400 bar
(other pressure values are available upon request)

Series N.
30 = transmitters with electrical connection type K10
31 = transmitters with electrical connection type K12
(the overall and mounting dimensions remain unchanged from 30 to 39)

Seals:
V = FPM seals for special fluids (**standard**)
N = NBR seals for mineral oil
EP = EPDM seals

WARNING! The EPDM is not suitable for use with mineral oil. Verify the compatibility of EPDM with the used fluid!

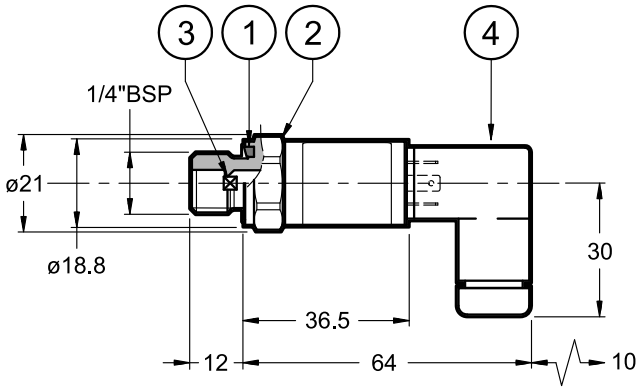
Analogue output signal (**standard**)
E0 = 0 ÷ 10 V
E1 = 4 ÷ 20 mA
upon request only:
E2 = 0 ÷ 5 V
E5 = 0.5 ÷ 4.5 V ratiometric

Electrical connection
K10 = Reduced electrical connector type DIN 43650
K12 = Electrical connector M12 - 4 pin

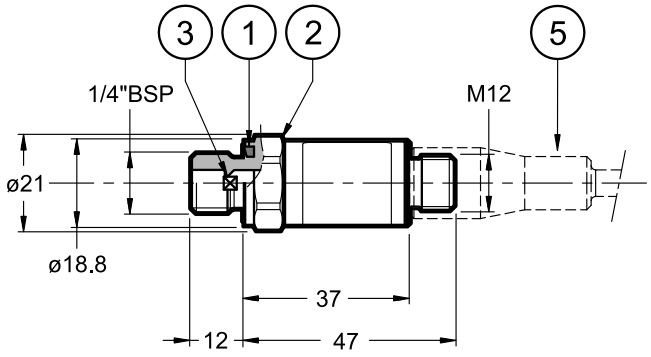
2 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

PTH-*/30*- *K10



PTH-*/31*- *K12



1	Integral seal type DIN 3869
2	Key: spanner 19 Tightening torque: 25 Nm
3	Damping restrictor
4	Electrical connector EN 17301-803 (ex DIN 43650) Micro C - PG7 **Included in delivery**
5	Electrical connector 5 pin EC5S/M12L/10 (**to be ordered separately**) code 3491001001 IP67 - PG7

3 - TECHNICAL CHARACTERISTICS

Electrical data

		E0	E1	E2	E5
Output signal		0 ÷ 10 V	4 ÷ 20 mA	0 ÷ 5 V	0.5 ÷ 4.5 V ratiometric
Supply voltage (U_S)	V CC	24 (15 ÷ 32)	24 (9 ÷ 32)	24 (9 ÷ 32)	5 (4.75 ÷ 5.25)
Max current consumption	mA	≤ 15	-	≤ 20	≤ 10
Load resistance	kΩ	≥ 5.0	see p. 4.2	≥ 5.0	≥ 5.0

Accuracy

Accuracy (typical at 25 °C)	% P_N	± 0.5
TEB Total error band (-25…+85 °C)	% P_N	± 1.75
NLH Non linearity and hysteresis (at 25 °C)	% P_N	± 0.2
TC Temperature coefficient	% P_N	± 0.03
Long-term stability after 1 year (at 25 °C)	% P_N	± 0.1

Environmental conditions

Electromagnetic compatibility (EMC): according to 2014/30/EU		Immunity 61000-6-2 Emissions 61000-6-4
Vibrations		50 G / 11 ms
Class protection according to EN 60529 with connector proprerly installed.	K10 K12	IP65 IP67

4 - TRANSMITTERS POWER SUPPLY

4.1 - Versions in voltage (E0, E2, E5 ratiometric)

These transmitters are equipped with voltage stabilizer which supplies the electric circuit with constant voltage, independently from power supply voltage.

We recommend a stabilized power supply voltage, within proper ranges as in table at point 3.

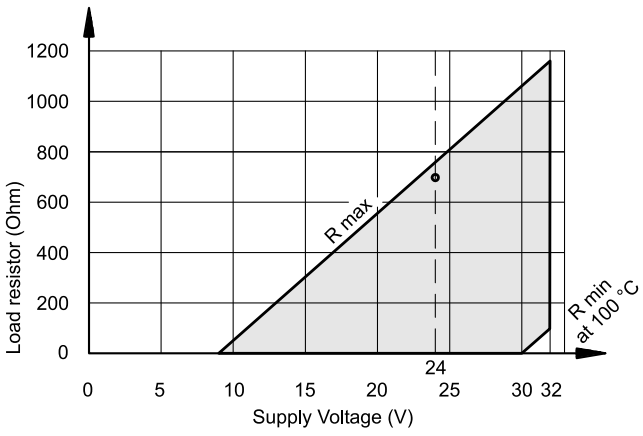
4.2 - Version in current 4 ÷ 20 mA (E1)

The transmitter works properly within an operating area (see diagram) that depends on both the voltage supply value and the external load resistance used to convert the signal.

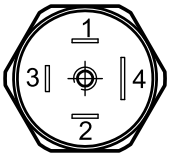
It is recommended to choose values close to the limit Rmax, in order to have a wide signal that is easier to read.

We suggest supply voltage of 24 VDC and a load resistance of 700 Ohm.

min / max resistor vs. supply voltage E1 version
with Pmax = 100%

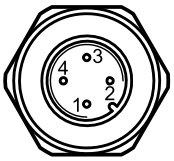


5 - ELECTRIC CONNECTIONS



K10

Connection DIN 43650 reduced
3 pin + GND

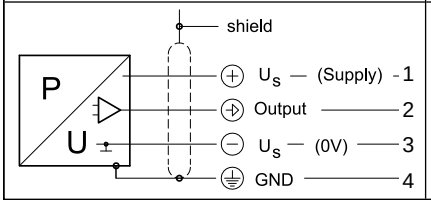


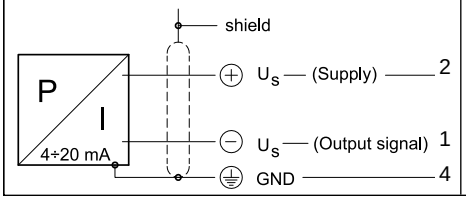
K12

Connection M12x1
4 pin

WARNING! Check that the connection cables are suitable for the temperature range intended for the use of the device.

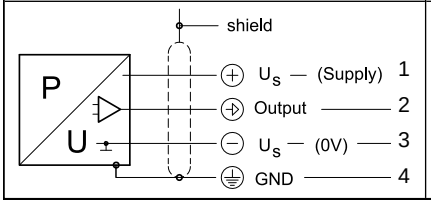
6 - WIRING DIAGRAMS - K10 CONNECTION

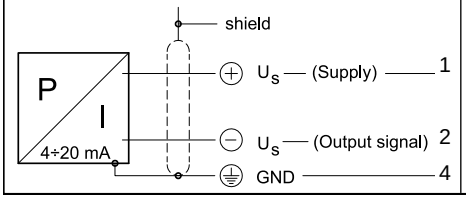
voltage output - 3 wires + GND	Version		
	E0	**E2**	**E5**
	24 V 0÷10 V 0 V GND	24 V 0÷5 V 0 V GND	5 V 0.5÷4.5 V 0 V GND

current output - 2 wires + GND	Version
	E1
	24 V 4 ÷ 20 mA GND

WARNING! The pin assignment for the transducer PTH - */30*-E0K10 (DIN 43650 connection) differs from that of the previous series!

7 - WIRING DIAGRAMS - K12 CONNECTION

voltage output - 3 wires + GND	Version		
	E0	**E2**	**E5**
	24 V 0÷10 V 0 V GND	24 V 0÷5 V 0 V GND	5 V 0.5÷4.5 V 0 V GND

current output - 2 wires + GND	Version
	E1
	24 V 4 ÷ 20 mA GND

WARNING! The pin assignment for the transducer PTH - */31*-E*K12 (M12 - 4 pin connection) differs from that of the previous series!

8 - VERSION WITH DIGITAL SWITCHING OUTPUT PNP

8.1 - Identification code

P	T	H	-		/	31		-	1P	K12

Pressure transmitter

High-dynamic performance

Nominal pressure
025 = 25 bar **040** = 40 bar
060 = 60 bar **100** = 100 bar
160 = 160 bar **250** = 250 bar
400 = 400 bar
(other pressure values are available upon request)

Series N.
(the overall and mounting dimensions remain unchanged from 30 to 39)

Seals:
V = FPM seals for special fluids (**standard**)
N = NBR seals for mineral oil
EP = EPDM seals

WARNING! The EPDM is not suitable for use with mineral oil. Verify the compatibility of EPDM with the used fluid!

Output signal: 1 output PNP transistor

Electrical connection for connector M12 - 4 pin

8.2 - Overall and mounting dimensions

Please refer to the dimensions at point 2 for version PTH-*/31*-*K12.

8.3 - Technical characteristics

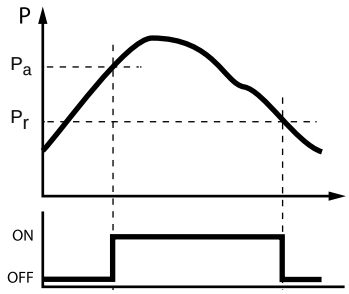
Please refer to the table at point 3 for accuracy and environmental conditions.

Output signal			1 PNP, U_S
Supply voltage (U_S)		V CC	24 (9 ÷ 32)
Max current consumption		mA	≤ 10
Switch point:	switch reset	% P_N	75 25
Switching resistance		Ohm	≤ 3
Switching frequency		Hz	≤ 60
Switch delay time		ms	0

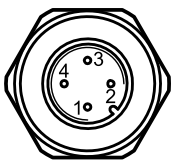
8.4 - Switch point

The transmitter changes state when the pressure achieves the switch point and again when the pressure drops down to the reset value.

The reset point is always lower than the switch point. These points are set as a percentage of the full scale value. The step between switch point and reset point must always be ≥ 1 % of the full scale value.



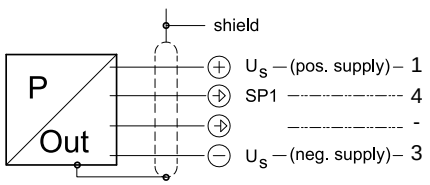
8.5 - Electrical connection and wiring diagram



K12

Connection M12x1 - male
4 pin

WARNING! Check that the connection cables are suitable for the temperature range intended for the use of the device.

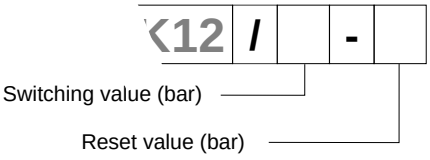
output PNP 1 transistor 1P	Version
	1P
	24 V U_S - 0V

8.6 - Customized setting of the switch points

It is possible to order PNP transmitters with customized setting of the switch point, after evaluation of the request by our Sales Dept. Please also indicate any needs of custumization of the delay time during the request phase.

Setting range of the switch point for customized setting	% P_N	1 ÷ 99
Step between switch point and reset point (switch point > reset point)	% P_N	≥ 1

The desired switch point and reset point have to be indicated at the end of the identification code.



Example: **PTH-060/31N1PK12/40-30**

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duplomaticmotionsolutions.com

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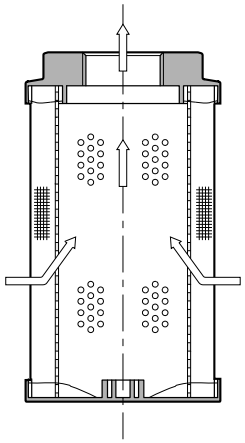
FSI

SUCTION FILTER FOR SUBMERGED MOUNTING

SERIES 10

Q max (see performance ratings table)

OPERATING PRINCIPLE



— FSI filters are filter elements which function being completely submerged in the tank. They are installed directly at the end of the pump suction line.

— They are aimed at protecting the pump from any possible gross contamination present inside the tank.

— The filter element is a metallic strainer with a 90 µm filtration degree,which grants a good pump protection without compromising the correct fluid supply.

— The filters are designed with a threaded BSP connection, available in the sizes from 3/8” to 3”. They are supplied with a hexagonal shank, which allows the filter element to be connected by spanner to the pump suction line.

TECHNICAL SPECIFICATIONS

Filter code	BSP port dimensions	Rated flow (**NOTE 1)** [l/min]	Rated filtration degree [µm]
FSI-TB038	3/8”	9	90
FSI-TB012	1/2”	14	
FSI-TB034	3/4”	25	
FSI-TB100	1”	45	
FSI-TB114	1 ¼”	75	
FSI-TB112	1 ½”	100	
FSI-TB200	2 ”	160	
FSI-TB212	2 ½”	250	
FSI-TB300	3”	350	

NOTE 1: The flow rates stated in the table correspond to a 0.02 bar pressure drop measured with mineral oil of viscosity 36 cSt at 50°C.

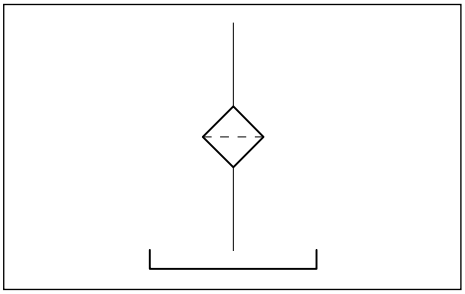
As for fluids whose viscosity degree at a specific operating pressure is different from 36 cSt, the real pressure drop has to be changed according to the following ratio:

$$\text{real } \Delta p \text{ value} = 0.02 \cdot \frac{\text{real Q}}{\text{table Q}} \cdot \frac{\text{real viscosity degree (cSt)}}{36}$$

The filter size has to be selected so that with the nominal flow rate the pressure drop is lower than 0.02 bar.

Collapsing differential pressure of the filter element	bar	1,0
Ambient temperature range	°C	-25 / +50
Fluid temperature range	°C	-25 / +110
Fluid viscosity range	cSt	10 ÷ 400

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

F	S	I	-	T	B				-	M	90	S	/	10	-	0

Submerged suction filter

BSP threaded port

Nominal dimension:
038 = 3/8” **114** = 1¼”
012 = 1/2” **112** = 1½”
034 = 3/4” **200** = 2”
100 = 1” **212** = 2 ½”
300 = 3”

Without a by-pass valve

Series No.
(from 10 to 19 sizes and mounting dimensions remain unchanged)

Standard filter element

Filter element metallic strainer.
90 µm filtration degree

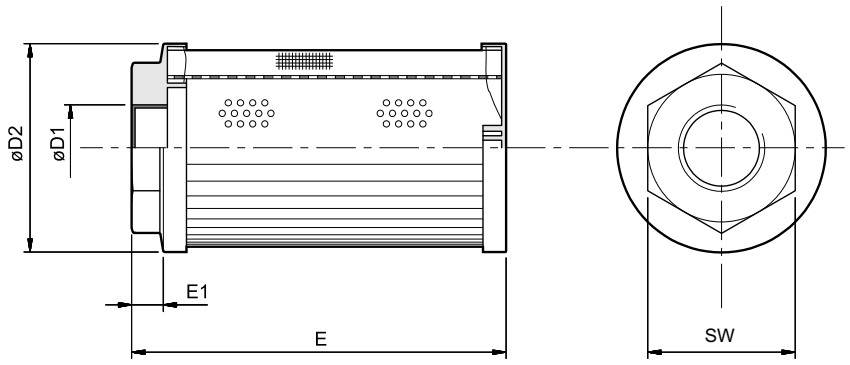
2 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals. For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

3 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



D1	D2	E	E1	SW
3/8”	52	73	12	30
1/2”	70	92	13	42
3/4”	70	137	13	42
1”	70	137	13	42
1 1/4”	99	135	15	70
1 1/2”	99	218	15	70
2”	130	201	15	70
2 1/2”	130	253	15	101
3”	130	253	15	101

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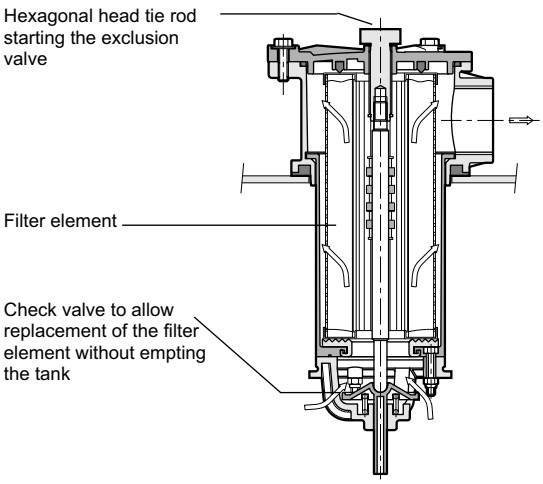
FST

SUCTION FILTER WITH SEALED FLANGE MOUNTING

SERIES 10

Q max (see performances table)

OPERATING PRINCIPLE



— FST filters are designed for sealed flange mounting.They are assembled directly on to the hydraulic power unit.

— They are aimed at protecting the pump from any possible gross contamination present inside the tank.

— The filter element is made of a metallic strainer with a 90 µm filtration degree, which grants a good pump protection without compromising the correct fluid flow. It can be easily replaced without empting the tank. See paragraph 6 for its identification code.

— The filters are designed with a SAE flange port with the exception of the smallest size, which uses a BSP threaded port.

— All the FST filters are designed to incorporate an electric or visual clogging indicator, to be ordered separately (see paragraph 5).

PERFORMANCES

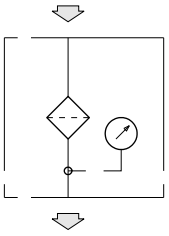
Filter code	port dimensions		Mass [kg]	Rated flow (indicative) [l/min]	Rated filtration degree [µm]
	BSP	SAE flange			
FST-TB114	1 ¼"	-	1,6	70	90
FST-FS212	-	2 ½"	3,0	100	
FST-FS300	-	3"	13,0	200	
FST-FS400	-	4"	16,0	300	

NOTE 1: the flow rates stated in the table correspond to a 0.02 bar pressure drop measured with mineral oil of viscosity 36 cSt at 50°C.
As for a different viscosity range, see NOTE 2 - paragraph 2.2.

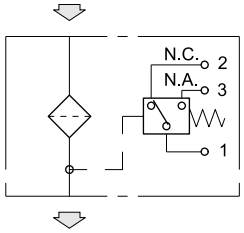
Collapsing differential pressure of the filter element	bar	1,0
Ambient temperature range	°C	-25 / +50
Fluid temperature range	°C	-25 / +110
Fluid viscosity range	cSt	10 ÷ 400

HYDRAULIC SYMBOL

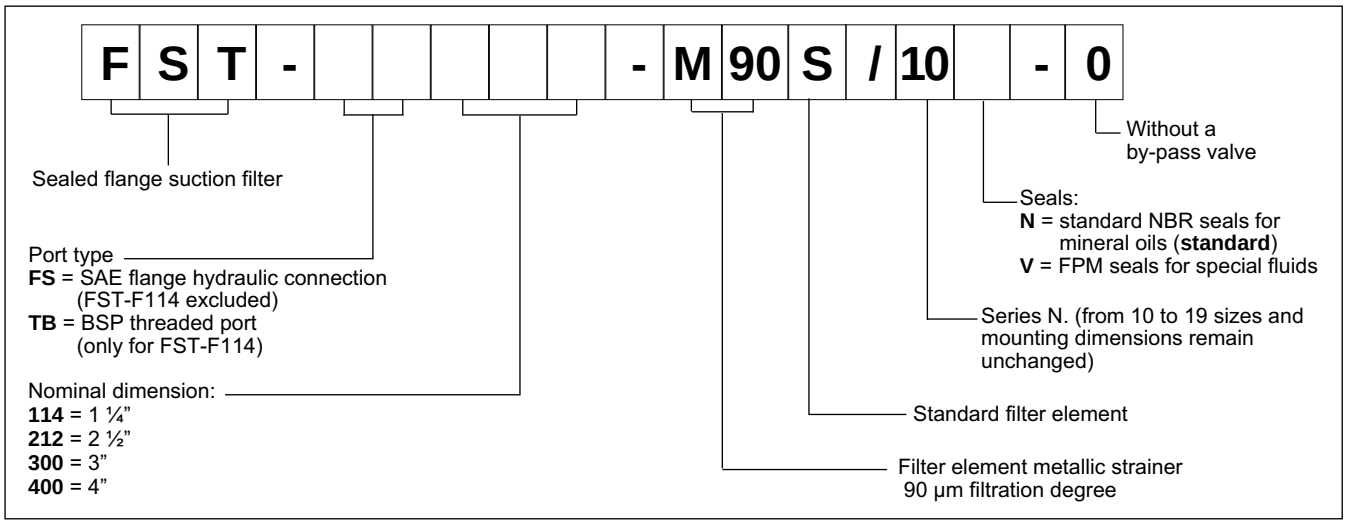
Filter with indicator VS type



Filter with indicator ES type



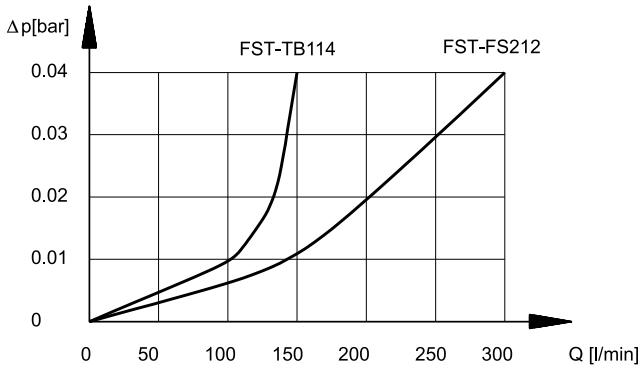
1 - IDENTIFICATION CODE

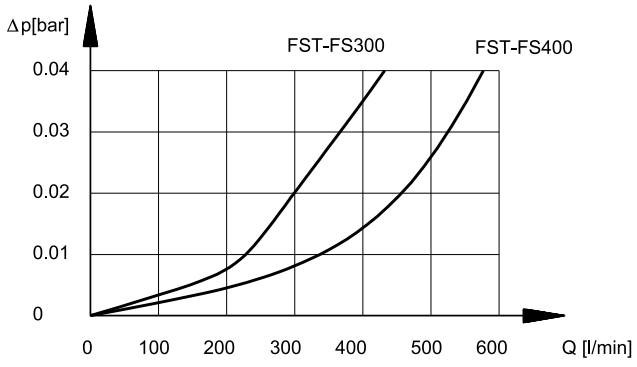


2 - CHARACTERISTIC CURVES

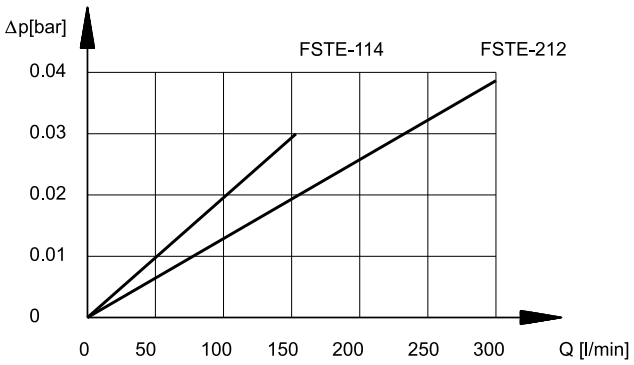
(values measured with viscosity of 36 cSt at 50°C)

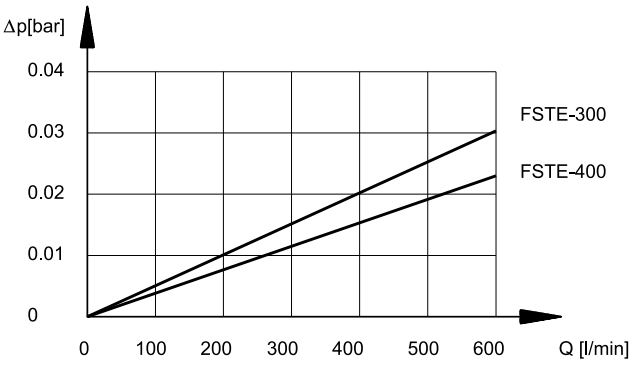
2.1 - Pressure drops through the filter body





2.2 - Pressure drops through the FSTE filter element





NOTE 2: the filter size has to be selected so that with the nominal flow rate the pressure drop is lower than 0,02 bar.

The total pressure drop through the filter is given by adding the body pressure drop values to those of the filter element.

As for fluids whose viscosity degree at a specific operating pressure is different from 36 cSt, the filter total pressure drop has to be changed according to the following ratio:

total Δpl value = body Δp value + (real Δp value of the filter element x real viscosity value (cSt) / 36)

real Δp value of the filter element = value obtainable through the diagrams in paragraph 2.2

Such ratio is valid for a viscosity value up to 200 cSt.

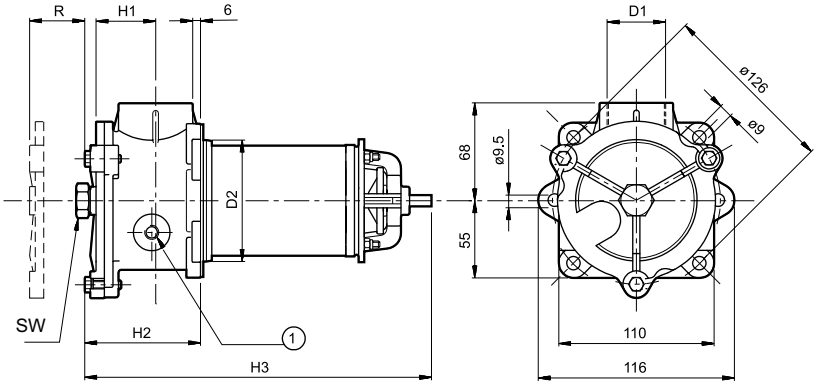
For a higher viscosity please consult our technical department.

3 - HYDRAULIC FLUIDS

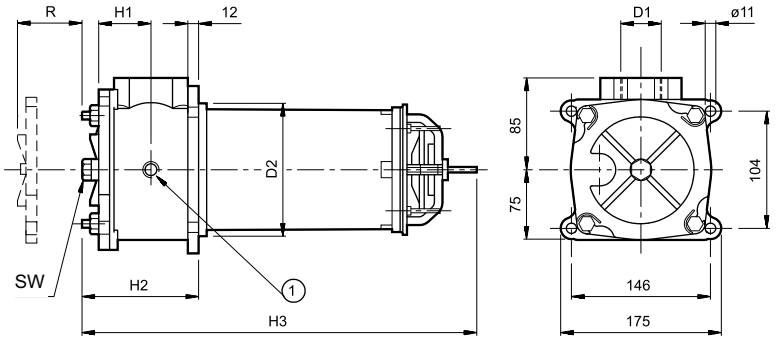
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

4 - OVERALL AND MOUNTING DIMENSIONS

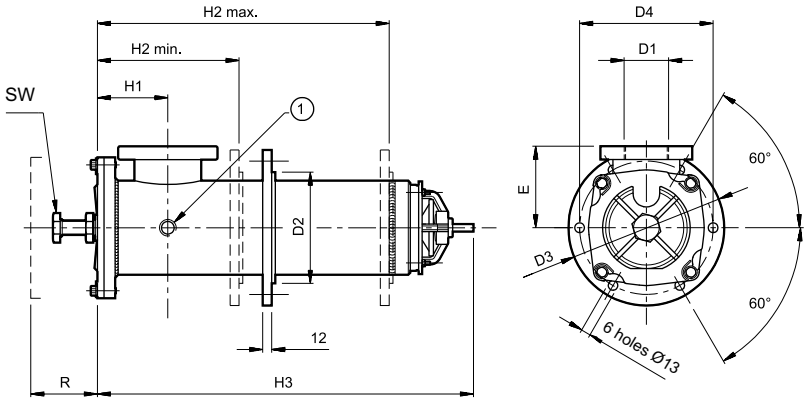
dimensions in mm



FST-TB114



FST-FS212



FST-FS300

FST-FS400

NOTE 3: tank hole = D2 + 1 (mm)
NOTE 4: flanges of filters FSU-FS300 and FSU-FS400 are not welded
R* = filter element removal space

Filter code	D1	D2 NOTE 3	D3	D4	E	H1	H2 NOTE 4	H3	R*	Ch
FST-TB114	1 ¼" BSP	86	-	-	-	42	80	275	250	22
FST-FS212	2 ½" SAE	130	-	-	-	66	120	322	300	22
FST-FS300	3" SAE	150	210	180	110	95	174÷355	480	500	32
FST-FS400	4" SAE	180	242	210	120	122	250÷405	470	500	32

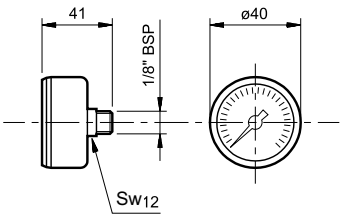
1	Clogging indicator port: 1/8" BSP usually plugged

5 - CLOGGING INDICATORS

The filters are designed to incorporate clogging indicators, which have to be ordered separately.

5.1 - Visual indicator for suction filters
Identification code: VS/10

This indicator is a vacuum gauge sensitive to the suction depression.



The indicator is supplied with a 0 ÷ -1 relative bar graduated scale and with a three-colour reading scale, which informs you about the clogging condition of the filter element:

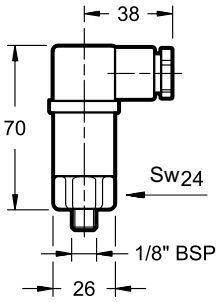
GREEN: efficient filter element (0 / -0.15 bar)

YELLOW: the filter element is wearing out (-0.15 / -0.25 bar)

RED: the filter element has to be replaced (> -0.25 bar)

5.2 - Electric indicator for suction filters
Identification code: ES/10

This indicator is a vacuum gauge sensitive to the suction depression, which operates by switching an electric contact when the filter element has reached the clogging limit.

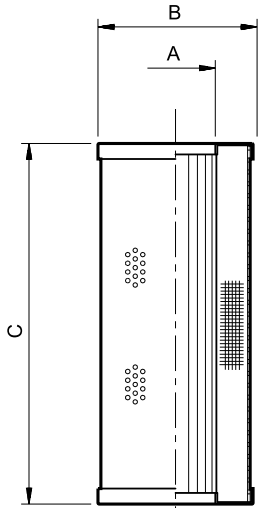


The contact can be wired in an open or closed condition (see the hydraulic symbol).

TECHNICAL SPECIFICATIONS

Operating pressure	bar	- 0,2
AC power supply		
Max. operating voltage	VAC	250 50/60 Hz
Max. load on the contacts (inductive or resistive) with V at 125 VAC with V at 250 VAC	A	 3 0,5
DC power supply		
Max. operating voltage	VDC	30
Max. load on the contacts resistive inductive	A	 3 1
Electric connector	DIN 43650	
Class of protection according to CEI EN 60529 (atmospheric agents)	IP65	
Atex classification	3 GD EEx e T6	

6 - FILTER ELEMENTS



Filter element code	ØA	ØB	C	Average filter surface [cm²]
FSTE - 114	29,5	70	163	1600
FSTE - 212	65	99	198	1845
FSTE - 300	65	99	375	3545
FSTE - 400	93	136	375	5065

FILTER ELEMENT IDENTIFICATION CODE

F	S	T	E	-				-	M	90	S	/	10

Filter element for a FST filter

Nominal dimensions
114 = 1 ¼” **300** = 3”
212 = 2 ½” **400** = 4”

Filter element metallic strainer 90 µm filtration degree

Standard filter element

Series N. (from 10 to 19 sizes and mounting dimensions remain unchanged)

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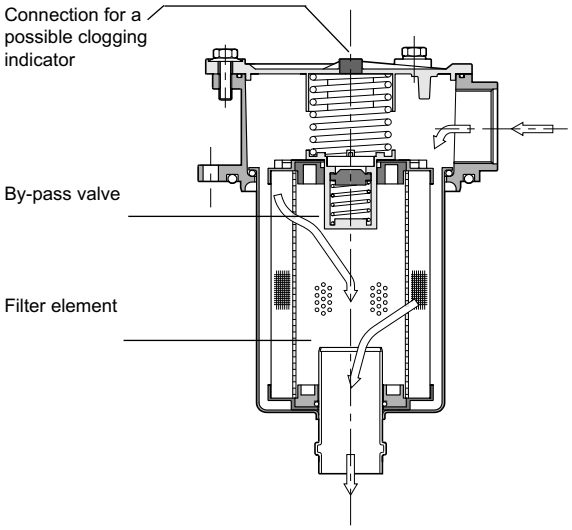
FRT

RETURN FILTER FOR FLANGE MOUNTING ON THE TANK

SERIES 10

p max **3** bar
Q max (see performance table)

OPERATING PRINCIPLE



— FRT filters are designed to be flange-mounted on the tank cover; the BSP threaded port for the input connection is positioned on the filter head and is therefore very accessible.

— The inspection cover fixed with three or four screws allows easy maintenance; the filter element is supplied with a screw, which makes its removal together with the container easier. In this way, by replacing the filter element, it is possible to clean the contamination present in the bowl of the filter.

— The filter element is made of high efficiency filtering materials and is able to hold high quantities of contamination material. It is available with three different filtration degrees:

F10 = 10 µm absolute (β_{10} > 100) - ISO 4406:1999 class 18/16/13
F25 = 25 µm absolute (β_{25} > 100) - ISO 4406:1999 class 19/17/14
P10 = 10 µm nominal (β_{10} > 2) - ISO 4406:1999 class 21/19/16

— FRT filters are always supplied with a by-pass valve.

— All the FRT filters are designed to incorporate an electric or visual clogging indicator, to be ordered separately (see par. 5).

PERFORMANCES

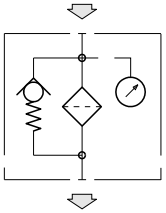
Filter code	BSP port dimensions	Mass [kg]	Rated flow (indicative) [l/min]		
			F10	F25	P10
FRT-TB012	1/2”	0,45	18	25	30
FRT-TB034	3/4”	0,95	50	70	85
FRT-TB100	1”	1,1	65	110	130
FRT-TB114	1 ¼”	2,1	150	190	210
FRT-TB112	1 ½”	3,1	160	250	290
FRT-TB200	2”	4,1	280	400	430

Maximum pressure	bar	3
Collapsing differential pressure of the filter element	bar	3
Differential pressure for the opening of the by-pass valve (±10 %)	bar	1,7
Ambient temperature range	°C	-25 / +50
Fluid temperature range	°C	-25 / +110
Fluid viscosity range	cSt	10 ÷ 400

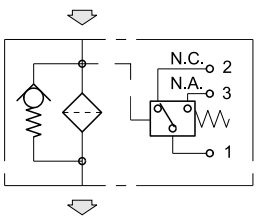
NOTE: the flow rates stated in the table correspond to a 0.5 bar pressure drop measured with mineral oil of viscosity 36 cSt at 50°C.
As for a different viscosity range, see **NOTE 2** - par. 2.2.

HYDRAULIC SYMBOL

Filter with indicator VR type



Filter with indicator ER type



1 - IDENTIFICATION CODE

F	R	T	-	T	B				-			S	/	10		-	B

Return filter tank-top mounted

BSP threaded ports

Nominal dimension:
012 = 1/2” **114** = 1 ¼”
034 = 3/4” **112** = 1 ½”
100 = 1” **200** = 2”

Filtration degree:
F10 = 10 µm fibre (β_{10} > 100) - ISO 4406:1999 class 18/16/13
F25 = 25 µm fibre (β_{25} > 100) - ISO 4406:1999 class 19/17/14
P10 = 10 µm paper (β_{10} > 2) - ISO 4406:1999 class 21/19/16

Standard filtering element

Series N. (from 10 to 19 sizes and mounting dimensions remain unchanged)

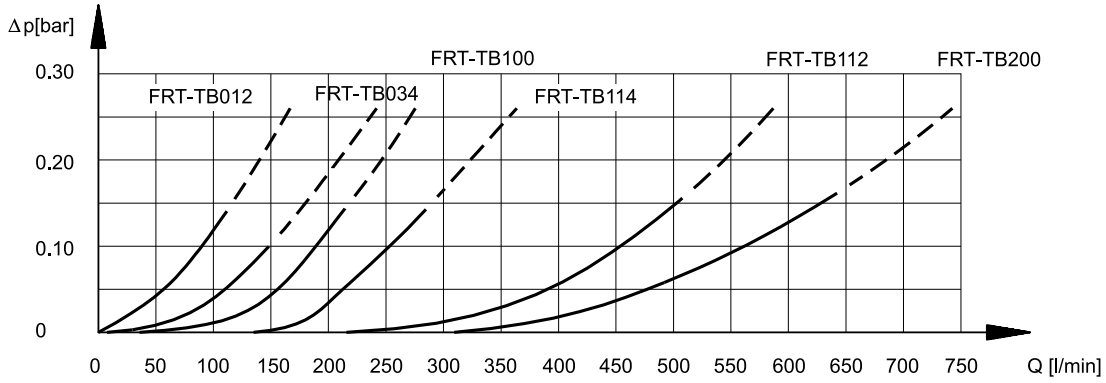
Seals:
N = NBR seals for mineral oils (**standard**)
V = FPM seals for special fluids

By-pass valve
Opening pressure: 1.7 bar

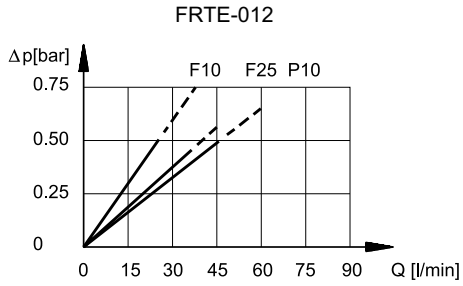
2 - CHARACTERISTIC CURVES

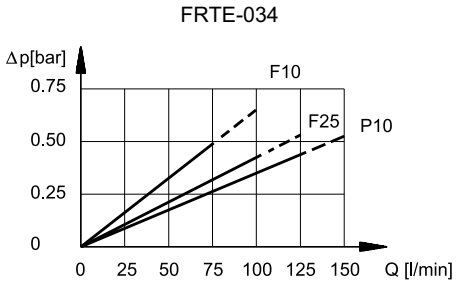
(values measured with viscosity of 36 cSt at 50°C)

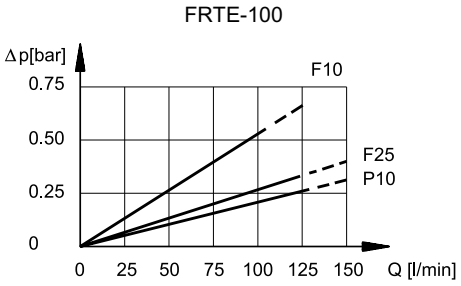
2.1 - Pressure drops through the filter body

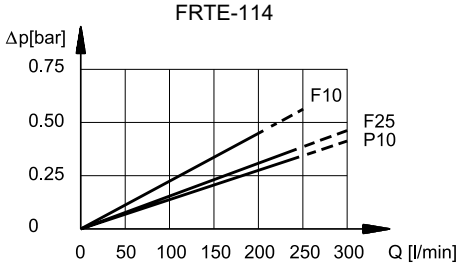


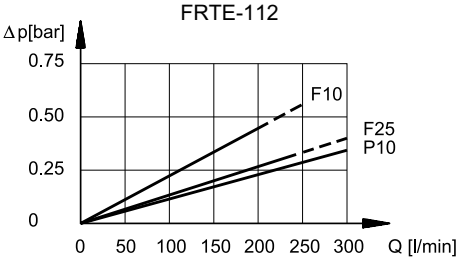
2.2 - Pressure drops through the FRTE filtering element

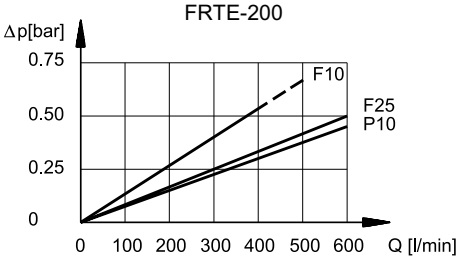












NOTE 2: the filter size has to be calculated so that with the nominal flow rate the pressure drop is lower than 0.5 bar.

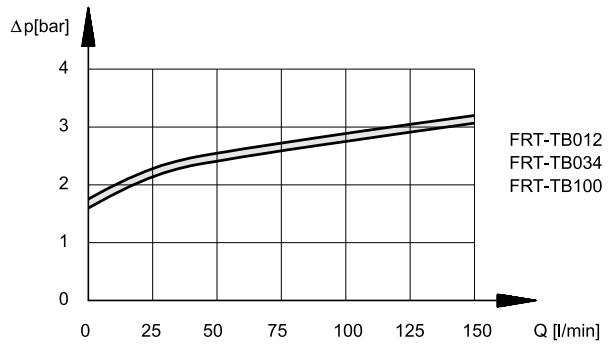
The total pressure drop through the filter is given by adding the body pressure drop values to those of the filter element. As for fluids whose viscosity degree at a specific operating pressure is different from 36 cSt, the filter total pressure drop has to be changed according to the following ratio:

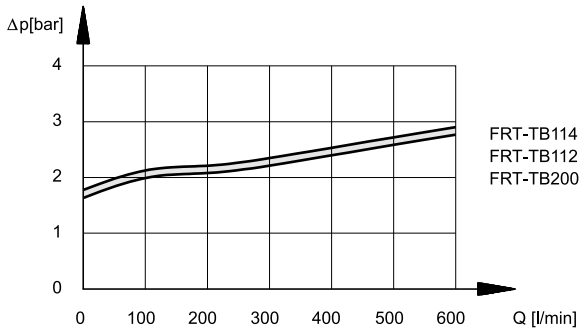
total Δp value = body Δp value + (real Δp value of the filter element x real viscosity value (cSt) / 36)

real Δp value of the filter element = value obtainable through the diagrams in par. 2.2

Such ratio is valid for a viscosity value up to 200 cSt. For a higher viscosity please consult our technical department.

2.3 - Pressure drops through the by-pass valve





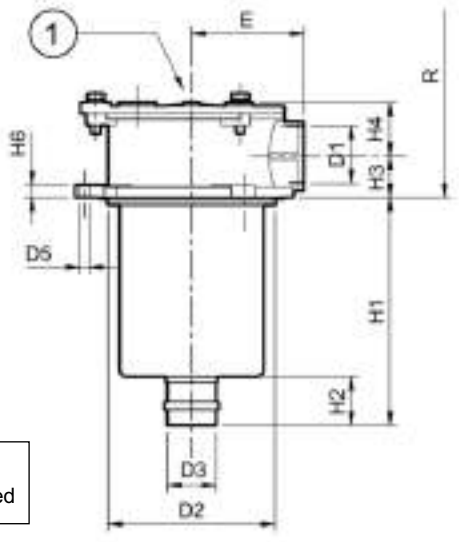
3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

4 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

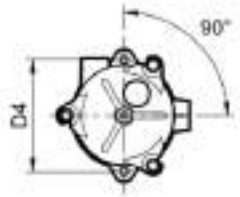


1	Clogging indicator port: 1/8” BSP usually plugged

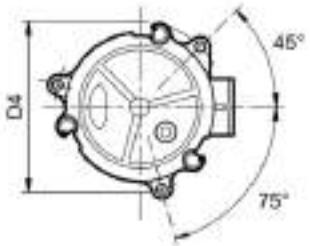
filter	D1	D2	D3	D4	D5	E	H1	H2	H3	H4	H6	R*
FRT - TB012	1/2”	67	24	90	6.5	50	80	20	22	33	9	120
FRT - TB034	3/4”	89	28	115	9	67	150	25	28	47	10	190
FRT - TB100	1”	89	40	115	9	67	234	30	28	47	10	270
FRT - TB114	1 ¼”	126	40	175	10.5	95	248	50	35	56	13	289
FRT - TB112	1 ½”	174	20	220	10.5	115	178	50	55	69	13	250
FRT - TB200	2”	174	63.5	220	10.5	115	285	50	55	69	13	355

R * = Filter element removal space starting from the tank surface

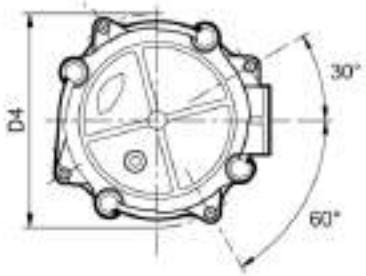
FRT - TB012
FRT - TB034
FRT - TB100



FRT - TB114



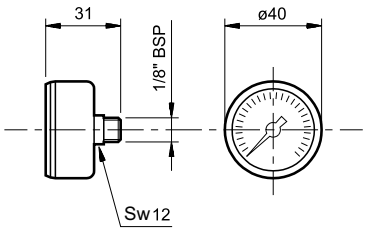
FRT - TB112
FRT - TB200



5 - CLOGGING INDICATORS

The filters are designed to incorporate clogging indicators, which have to be ordered separately.

5.1 - Visual indicator for return filters
Identification code: VR/10

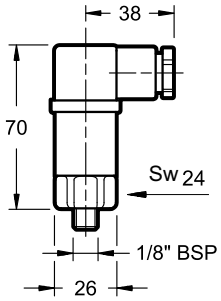


This indicator is a pressure gauge sensitive to the filter input pressure.

The indicator is supplied with a 0 ÷ 6 bar graduated scale and with a two-colour reading scale, which informs you about the clogging condition of the filter element:

GREEN: efficient filter element (0 ÷ 1.7 bar)
RED: the filter element has to be replaced (> 1.7 bar)

5.2 - Electric indicator for return filters
Identification code: ER/11



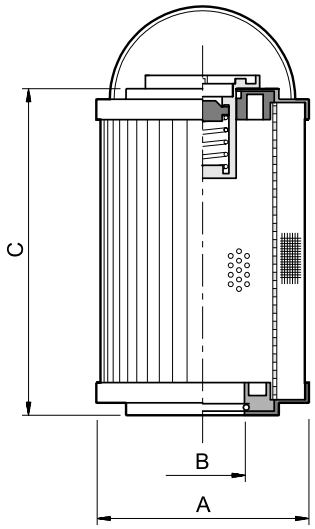
This indicator is a pressure switch sensitive to the filter input pressure, which switches an electrical contact when the filter element has reached the clogging limit.

The contact can be wired in an open or closed condition (see the hydraulic symbol).

TECHNICAL SPECIFICATIONS

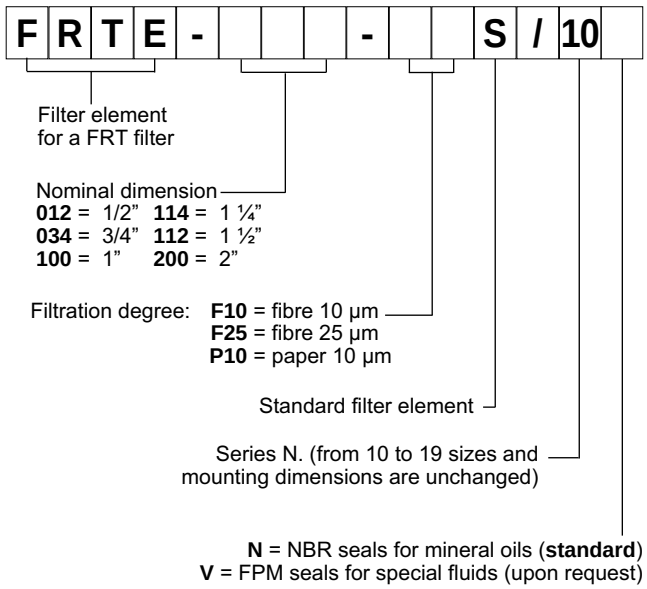
Operating pressure	bar	1,5
AC power supply		
Max. operating voltage	VAC	250 50/60 Hz
Max. load on the contacts (inductive or resistive) with V at 125 VAC with V at 250 VAC	A	3 0,5
DC power supply		
Max. operating voltage	VDC	30
Max. load on the contacts resistive inductive	A	3 1
Electric connector	DIN 43650	
Class of protection according to CEI EN 60529 (atmospheric agents)	IP65	
Atex classification	3 GD EEx e T6	

6 - FILTER ELEMENTS



Filter element code	ØA	ØB	C	Average filtering surface [cm²]	
				P10	F12/F25
FRTE - 012	52	24	70	310	380
FRTE - 034	70	28	130	1000	1600
FRTE - 100	70	40	210	1660	2670
FRTE - 114	99	40	211	3800	4280
FRTE - 112	130	51	140	4140	4360
FRTE - 200	130	63	251	7930	8350

FILTER ELEMENT IDENTIFICATION CODE



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tel. +39 0331.895.111 • www.duplomatic.com • e-mail: sales.exp@duplomatic.com

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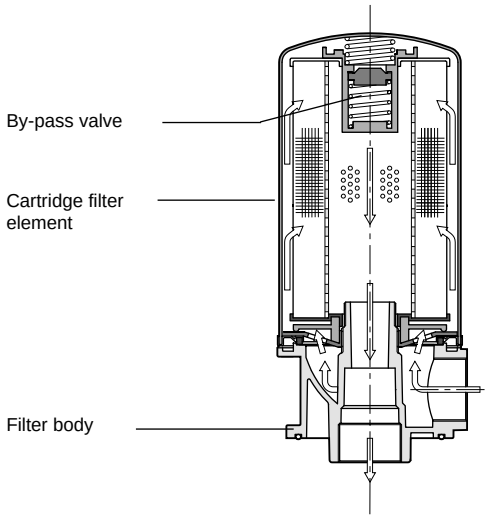
FRC

RETURN FILTER FOR TANK TOP OR IN-LINE MOUNTING

SERIES 10

p max **7** bar
Q max (see table of performances)

OPERATING PRINCIPLE



— FRC filters can be installed either on the tank cover by using a 4-hole flange fixing system with a direct bottom discharge, or in the return line.

— The screw-in cartridge filter element allows easy and practical replacement; a special membrane inside the cartridge prevents leakage of residual oil.

— The filter element is made of high efficiency filtering materials and is able to accumulate high quantities of contamination particles. It is available with three different filtration degrees:

F25 = 25 µm: absolute (β_{25} > 100) - ISO 4406:1999 class 19/17/14
P10 = 10 µm: nominal (β_{10} > 2) - ISO 4406:1999 class 21/19/16
P25 = 25 µm: nominal (β_{25} > 2) - ISO 4406:1999 class 24/22/19

— FRC filters are always supplied with a by-pass valve.

— All the FRC filters are designed for the electric or visual clogging indicator, to be ordered separately (see point 5).

PERFORMANCES

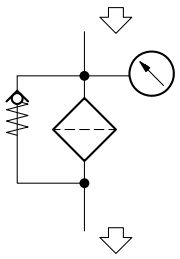
Filter code	BSP port dimensions	Mass [kg]	Indicative rated flow (**NOTE**) [l/min]				
			F25L	P10S	P10L	P25S	P25L
FRC-TB034	3/4”	2.3 - 2.8	65	65	70	70	75
FRC-TB112	1 1/2”	3.5 - 3.7	180	150	200	200	200

NOTE: Values obtained with mineral oil with viscosity 36 cSt at 50°C and Δp 0.5 bar.
As for a different viscosity range, see **NOTE 2 - point 2.2**.

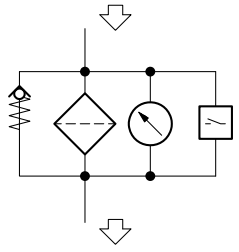
Maximum pressure	bar	7
Collapsing differential pressure of the filter element	bar	3.0
Differential pressure for the opening of the by-pass valve (±10 %)	bar	1.7
Ambient temperature range	°C	-25 / +50
Fluid temperature range	°C	-25 / +110
Fluid viscosity range	cSt	10 ÷ 400

HYDRAULIC SYMBOL

Filter with indicator VR type



Filter with indicator ER type



1 - IDENTIFICATION CODE

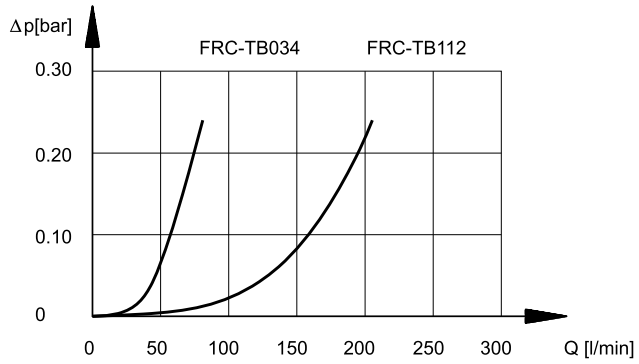
F R C - T B _ _ _ - _ _ _ / 10 N - B

- Return filter for tank top or in-line mounting
- BSP threaded ports
- Nominal dimension:
  034 = 3/4”
  112 = 1 1/2”
- Filtration degree:
  F25 = fibre 25 µm (β_{25} > 100) - ISO 4406:1999 class 19/17/14
  P10 = paper 10 µm (β_{10} > 2) - ISO 4406:1999 class 21/19/16
  P25 = paper 25 µm (β_{25} > 2) - ISO 4406:1999 class 24/22/19
- Type of filter element:
  S = standard
  (not available for a F25 filtration degree)
  L = long-lasting element
- Series N.
  (from 10 to 19 sizes and mounting dimensions remain unchanged)
- NBR seals for mineral oils
- By-pass valve
  Opening pressure: 1.7 bar

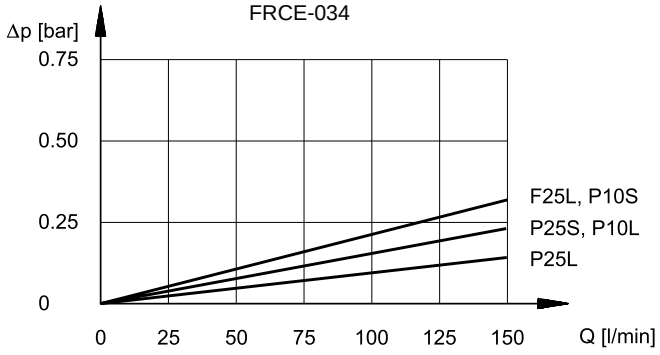
2 - CHARACTERISTIC CURVES

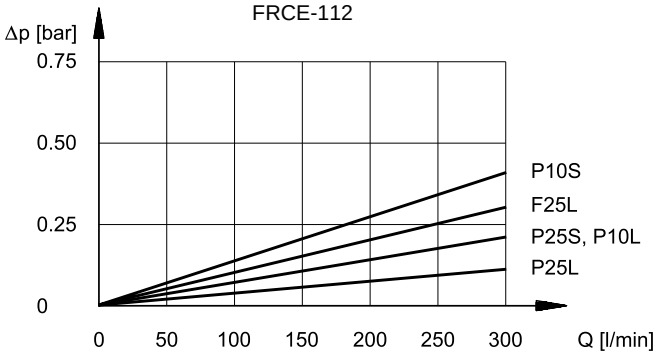
(values measured with viscosity of 36 cSt at 50°C)

2.1 - Pressure drops through the filter body



2.2 - Pressure drops through the FRCE filter element





NOTE 2: The filter size has to be selected so that with the nominal flow rate the pressure drop is lower than 0.5 bar.

The total pressure drop through the filter is given by adding the body pressure drop values to those of the filter element.

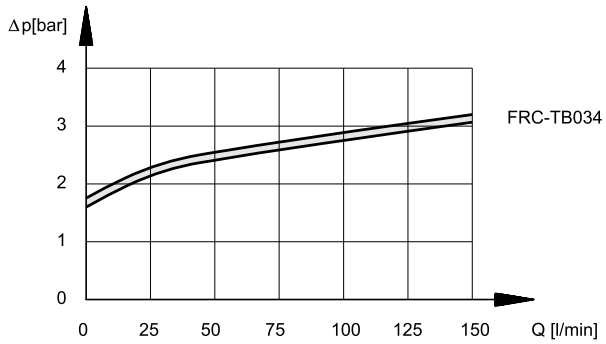
As for fluids whose viscosity degree at a specific operating pressure is different from 36 cSt, the filter total pressure drop has to be changed according to the following ratio:

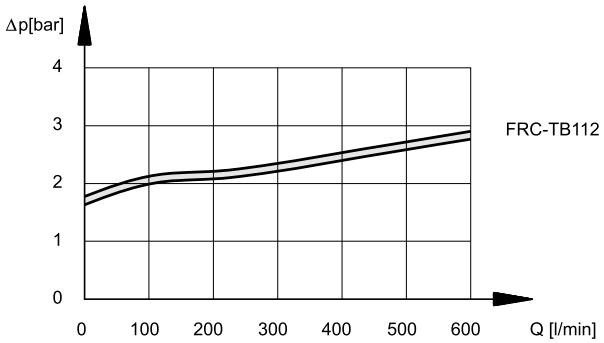
total Δp value = body Δp value + (real Δp value of the filter element x real viscosity value (cSt) / 36)

real Δp value of the filter element = value obtainable through the diagrams in point 2.2

Such ratio is valid for a viscosity value up to 200 cSt. For a higher viscosity please consult our technical department.

2.3 - Pressure drops through the by-pass valve



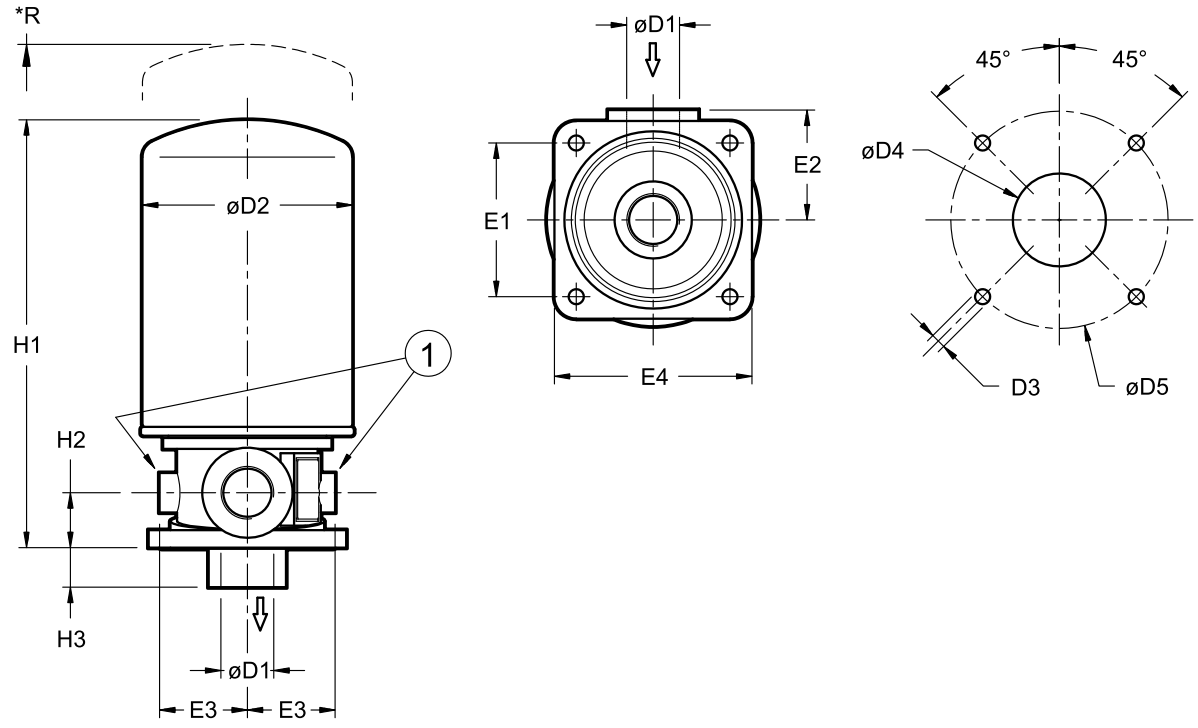


3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

4 - OVERALL AND MOUNTING DIMENSIONS



filter	filter element	D1 (BSP)	D2	D3	D4	D5	H1	H2	H3	E1	E2	E3	E4	R*
FRC-TB034	S	3/4”	95	7	40 ÷ 45	99	196	25	18	70	50	38	90	15
	L						241							
FRC-TB112	S	1 ½”	130	9	65 ÷ 70	141	252	36	18	100	72	56	124	30
	L						297							

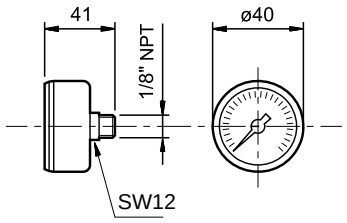
dimensions in mm

1	Clogging indicator port: 1/8” NPT. Plugged.

5 - CLOGGING INDICATORS

The filters are designed to incorporate clogging indicators, which have to be ordered separately.

5.1 - Visual indicator for return filters
Identification code: VR/10

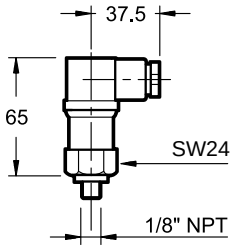


This type of indicator is a pressure gauge sensitive to the filter inlet pressure.

The indicator is preset with a 0 ÷ 6 bar relative scale and with a two-colour reading scale, which provide an indication of the clogging status of the filter element:

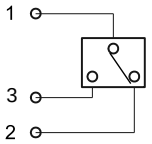
GREEN: efficient filter element (0 ÷ 1.7 bar)
RED: the filter element has to be replaced (> 1.7 bar)

5.2 - Electric indicator for return filters
Identification code: ER/11



This type of indicator is an SPDT pressure switch, sensitive to the filter inlet pressure, which intervenes by modifying the state of the electrical contact when the filter element has reached the clogging limit.

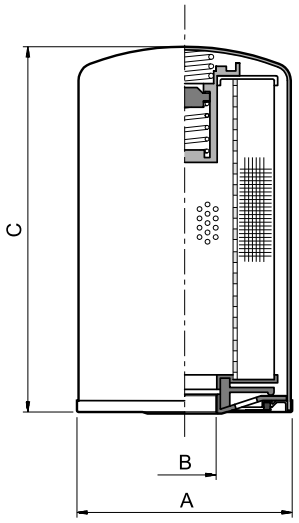
The contact can be wired normally open or closed (see diagram).



TECHNICAL SPECIFICATIONS

		AC	DC
Operating pressure	bar	1.5	
Operating voltage	V	250	110
Max. load on contacts	A	0.5	0.15
Electric connector		EN 175301-803 (ex DIN 43650)	
Class of protection according to EN 60529 (atmospheric agents)		IP65	
ATEX suitability		3 GD EEx e T6	

6 - FILTER ELEMENTS



Filter element code	ØA	ØB	C	Average filtering surface [cm²]
FRCE-034-P*S	96.5	3/4" BSP	146	3100
FRCE-034-P*L	96.5	3/4" BSP	191	4745
FRCE-034-F25L	96.5	3/4" BSP	191	3630
FRCE-112-P*S	129	1 ¼" BSP	181	5560
FRCE-112-P*L	129	1 ¼" BSP	226	7360
FRCE-112-F25L	129	1 ¼" BSP	226	5088

FILTER ELEMENT IDENTIFICATION CODE

F	R	C	E	-				-				/	10	N

Cartridge filter element for FRC filters

Nominal dimension
034 = 3/4" **112** = 1 ½"

Filtration degree : **F25** = fibre 25 µm
P10 = paper 10 µm
P25 = paper 25 µm

Type of filter element:
S = standard
(not available with a F25 filtration degree)
L = long-lasting element

Series N.
(from 10 to 19 sizes and mounting dimensions remain unchanged)

NBR seals for mineral oils

DUPLOMATIC MOTION SOLUTIONS
a member of DAIKIN group

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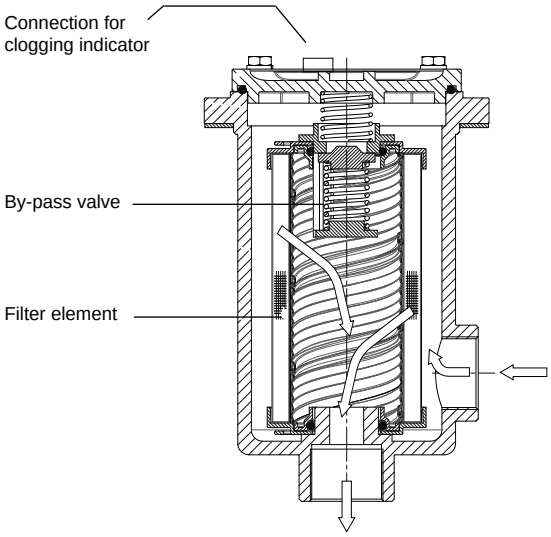
FRI

TANK TOP FILTER WITH IMMERSED PORTS, FOR RETURN LINE

SERIES 10

p max **10** bar
Q max (see performance table)

OPERATING PRINCIPLE



— FRI filters are designed to be flange-mounted on the tank top; the BSP threaded ports are immersed.

— The inspection cover fixed with screws allows easy maintenance; the filter element is supplied with a screw, which makes its removal together with the container easier. In this way, by replacing the filter element, it is possible to clean the contamination present in the bowl of the filter.

— The filter element is made of high efficiency filtering materials and is able to hold high quantities of contamination material. It is available with three different filtration degrees:

F10 = 10 µm absolute ($\beta_{10} > 100$) - ISO 4406:1999 class 18/16/13
F25 = 25 µm absolute ($\beta_{25} > 100$) - ISO 4406:1999 class 19/17/14
P10 = 10 µm nominal ($\beta_{10} > 2$) - ISO 4406:1999 class 21/19/16

— FRI filters are always supplied with a by-pass valve.

— All the FRI filters are designed to incorporate an electric or visual clogging indicator, to be ordered separately (see point 5).

PERFORMANCES

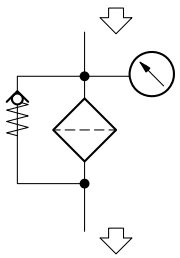
Filter code	BSP port dimensions	Mass [kg]	Rated flow (indicative) [l/min] F10
FRI-TB100	1”	1.85	125
FRI-TB114	1 ¼”	4.60	250

NOTE 1: the flow rates stated in the table correspond to a 0.5 bar pressure drop measured with mineral oil of viscosity 36 cSt at 50 °C.
As for a different viscosity range, see **NOTE 2** - point 2.2.

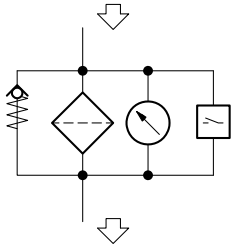
Maximum pressure	bar	10
Collapsing differential pressure of the filter element	Δp bar	3
Differential pressure for the opening of the by-pass valve (±10 %)	bar	1.7
Ambient temperature range	°C	-25 / +50
Fluid temperature range	°C	-25 / +90
Fluid viscosity range	cSt	10 ÷ 400

HYDRAULIC SYMBOL

Filter with clogging indicator VR type



Filter with clogging indicator ER type



1 - IDENTIFICATION CODE

F	R	I	-	T	B				-			S	/	10	N	-	B

Return line filter with immerded port, tank-top mounted

BSP threaded ports

Nominal dimension:
100 = 1”
114 = 1 ¼”

Filtration degree:
F10 = 10 µm fibre (β_{10} > 100) - ISO 4406:1999 class 18/16/13
F25 = 25 µm fibre (β_{25} > 100) - ISO 4406:1999 class 19/17/14
P10 = 10 µm paper (β_{10} > 2) - ISO 4406:1999 class 21/19/16

Standard filtering element

Series N. (from 10 to 19 sizes and mounting dimensions remain unchanged)

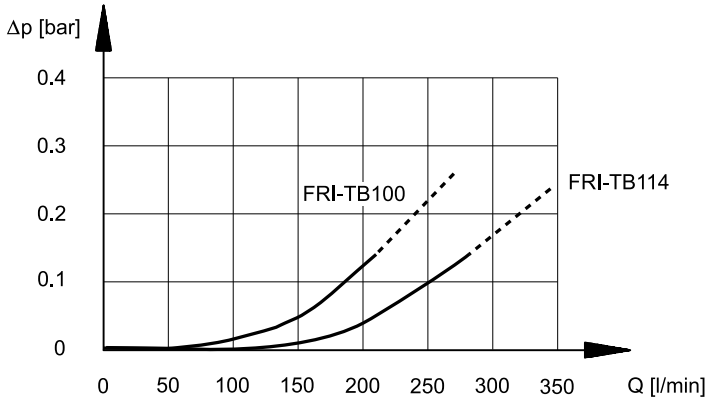
NBR seals for mineral oils

By-pass valve
Opening pressure: 1.7 bar

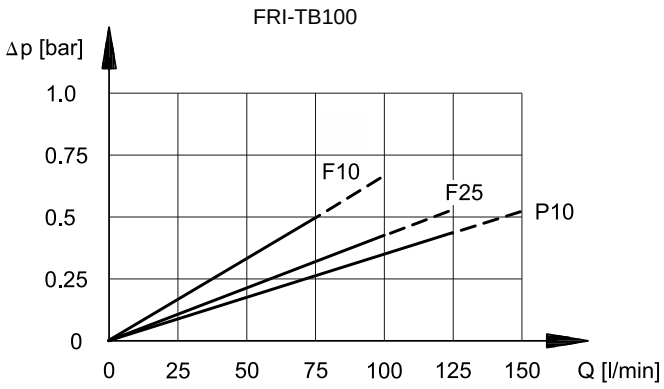
2 - CHARACTERISTIC CURVES

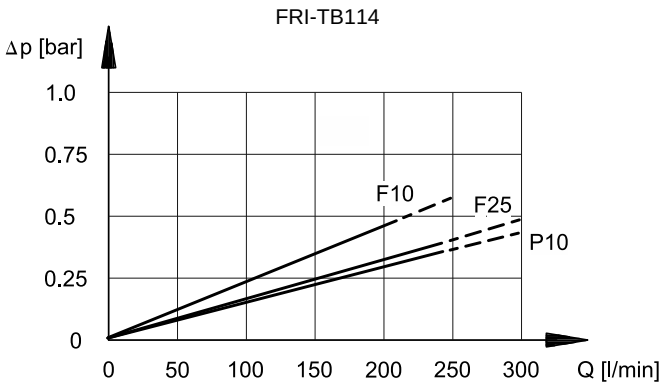
(values measured with viscosity of 36 cSt at 50°C)

2.1 - Pressure drops through the filter body



2.2 - Pressure drops through the FRTE filtering element





NOTE 2: the filter size has to be calculated so that with the nominal flow rate the pressure drop is lower than 0.5 bar.

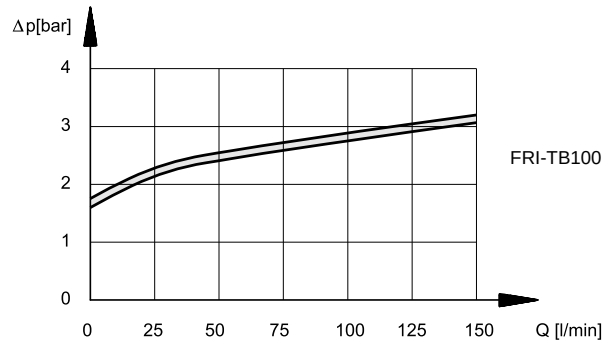
The total pressure drop through the filter is given by adding the body pressure drop values to those of the filter element. As for fluids whose viscosity degree at a specific operating pressure is different from 36 cSt, the filter total pressure drop has to be changed according to the following ratio:

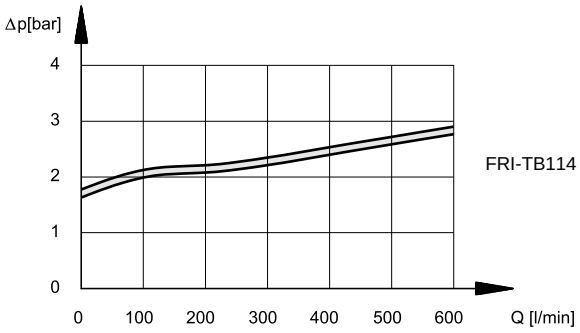
total Δp value = body Δp value + (real Δp value of the filter element x real viscosity value (cSt) / 36)

real Δp value of the filter element = value obtainable through the diagrams in p. 2.2

Such ratio is valid for a viscosity value up to 200 cSt. For a higher viscosity please consult our technical department.

2.3 - Pressure drops through the by-pass valve





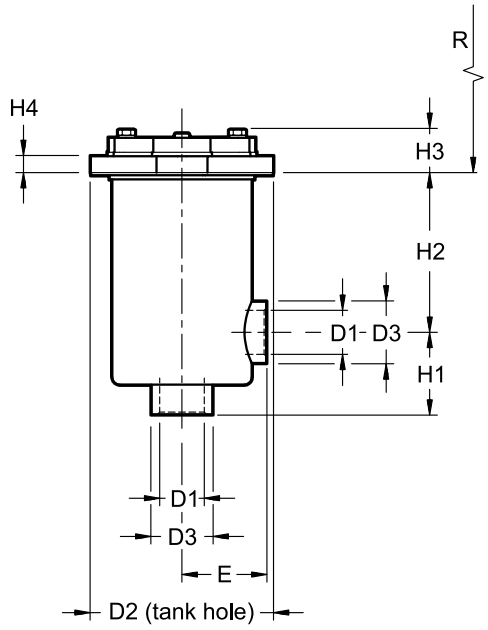
3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

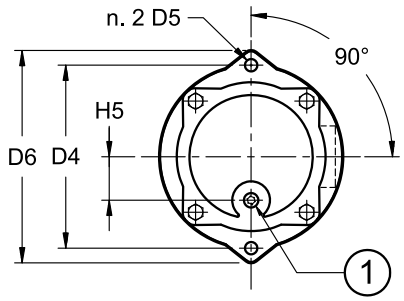
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

4 - OVERALL AND MOUNTING DIMENSIONS

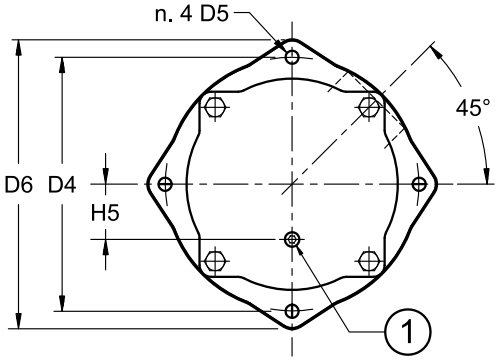
dimensions in mm



FRI - TB100



FRI - TB114



R * = Filter element removal space starting from the tank surface

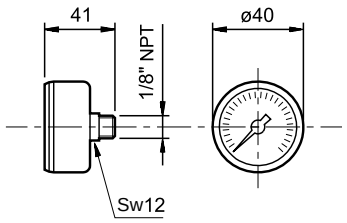
Filter	D1	D2	D3	D4	D5	D6	E	H1	H2	H3	H4	H5	R*
FRI - TB100	1”	110 $^{+1}_{0}$	42	126 ±0.5	9	145	58	57	110	30	11	30	170
FRI - TB114	1 ¼”	156 ±1	55	175 ±0.5	9	198	82	57	190	37	14	38	250

1	Clogging indicator port: 1/8” NPT usually plugged

5 - CLOGGING INDICATORS

The filters are designed to incorporate clogging indicators, which have to be ordered separately.

5.1 - Visual indicator for return filters
Identification code: VR/10

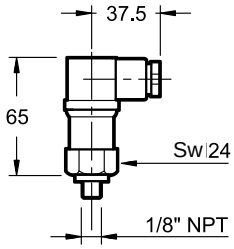


This indicator is a pressure gauge sensitive to the filter input pressure.

The indicator is supplied with a 0 ÷ 6 bar graduated scale and with a two-colour reading scale, which informs you about the clogging condition of the filter element:

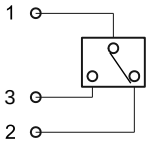
GREEN: efficient filter element (0 ÷ 1.7 bar)
RED: the filter element has to be replaced (> 1.7 bar)

5.2 - Electric indicator for return filters
Identification code: ER/11



This indicator is a pressure switch sensitive to the filter input pressure, which switches an electrical contact when the filter element has reached the clogging limit.

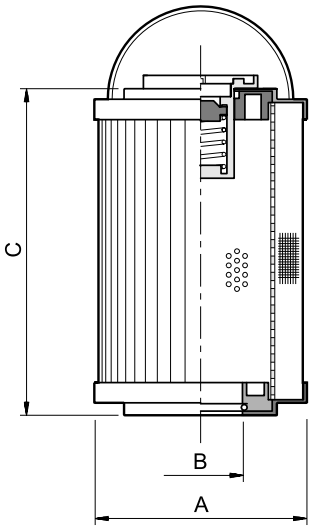
The contact can be wired in an open or closed condition (see the hydraulic symbol).



TECHNICAL SPECIFICATIONS

		AC	DC
Operating pressure	bar	1.5	
Supply voltage	V	250	110
Max load on the contacts	A	0.5	0.15
Electric connector		EN 175301-803 (ex DIN 43650)	
Class of protection according to IEC EN 60529 (atmospheric agents)		IP65	
ATEX classification: - gases - dusts		II 3G Ex nc IIB T5 Gc IP65 II 3D Ex nc IIIB T100°C Dc IP65	

6 - FILTER ELEMENTS



Filter element code	ØA	ØB	C	Average filtering surface [cm²]	
				P10	F10/F25
FRTE - 034	70	28	130	1600	1000
FRTE - 114	99	40	211	2480	3800

FILTER ELEMENT IDENTIFICATION CODE

F	R	T	E	-				-			S	/	10	N

Filter element for FRI filter

Nominal dimension:
034 = 3/4" for FRI-TB100
114 = 1 ¼" for FRI-TB114

Filtration degree: **F10** = fibre 10 µm
F25 = fibre 25 µm
P10 = paper 10 µm

Standard filter element

Series N. (from 10 to 19 sizes and mounting dimensions are unchanged)

NBR seals for mineral oils

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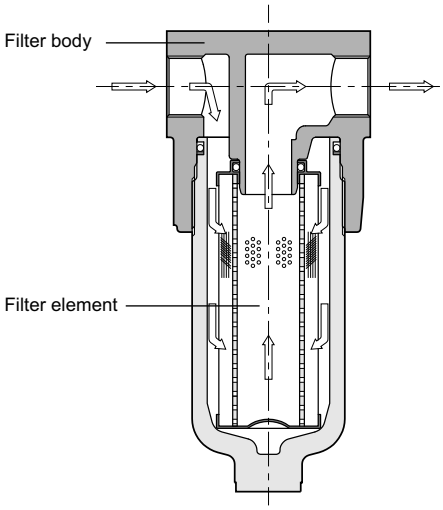
FPH

PRESSURE FILTER FOR LINE MOUNTING

SERIES 11

p max **420** bar
Q max (see table of performances)

OPERATING PRINCIPLE



— FPH filters are designed to be line-mounted with BSP threaded ports for hydraulic connections. Threaded holes are machined on the head for possible filter bracket fixing.

— The replacement of the filter element can be easily carried out by using a hexagon spanner to unscrew the bowl of the filter, which has a suitably shaped end.

— FPH filters are designed to be installed on pressure lines up to 420 bar; the filter elements are made of high efficiency filtering materials and are capable of holding high quantities of contamination particles. They are available with three different filtration degrees:

H05 = 5 µm: absolute (β_5> 100 - ISO 4406:1999 class 17/15/12) cartridge with a collapsing differential pressure = 210 bar to be used without a by-pass valve.
F10 = 10 µm: absolute (β_{10}> 100 - ISO 4406:1999 class 18/16/13)
F25 = 25 µm: absolute (β_{25}> 100 - ISO 4406:1999 class 19/17/14)

— Filters with F10 and F25 filtration degree can be supplied with or without a by-pass valve and they need cartridges with a collapsing differential pressure = 20 bar.

— All the FPH filters are designed to incorporate a visual-differential or a visual-electric clogging indicator, to be ordered separately (see par. 5).

PERFORMANCES

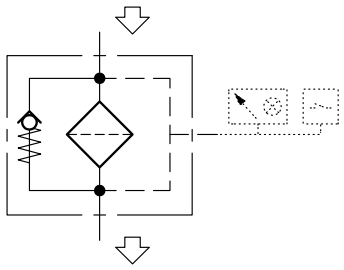
Filter code	BSP port dimensions	Mass [Kg]	Rated flow (indicative) [l/min]		
			H05	F10	F25
FPH-TB012	1/2”	4.6	10	27	33
FPH-TB034	3/4”	5.7	19	42	65
FPH-TB100	1”	8.8	40	95	105
FPH-TB114	1 ¼”	15.2	88	190	230
FPH-TB112	1 ½”	18.8	120	260	320

NOTE 1: The flow rates stated in the table correspond to a 0.8 bar pressure drop, measured with mineral oil of viscosity 36 cSt at 50°C.
Please refer to the **NOTE 2 - par. 2.2** for different viscosity ranges.

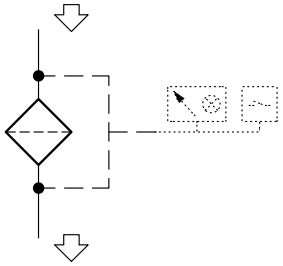
Maximum operating pressure	bar	420
Collapsing differential pressure of the filter element: H05 F10 - F25	bar	210 20
Differential pressure for the opening of the by-pass valve (±10 %)	bar	6
Ambient temperature range	°C	-25 / +50
Fluid temperature range	°C	-25 / +110
Fluid viscosity range	cSt	10 ÷ 400

HYDRAULIC SYMBOL

Filter with bypass valve



Filter without bypass valve



1 - IDENTIFICATION CODE

F	P	H	-	T	B				-			S	/	11		-	

High pressure delivery filter

BSP threaded ports

Nominal dimension:
012 = 1/2" **100** = 1" **112** = 1 1/2"
034 = 3/4" **114** = 1 1/4"

Filtration degree: **H05** = fibre 5 µm (β_5 > 100) - ISO 4406:1999 class 17/15/12
F10 = fibre 10 µm (β_{10}> 100) - ISO 4406:1999 class 18/16/13
F25 = fibre 25 µm (β_{25}> 100) - ISO 4406:1999 class 19/17/14

Standard filter element

Series No.
(from 10 to 19 sizes and mounting dimensions remain unchanged)

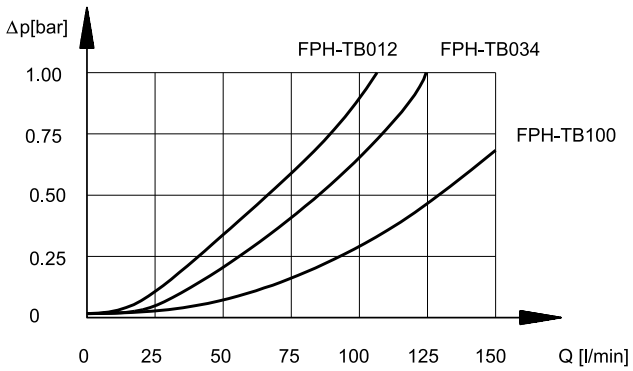
Seals:
N = NBR standard seals for mineral oils (standard)
V = FPM seals for special fluids

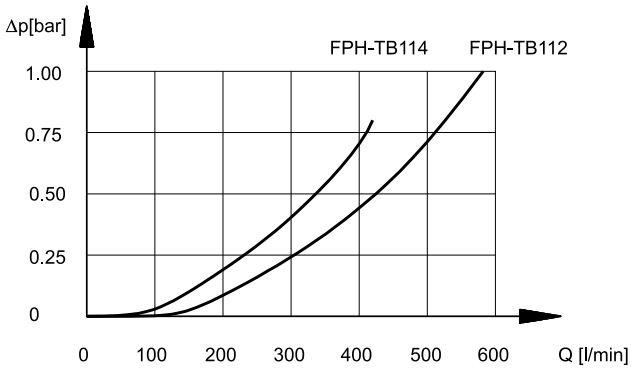
B = with by-pass valve Opening pressure: 6 bar
0 = without by-pass valve (recommended for a H05 filtration degree)

2 - CHARACTERISTIC CURVES

(values measured with viscosity of 36 cSt at 50°C)

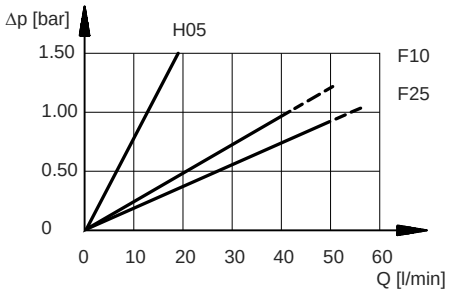
2.1 - Pressure drops through the filter body



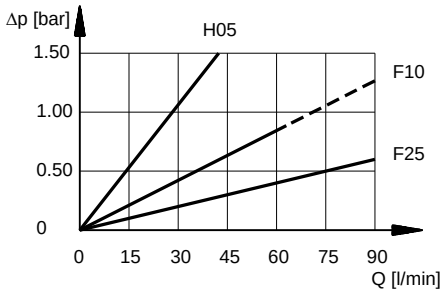


2.2 - Pressure drops through the FPHE filter element

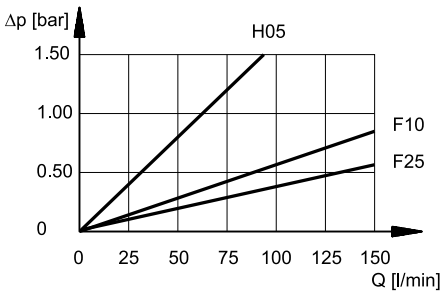
FPHE-TB012



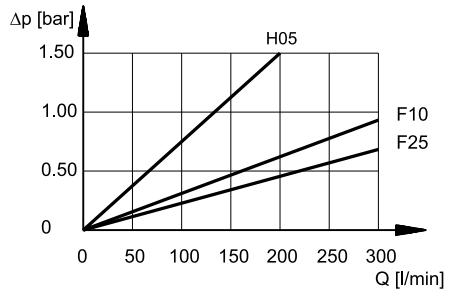
FPHE-TB034



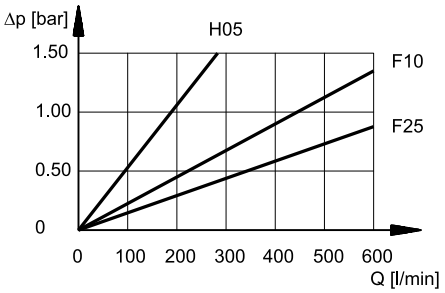
FPHE-TB100



FPHE-TB114



FPHE-TB112



NOTE 2: The size of the filter must be sized so that, at nominal flow rate, the total pressure drop is less than 1.2 bar.

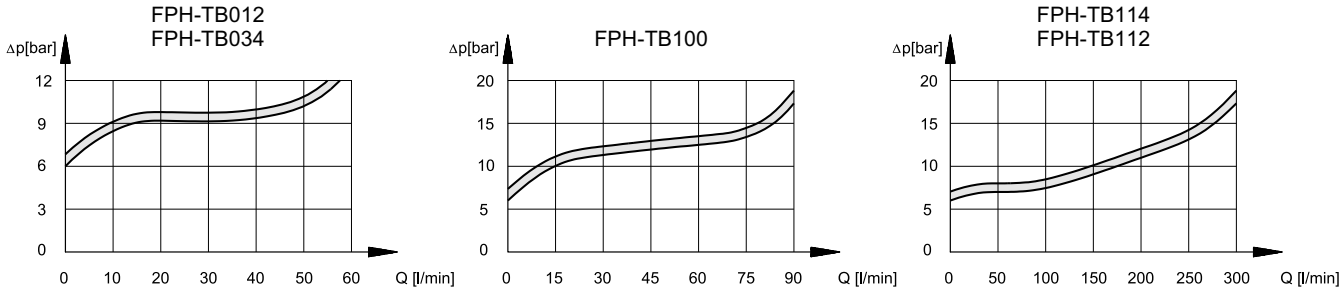
The total pressure drop through the filter is given by adding the body pressure drop values to those of the filter element. As for fluids whose viscosity degree at a specific operating pressure is different from 36 cSt, the filter total pressure drop has to be changed according to the following ratio:

total Δp value = body Δp value + (real Δp value of the filter element x real viscosity value (cSt) / 36)

real Δp value of the filter element = value obtainable through the diagrams in par. 2.2

Such ratio is valid for a viscosity value up to 200 cSt. For a higher viscosity please consult our technical department.

2.3 - Pressure drops through the by-pass valve



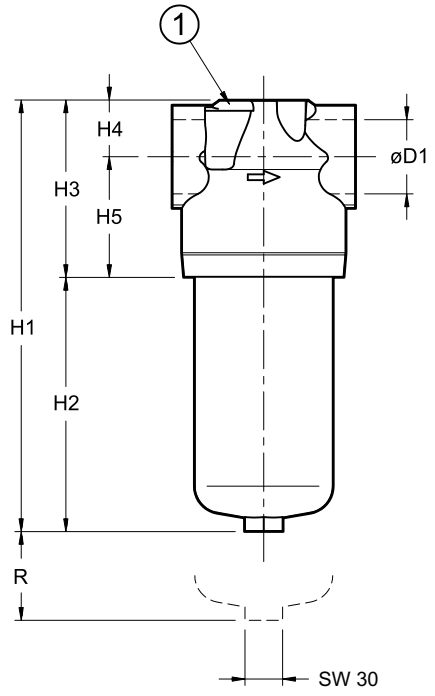
3 - HYDRAULIC FLUIDS

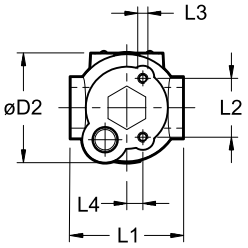
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

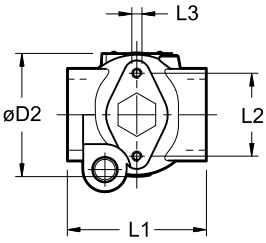
4 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

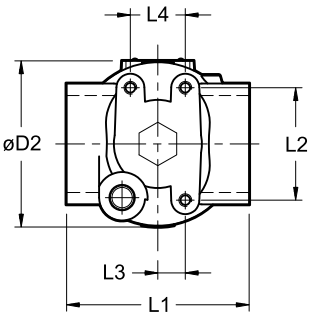




FPH - TB012
FPH - TB034



FPH - TB100



FPH - TB114
FPH - TB112

R* = removal space for filter element

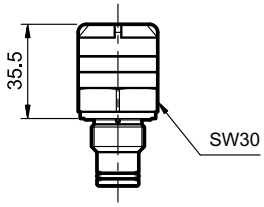
	D1	D2	H1	H2	H3	H4	H5	L1	L2	L3	L4	R*
FPH-TB012	1/2”	86	166	79	87	24	63	88	46	M8	12,5	100
FPH-TB034	3/4”	86	296	209	87	24	63	88	46	M8	12,5	100
FPH-TB100	1”	94	317	207	112	35	77	108	65	M8	-	100
FPH-TB114	1 ¼”	128	337	199	138	44	94	143	88	M10	43	100
FPH-TB112	1 ½”	128	457	319	138	44	94	143	88	M10	43	100

1	Clogging indicator port: M20 x 1,5

5 - CLOGGING INDICATORS

The filters are all designed to incorporate clogging indicators, which have to be ordered separately. Tightening torque 90 Nm.

5.1 - Visual indicator for delivery filters
Identification code: VPM/10



This indicator measures the differential pressure between filter input and filter output.

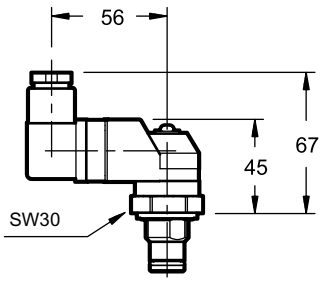
The indicator is supplied with coloured bands, which inform you about the clogging condition of the filter element:

WHITE: efficient filter element
$\Delta p < 5$ bar (± 10%)

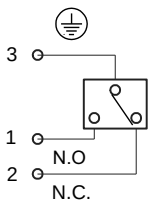
RED: the filter element has to be replaced $\Delta p > 5$ bar (± 10%)

5.2 - Electric-visual indicator for delivery filters
Identification code: EPM/10

This type of indicator, in addition to giving a visual indication as the VPM model, operates by switching an electric contact when the filter element has reached the clogging limit.



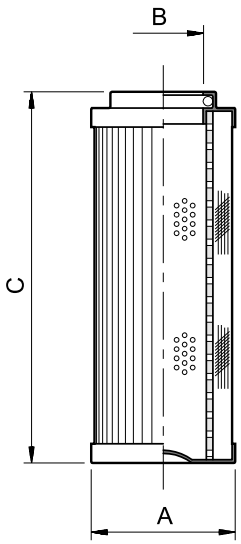
The contact can be wired in open or closed condition (see scheme).



TECHNICAL SPECIFICATIONS

		AC	DC
Differential operating pressure	bar	5	
Operating voltage	V	125 - 250	14 - 30
Max. load on contacts - resistive - inductive	A	 1 1	 4 3
Electric connector		EN 175301-803 (ex DIN 43650)	
Class of protection according to EN 60529 (atmospheric agents)		IP65	

6 - FILTER ELEMENTS



filter element code	ØA	ØB	C	Average filtering surface [cm²]	
				H05	F10/F25
FPHE - 012	45	25	85	340	355
FPHE - 034	45	25	211	915	935
FPHE - 100	52	23,5	210	1785	1830
FPHE - 114	78	42,5	210	2695	3695
FPHE - 112	78	42,5	330	4325	5025

FILTER ELEMENT IDENTIFICATION CODE

FPHE	-		-		S	/	10	

Filter element for FPH filters

Nominal dimension
012 = 1/2” **114** = 1 1/4”
034 = 3/4” **112** = 1 1/2”
100 = 1”

Filtration degree: **H05** = fibre 5 µm
F10 = fibre 10 µm
F25 = fibre 25 µm

Standard filter element

Series N.
(from 10 to 19 sizes and mounting dimensions remain unchanged)

N = NBR seals for mineral oils (**standard**)
V = FPM seals for special fluids (upon request)

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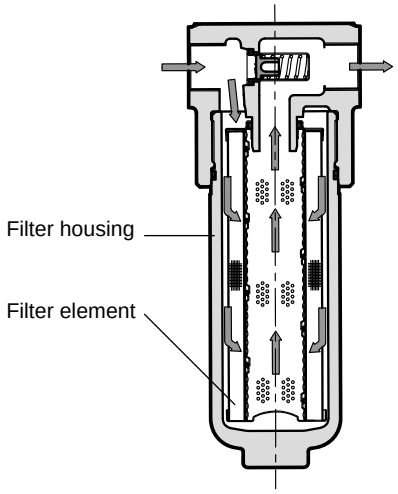
FPM

MEDIUM PRESSURE FILTER FOR IN-LINE MOUNTING

SERIES 20

p max **315** bar
Q nom (see table of performances)

OPERATING PRINCIPLE



— FPM filters are designed for in-line mounting, with BSP threaded hydraulic connections. There are threaded holes on the head for possible filter bracket fixing.

— The filter element is easily replaced using a standard hex spanner to unscrew the bowl, which has a specially shaped end

— FPM filters are designed to be installed on medium pressure lines up to 315 bar; the filter elements are made of high efficiency filtering materials and are available with three different filtration degrees:
F05 = 5 µm absolute (β_5 >100 - ISO 4401:1999 class 17/15/12)
F10 = 10 µm absolute (β_{10}>100 - ISO 4401:1999 class 18/16/13)
F25 = 25 µm absolute (β_{25} >100 - ISO 4401:1999 class 19/17/14)

— The filters are always supplied with bypass valve.

— Filters are available in standard (S) or long-life (L) versions, with large contaminant holding capacity. The collapse differential pressure is 21 bar for all the filter elements.

— All the FPM filters are designed to accomodate a differential clogging indicator, just optical or optical with electrical contact, that must be ordered separately (see point 5).

PERFORMANCES

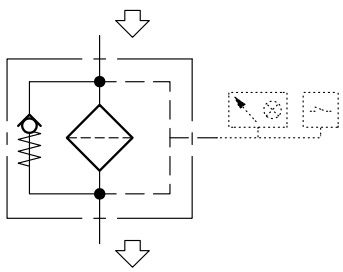
Filter code	BSP ports	Mass [kg]		Rated flow (indicative) (**NOTE**) [l/min]					
		type S	type L	F05S	F05S	F10S	F10L	F25S	F25L
FPM-TB012	1/2”	4	5	25	40	35	50	45	60
FPM-TB034	3/4”			35	50	50	65	65	80

Maximum operating pressure	bar	315
Collapsing differential pressure of the filter element	bar	21
Differential pressure for the opening of the bypass valve (±10 %)	bar	6
Ambient temperature range	°C	-25 / +50
Fluid temperature range	°C	-25 / +110
Fluid viscosity range	cSt	10 ÷ 400

NOTE: the flow rates stated in the table correspond to a pressure drop of 0.8 bar measured with mineral oil of viscosity 36 cSt at 50°C.
As for a different viscosity range, see the **NOTE** to point 2.2.

HYDRAULIC SYMBOL

(with bypass valve)



1 - IDENTIFICATION CODE

F	P	M	-	T	B				-				/	20		-	

Medium pressure filter, in line mounting

BSP threaded ports

Nominal dimension:
012 = 1/2” **034** = 3/4”

Filtration degree:
F05 = fibre 5 µm (β_5 > 100) - ISO 4401:1999 class 17/15/12
F10 = fibre 10 µm (β_{12} > 100) - ISO 4401:1999 class 18/16/13
F25 = fibre 25 µm (β_{25} > 100) - ISO 4401:1999 class 19/17/14

Filter type :
S = standard **L** = long-lasting element

B = with bypass valve Opening pressure 6 bar
0 = without bypass valve (upon request only)

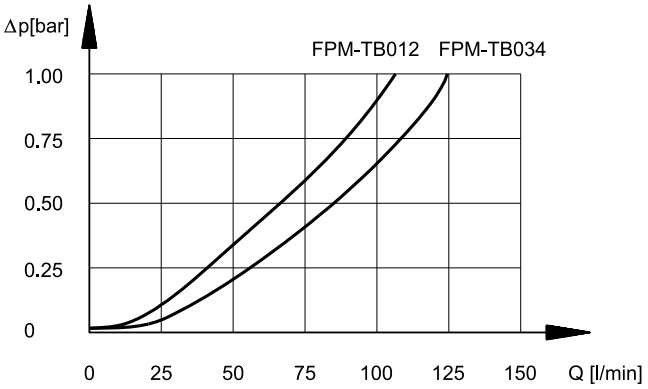
Seals:
N = NBR standard seals for mineral oils (**standard**)
V = FPM seals for special fluids

Series No.
(size and mounting dimensions remain unchanged from 20 to 29)

2 - CHARACTERISTIC CURVES

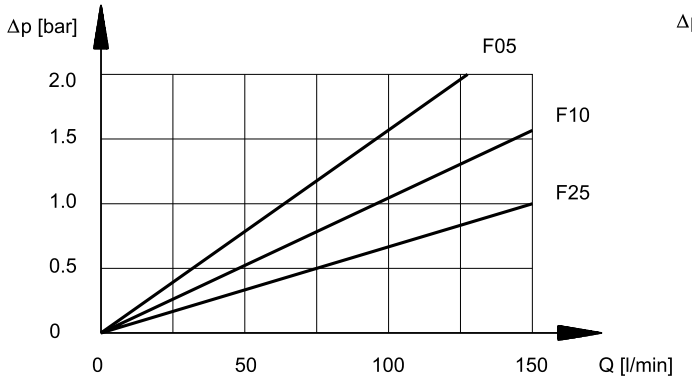
(values measured with viscosity of 36 cSt at 50 °C)

2.1 - Filter housing pressure drops

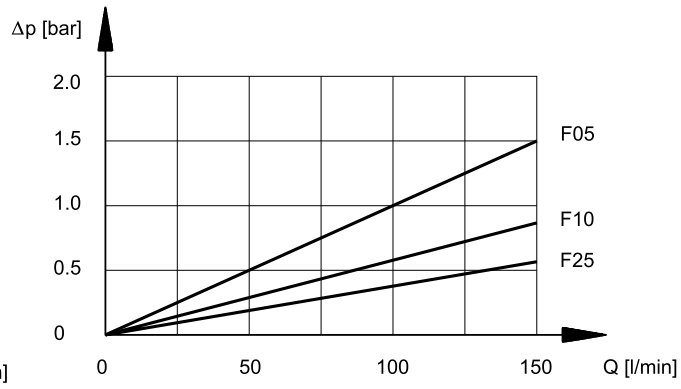


2.2 - FPME filter elements pressure drops

FPME-*S
(standard filter)



FPME-*L
(long-lasting filter)



NOTE 2: The filter size has to be selected so that, at the nominal flow rate, the total pressure drop is less than 1.2 bar and in any case this value must not exceed 1/3 of the setting of the bypass valve.

The total pressure drop through the filter is obtained by adding the pressure drop values of the housing to those of the filter element.

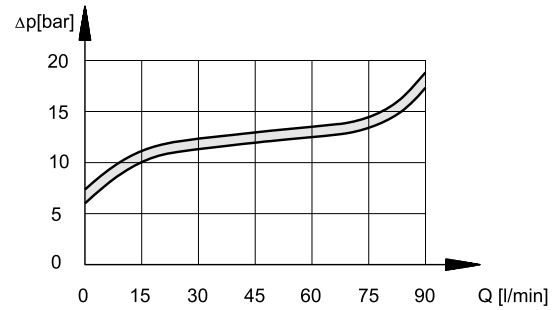
For fluids having a viscosity other than 36 cSt at operating temperature, the total pressure drop of the filter must be corrected by the following equation:

total Δp = housing Δp + (actual Δp of the filter element x actual viscosity (cSt) / 36)

actual Δp of the filter element = value obtainable from the diagrams in point 2.2

These formulae are valid for viscosities up to a maximum of 200 cSt. For applications with higher viscosities please consult our Technical Department.

2.3 - Pressure drops of the bypass valve



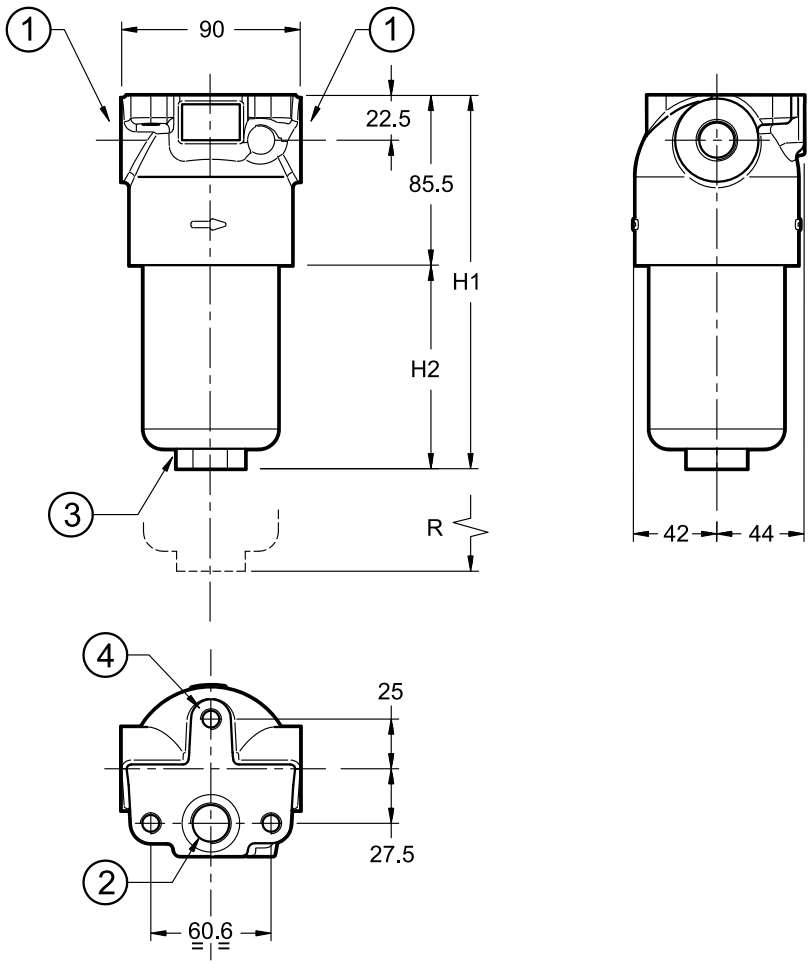
3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

4 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	In-line BSP connections: **FPM-TB012:** 1/2” BSP **FPM-TB034:** 3/4” BSP
2	Clogging indicator port: M20x1.5
3	Bowl removal spanner: SW30
4	No. 3 threaded holes M10 depth 15 mm for possible filter bracket.

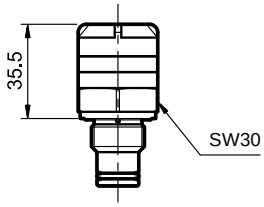
R = Clearance space for filter element removal

Filter code	H1	H2	R
FPM-TB*-F**S**	195	110	90
FPM-TB*-F**L**	290	205	90

5 - CLOGGING INDICATORS

The filters are all designed to accomodate a clogging indicator, which must be ordered separately. Tightening torque 90 Nm.

5.1 - Visual indicator for pressure filters
Identification code: VPM/10



This indicator measures the differential pressure between filter inlet and filter outlet.

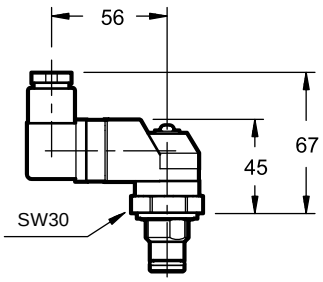
The indicator is supplied with coloured bands, which inform you about the clogging condition of the filter element:

WHITE: efficient filter element
$\Delta p < 5$ bar (± 10%)

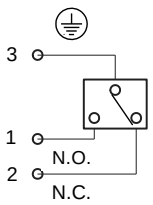
RED: the filter element need to be replaced $\Delta p > 5$ bar (± 10%)

5.2 - Electric-visual indicator for pressure filters
Identification code: EPM/10

This type of indicator operates by switching the electric contact when the clogging limit of the filter element is reached, as well as having a visual indicator like that of the VPM model.



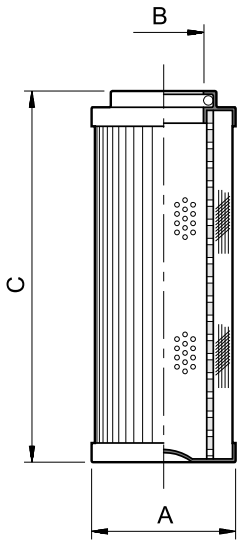
The contact can be wired in open or closed condition (see scheme).



TECHNICAL SPECIFICATIONS

		AC	DC
Differential operating pressure	bar	5	
Operating voltage	V	125 - 250	14 - 30
Max. load on contacts - resistive - inductive	A	 1 1	 4 3
Electric connector		EN 175301-803 (ex DIN 43650)	
Class of protection according to EN 60529 (atmospheric agents)		IP65	

6 - FILTER ELEMENTS



filter element code	ØA	ØB	C	Average filtering surface [cm²]
FPME-F*S**	52	23.5	115	975
FPME-F*L**	52	23.5	210	1830

FILTER ELEMENT IDENTIFICATION CODE

F P M E - | | | | / 10 |

Filter element for FPM filters

Filtration degree:
F05 = fibre 5 µm
F10 = fibre 10 µm
F25 = fibre 25 µm

Filter element type:
S = standard
L = long-lasting

Series No. (from 10 to 19 sizes and mounting dimensions remain unchanged)

N = NBR seals for mineral oils **(standard)**
V = FPM seals for special fluids (upon request)

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duplomaticmotionsolutions.com

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FPHM
PRESSURE FILTER
SERIES 10

MODULAR VERSION

p max **320** bar
Q max (see table of performances)

OPERATING PRINCIPLE

— The FPHM filters are designed for modular mounting, directly under proportional valves or servovalves with ISO 4401 mounting interfaces.

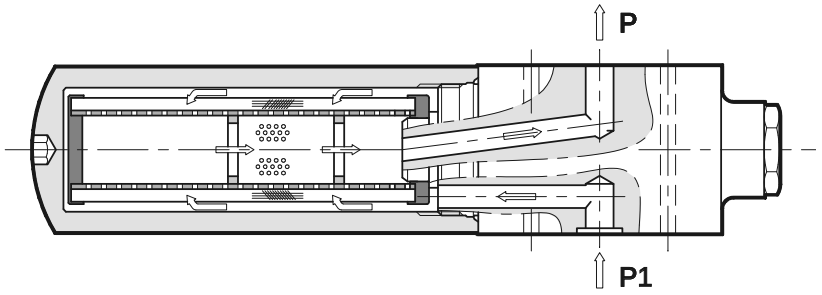
— They are available in two nominal dimensions with mounting surface ISO 4401-03 and ISO 4401-05.

— These filters are designed for working pressures up to 320 bar. Filter elements are made of high efficiency filtering materials and they are available with three different filtration degrees, with a collapsing differential pressure of 210 bar:

F05 = 5 µm absolute
(β_5>100 - ISO 4406:1999 class 17/15/12)
F10 = 10 µm absolute
(β_{10}>100 - ISO 4406:1999 class 18/16/13)
F25 = 25 µm absolute
(β_{25}>100 - ISO 4406:1999 class 19/17/14)

— All the FPHM filters are supplied without by-pass valve.

— Filters are arranged for clogging indicator, which must be always ordered separately and mandatorily installed by the customer (see paragraph 5).



PERFORMANCES

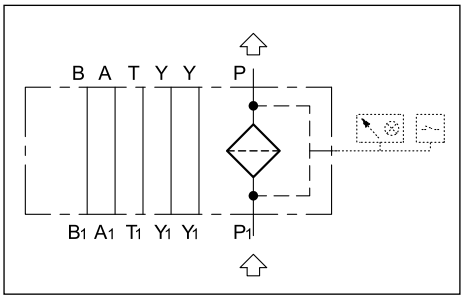
Filter	Dimensions	Mass [kg]	Rated flow (indicative) [l/min]		
			F05	F10	F25
FPHM3	ISO 4401-03	2,6	12	13,5	16
FPHM5	ISO 4401-05	4,7	22	25	28

NOTE 1: Flow rates stated in the table correspond to a 3 bar pressure drop, measured with mineral oil of viscosity 36 cSt at 50°C.

As for a different viscosity range, see **NOTE 2 - par. 2.2.**

Maximum operating pressure	bar	320
Collapsing differential pressure of the filter element	bar	210
Ambient temperature range	°C	-25 / +50
Fluid temperature range	°C	-25 / +110
Fluid viscosity range	cSt	10 ÷ 400

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

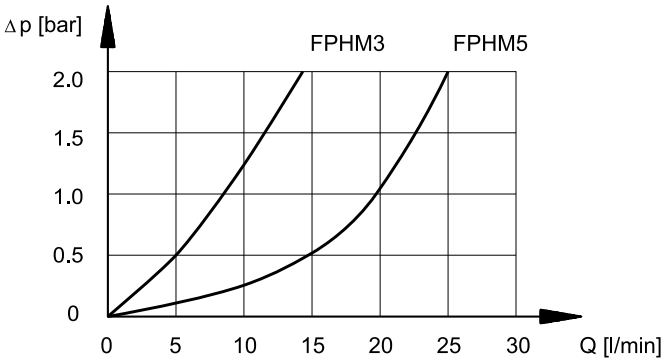
F	P	H	M		-			S	/	10		-	0

- High pressure delivery filter
- Modular version
- Nominal dimension:
  3 = ISO 4401-03 **5** = ISO 4401-05
- Filtration degree:
  F05 = fibre 5 µm (β_5>100 - ISO 4406:1999 class 17/15/12)
  F10 = fibre 10 µm (β_{10}>100 - ISO 4406:1999 class 18/16/13)
  F25 = fibre 25 µm (β_{25}>100 - ISO 4406:1999 class 19/17/14)
- Standard filter element
- Series No.
  (from 10 to 19 sizes and mounting dimensions remain unchanged)
- Seals:
  N = NBR standard seals for mineral oils (**standard**)
  V = FPM seals for special fluids
- without by-pass valve

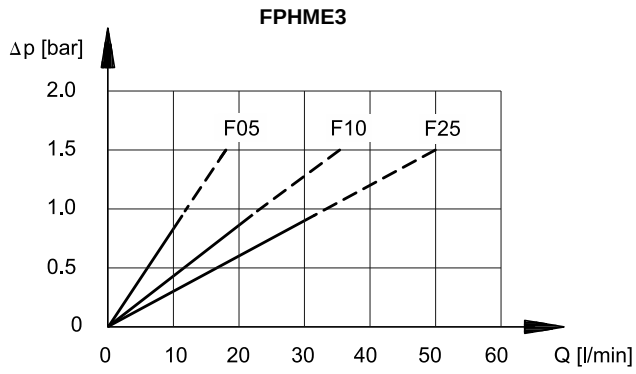
2 - CHARACTERISTIC CURVES

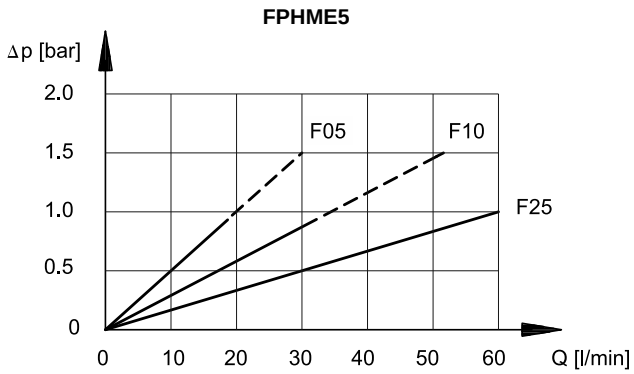
(values measured with viscosity of 36 cSt at 50°C)

2.1 - Pressure drops through the filter body



2.2 - Pressure drops through FPHME filter element





NOTE 2: The filter size has to be selected so that with nominal flow rate, the total pressure drop is less than 1.2 bar.

The total pressure drop through the filter is given by adding the body pressure drop values to those of the filter element. As for fluids whose viscosity degree at a specific operating pressure is different from 36 cSt, the filter total pressure drop has to be changed according to the following ratio:

total Δp value = body Δp value + (real Δp value of the filter element x real viscosity value (cSt) / 36)

real Δp value of the filter element = value obtainable through the diagrams in par. 2.2

Such ratio is valid for a viscosity value up to 200 cSt. For a higher viscosity please consult our technical department.

3 - HYDRAULIC FLUIDS

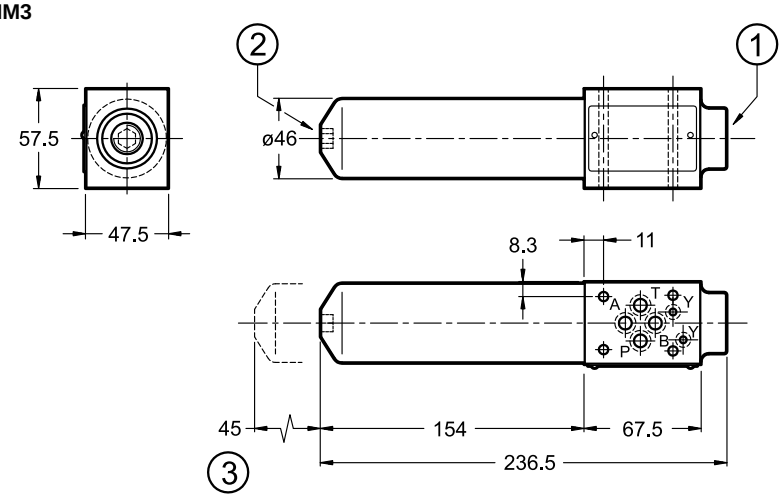
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

4 - OVERALL AND MOUNTING DIMENSIONS

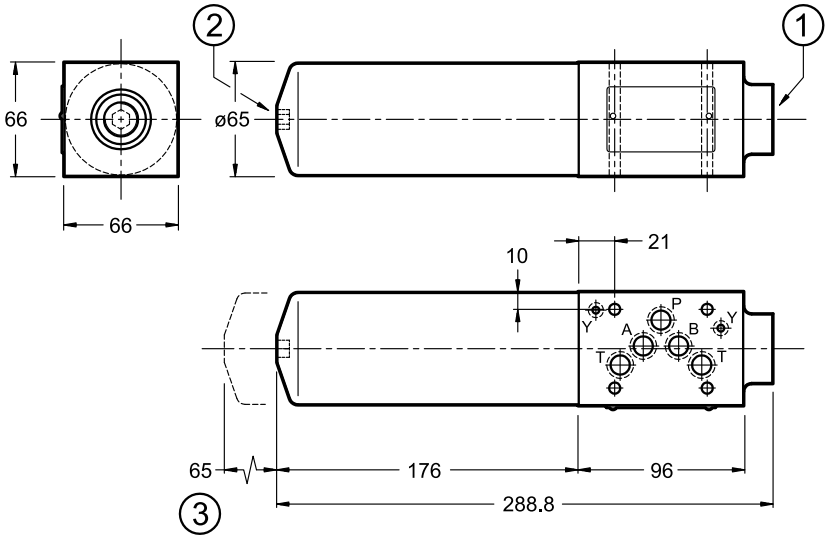
FPHM3

dimensions in mm

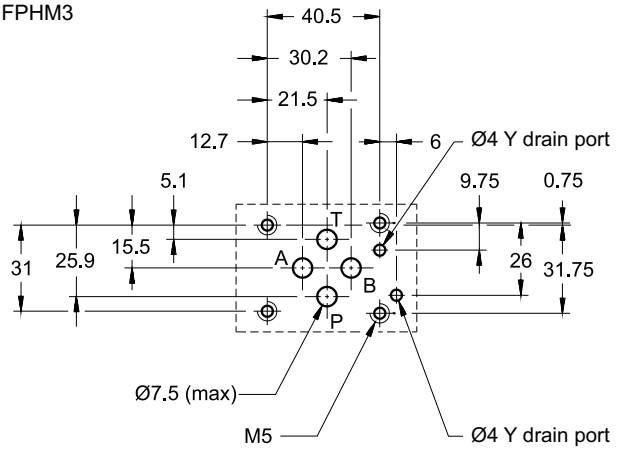


1	Clogging indicator port: M20x1,5 (Clogging indicator must be ordered separately)
2	Hex socket for housing removal: Allen key 10
3	Mounting surface with sealing rings 70 shore: **FPHM3:** 4 OR 108 (8.73x1.78) 2 OR 2021 (5.28x1.78) **FPHM5:** 5 OR 2050 (12.42x1.78) 2 OR 2021 (5.28x1.78)
4	Removal space of filter element

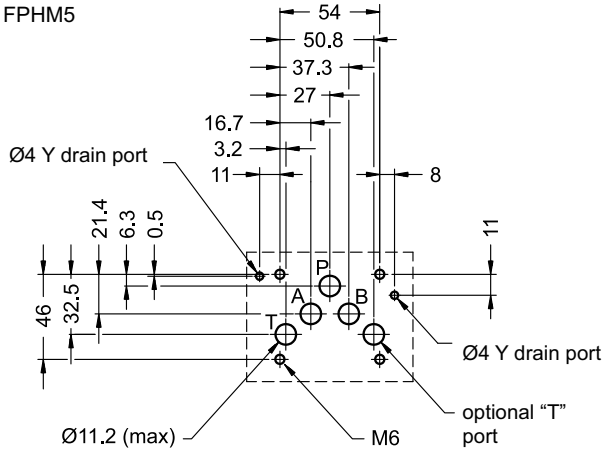
FPHM5



MOUNTING INTERFACE
FPHM3



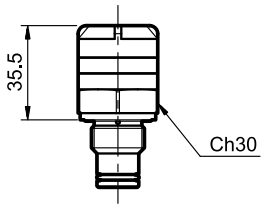
MOUNTING INTERFACE
FPHM5



5 - CLOGGING INDICATORS

The filters are all designed to incorporate clogging indicators, which have to be ordered separately. Tightening torque 90 Nm

5.1 - Visual indicator for modular filters
Identification code: VM/10



This indicator measures the differential pressure between the filter input and output.

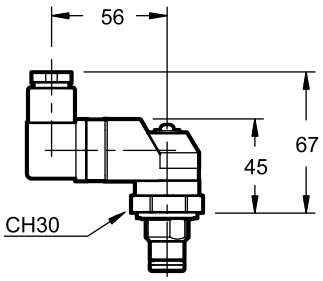
The indicator is supplied with coloured bands, which informs you about the clogging condition of the filter element:

WHITE: efficient filter element
$\Delta p < 8$ bar (± 10%)

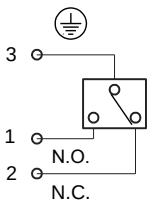
RED: the filter element has to be replaced $\Delta p > 8$ bar (± 10%)

5.2 - Electric-visual indicator for modular filters
Identification code: EM/10

This type of indicator, in addition to giving a visual indication as the VM model, operates by switching an electric contact when the filter element has reached the clogging limit.



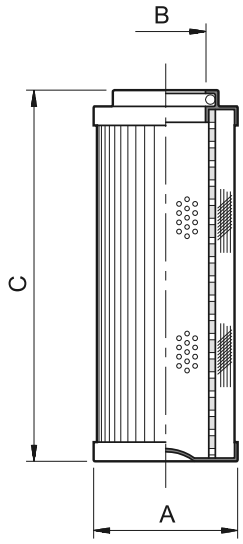
The contact can be wired in an open or closed condition (see scheme).



TECHNICAL SPECIFICATIONS

		AC	DC
Differential operating pressure	bar	8	
Operating voltage	V	125 - 250	14 - 30
Max. load on contacts - resistive - inductive	A	 1 1	 4 3
Electric connector		EN 175301-803 (ex DIN 43650)	
Class of protection according to EN 60529 (atmospheric agents)		IP65	

6 - FILTER ELEMENTS



Filter element code	ØA	ØB	C	Average filtering surface [cm²]
FPHME3	33	16	100	270
FPHME5	45	25	115	475

FILTER ELEMENTS IDENTIFICATION CODE

FPHME		-		S	/	10	

Filter element for FPHM modular filter

Nominal dimension:
3 = ISO 4401-03
5 = ISO 4401-05

Filtration degree : **F05** = fibre 5 µm
F10 = fibre 10 µm
F25 = fibre 25 µm

Standard filter element

Series No.
(from 10 to 19 sizes and mounting dimensions remain unchanged)

N = NBR seals for mineral oils **(standard)**
V = FPM seals for special fluids (upon request)

DUPLOMATIC MOTION SOLUTIONS

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tel. +39 0331.895.111 • www.duplomatic.com • e-mail: sales.exp@duplomatic.com

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EHU

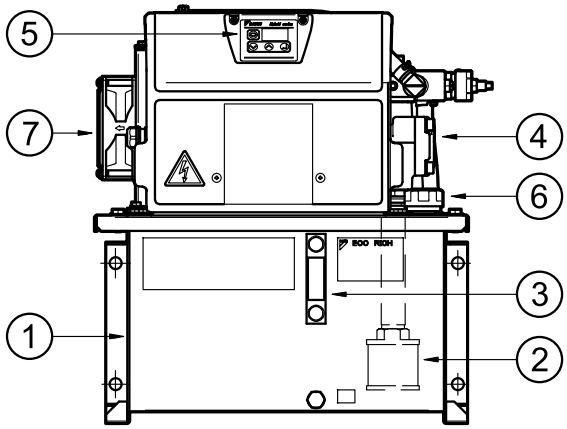
ECORICH HYBRID HYDRAULIC POWER UNIT

SERIES 40

TANK CAPACITY
18 litres

MOTOR PUMP FLOW RATE
28.5 l/min

DESCRIPTION



The ECORICH hybrid units are designed and manufactured by Daikin Industries LTD.

They merge the hydraulics technology with an interior permanent magnet synchronous motor.

The result is a compact power unit that achieves high torque and maximum efficiency while suppressing heat and noise generation. Energy consumption is reduced significantly.

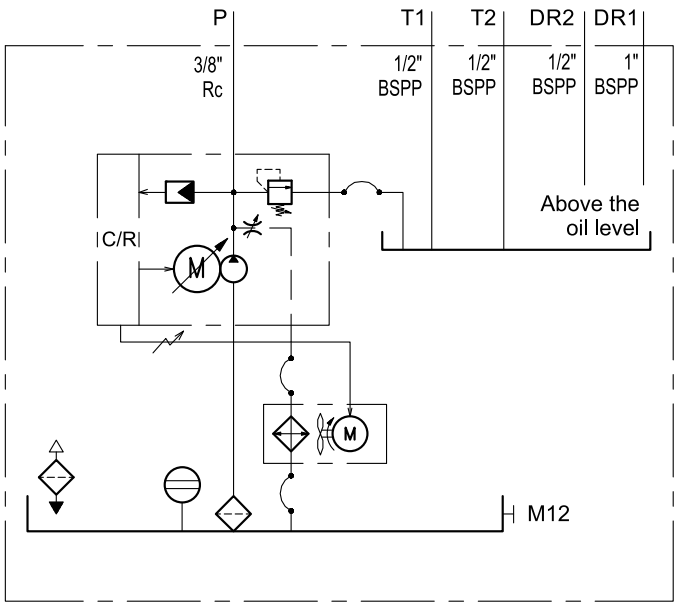
The high efficiency of the motor-pump ensures that oil heating is minimal. This advantages the machine tool on which the ECORICH is installed in terms of oil and heat-sensitive parts life, and less heat dissipation in the surrounding ambient.

The ECORICH units are equipped with IPM motor-pump, controller, pressure relief valve, oil cooler, suction filter and oil filler cap with air breather. Thermometer, temperature switch, level switch and adapter can be ordered as options.

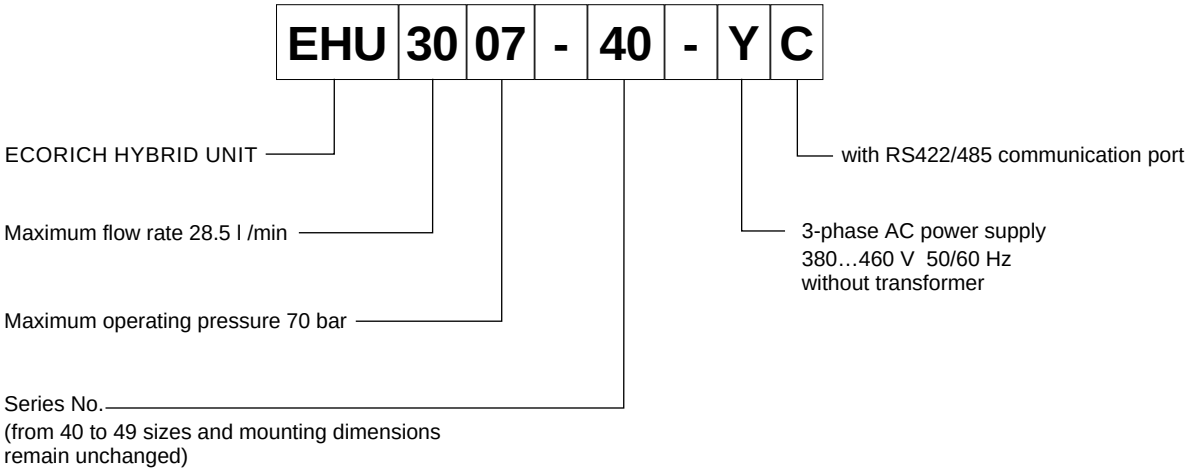
The power unit is designed for 3-phase AC 380 to 460V 50/60 Hz.

1) Oil tank
2) Suction filter
3) Oil level visual indicator
4) Motor pump with IPM motor
5) Control unit
6) Oil filler cap with air breather
7) Cooler

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE



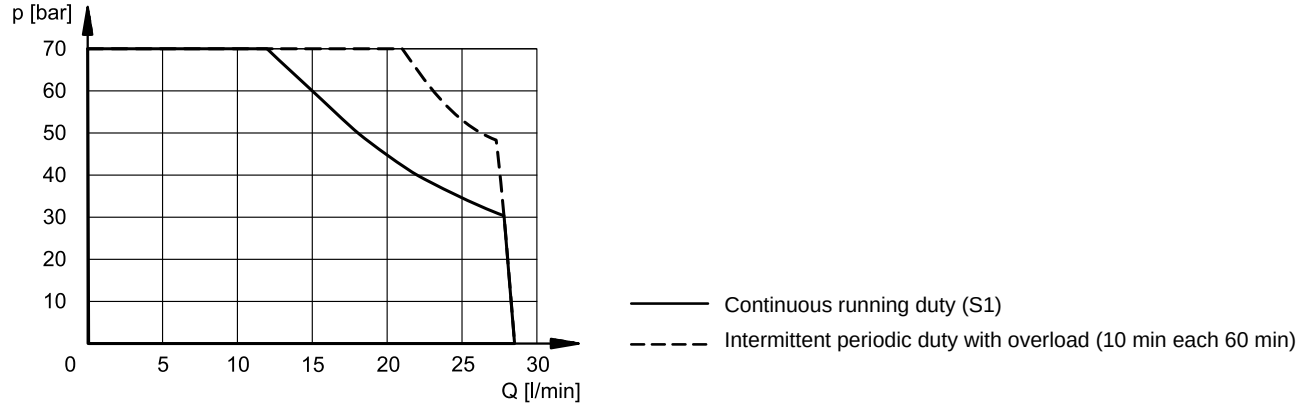
NOTE: Optional components such as level switch, sensors, adapter, etc. must be ordered separately. Assembly is the responsibility of the customer. See point 10.

2 - SPECIFICATIONS

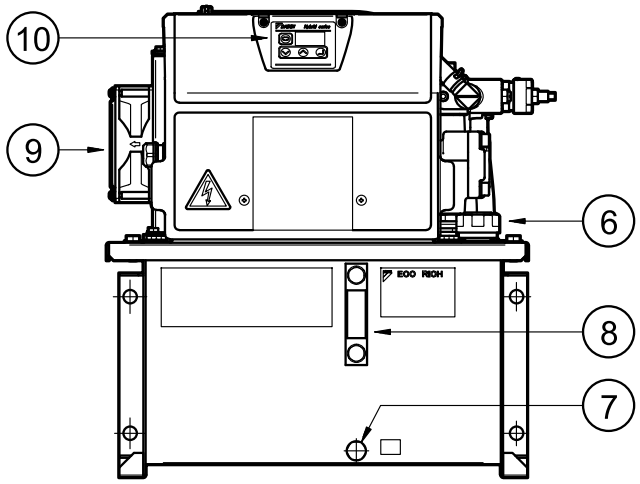
Maximum operating pressure	bar	70
Operating pressure range	bar	15 ÷ 70
Operating flow range	l/min	3.5 ÷ 28.5
Tank capacity	l	18 (fluctuation: -5 litres)
Supply voltage permissible voltage fluctuation		3-phase AC 380…460 V 50/60 Hz ±10%
Nominal motor power	kW	1.5
Rated current	A	7
No-fuse breaker capacity	A	10
Input signal, external		3 channels, photo coupler insulation, DC 24 V (maximum of DC 27 V), 5 mA per channel
Digital output signal, external		1 channel, photo coupler insulation, open collector output, DC 24 V, 50 mA maximum per channel
Contact output signal, external		1 channel, relay output, contact capacity: DC 30 V, 1 A (resistance load), 1 common contact
Ambient temperature range	°C	0 to +40
Fluid temperature range in the tank	°C	0 to +60 (recommended +15 to +50)
Fluid contamination degree		within ISO 4406 class 21/19/16
Viscosity		Viscosity grade: ISO VG32 to 68 • Viscosity range: 15 to 400 mm^2/s
Operating ambient humidity	RH	< 85%, without condensation
Protection class		IP44
Installation		altitude max 1000 mt , indoor, fixed on a flat surface without vibrations.
Noise level range (distance: 1 meter)		58 ÷ 70 dB
Mass (without oil)	kg	29

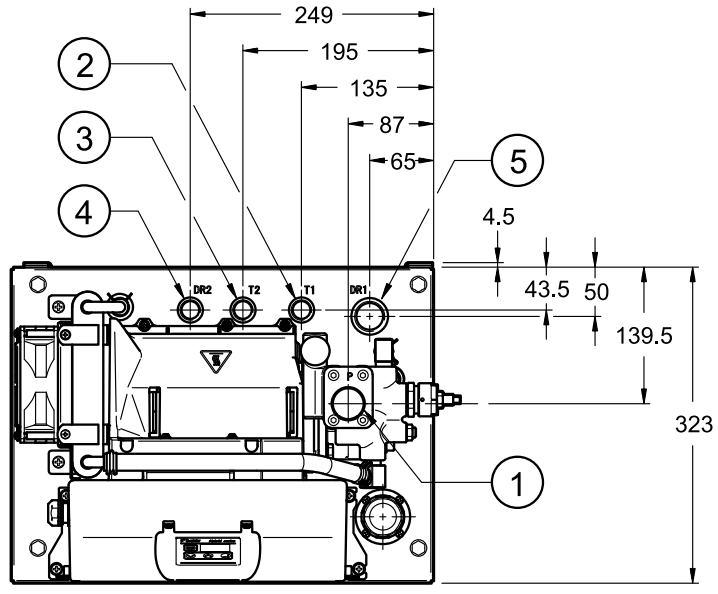
3 - CHARACTERISTICS

Values obtained and rated for ambient temperature ≤ 40 °C and fluid temperature ≤ 60 °C.



4 - MAIN PARTS AND OPTIONS

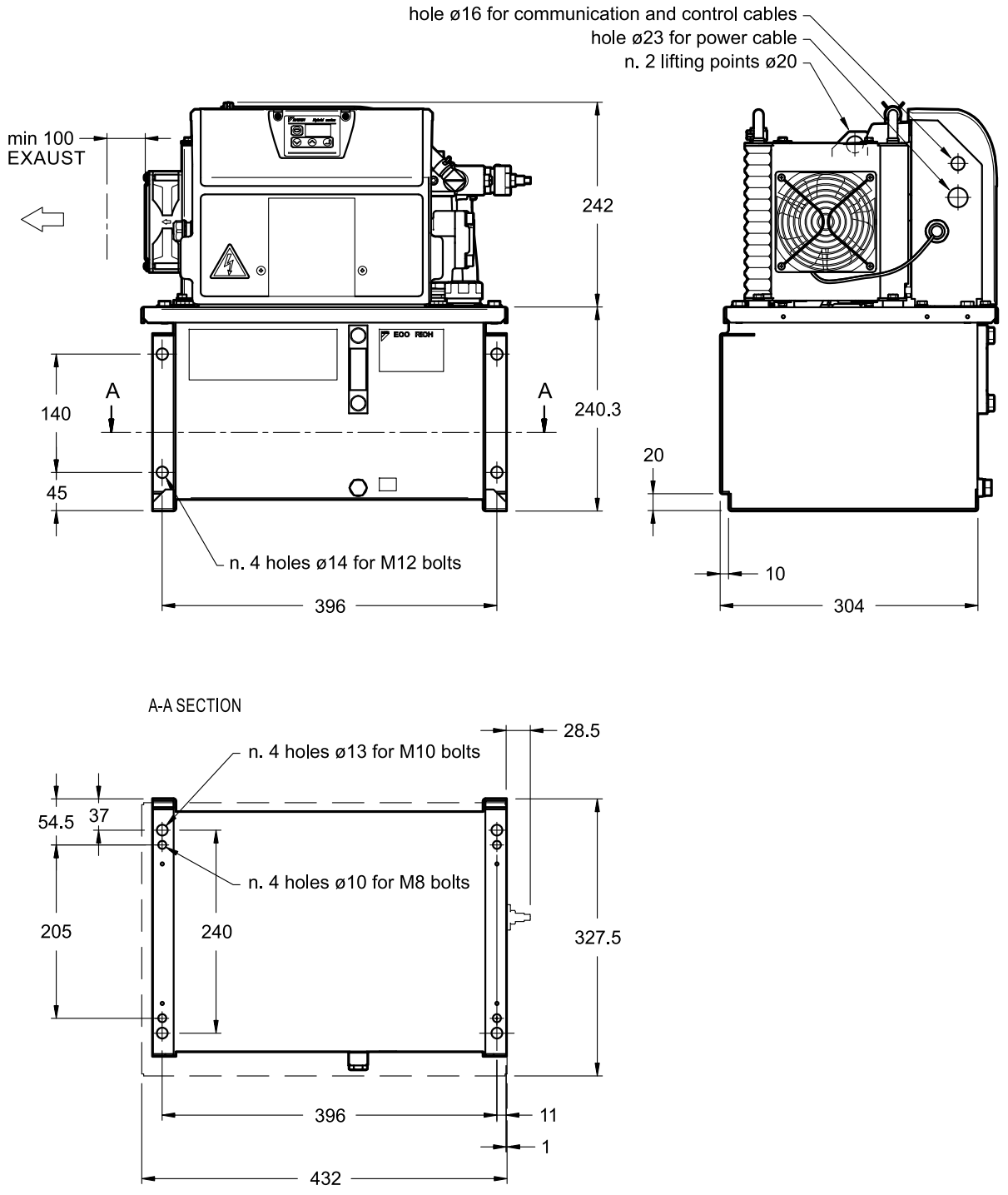




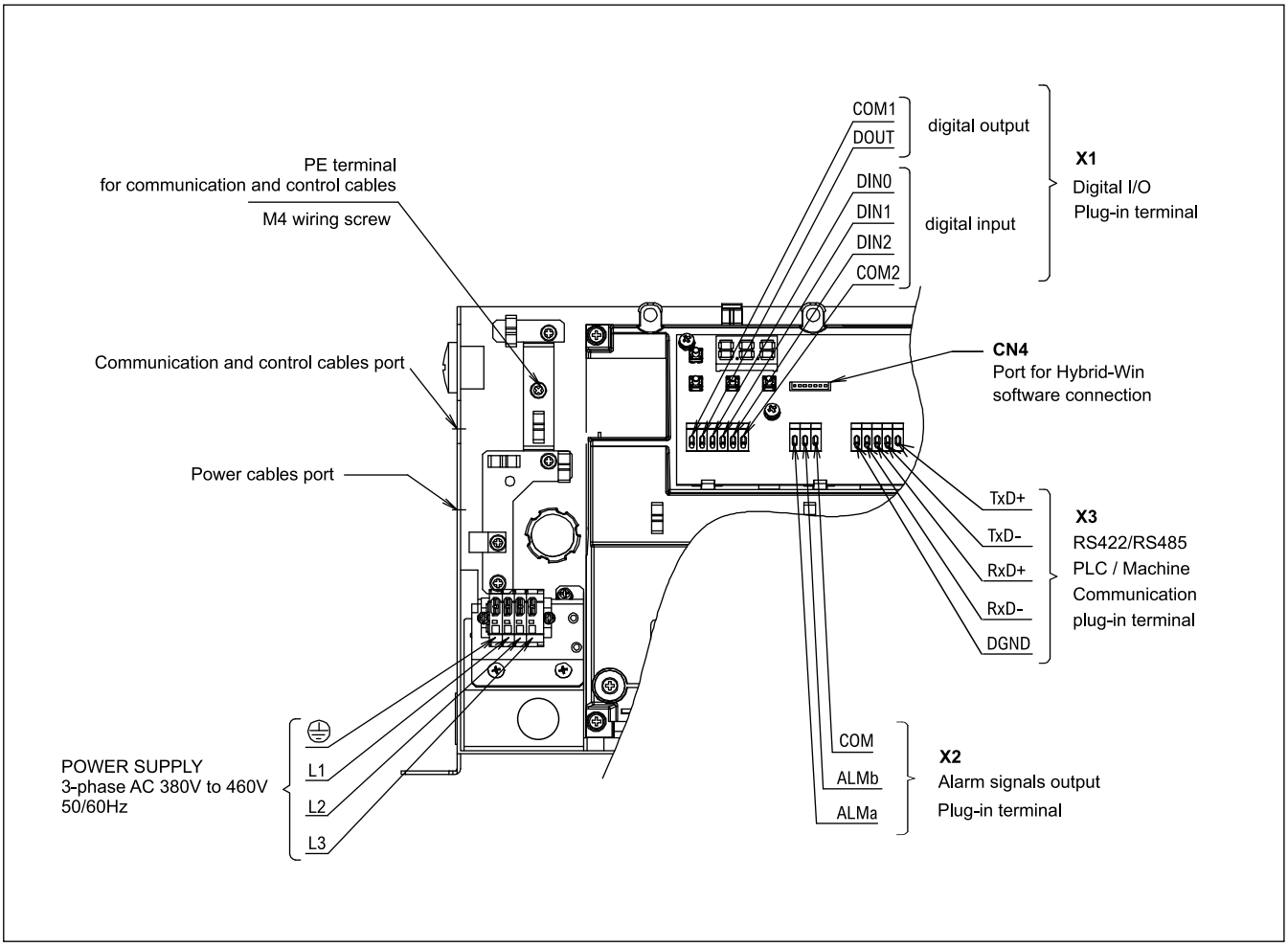
NOTE: Rc is a tapered female thread from the taper screw standard for pipes JIS B 0203:1999. It is compatible with the male BSPT thread.
BSPP adapter available. See point 10

1	P Pressure port: Rc 3/8” (**NOTE**) delivered with resin cap
2	T1 Port for return line T1: 1/2” BSPP delivered with resin cap
3	T2 Port for return line or temperature switch or thermometer: 1/2” BSPP delivered with resin cap
4	DR2 Drain port or level switch: 1/2” BSPP delivered with resin cap
5	DR1 Drain port: 1” BSPP delivered with resin cap
6	Oil filler port with air breather
7	Oil sampling and tank drain port
8	Oil level indicator: upper 18 L; lower 13 L
9	Cooler
10	Control panel

5 - OVERALL AND MOUNTING DIMENSIONS

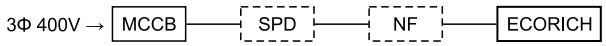


6 - WIRING



6.1 - EMC 2014/30/EU compliance

The EN 61800-3:2004 (Second environment / PDS Category “C3”) requires the installation of a surge on protection device and a noise filter between the breaker and the ECORICH hybrid unit on the power source line.



The assessment for the installation of these components is the responsibility of the machine manufacturer, as compliance with EMC regulations involves the entire machine on which the EHU unit will be installed. If EHU has to be compliance EMC 2014/30/EU as a standalone, noise filter and protection device are must have.

Surge protection device (SPD) and noise filters can be ordered separately. See point 10.

6.2 - Wiring notes

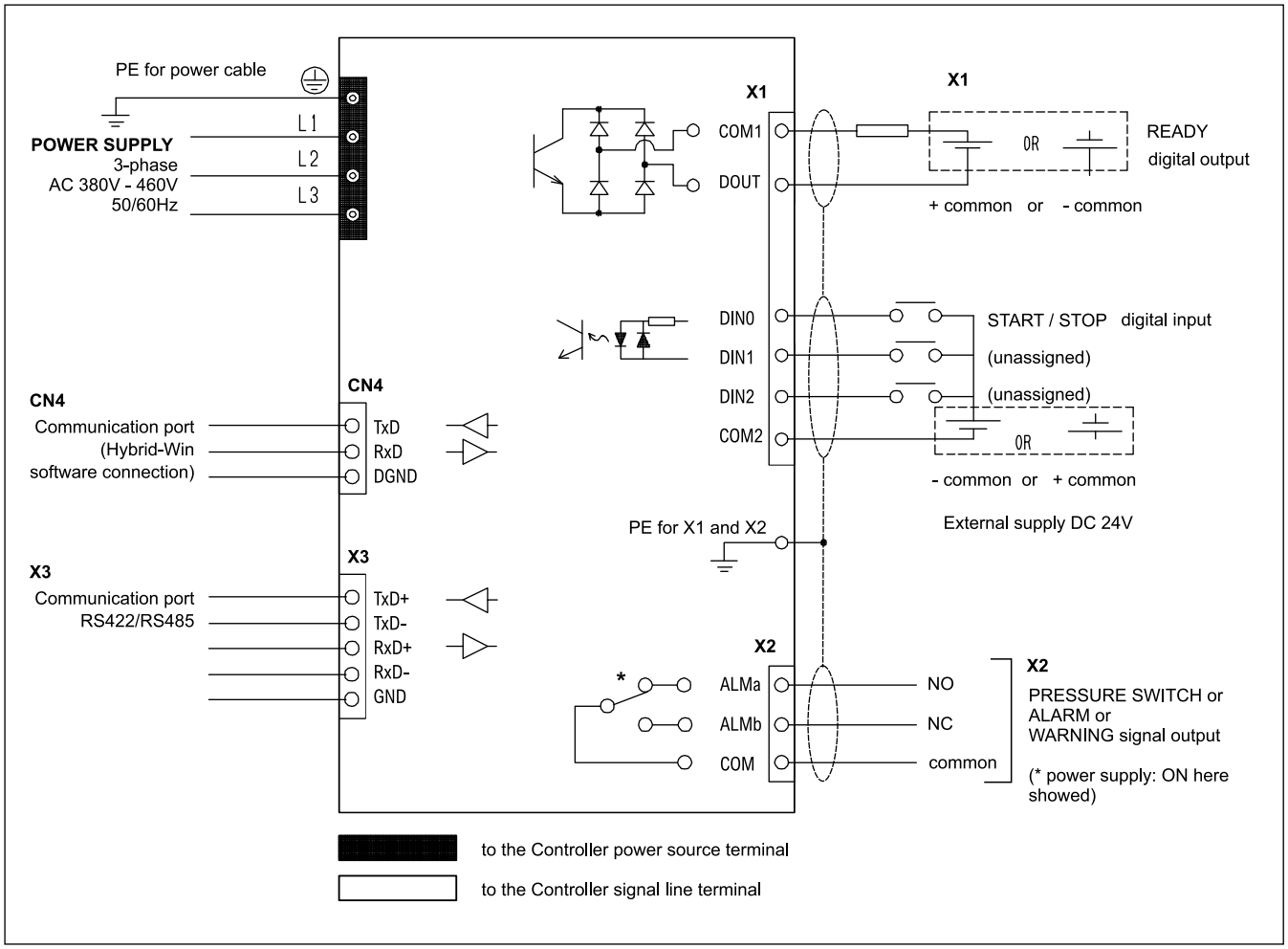
- Install a no-fuse breaker and a ground fault interrupter compliant with European Standard EN 60947-2 in the main power supply of ECORICH, to protect the electrical circuits against shorting and overcurrent, and to prevent electric shocks.
- Use straight type terminals for the power supply wiring.
- Use suitable electric cable in accordance with the power supply capacity. In addition, connect the cables correctly in accordance with the wiring guide.
- Provide a ground connection in compliance with the law in the relevant country. Connect the grounding wire directly with no breaker in the line.
- Avoid the entry of waste metal such as screws and wiring debris, or combustible matter such as wood waste or oil, inside the control unit.
- Use a commercial power supply for the power source. The use of an inverter power supply may cause burn damage to the unit.
- Before accessing the interior of the control unit, check that the unit’s power supply has turned OFF **and then wait at least 5 minutes.**

6.3 - Cables

For the main power connection (L1, L2 and L3) use cables with 4-wires, with 1.5 mm² section.

For signals and for ModBUS communication to the PLC use shielded cables with section from 0.35 mm² to 0.5 mm².

7 - BLOCK DIAGRAM



Digital I/O & alarm signals

		description		function / notes
X1	COM1	common output	24 V DC (±10%) I max 50 mA resistive	Can be either positive or negative
	DOUT	digital output		Ready to operate / motor operation signal. ON or OFF is selectable by parameter setting.
	COM2	common digital input	24 V DC (±10%) I max 5 mA resistive	Can be either positive or negative
	DIN0	digital input 0		Unit start / stop signal Selectable by parameter setting.
	DIN1	digital input 1		reserved
	DIN2	digital input 2		reserved
X2	ALMa	NO alarm output	switching 30 V DC 1A resistive (min load 24 VDC 10 mA approx)	When the power supply unit is switched ON, ALMa is closed (ALMb open). If an alarm / warning has occurred and when the pressure switch is actuated the contact ALMa is open (ALMb closed).
	ALMb	NC alarm output		
	COM	common alarm output		

8 - INSTALLATION NOTES

8.1 - Installation and piping

- The unit is a stationary type. Fix it with bolts on a level location that is free of vibration.
- Keep obstacles that will obstruct air intake and emission at least 100 mm away from the end face of the unit. Install the unit at a location with good air flow so that heated air can be vented.

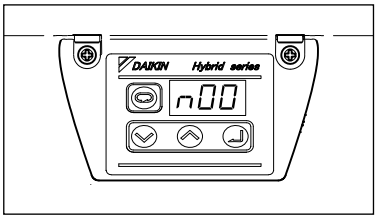
8.2 - Hydraulic fluid

- Use mineral-oil base hydraulic oil. Use of hydraulic oils other than mineral-oil based type (e.g., hydrous/synthetic) is prohibited.

8.3 - Other precautions

- If a failure occurs in the hydraulic unit, the system indicates an alarm and terminates. If a failure or malfunction of this unit is expected to cause death or pose a danger to human beings, adopt appropriate safety measures in the facilities.
- Turning the power supply ON/OFF frequently will significantly shorten the life of the controller. Use the start/stop digital inputs to start/stop this hydraulic unit. Leave an interval of at least 5 minutes between operation stops invoked by turning the power supply ON/OFF. Also, when starting and stopping the unit using the start/stop signals, leave an interval of at least 0.5 seconds between a stop command and restarting.
- It takes approximately 3 seconds for this hydraulic unit to start up after being powered ON. Depending on the piping conditions, the unit may take longer to increase the pressure to the pressure switch's preset level, resulting in pressure switch signal output. In this case, set the machine up so that it will not accept this alarm output during this period.

9 - DEVICE SETUP



The ECORICH control unit is configured by connecting the CN4 port located inside the unit control panel to a device with the Hybrid-win software installed. It is always possible to modify the parameters also by keys on the control panel.

The ECORICH unit communicates with the machine tool via Modbus-RTU protocol.
The communication setting between them is done from the operation panel of the hydraulic unit.

9.1 - Hybrid-win software

The software allows to monitor the operating data in real time through a graphical interface; to read and set parameters, to monitor alarms and warnings history and to save and copy the parameter set.

The software is compliant with Microsoft Windows OS.

The connection between the ECORICH and the PC requires a cable connection kit, that can be ordered separately. See point 10.

The Hybrid-win software and the additional literature for the ECORICH unit can be easily downloaded from the Customer's page in the product section at www.hyd.daikin.com after subscribing the membership for free.

9.2 - Parameters table

Please refer to the *Instruction Manual* delivered with the product for a complete list of parameters and their settings.

10 - ACCESSORIES

These accessories are supplied separately and their assembly on the power unit is charged to the customer.

ordering code	description	
3906500010	LS-B12-114/10-D24K1-SPDT	Level switch SPDT 1/2" BSPP
3906500012	TS-B12-170-60/10-D24K1-SPDT	Temperature switch 1/2" BSPP - 24V DC - switching temperature 60 °C
0119801	Adapter Rc 3/8" to BSPP 3/8" for P pressure port	
3906500014	Surge protection device (SCHNEIDER ELECTRIC A9L20321)	
3906500013	Noise filter (SCHAFFNER FN3025HP-10-71)	
3906500003	EHUPC/10 - Kit for Hybrid-Win software connection	

DUPLOMATIC
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duplomaticmotionsolutions.com

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EHU

ECORICH HYBRID HYDRAULIC POWER UNIT

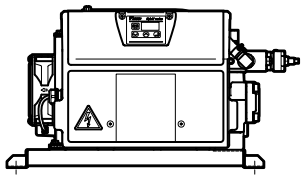
SERIES 40

TANK CAPACITY
45 litres

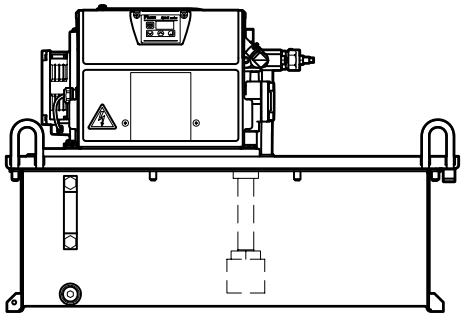
MOTOR PUMP FLOW RATE
up to 28.5 l/min

DESCRIPTION

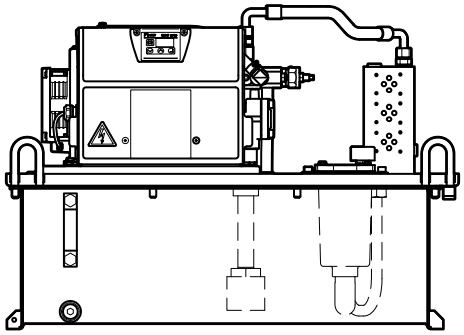
EHU**-40-YC-QU-D1**



EHU**-40-YC-Q045-D1**



EHU**-40-YC-Q045M3-D1**



The ECORICH hybrid units are designed and manufactured by Daikin Industries LTD.

They merge the hydraulics technology with an interior permanent magnet synchronous motor.

The result is a compact power unit that achieves high torque and maximum efficiency while suppressing heat and noise generation. Energy consumption is reduced significantly.

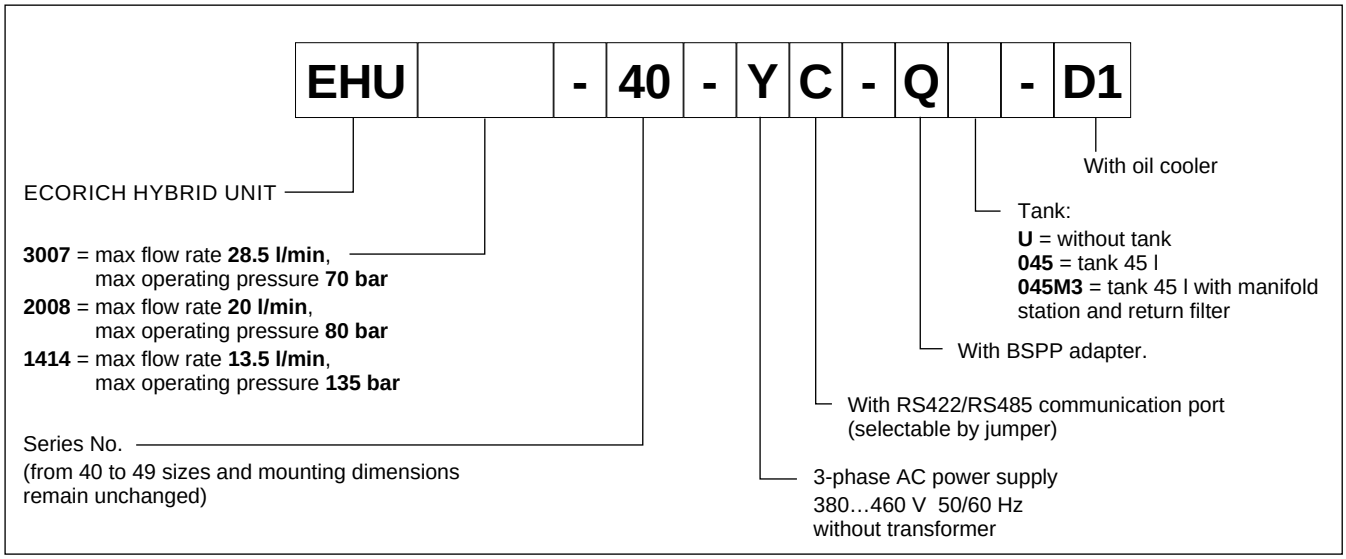
The high efficiency of the motor-pump ensures that oil heating is minimal. This advantages the machine tool on which the ECORICH is installed in terms of oil and heat-sensitive parts life, and less heat dissipation in the surrounding ambient.

The power unit is designed for 3-phase AC 380 to 460V 50/60 Hz.

ECORICH hybrid units are available in three versions:
- EHU3007 pressure up to 70 bar, flow rate up to 28.5 l/min
- EHU2008 pressure up to 80 bar, flow rate up to 20 l/min
- EHU1414 pressure up to 135 bar, flow rate up to 13.5 l/min

They are deliverable with:
- fixing frame, no tank
- 45 litre tank, equipped with suction filter, level switch and customizable plate.
- 45 litre tank equipped with suction filter, level switch, multi station manifold for ISO 4401-03 valves and return filter.

1 - IDENTIFICATION CODE



2 - SPECIFICATIONS

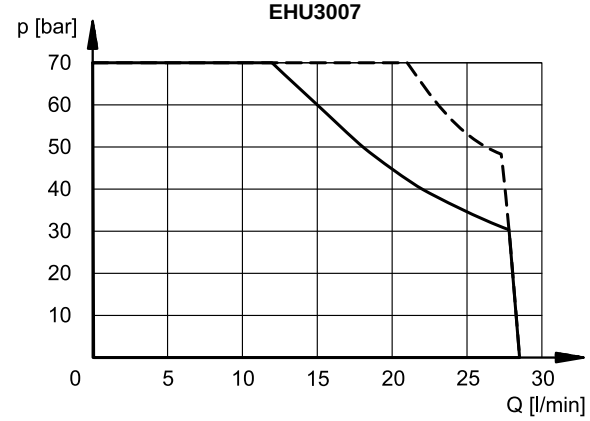
		EHU3007-40-YC		EHU2008-40-YC		EHU1414-40-YC	
		-QU	-Q045	-QU	-Q045	-QU	-Q045
Maximum operating pressure	bar	70				135	
Operating pressure range	bar	15 ÷ 70		15 ÷ 80		15 ÷ 135	
Operating flow range	l/min	3.5 ÷ 28.5		2.5 ÷ 20		1.8 ÷ 13.5	
Tank capacity	l	-	45	-	45	-	45
Oscillating volume	l	-	18	-	18	-	18
Supply voltage permissible voltage fluctuation		3-phase AC 380…460 V 50/60 Hz ±10%					
Nominal motor power	kW	1.5					
Rated current	A	7					
No-fuse breaker capacity	A	10					
Return flow filter rating (**NOTE**)	µm	-	25	-	25	-	25
Filling level monitoring shut off	l	-	25	-	25	-	25
Input signal, external		3 channels, photo coupler insulation, DC 24 V (maximum of DC 27 V), 5 mA / channel					
Digital output signal, external		1 channel, photo coupler insulation, open collector output, DC 24 V, 50 mA maximum / channel					
Contact output signal, external		1 channel, relay output, contact capacity: DC 30 V, 1 A (resistance load), 1 common contact					
Ambient temperature range	°C	0 to +40					
Fluid temperature range in the tank	°C	0 to +60 (recommended +15 to +50)					
Fluid contamination degree		within ISO 4406 class 20/18/15 (below 70 bar: within ISO 4406 class 21/19/16)					
Viscosity		Viscosity grade: ISO VG32 to 68 • Viscosity range: 15 to 400 mm²/s					
Operating ambient humidity	RH	< 85%, without condensation					
Protection class		IP44					
Installation		altitude max 1000 mt , indoor, fixed on a flat surface without vibrations.					
Noise level range (distance: 1 m)		58 ÷ 70 dB					
Mass: EHU*-QU EHU*-Q045 EHU*-Q045M3	kg	 22 - -	 - 58 69	 22 - -	 - 58 69	 24 - -	 - 60 71

NOTE 2: Only for EHU*-Q045M3.

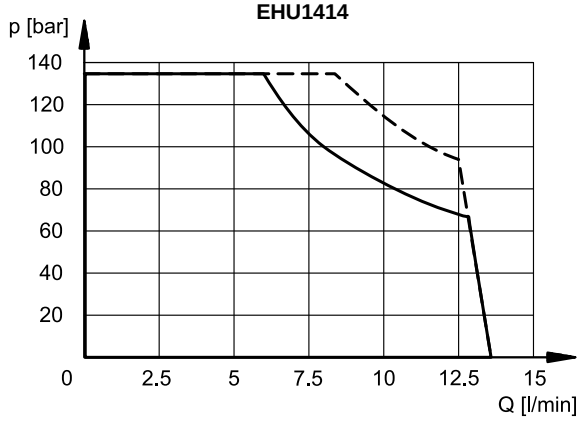
3 - CHARACTERISTICS

Values obtained and rated for ambient temperature ≤ 40 °C and fluid temperature ≤ 40 °C.

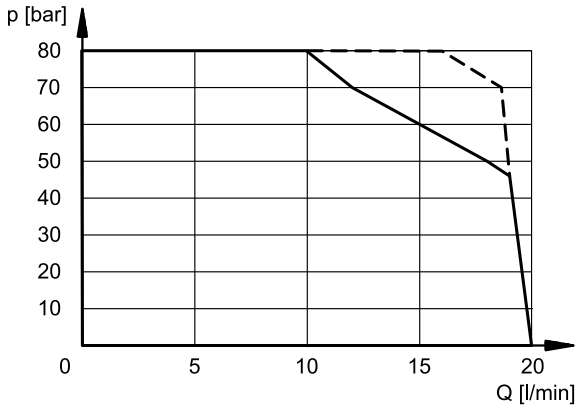
EHU3007



EHU1414



EHU2008



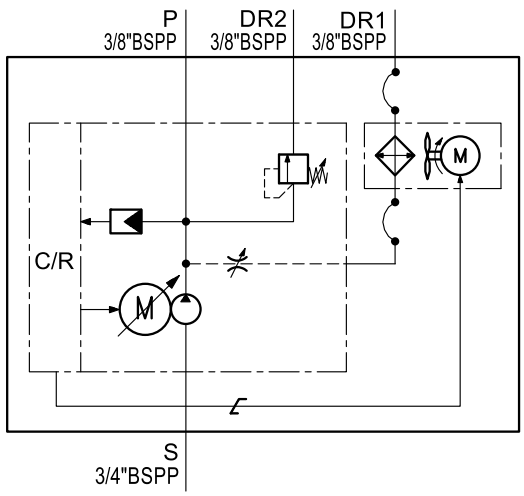
Continuous running duty (S1)

Intermittent periodic duty with overload (S2 30 min)

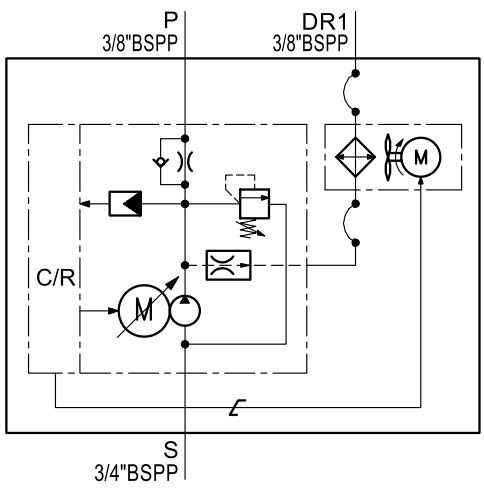
4 - CIRCUIT DIAGRAMS

4.1 - Versions without tank

EHU3007-40-YC-QU-D1
EHU2008-40-YC-QU-D1

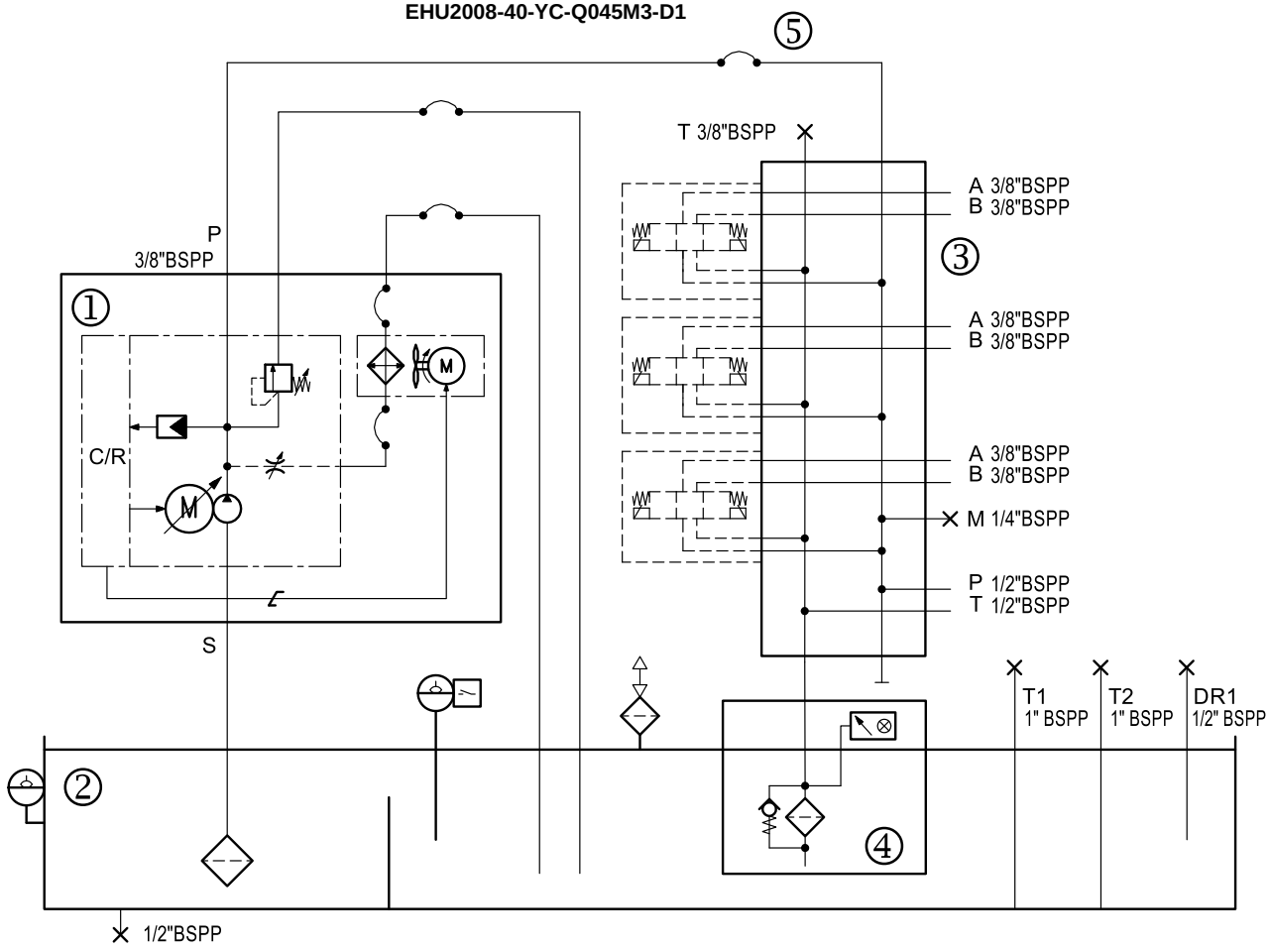


EHU1414-40-YC-QU-D1



4.2 - EHU3007 and EHU2008 - Versions with tank

EHU3007-40-YC-Q045M3-D1
EHU2008-40-YC-Q045M3-D1

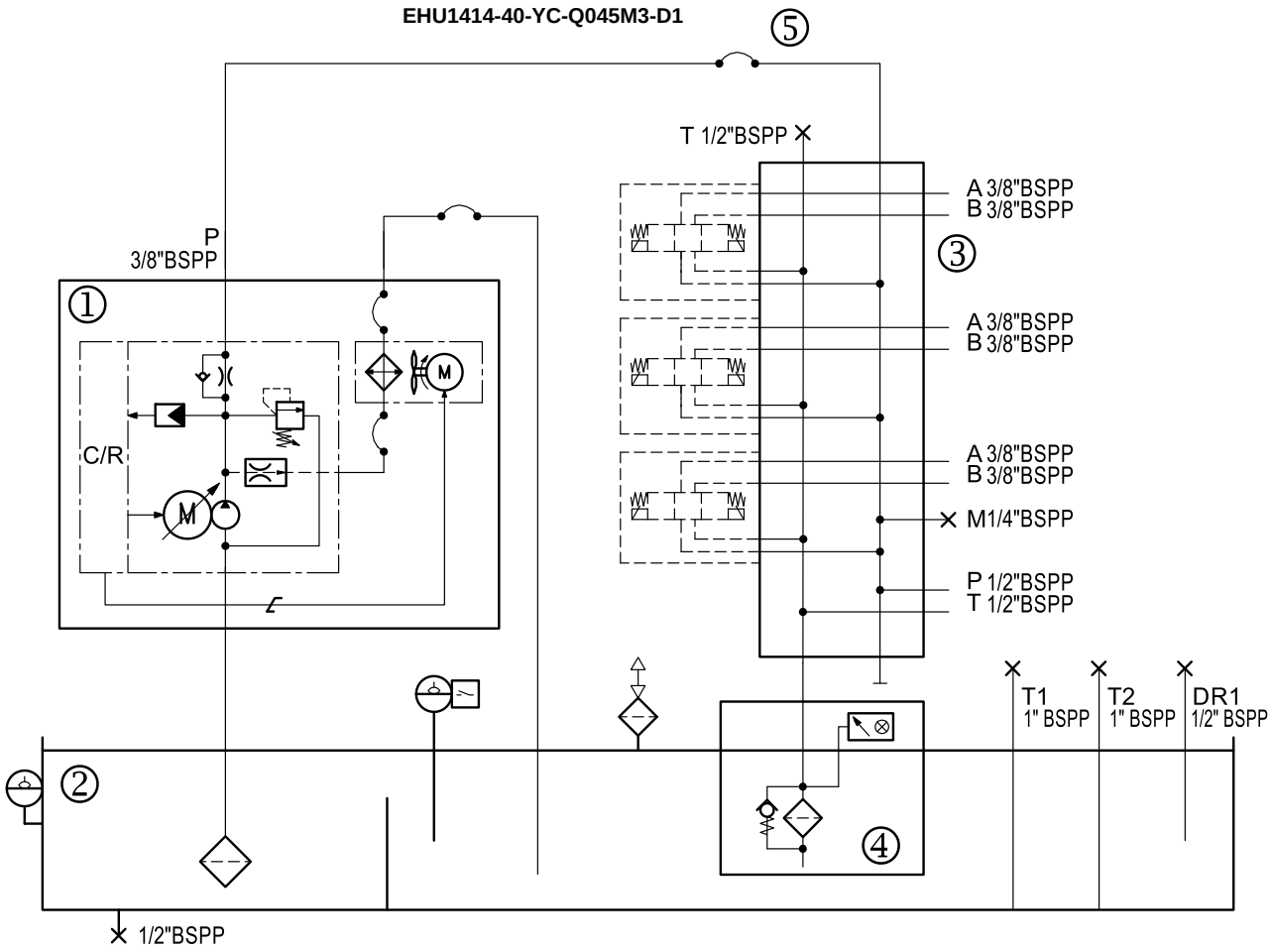


1	Daikin ECORICH Hybrid unit
2	Tank
3	Multi station manifold
4	Return filter
5	Piping

NOTE: Parts no. 3, 4 and 5 are not included on EHU3007-40-YC-Q045-D1 and EHU2008-40-YC-Q045-D1.

4.3 - EHU1414 - Versions with tank

EHU1414-40-YC-Q045M3-D1



1	Daikin ECORICH Hybrid unit
2	Tank
3	Multi station manifold
4	Return filter
5	Piping

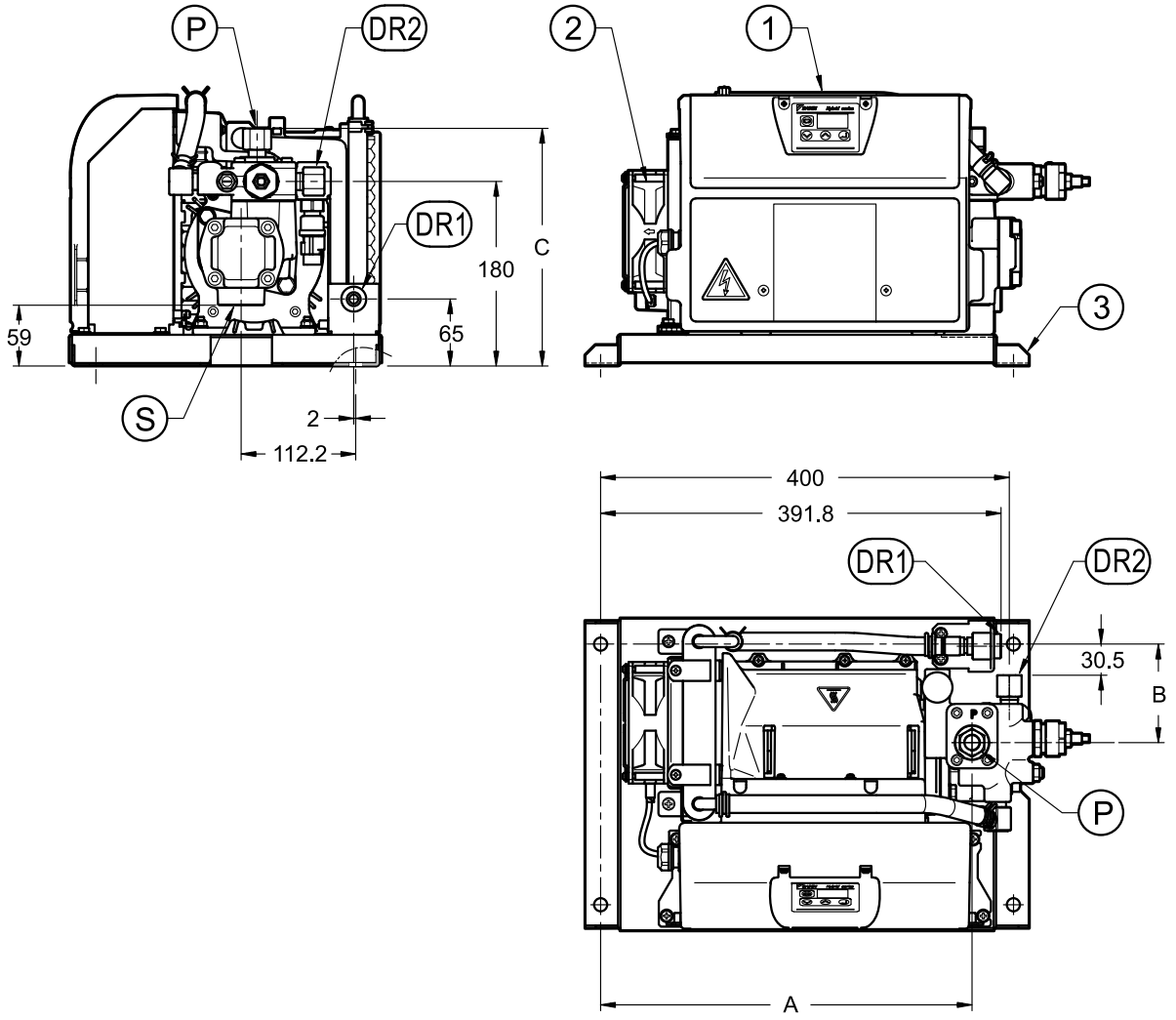
NOTE: Parts no. 3, 4 and 5 are not included on EHU1414-40-YC-Q045-D1.

5 - EHU WITHOUT TANK (EHU****- 40-YC - QU-D1)

5.1 - Main parts

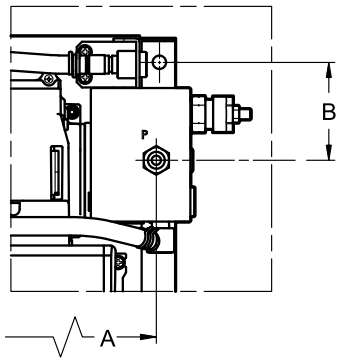
The main picture refers to the EHU3007 and EHU2008. Dimensions of EHU1414 that differ are reported in the table.

dimensions in mm



	EHU3007 EHU2008	EHU1414
A	364	401
B	97	94
C	232	238

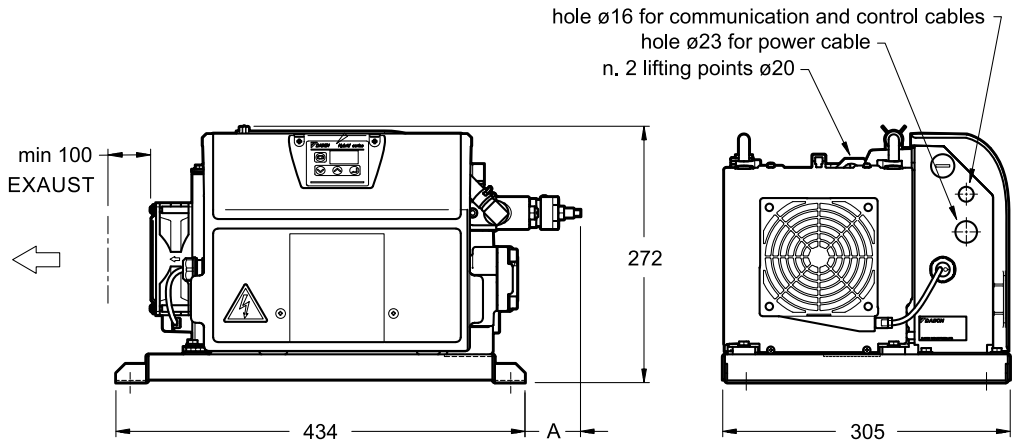
EHU1414

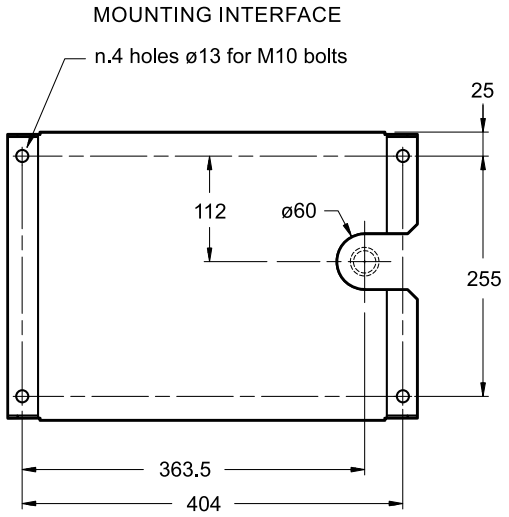


P	Pressure port: 3/8” BSPP
S	Suction port: 3/4” BSPP N. 1 OR type 4093 (23.4x3.5)
DR1	Oil sampling and drain port: 3/8” BSPP
DR2	Drain port: 3/8” BSPP (not available on EHU1414)
1	Control panel
2	Cooler
3	Fixing frame

5.2 - Overall and mounting dimensions

dimensions in mm





	EHU3007 EHU2008	EHU1414
A	59	72

NOTE: The use of hose whip restraints devices both at pump side and at manifold side is strongly recommended to avoid the possible swip-off from the hose fitting during operation.

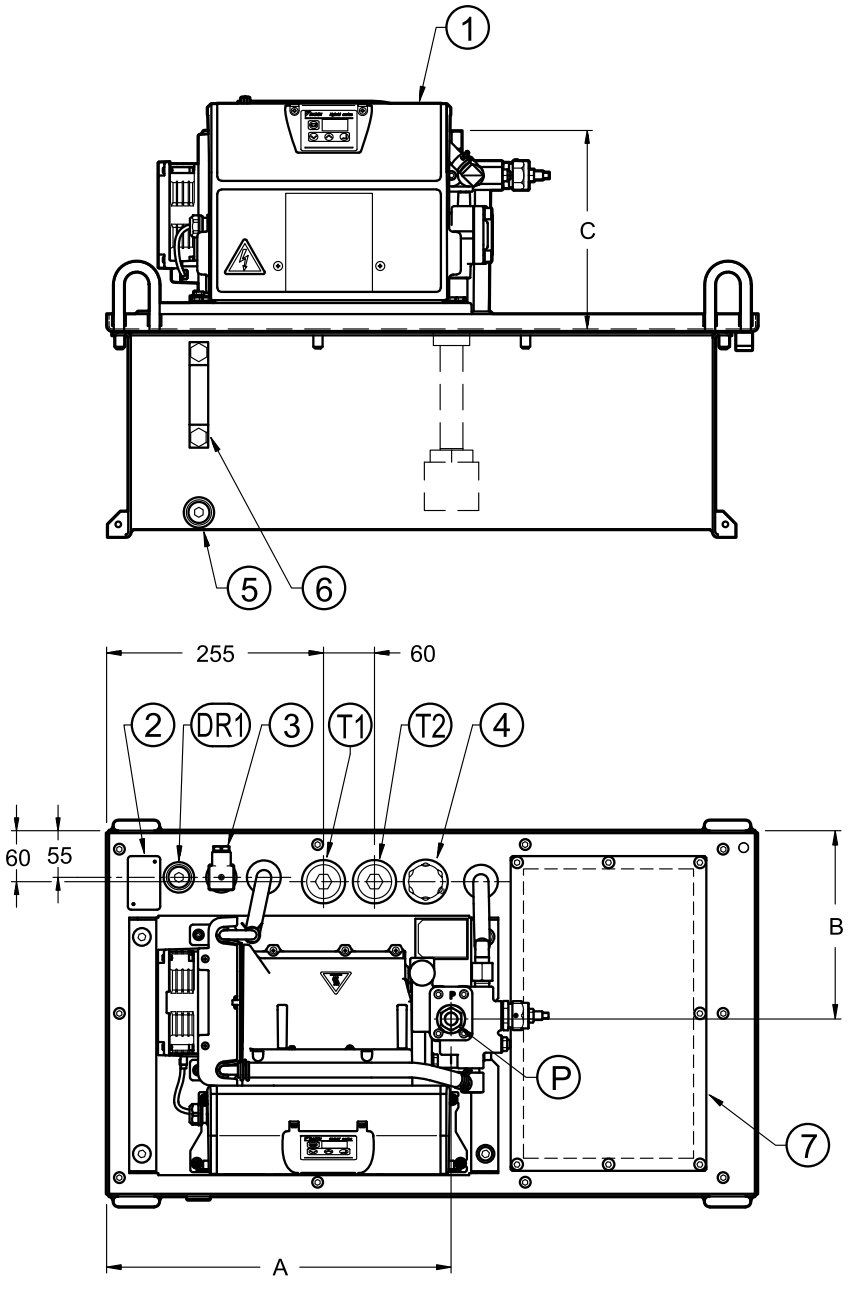
The EHU****-40-YC-Q045M3-D1 models are already equipped with these devices.

6 - EHU WITH TANK (EHU****- 40-YC - Q045-D1)

6.1 - Main parts

The drawing is representative of all versions: EHU3007, EHU2008 and EHU1414.

dimensions in mm



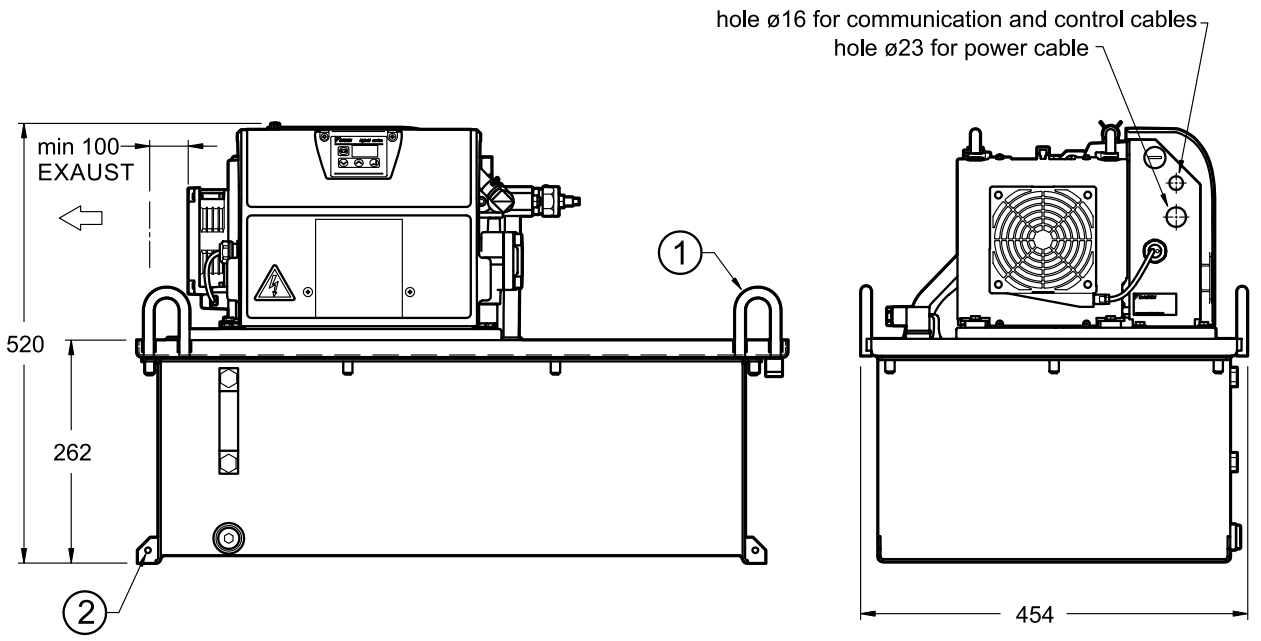
	EHU3007 EHU2008	EHU1414
A	405.5	443
B	221.5	218.5
C	232	238

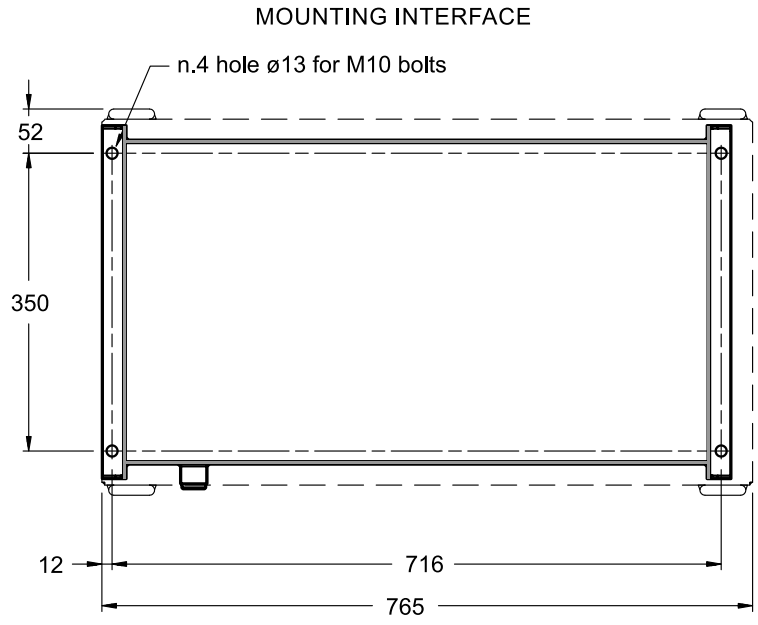
P	Pressure port: 3/8” BSPP
T1	T1 ports for return / drain line: 1” BSPP delivered with plug
T2	T2 port: 1” BSPP delivered with plug
DR1	DR1 Drain port: 1/2” BSPP delivered with plug
1	EHU hybrid unit
2	Label identification

3	Level switch
4	Oil filler port with air breather
5	Oil sampling and tank drain port
6	Oil level indicator: upper 48 L; lower 30 L
7	Blind plate, customizable area 200x340 mm

6.2 - Overall and mounting dimensions

dimensions in mm





1	No. 4 lifting points
2	GND grounding point

NOTE: The use of hose whip restraints devices both at pump side and at manifold side is strongly recommended to avoid the possible swip-off from the hose fitting during operation.

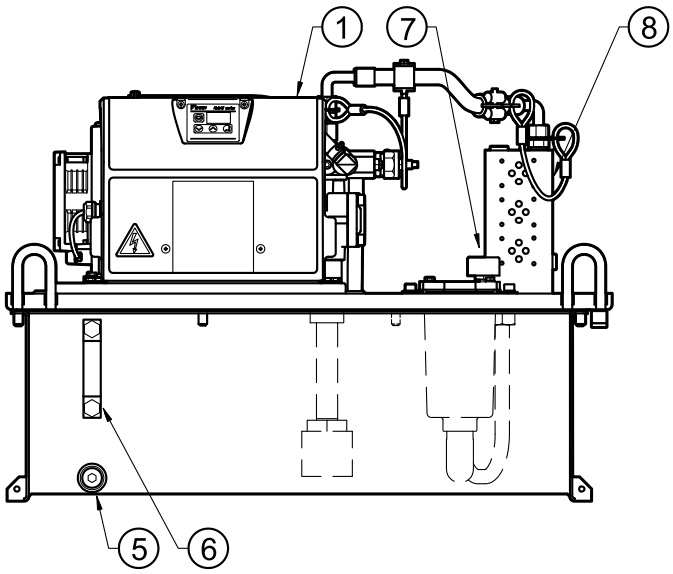
The EHU****-40-YC-Q045M3-D1 models are already equipped with these devices.

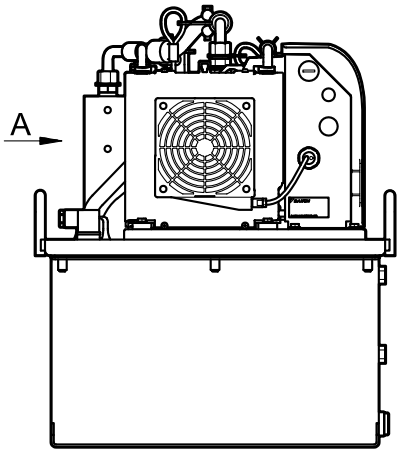
7 - EHU WITH TANK, 3-STATION MANIFOLD AND RETURN FILTER (EHU****- 40-YC - Q045M3-D1)

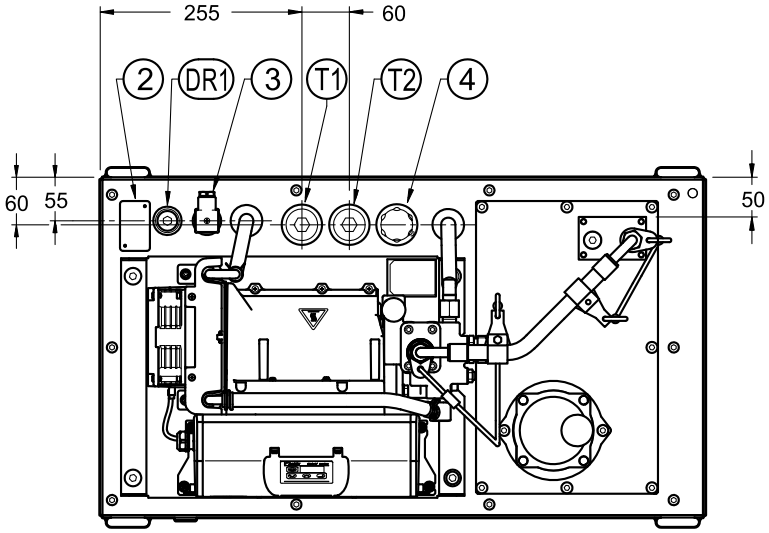
7.1 - Main parts

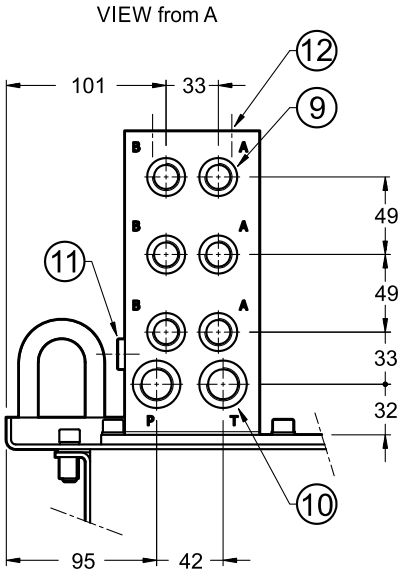
The drawing is representative of all versions: EHU3007, EHU2008 and EHU1414.

dimensions in mm







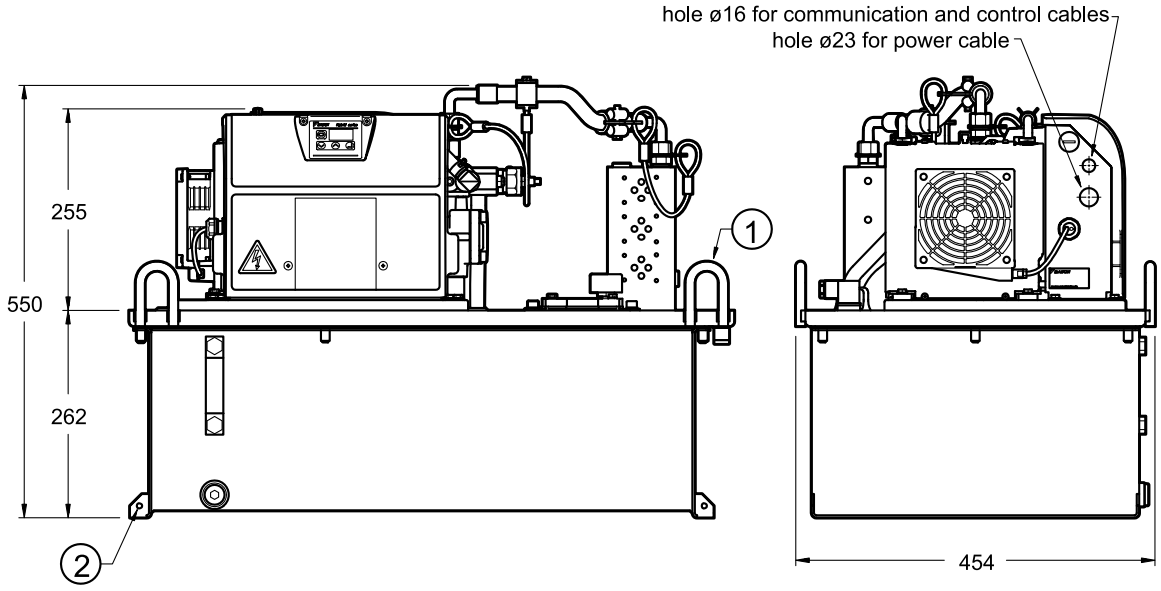


T1	T1 ports for return / drain line: 1” BSPP delivered with plug
T2	T2 port: 1” BSPP delivered with plug
DR1	DR1 Drain port: 1/2” BSPP delivered with plug
1	EHU hybrid unit
2	Label identification
3	Level switch
4	Oil filler port with air breather
5	Oil sampling and tank drain port
6	Oil level indicator: upper 48 L; lower 30 L

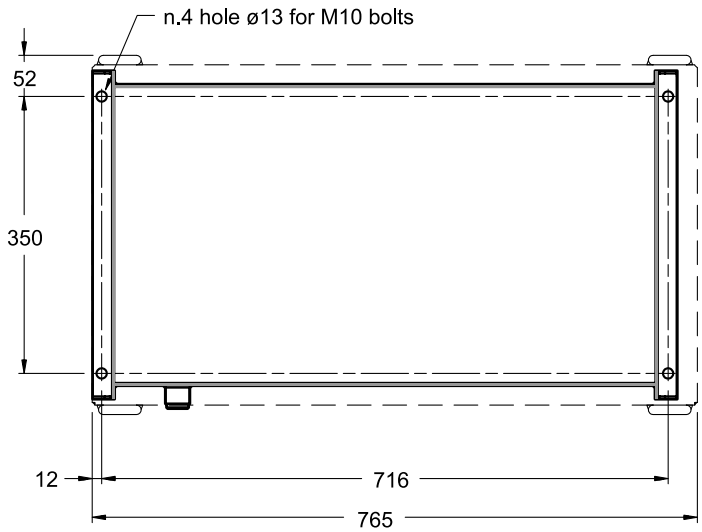
7	Return filter FRI-TB100 with visual clogging indicator (see catalogue 95 180)
8	3-station manifold for ISO 4401-03 valves
9	A, B working lines: 3/8” BSPP
10	P, T ports: 1/2” BSPP
11	Pressure gauge port: 1/4” BSPP
12	Mounting interface for P2 stackable subplate (see catalogue 52 000)

7.2 - Overall and mounting dimensions

dimensions in mm

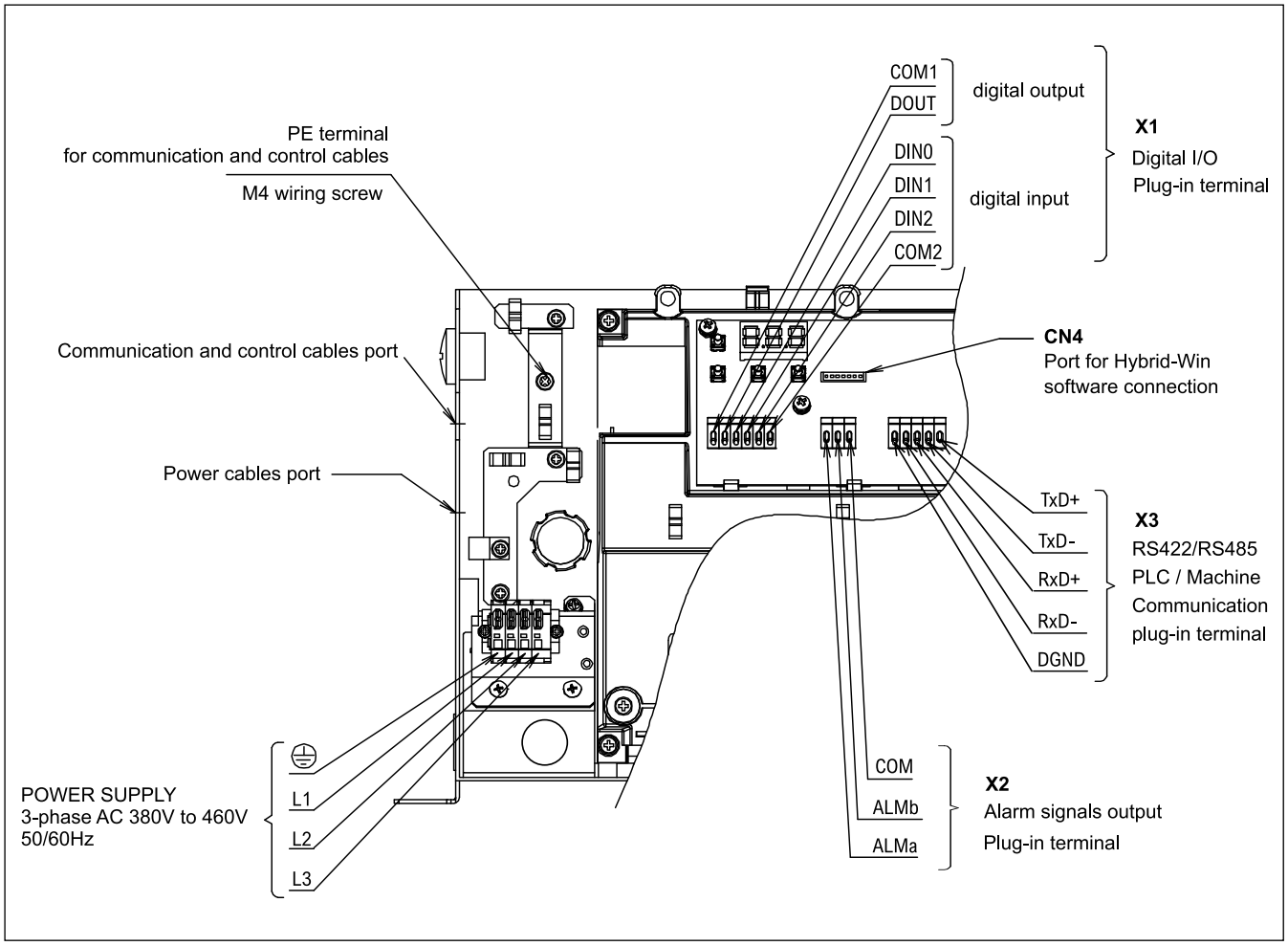


MOUNTING INTERFACE



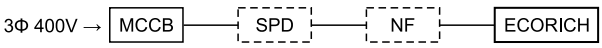
1	No. 4 lifting points
2	GND grounding point

8 - WIRING



8.1 - EMC 2014/30/EU compliance

The EN 61800-3:2004 (Second environment / PDS Category “C3”) requires the installation of a surge on protection device and a noise filter between the breaker and the ECORICH hybrid unit on the power source line.



The assessment for the installation of these components is the responsibility of the machine manufacturer, as compliance with EMC regulations involves the entire machine on which the EHU unit will be installed. If EHU has to be in compliance with EMC 2014/30/EU as a standalone, noise filter and protection device are must have.

Surge protection device (SPD) and noise filters can be ordered separately. See point 12.

8.2 - Wiring notes

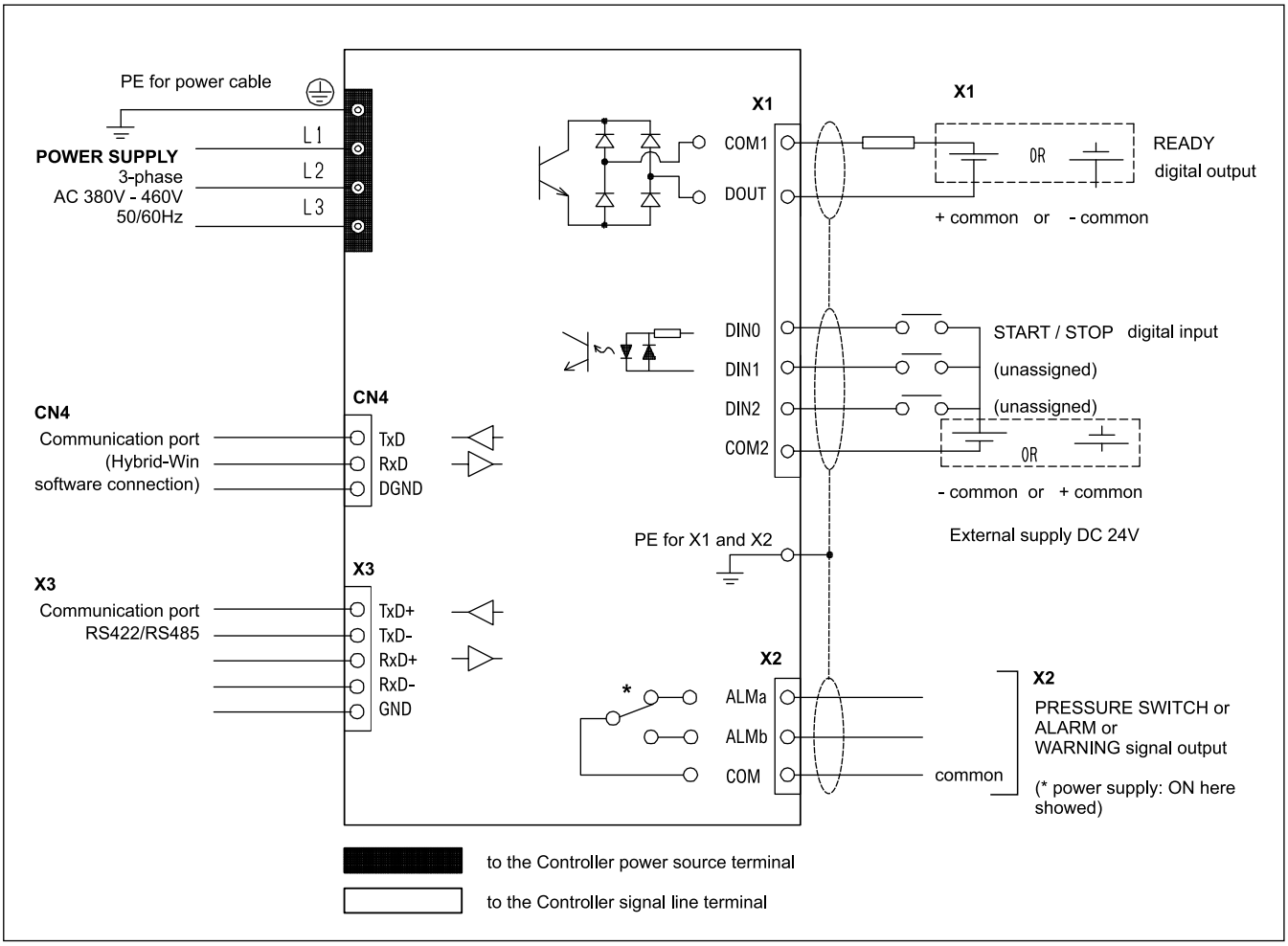
- Install a no-fuse breaker and a ground fault interrupter compliant with European Standard EN 60947-2 in the main power supply of ECORICH, to protect the electrical circuits against shorting and overcurrent, and to prevent electric shocks.
- Use straight type terminals for the power supply wiring.
- Use suitable electric cable in accordance with the power supply capacity. In addition, connect the cables correctly in accordance with the wiring guide.
- Provide a ground connection in compliance with the law in the relevant country. Connect the grounding wire directly with no breaker in the line.
- Avoid the entry of waste metal such as screws and wiring debris, or combustible matter such as wood waste or oil, inside the control unit.
- Use a commercial power supply for the power source. The use of an inverter power supply may cause burn damage to the unit.
- Before accessing the interior of the control unit, check that the unit’s power supply has turned OFF **and then wait at least 5 minutes.**

8.3 - Cables

For the main power connection (L1, L2 and L3) use cables with 4-wires, with 1.5 mm² section.

For signals and for ModBUS communication to the PLC use shielded cables with section from 0.35 mm² to 0.5 mm².

9 - BLOCK DIAGRAM



Digital I/O & alarm signals

		description		function / notes
X1	COM1	common digital output	24 V DC (±10%) I max 50 mA resistive	Can be either positive or negative
	DOUT	digital output		Ready to operate / motor operation signal. ON or OFF is selectable by parameter setting.
	COM2	common digital input	24 V DC (±10%) I max 5 mA resistive	Can be either positive or negative
	DIN0	digital input 0		Unit start / stop signal. Selectable by parameter setting.
	DIN1	digital input 1		reserved
	DIN2	digital input 2		reserved
X2	ALMa	alarm output A	switching 30 V DC 1A resistive (min load 24 V DC 10 mA approx)	When the power supply unit is switched ON, ALMa closes. (ALMb open). If an alarm (E**) or a warning (L70) has occurred; when the pressure switch is actuated, the ALMa contact is open (ALMb closed).
	ALMb	alarm output B		
	COM	common alarm output		

10 - INSTALLATION NOTES

10.1 - Installation and piping

- The unit is a stationary type. Fix it with bolts on a level location that is free of vibration.
- Keep obstacles that will obstruct air intake and emission at least 100 mm away from the end face of the unit. Install the unit at a location with good air flow so that heated air can be vented.

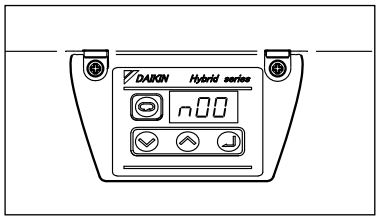
10.2 - Hydraulic fluid

- Use mineral-oil base hydraulic oil. Use of hydraulic oils other than mineral-oil based type (e.g., hydrous/synthetic) is prohibited.

10.3 - Other precautions

- If a failure occurs in the hydraulic unit, the system indicates an alarm and terminates. If a failure or malfunction of this unit is expected to cause death or pose a danger to human beings, adopt appropriate safety measures in the facilities.
- Turning the power supply ON/OFF frequently will significantly shorten the life of the controller. Use the start/stop digital inputs to start/stop this hydraulic unit. Leave an interval of at least 5 minutes between operation stops invoked by turning the power supply ON/OFF. Also, when starting and stopping the unit using the start/stop signals, leave an interval of at least 0.5 seconds between a stop command and restarting.
- It takes approximately 3 seconds for this hydraulic unit to start up after being powered ON. Depending on the piping conditions, the unit may take longer to increase the pressure to the pressure switch's preset level, resulting in pressure switch signal output. In this case, set the machine up so that it will not accept this alarm output during this period.

11 - DEVICE SETUP



The ECORICH hybrid unit is configured by connecting the CN4 port located inside the unit control panel to a device with the Hybrid-win software installed. It is always possible to modify the parameters also by keys on the control panel.

The ECORICH unit communicates with the machine tool via Modbus-RTU protocol.
The communication setting between them is done from the operation panel of the hydraulic unit.

11.1 - Hybrid-win software

The software allows to monitor the operating data in real time through a graphical interface; to read and set parameters, to monitor alarms and warnings history and to save and copy the parameter set.

The software is compliant with Microsoft Windows OS.

The connection between the ECORICH and the PC requires a cable connection kit, that can be ordered separately. See point 12.

The Hybrid-win software and the additional literature for the ECORICH unit can be easily downloaded from the Customer's page in the product section at www.hyd.daikin.com

11.2 - Parameters table

Please refer to the *Instruction Manual PIM00496 (English)* delivered with the product for a complete list of parameters and their settings.

12 - ACCESSORIES

These accessories are supplied separately and their assembly on the power unit is charged to the customer.

ordering code	description	
3906500015	LS-B12-140/10-D24K1-SPDT	Level switch SPDT 1/2" BSPP. (**NOTE**)
3906500012	TS-B12-170-60/10-D24K1-SPDT	Temperature switch 1/2" BSPP - 24V DC switching temperature 60 °C.
3906500014	Surge protection device (SCHNEIDER ELECTRIC A9L20321)	
3906500013	Noise filter (SCHAFFNER FN3025HP-10-71)	
3906500003	EHUPC/10 - Kit for Hybrid-Win software connection	

NOTE: This part is already installed as standard on the power units with tank. Available as spare part.

DUPLOMATIC
MOTION SOLUTIONS
a member of DAIKIN group

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duplomaticmotionsolutions.com

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SUT

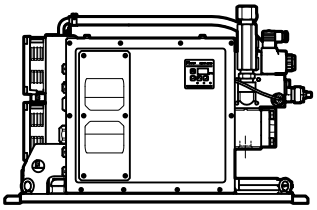
SUPER UNIT (HYBRID HYDRAULIC POWER UNIT) SERIES 40

TANK CAPACITY
100 litres

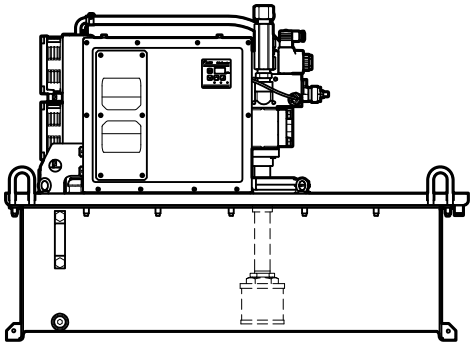
MOTOR PUMP FLOW RATE
up to 81 l/min

DESCRIPTION

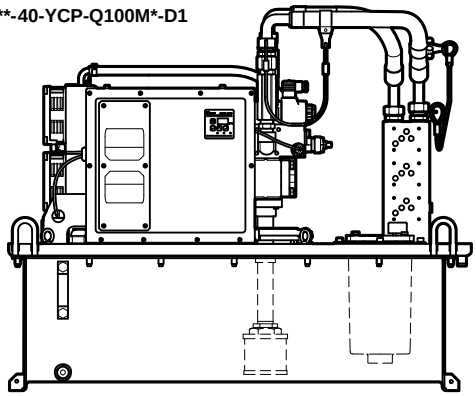
SUT***-40-YCP-Q-D1**



SUT***-40-YCP-Q100-D1**



SUT***-40-YCP-Q100M*-D1**



Daikin Industries LTD. designs and manufactures the hybrid SUPER UNITS by combining hydraulic technology with an interior permanent magnet synchronous motor.

This results in a power pack that achieves high torque and maximum efficiency while suppressing heat and noise generation. The motor-pump's high efficiency ensures minimal oil heating.

The use of the SUPER UNIT results in advantages for the machinery it operates on. These include increased lifespan for oil and heat-sensitive parts, as well as reduced heat dissipation in the surrounding environment.

The power pack is designed for 3-phase AC 380 to 480V 50/60 Hz.

On SUTs equipped with a double pump, the primary pump delivers high pressure and limited flow. When the flow rate demand is higher than the flow rate the primary pump can supply, the second pump is also activated guaranteeing the required flow, at lower pressure.

The switching from single to combined operation is done by a solenoid valve, that can be managed automatically by the SUT, or activated by an analogue external signal coming from the PLC.

The SUPER UNITS are deliverable with:

- mounting frame, no tank

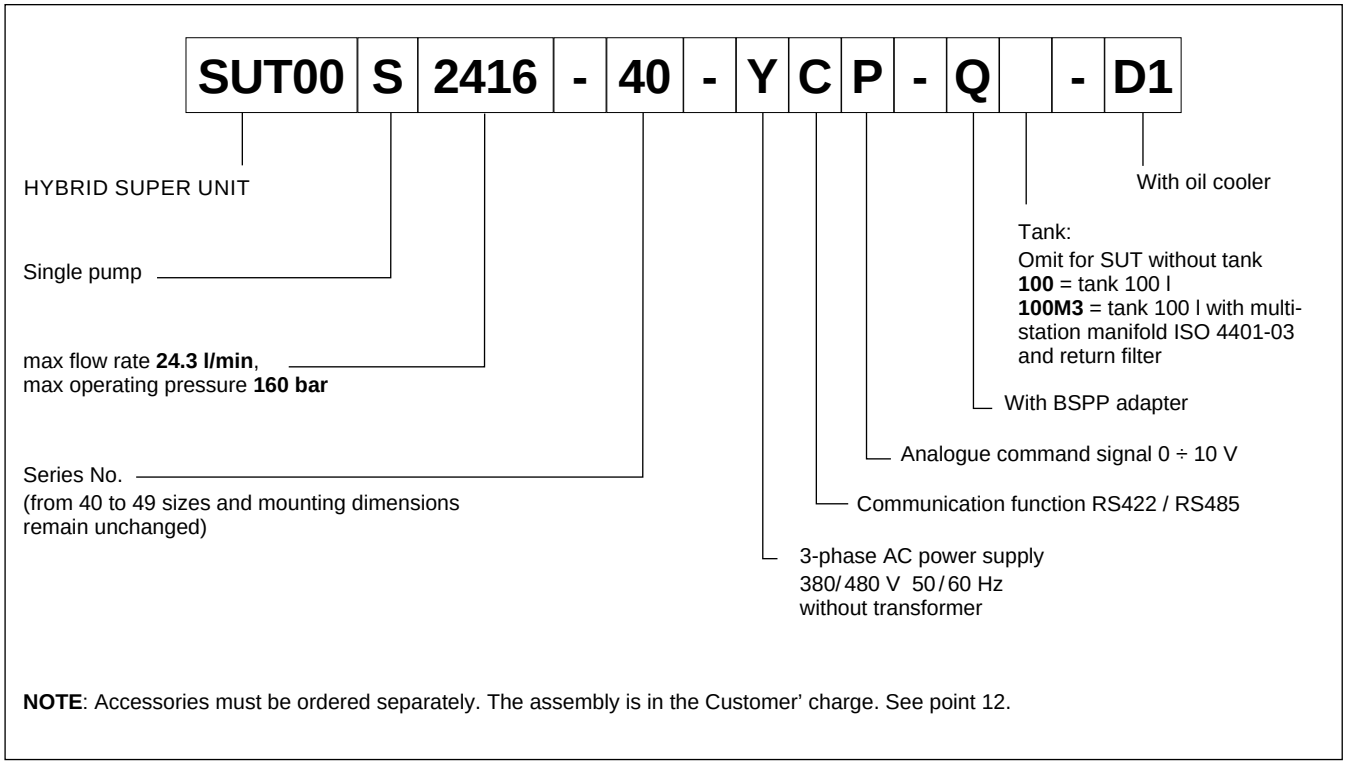
- 100-litres tank, equipped with suction filter, level switch and blind plate that customers may customize.

- 100-litres tank equipped with suction filter, level switch, multi-station manifold for stackable valves and return filter.

Accessories and valves can be ordered separately.

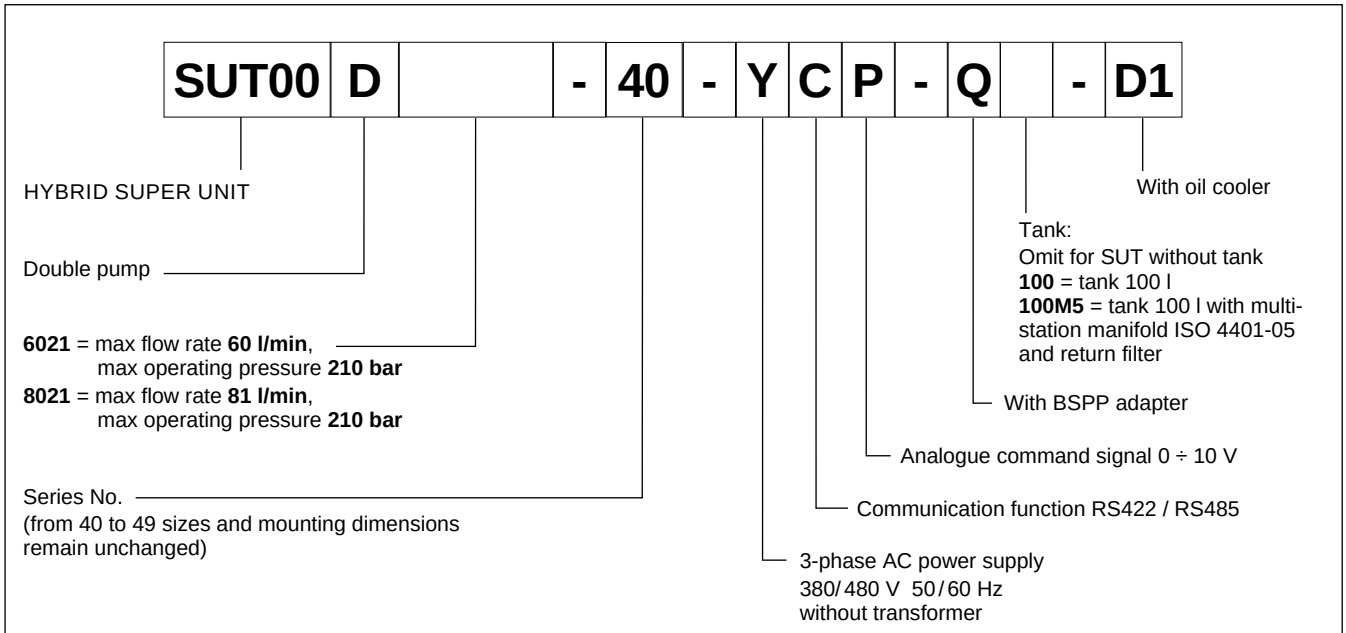
1 - IDENTIFICATION CODE

1.1 - Versions with single pump



NOTE: Accessories must be ordered separately. The assembly is in the Customer' charge. See point 12.

1.2 - Versions with double pump



NOTE: The kit for the suction flange and the accessories must be ordered separately. The assembly is in the Customer' charge. See point 12.

2 - SPECIFICATIONS

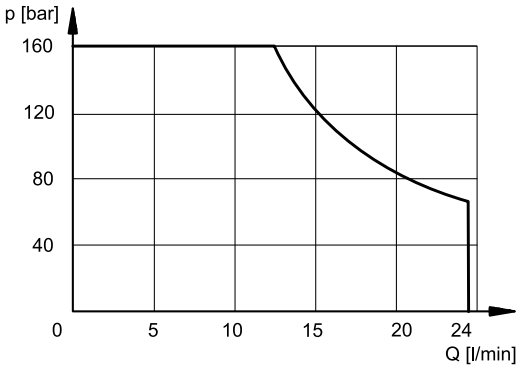
		SUT00S2416		SUT00D6021		SUT00D8021	
		Q	Q100	Q	Q100	Q	Q100
Maximum operating pressure	bar	160		210		210	
Operating pressure range: - 1st pump (HP) - 1st + 2nd pump (HP+LP)	bar	5 ÷ 160 -		5 ÷ 210 5 ÷ 70		5 ÷ 210 5 ÷ 70	
Operating flow range: - 1st pump (HP) - 1st + 2nd pump (HP+LP)	l/min	3.5 ÷ 24.3 -		3.1 ÷ 21.2 8.8 ÷ 60		4.1 ÷ 28.7 11.6 ÷ 81	
Tank capacity	l	-	100	-	100	-	100
Oscillating volume		-	30	-	30	-	30
Main supply voltage permissible voltage fluctuation		3-phase AC 380 V to 480 V - 50 / 60 Hz ±10%					
Controller supply voltage		-		24V DC (min 50 W)			
Nominal motor power	kW	3.0		3.0		4.0	
Rated current	A	9.3		10.3		14.1	
No-fuse breaker capacity	A	15		15		20	
Ambient temperature range	°C	0 to +40					
Fluid temperature range in the tank	°C	0 to +60 (recommended +15 to +50)					
Fluid contamination degree		ISO 4406:1999 class 20/18/15					
Viscosity		Viscosity grade: ISO VG32 to 68 • Viscosity range: 15 to 400 mm^2/s					
Operating ambient humidity	RH	< 85%, without condensation					
Protection class		IP44; controller box IP54					
Noise level (**NOTE)**	dB	DH (160 bar) 52 dBA 24.3 l/min (20 bar) 70 dBA		DH (210 bar) 57 dBA 60 l/min (20 bar) 74 dBA		DH (210 bar) 57 dBA 81 l/min (20 bar) 77 dBA	
Installation		altitude max 1000 m, indoor, fixed on a flat surface without vibrations.					
Mass: - without tank - 100 - 100M*	kg	53 - -	- 126 132	62 - -	- 133 148	65 - -	- 147 164

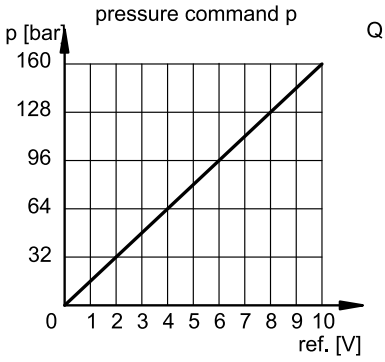
external input signals	analogue input	2 channels; pressure command 0 ÷ 10 V; flow command 0 ÷ 10 V.
	digital input	6 channels, photo coupler insulation, 24V DC (max 27 V DC), 5 mA per channel.
external output signals	analogue output	2 channels; pressure monitor 0 ÷ 10 V; flow monitor ± 10 V.
	digital output	2 channels, photo coupler insulation, open collector output, 24V DC, 50 mA max per channel.
	contact output	1, relay output, contact capacity: 30 V DC; resistance load 0.5 A; 1 common contact.

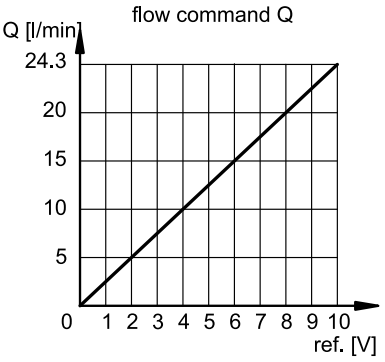
NOTE: The noise level is representative of the four-way average at a distance of 1 m.

3 - SUT00S2416 - CHARACTERISTICS

Values obtained and rated for ambient temperature ≤ 40 °C and fluid temperature ≤ 60 °C, in continuous operation (S1)



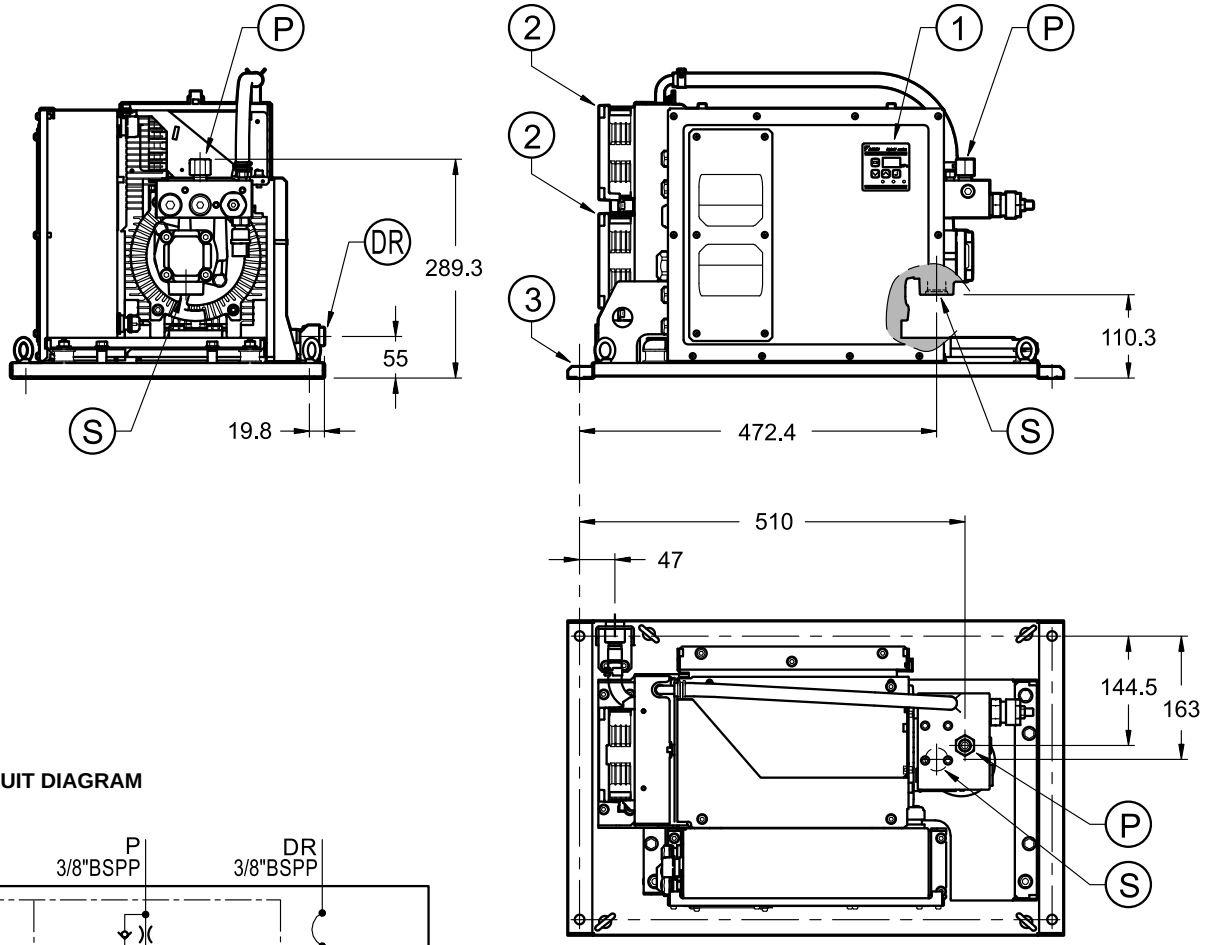




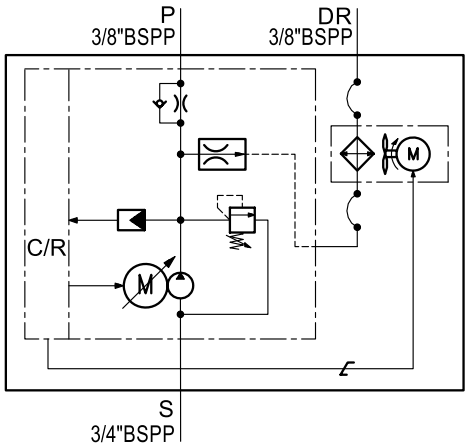
4 - SUT00S WITHOUT TANK

4.1 - SUT00S2416-40-YCP-Q-D1 - Main parts and options

dimensions in mm



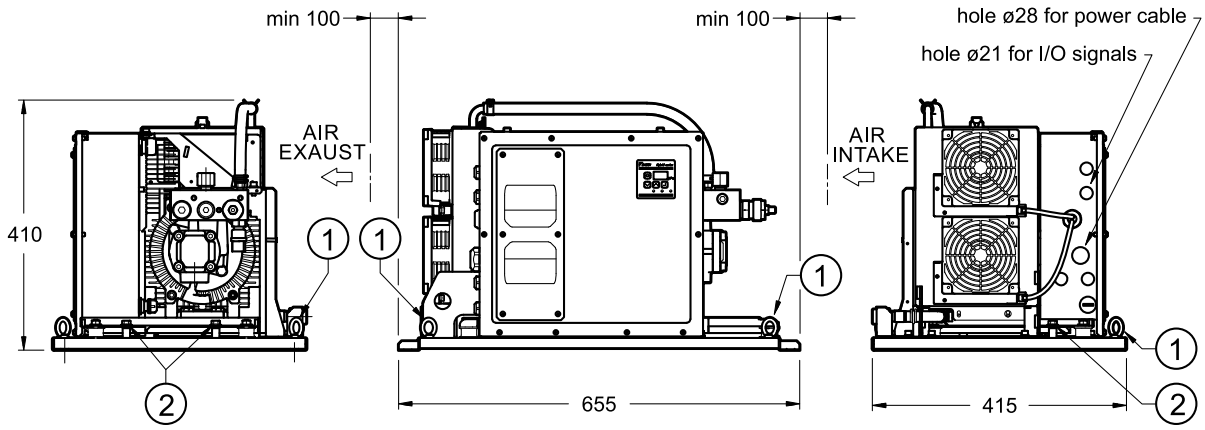
CIRCUIT DIAGRAM



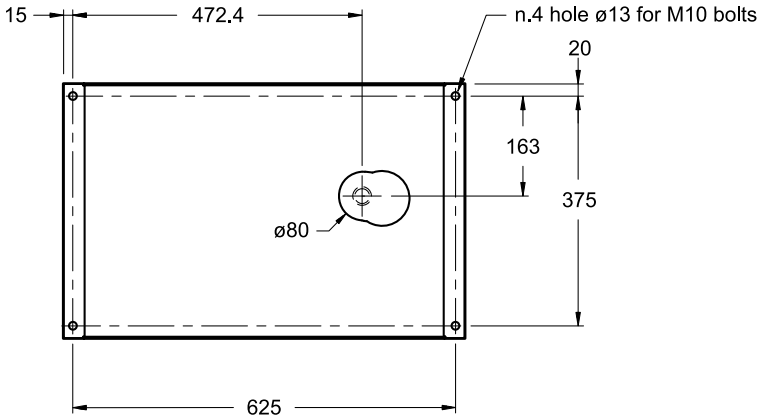
P	Pressure port: 3/8” BSPP
S	Suction port: 3/4” BSPP N. 1 OR type 4093 (23.4x3.5)
DR	Drain port: 3/8” BSPP
1	Control panel
2	Cooler
3	Fixing frame

4.2 - SUT00S2416-40-YCP-Q-D1 - Overall dimensions and mounting

dimensions in mm



MOUNTING INTERFACE



1	n° 4 eyebolts for lifting
2	Vibration dampers: remove the transport fixing nut before starting the unit

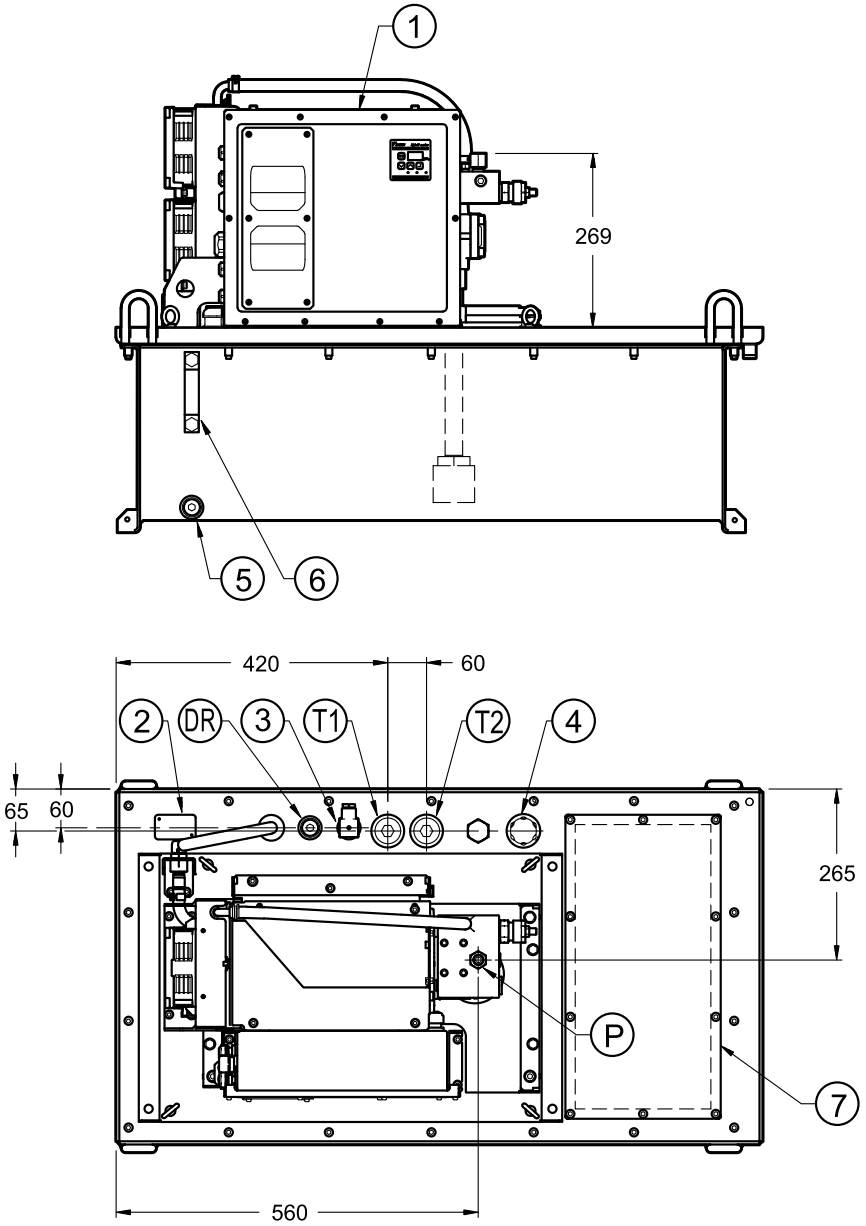
NOTE: The use of hose whip restraints devices both at pump side and at manifold side is strongly recommended, to avoid the possible swip-off from the hose fitting during operation.

The SUT00S2416-40-YCP-Q100M3-D1 models come already equipped with these devices.

5 - SUT00S WITH TANK

5.1 - SUT00S2416-40-YCP-Q100 - Main parts and options

dimensions in mm

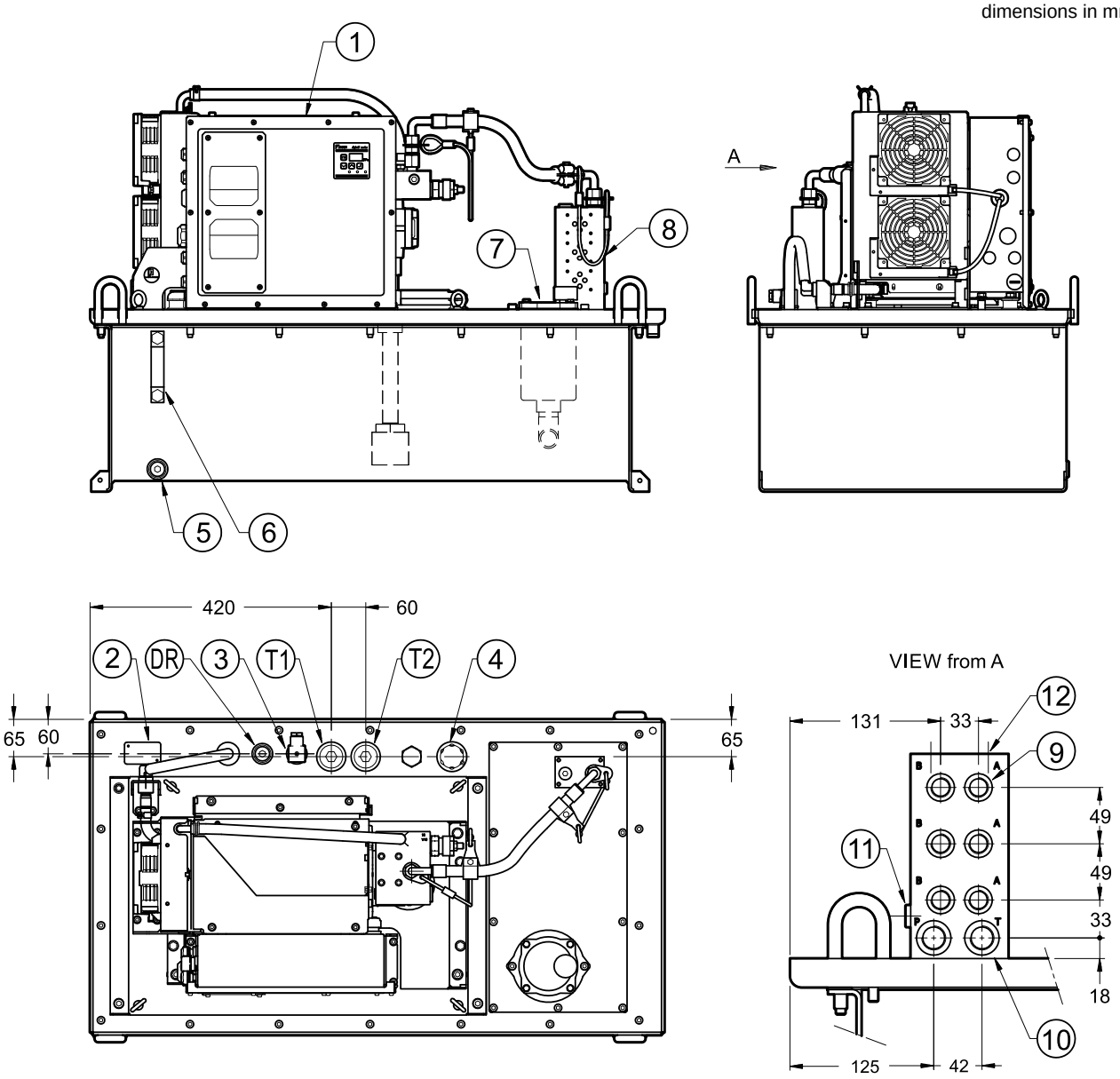


P	Pressure port: 3/8” BSPP delivered with plug
T1	Port for return line: 1” BSPP delivered with plug
T2	Port for return line: 1” BSPP delivered with plug
DR	Drain port: 1/2” BSPP delivered with plug

1	SUT hybrid unit
2	Identification label
3	Level switch
4	Oil filler port with air breather
5	Oil sampling and tank drain port
6	Oil level indicator: upper 100 L; lower 70 L
7	Blind plate 230x460 mm

5.2 - SUT00S2416-40-YCP-Q100M3 - Main parts and options

dimensions in mm

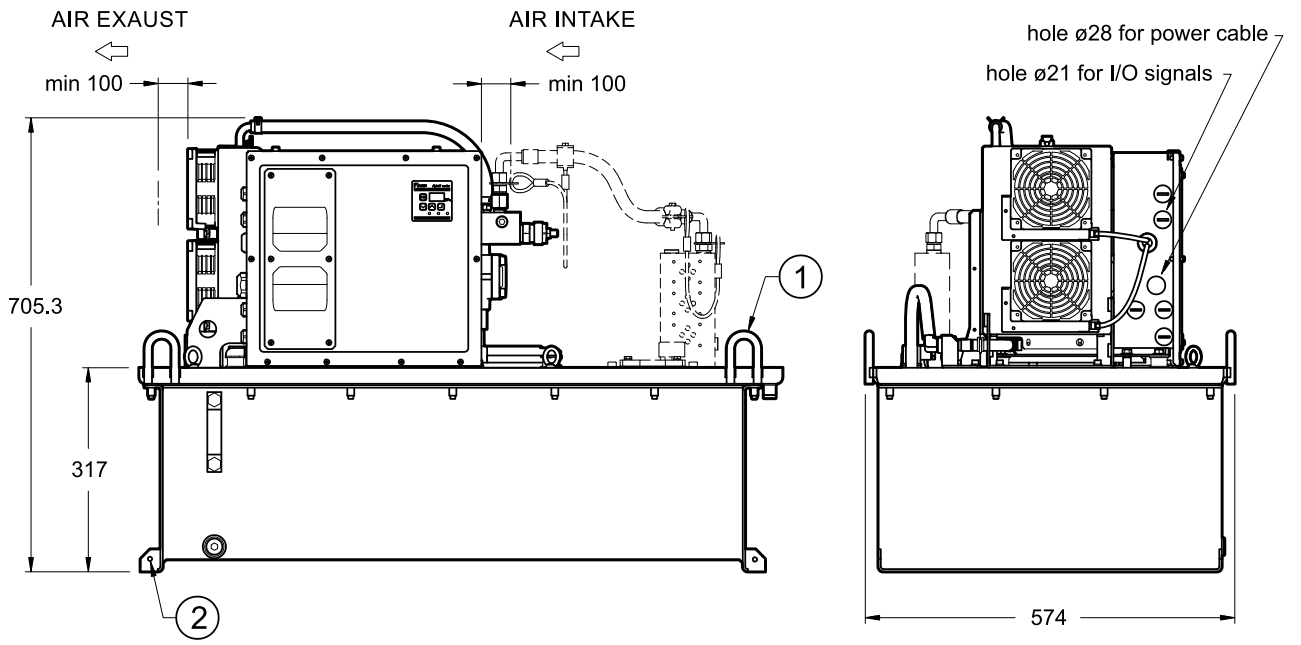


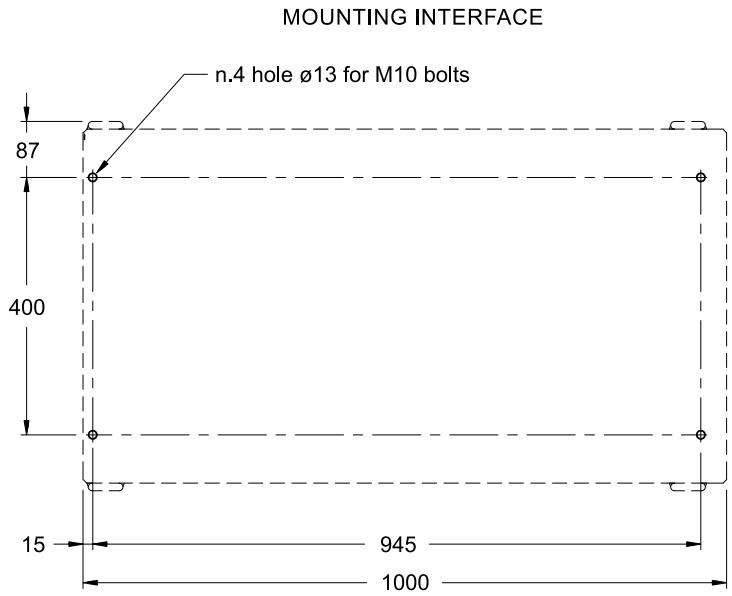
T1	Port for return line: 1” BSPP delivered with plug
T2	Port for return line: 1” BSPP delivered with plug
DR	Drain port: 1/2” BSPP delivered with plug
1	SUT hybrid unit
2	Identification label
3	Level switch
4	Oil filler port with air breather
5	Oil sampling and tank drain port

6	Oil level indicator: upper 100 L; lower 70 L
7	Return filter type FRI-TB100, with visual clogging indicator. (See catalogue 95 180)
8	3-station manifold for ISO 4401-03 valves
9	A, B working lines: 3/8” BSPP
10	P, T ports: 1/2” BSPP
11	Pressure gauge port: 1/4” BSPP
12	Mounting interface for P2 stackable subplate (See catalogue 52 000)

5.3 - SUT00S2416-* with tank - Overall dimensions and mounting

The drawing is representative of both the versions with tank.



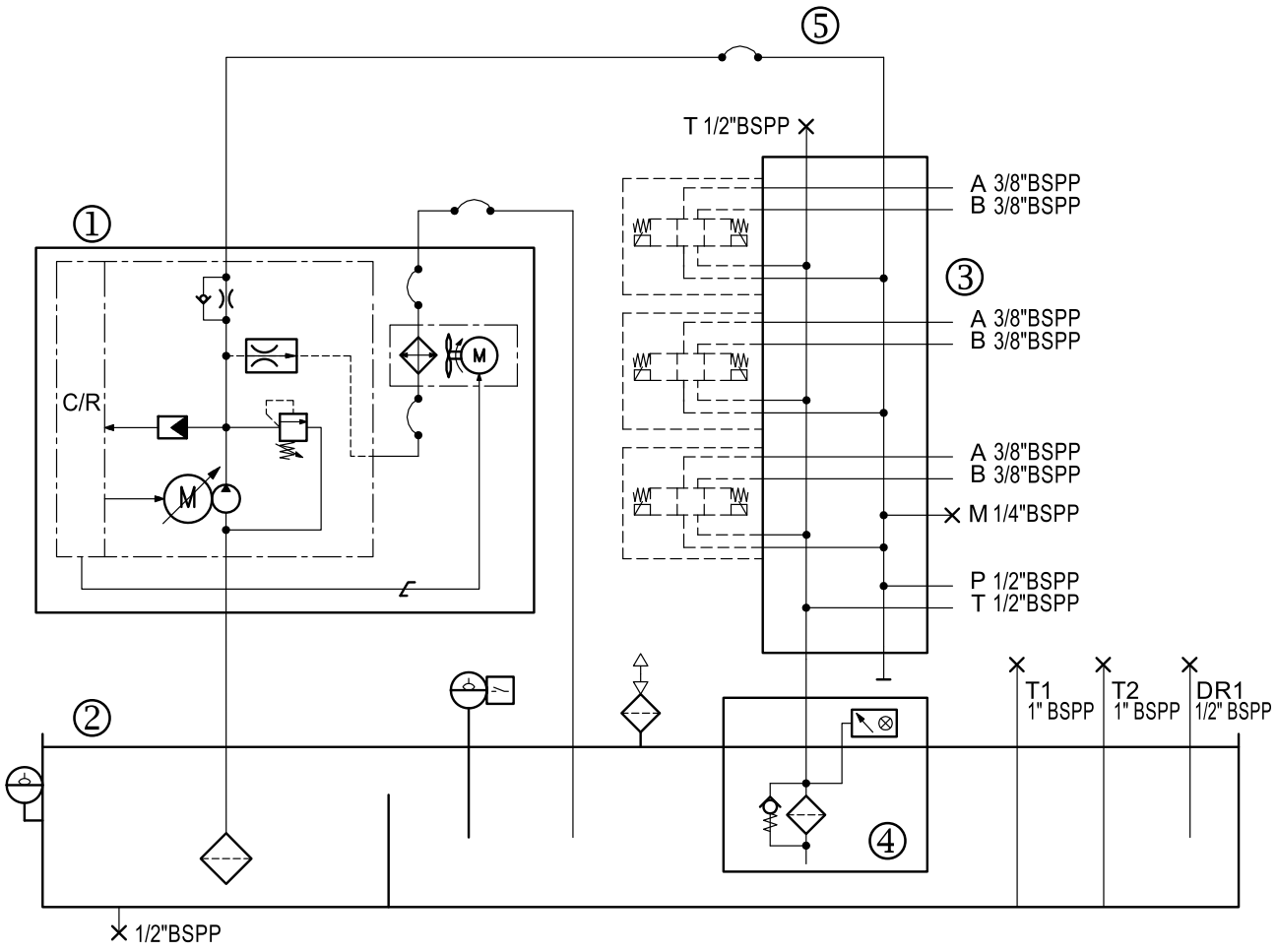


1	No. 4 lifting points
2	GND grounding point

NOTE: The use of hose whip restraints devices both at pump side and at manifold side is strongly recommended to avoid the possible swip-off from the hose fitting during operation.

The SUT00S2416-40-YCP-Q100M3-D1 models come already equipped with these devices.

5.4 - SUT00S2416-* with tank - Circuit diagram



1	Daikin SUT Hybrid unit
2	Tank
3	Multi station manifold
4	Return filter
5	Piping

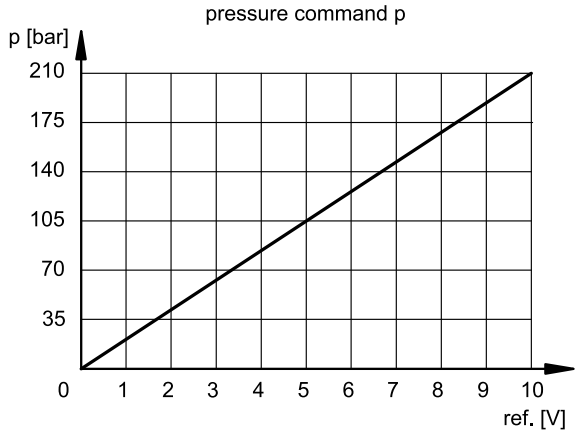
6 - SUT00D* - CHARACTERISTICS CURVES AND P/Q COMMANDS

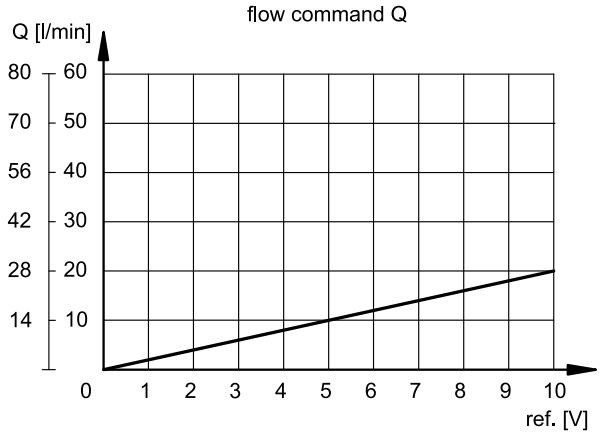
Double pump type units allow to work with a high flow at limited pressure or with a limited flow at high pressure. The switching between them in done by means of a dedicated solenoid valve. This achieves sustained high pressure control, as is often required for presses and other equipment.

The switching between these two conditions can be carried out autonomously by the SUT, or by means of an analog signal coming from the PLC. This configuration is set by parameter (see points 9.4 and 9.5).

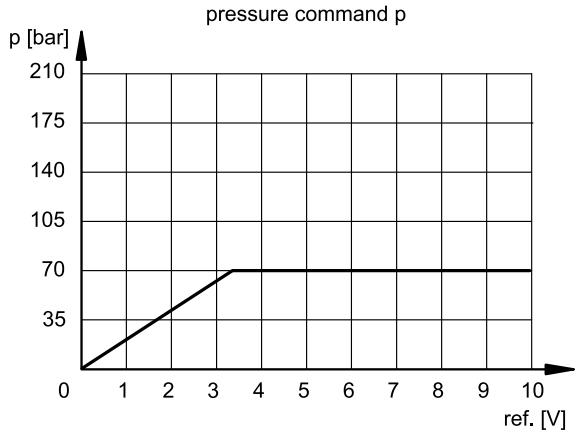
Diagrams below shows the relationship between the PQ analogue inputs and the SUT internal command.

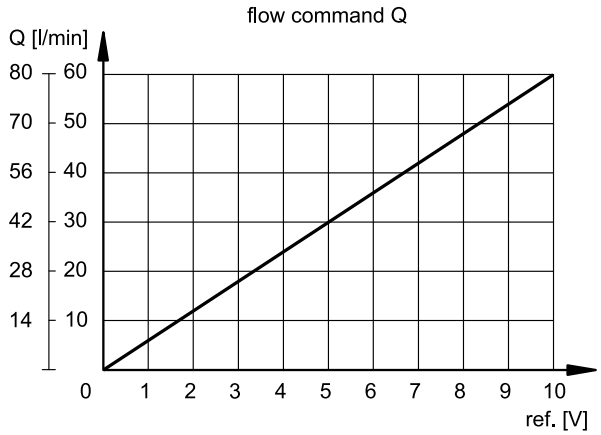
6.1 - HIGH PRESSURE MODE / low flow rate (PH pump only)





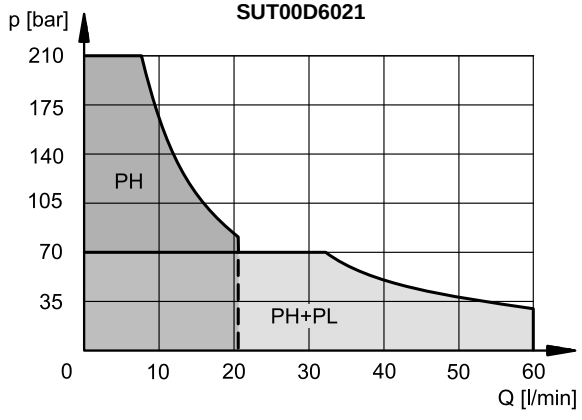
6.2 - LOW PRESSURE MODE / high flow rate (combined pumps PH+PL)

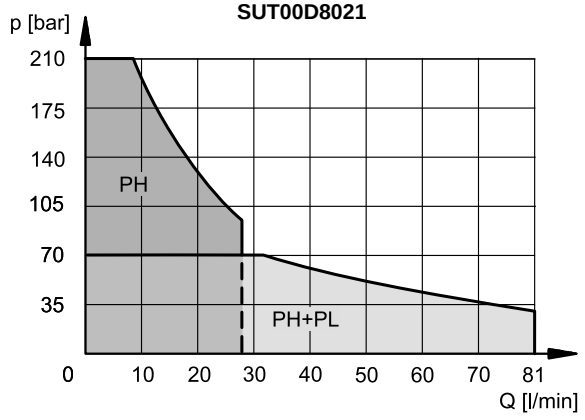




6.3 - Pressure - flow rate diagrams

Values obtained and rated for ambient temperature ≤ 40 °C and fluid temperature ≤ 60 °C, in continuous operation (S1)

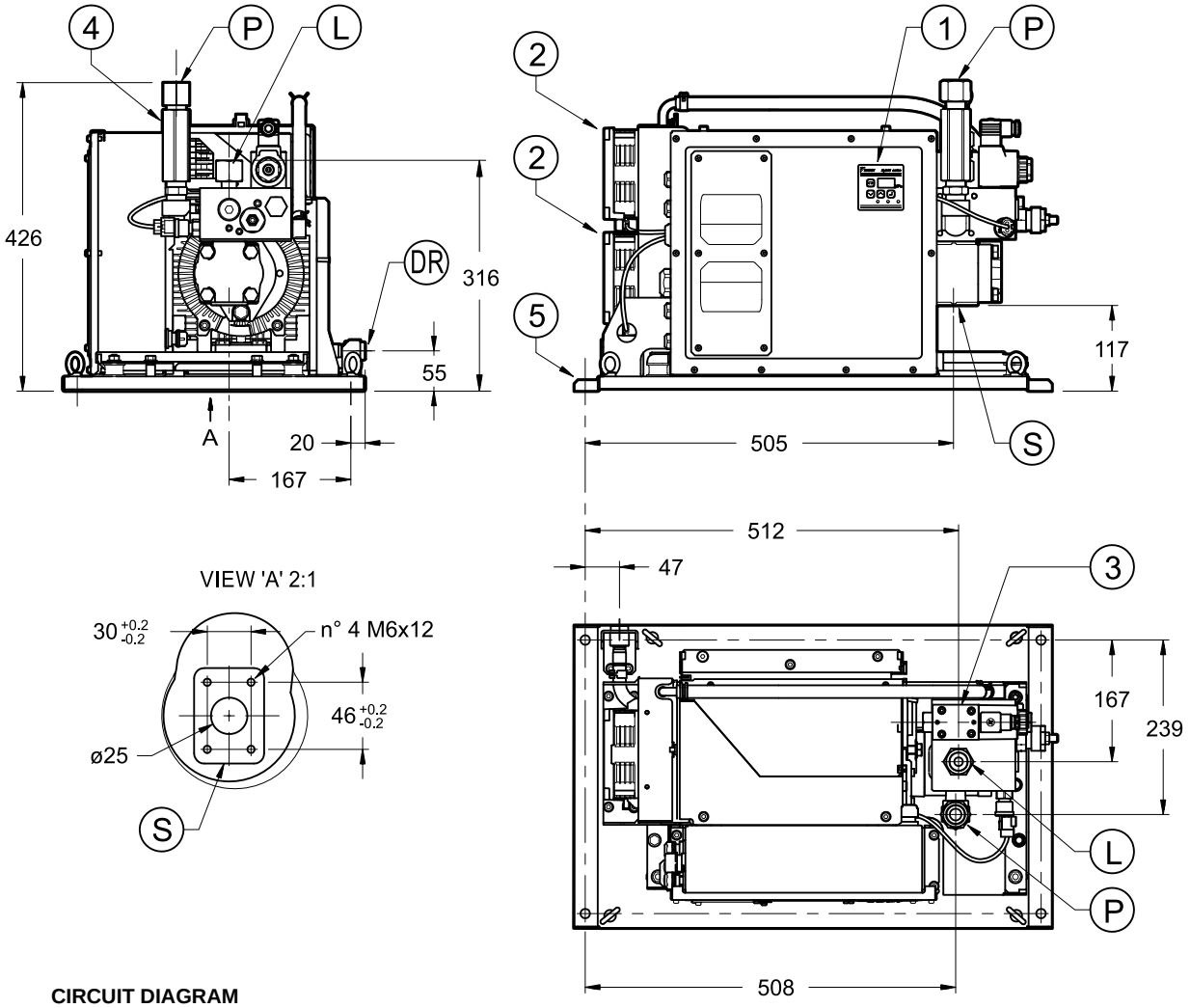




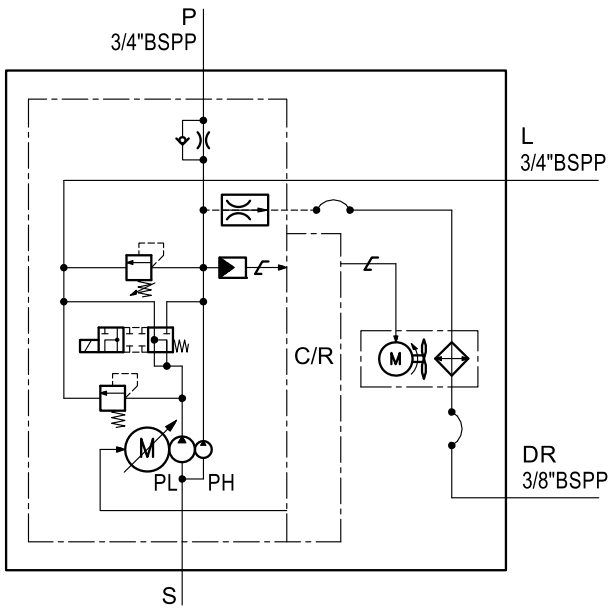
7 - SUT00D* - MODELS WITHOUT TANK

7.1 - SUT00D6021-40-YCP-Q-D1 - Main parts and options

dimensions in mm



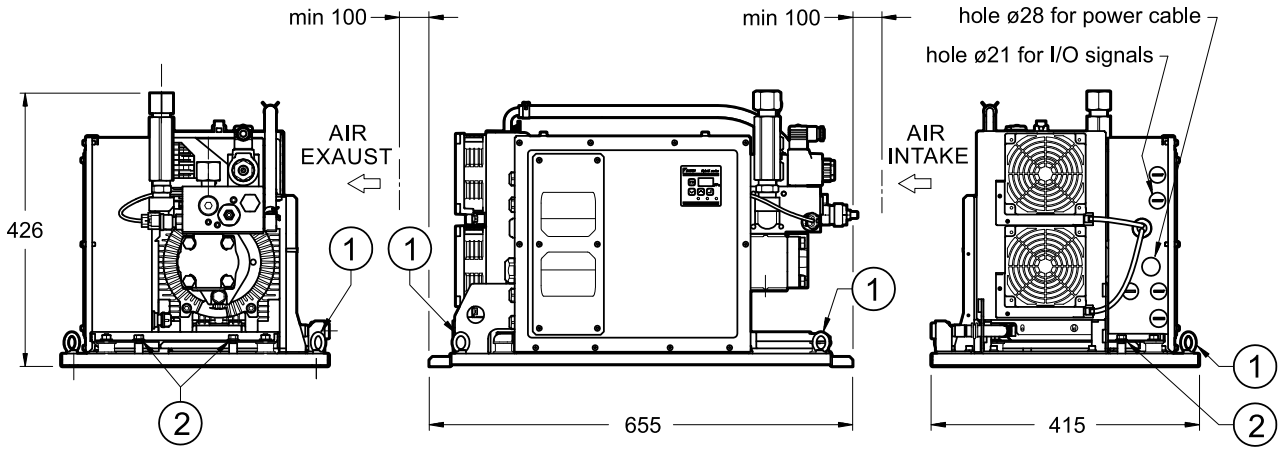
CIRCUIT DIAGRAM

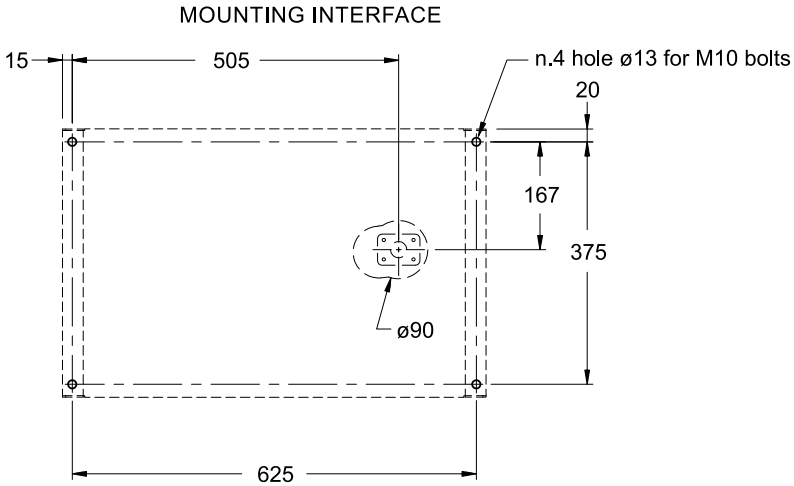


P	Pressure port: 3/4” BSPP
S	Suction port. 1" BSPP suction flange kit to be ordered separately. See point 12
L	Unload port: 3/4” BSPP
DR	Drain port / oil sampling: 3/8” BSPP
1	Control panel
2	Cooler
3	Switching valve
4	In-line check valve
5	Fixing frame

7.2 - SUT00D6021-40-YCP-Q-D1 - Overall dimensions and mounting

dimensions in mm





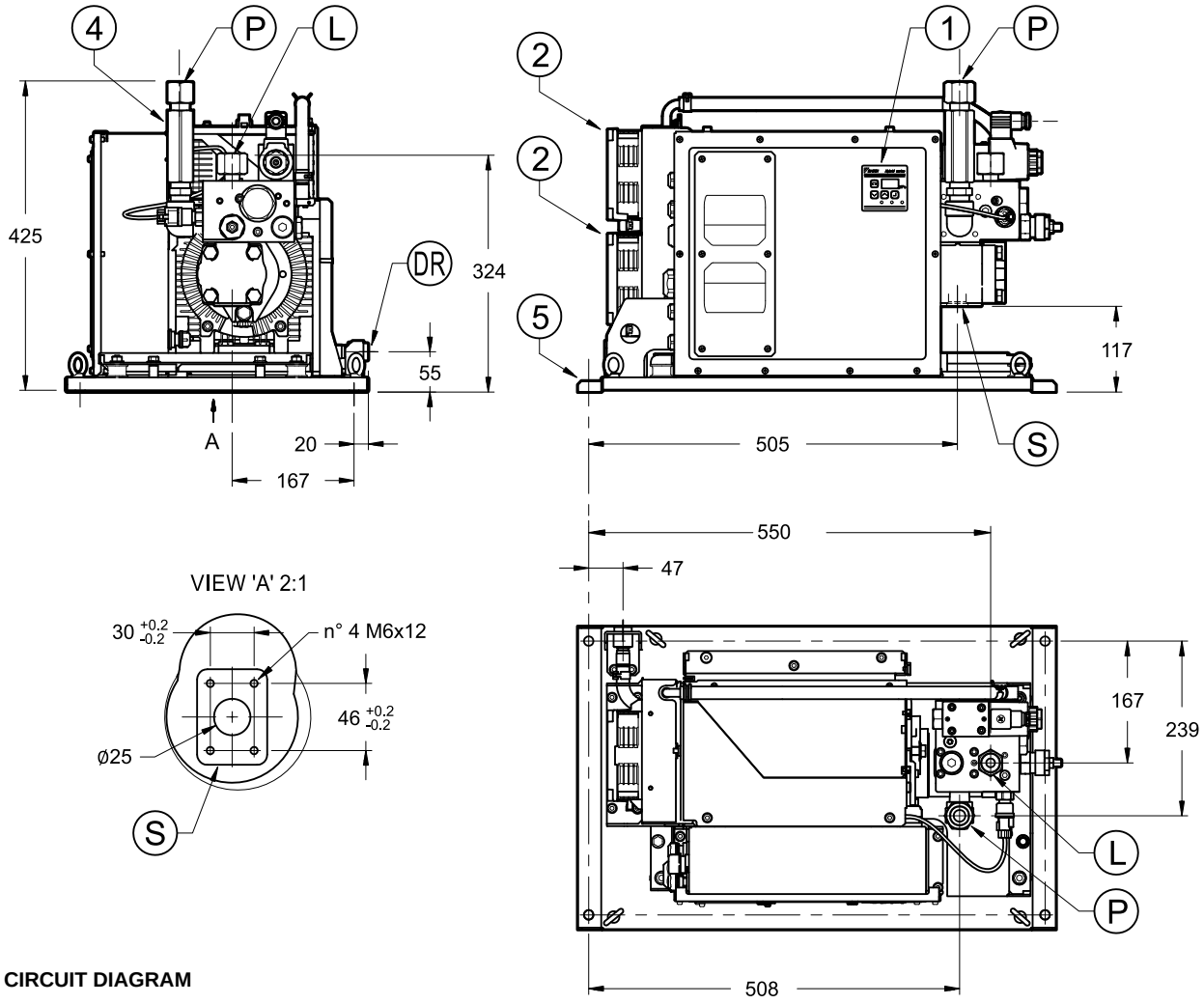
1	n° 4 eyebolts for lifting
2	Vibration dampers: remove the transport fixing nut before starting the unit

NOTE: The use of hose whip restraints devices both at pump side and at manifold side is strongly recommended to avoid the possible swip-off from the hose fitting during operation.

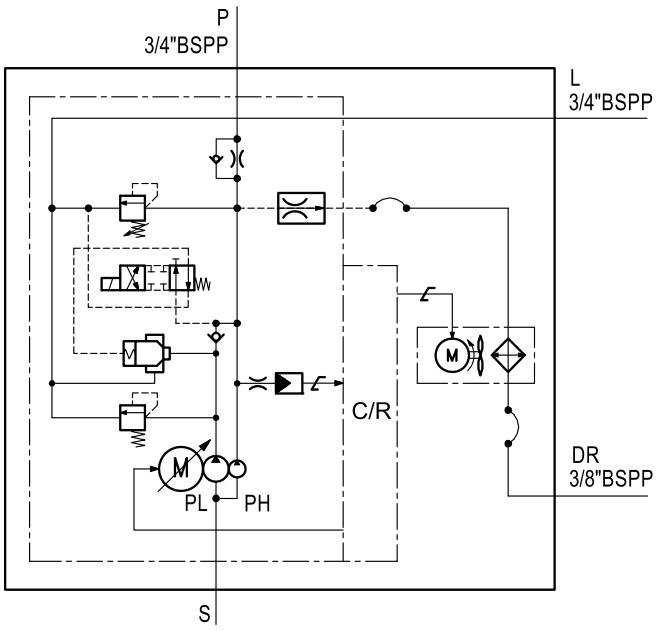
The SUT00D*021-40-YCP-Q100M5-D1 models come already equipped with these devices.

7.3 - SUT00D8021-40-YCP-Q-D1 - Main parts and options

dimensions in mm



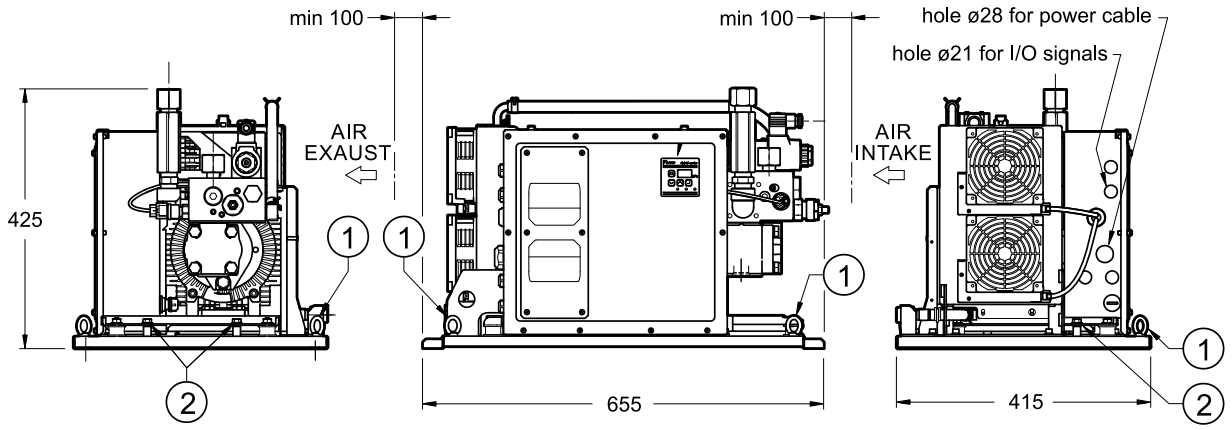
CIRCUIT DIAGRAM



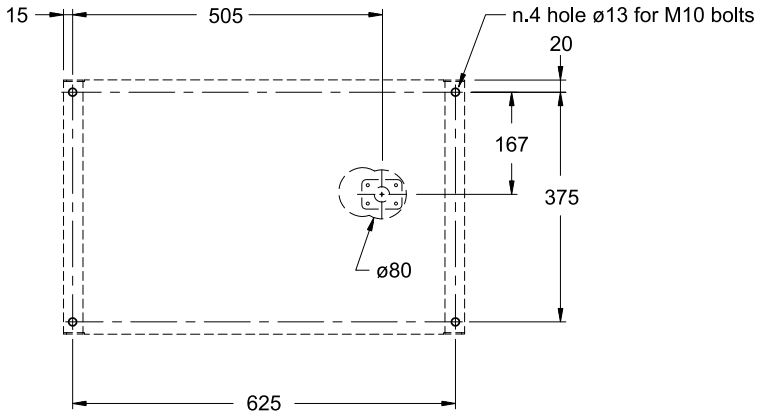
P	Pressure port: 3/4” BSPP
S	Suction port. 1" BSPP suction flange kit to be ordered separately. See par. 12
L	Unload port: 3/4” BSPP
DR	Drain port / oil sampling: 3/8” BSPP
1	Control panel
2	Cooler
3	Switching valve
4	In-line check valve
5	Fixing frame

7.4 - SUT00D8021-40-YCP-Q-D1 - Overall dimensions and mounting

dimensions in mm



MOUNTING INTERFACE



1	n° 4 eyebolts for lifting
2	Vibration dampers: remove the transport fixing nut before starting the unit

NOTE: The use of hose whip restraints devices both at pump side and at manifold side is strongly recommended to avoid the possible swip-off from the hose fitting during operation.

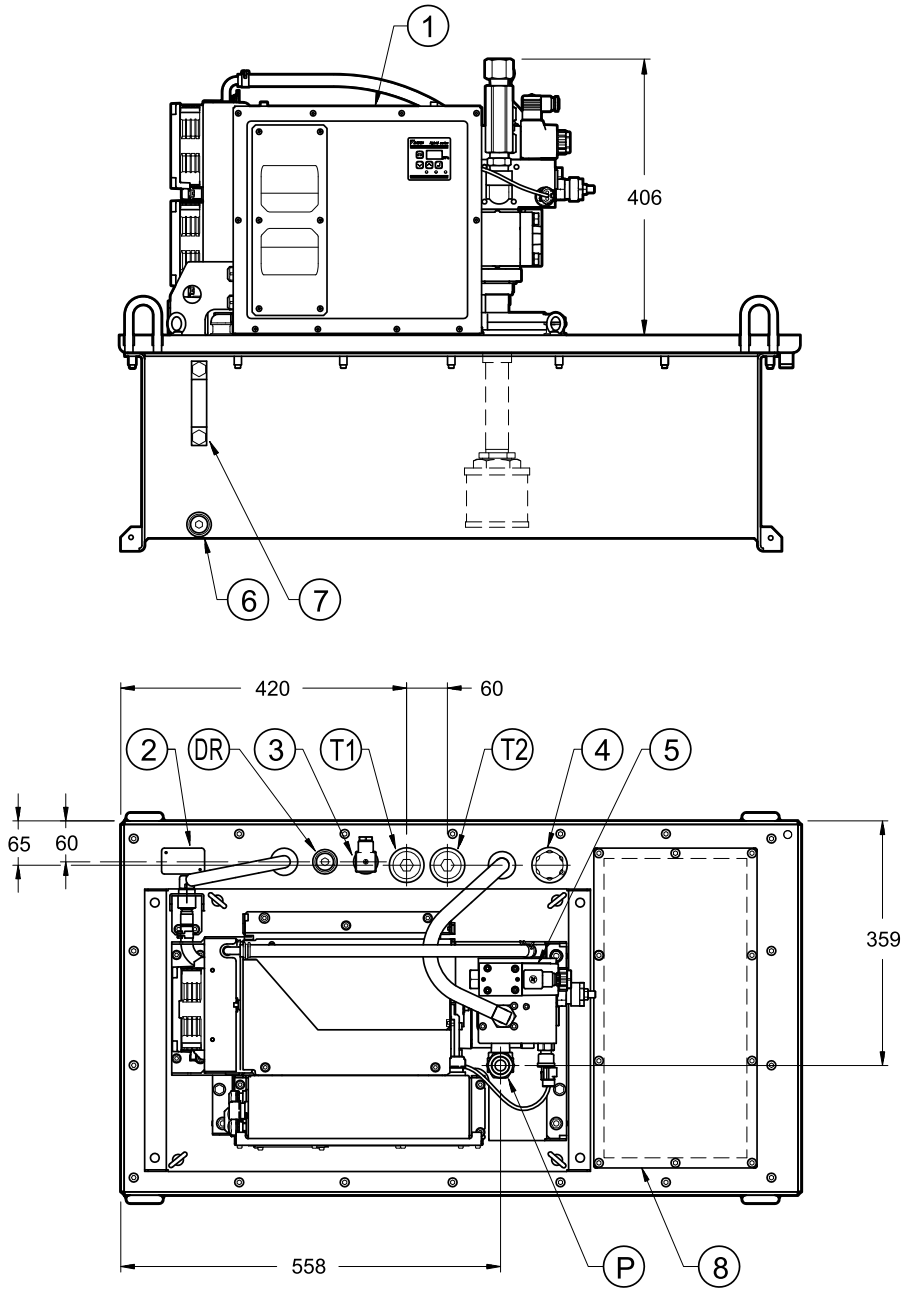
The SUT00D*021-40-YCP-Q100M5-D1 models come already equipped with these devices.

8 - SUT00D* - MODELS WITH TANK

8.1 - SUT00D*021-40-YCP-Q100 - Main parts and options

The drawing is representative of both SUTD6021 and SUTD8021 versions with tank.

dimensions in mm



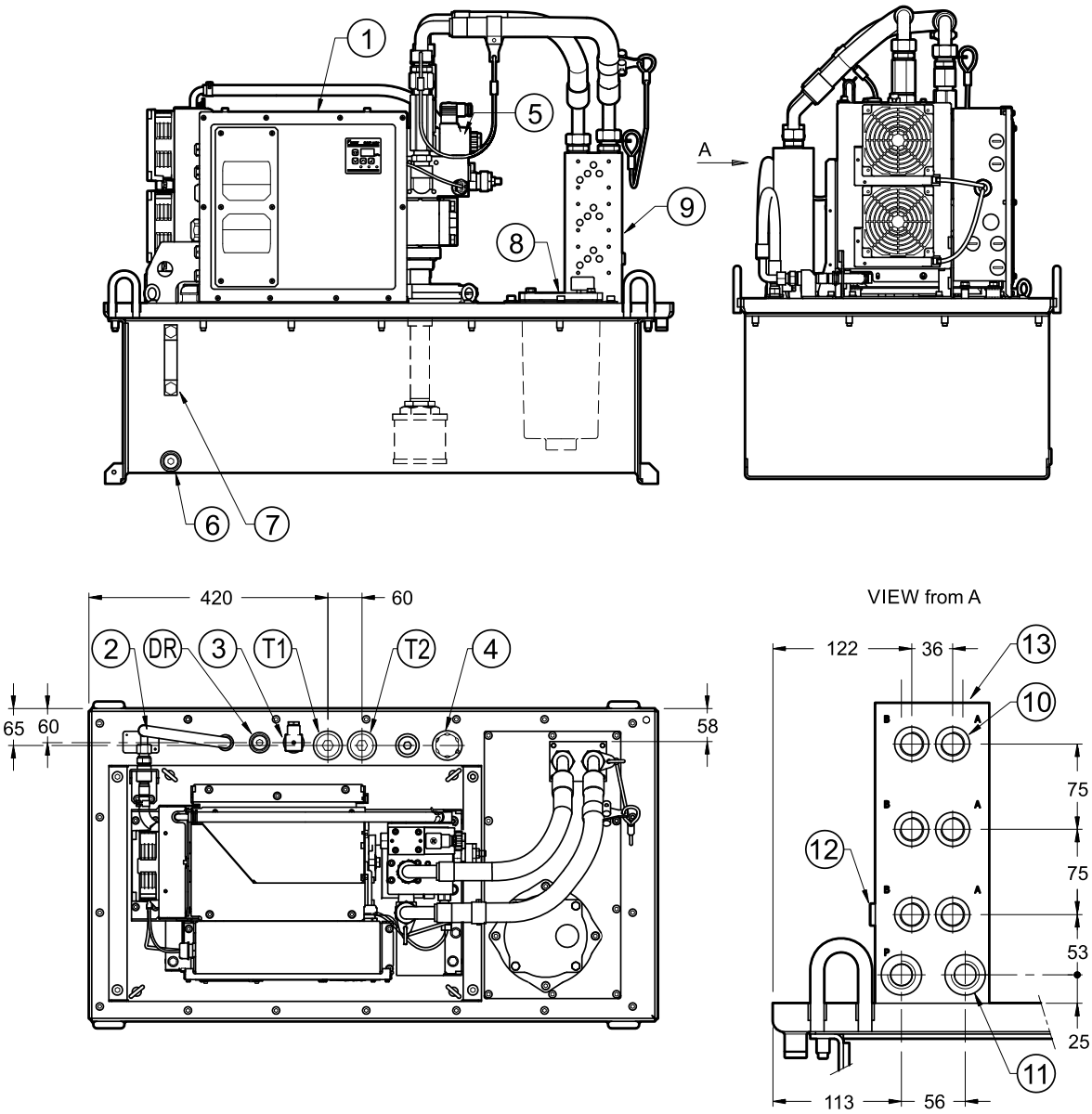
P	Pressure port: 3/8” BSPP delivered with plug
T1	Port for return line: 1” BSPP delivered with plug
T2	Port for return line: 1” BSPP delivered with plug
DR	Drain port: 3/4” BSPP delivered with plug
1	SUT hybrid unit
2	Identification label

3	Level switch
4	Oil filler port with air breather
5	Switching valve
6	Oil sampling and tank drain port
7	Oil level indicator: upper 100 L; lower 70 L
8	Blind plate 230x460 mm

8.2 - SUT00D*021-40-YCP-Q100M5 - Main parts and options

The drawing is representative of both SUTD6021 and SUTD8021 versions with tank.

dimensions in mm



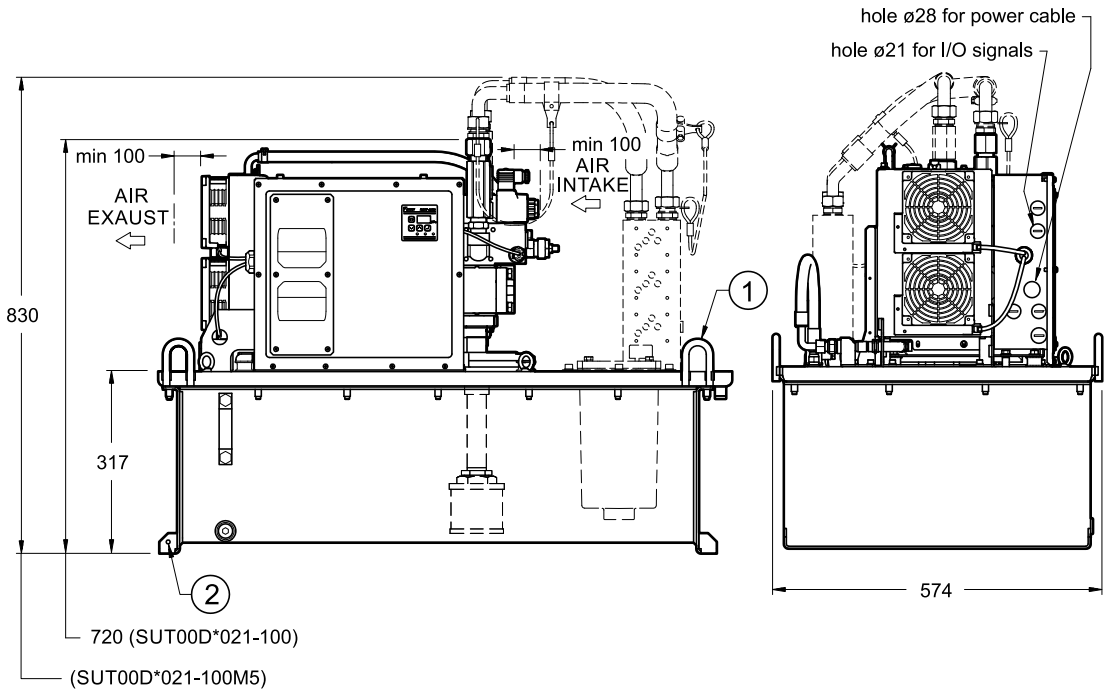
T1	Port for return line: 1” BSPP delivered with plug
T2	Port for return line: 1” BSPP delivered with plug
DR	Drain port: 3/4” BSPP delivered with plug
1	SUT hybrid unit
2	Identification label
3	Level switch
4	Oil filler port with air breather
5	Switching valve
6	Oil sampling and tank drain port

7	Oil level indicator: upper 100 L; lower 70 L
8	Return filter type FRI-TB114, with visual clogging indicator. (See catalogue 95 180)
8	3-station manifold for ISO 4401-05 valves
10	A, B working lines: 1/2” BSPP
11	P, T ports: 3/4” BSPP
12	Pressure gauge port: 1/4” BSPP
13	Mounting interface for subplates (see point 12)

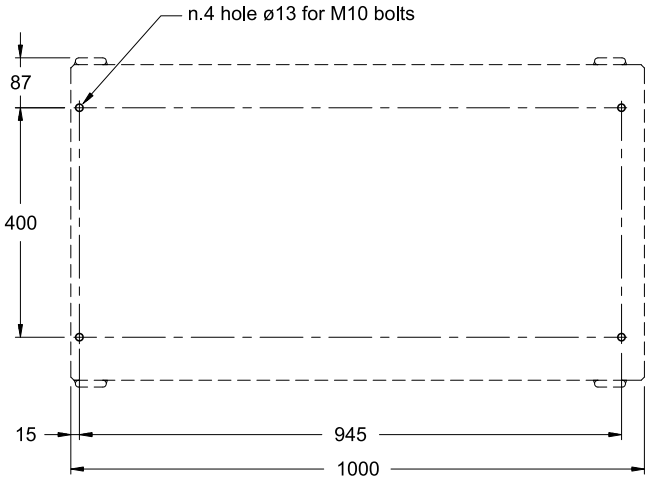
8.3 - SUT00D*- with tank - Overall dimensions and mounting

The drawing is representative of both the versions with tank.

dimensions in mm



MOUNTING INTERFACE



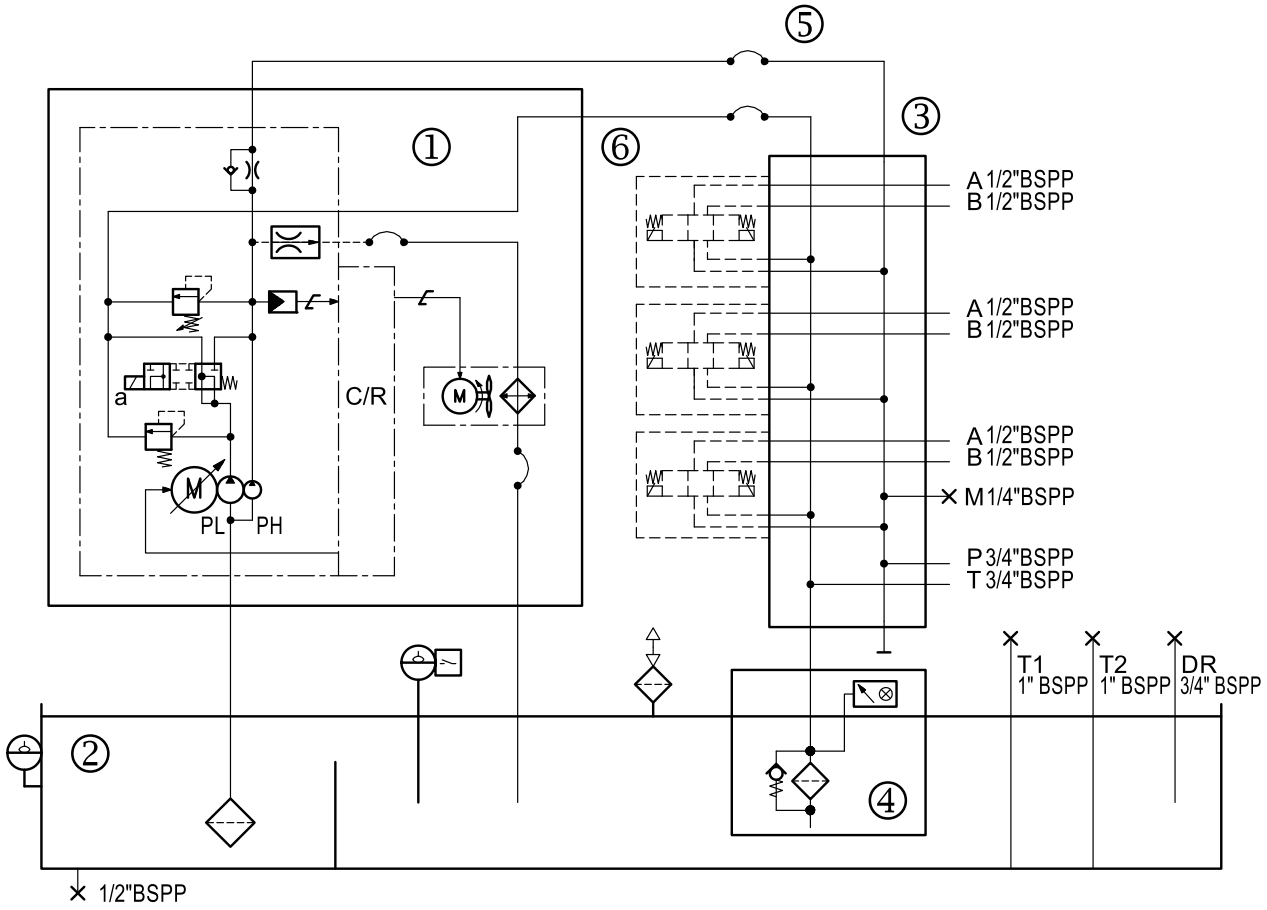
1	No. 4 lifting points
2	GND grounding point

NOTE: The use of hose whip restraints devices both at pump side and at manifold side is strongly recommended to avoid the possible swip-off from the hose fitting during operation.

The SUT00D*021-40-YCP-Q100M5-D1 models come already equipped with these devices.

8.4 - SUT00D6021 with tank - Circuit diagram

The drawing is representative of all the SUT00D6021 with tank.

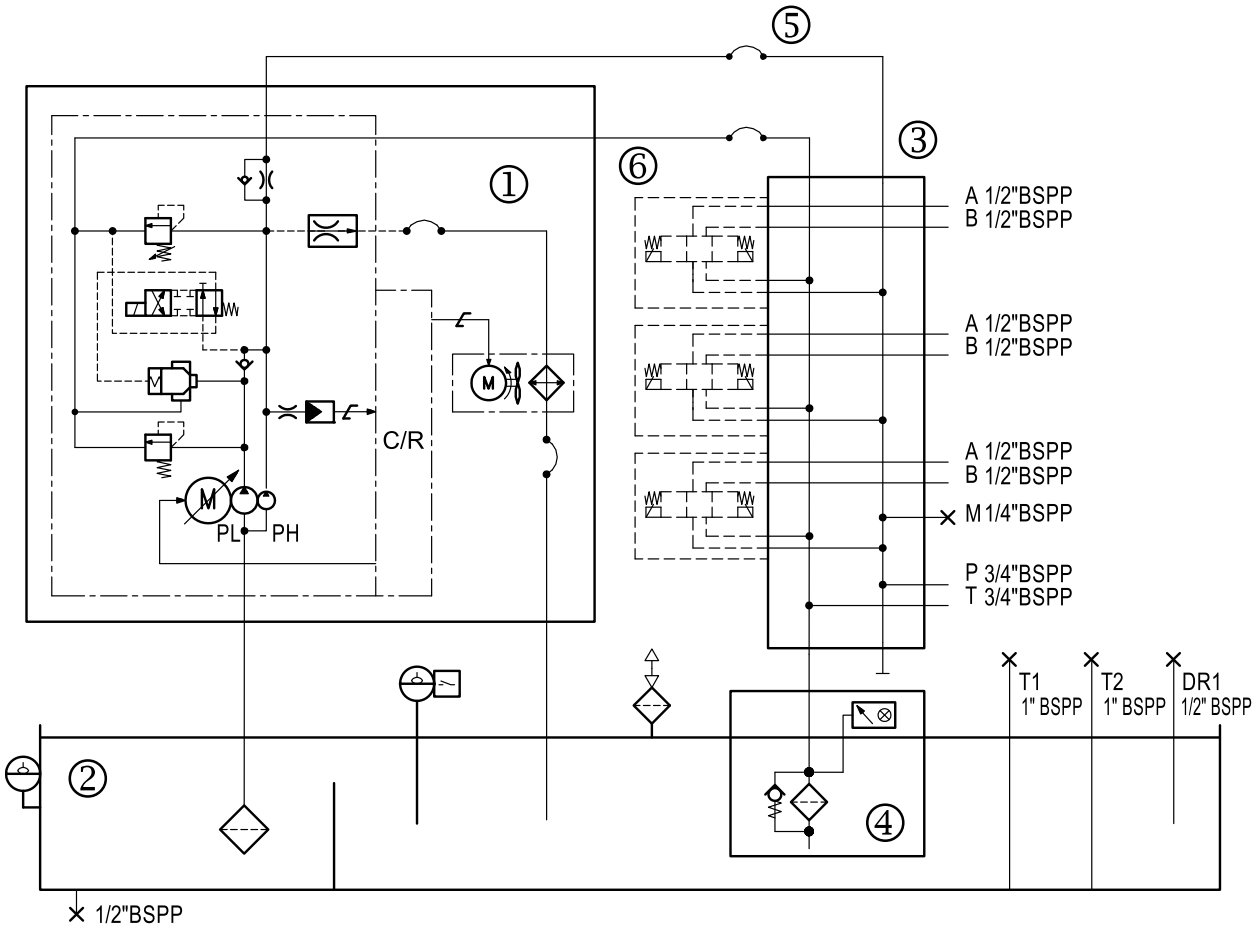


1	Daikin SUT Hybrid unit
2	Tank
3	Multi station manifold
4	Return filter
5	Piping
6	Tank line 3/4” BSPP

NOTE: Items no. 3, 4 and 5 are not included On SUT00D6021-40-YCP-Q100-D1.
The piping n° 6 discharges directly into the tank.

8.5 - SUT00D8021 with tank - Circuit diagram

The drawing is representative of all the SUT00D8021 with tank.



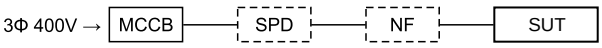
1	Daikin SUT Hybrid unit
2	Tank
3	Multi station manifold
4	Return filter
5	Piping
6	Tank line 3/4” BSPP

NOTE: Items no. 3, 4 and 5 are not included On SUT00D(021-40-YCP-Q100-D1.
The piping n° 6 discharges directly into the tank.

9 - WIRING

9.1 - EMC 2014/30/EU compliance

The EN 61800-3:2004 (Second environment / PDS Category “C3”) requires the installation of a surge on protection device and a noise filter between the breaker and the SUT hybrid unit on the power source line.

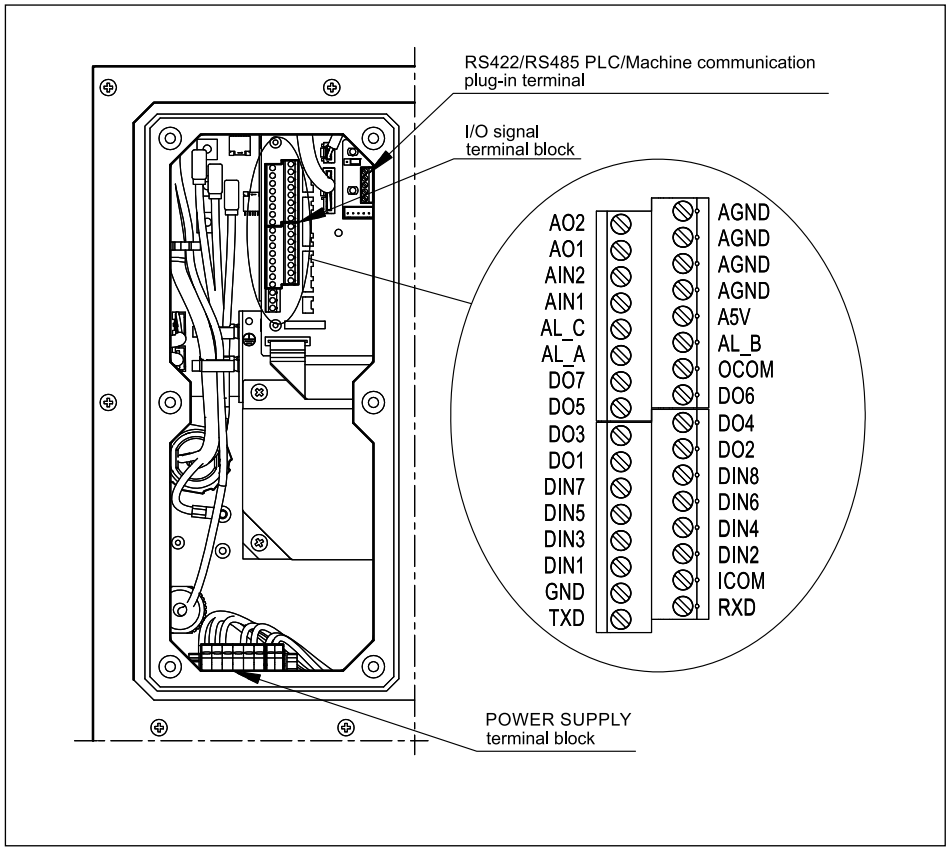


The assessment for the installation of these components is the responsibility of the machine manufacturer, as compliance with EMC regulations involves the entire machine on which the SUT unit will be installed. If SUT has to be compliance EMC 2014/30/EU as a standalone, noise filter and protection device are must have.

Surge protection device (SPD) and noise filters can be ordered separately. See point 12.

9.2 - Wiring notes

- Install a no-fuse breaker and a ground fault interrupter compliant with European Standard EN 60947-2 in the main power supply of SUT, to protect the electrical circuits against shorting and overcurrent, and to prevent electric shocks.
- Use straight type terminals for the power supply wiring.
- Use suitable electric cable in accordance with the power supply capacity. In addition, connect the cables correctly in accordance with the wiring guide.
- Provide a ground connection in compliance with the law in the relevant country. Connect the grounding wire directly with no breaker in the line.
- Avoid the entry of waste metal such as screws and wiring debris, or combustible matter such as wood waste or oil, inside the control unit.
- Use a commercial power supply for the power source. The use of an inverter power supply may cause burn damage to the unit.
- Before accessing the interior of the control unit, check that the unit’s power supply has turned OFF **and then wait at least 5 minutes.**



9.3 - Cables

For the main power connection (L1, L2 and L3) use cables with 4-wires.

SUT00D2416, SUT00D6021: > 1.5 mm² section (AWG 16).
SUT00D8021: > 2.5 mm² section (AWG 14).

For coil connection of the switching valve on SUTD* models: 1 mm²

For signals and for ModBUS communication to the PLC use shielded cables with section from 0.35 mm² to 0.5 mm² (AWG 20 ~ 22).

Related cable clamps must be IP54 min.

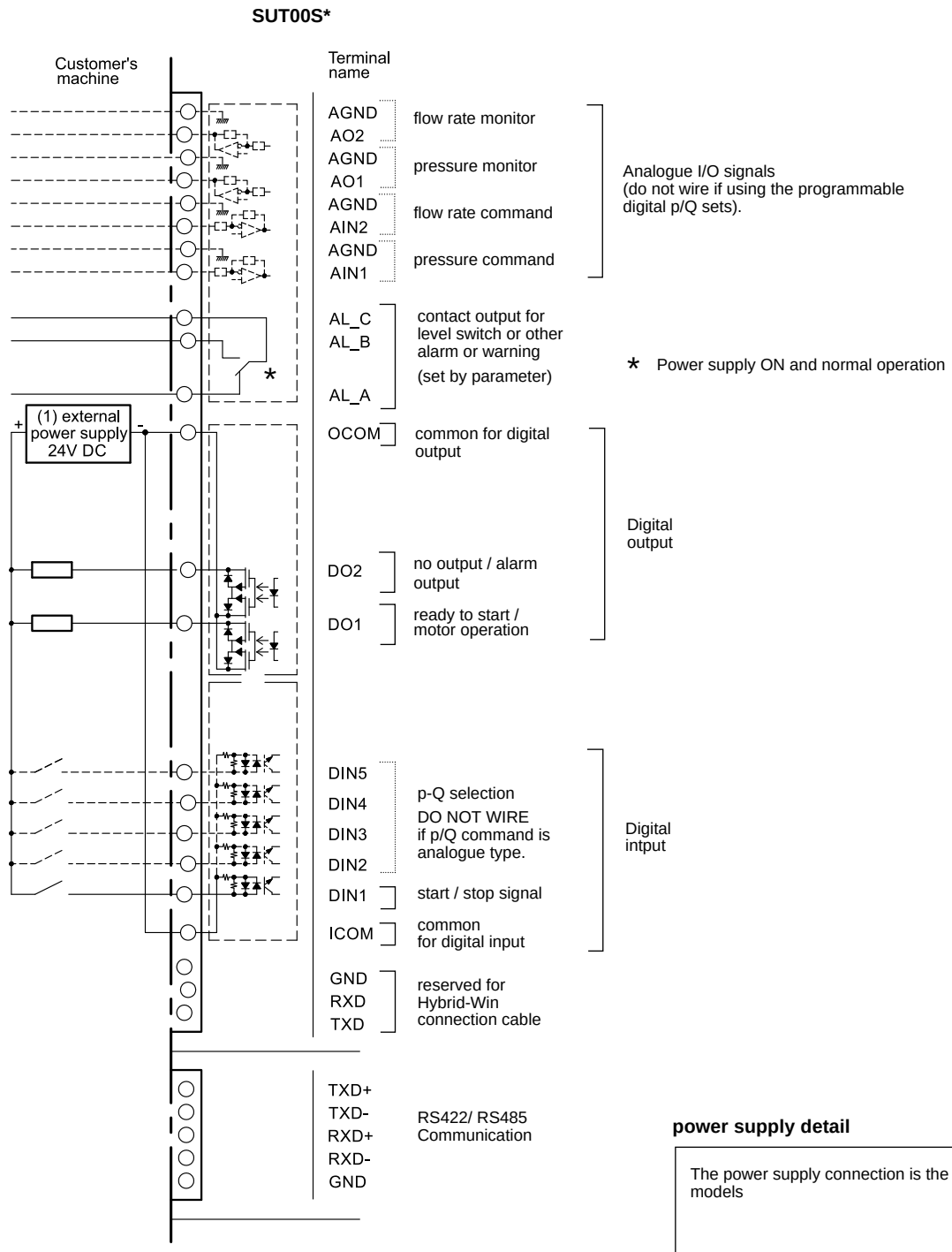
9.4 - Switching valve of SUT00D**

The wiring of the switching valve is in the customer’s charge, as it is not powered by the SUT controller. The connector with surge killer and led is supplied.

	Nominal voltage [V]	Resistance at 20°C [Ω]	Current consumpt. [A]	Power consumpt [W]	Permissible voltage [%]	IP degree (**NOTE**)
DC	24	18,6	1,22	29.2	90 ÷ 110	IP65

NOTE: The IP protection degree from atmospheric agents IEC 60529 is guaranteed only when the connector is correctly connected and installed.

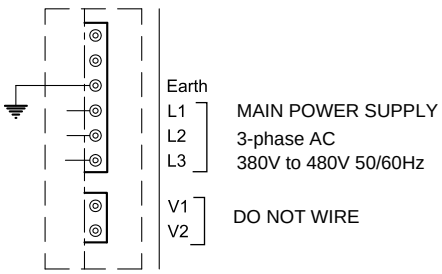
9.5 - SUT00S2416 Wiring diagram



NOTE: The type of the desired target PQ signal (external analog command or set of preset pQ points) is set by means of the P67 parameter.

power supply detail

The power supply connection is the same for all the SUTs models



9.6 - SUT00D* Wiring diagrams

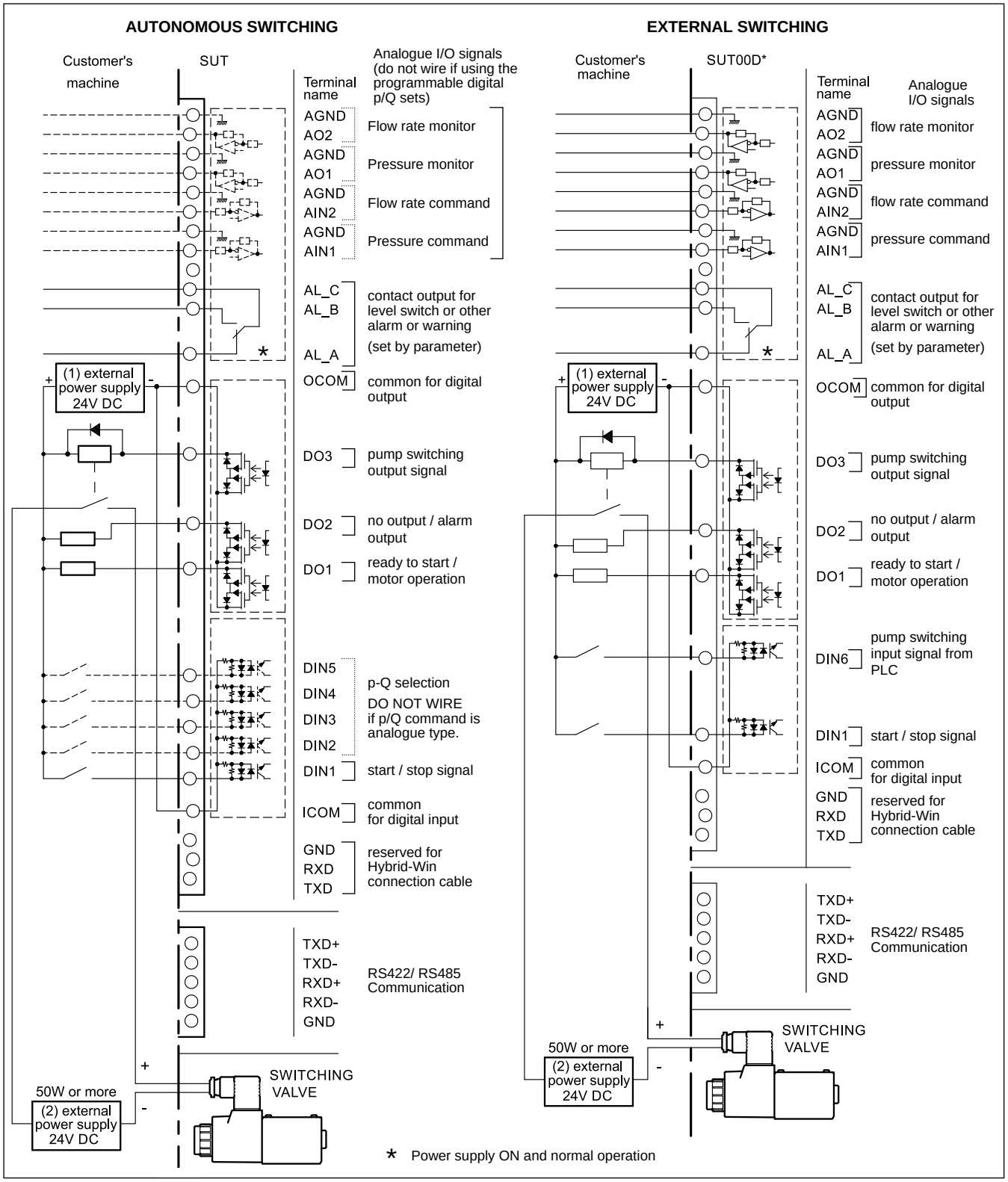
SUT00D* are factory set for autonomous pump switching. In this configuration, the SUT can operate either with analogue signals or with digital pre-set p/Q signals.

In order to operate the pump switching by the external command from the main machine, connect the external command to the DIN6 of the SUT. Then, configure the P70 parameter again. The DIN6 that can be set as ON or OFF (depending on the customer's choice) to obtain the single or the combined operation. Either way, the solenoid valve switching signal will output on pin DO3.

The relay in the machine tool cabinet and the related wiring, from DO3 output of the SUT to the coil of the switching valve is in the Customer's charge.

Relay requirements: 24V DC (max 50 mA) coil, single stable, with diode coil surge killer, 24V DC 5A / 220V AC 5A contact rating.

Please refer to the *PIM00693 Instruction Manual* for parameter setting options and digital p/Q setting management.



9.7 - Digital I/O & alarm signals

terminal	description	value	function / notes
AGND	analogue output: flow rate monitor	0V GND	- QMAX ÷ QMAX (value can be modified by parameter)
AO2		± 10 V	
AGND	analogue output: pressure monitor	0V GND	0 ÷ PMAX
AO1		0 ÷ 10 V	
AGND	analogue input: flow rate command	0V GND	0 ÷ QMAX
AIN2		0 ÷ 10 V	
AGND	analogue input: pressure command	0V GND	0 ÷ PMAX
AIN1		0 ÷ 10 V	
A5V			Unused
AL_C	common alarm output C	switching 30 V DC 0.5 A resistive (min load 10 mV DC 10 µA approx)	Alarm common terminal
AL_B	alarm output B		Connected to the common terminal when the pressure switch is activated, or alarm signal or warning signal output (set by parameter)
AL_A	alarm output A		Connected to the common terminal during normal operation
OCOM	common digital output	24 V DC (±1V, 0.5 A) I max 50 mA / channel resistive	Can be either positive or negative
DO7	digital output 7		Unused
DO6	digital output 6		
DO5	digital output 5		
DO4	digital output 4		
DO3	digital output 3		Pump switching signal to the solenoid valve **Available on SUT00D* only.**
DO2	digital output 2		Factory setting: no output. Can be set as alarm output.
DO1	digital output 1		Operation completed or motor running (set by parameter)
DIN8	digital input 8	24 V DC (±10%) I max 5 mA / channel resistive	Unused
DIN7	digital input 7		
DIN6	digital input 6		Pump selection signal from PLC. **Wire only in external switching mode for SUT00D*.**
DIN5	digital input 5		Programmable digital p/Q point set Up to 16 p/Q points can be set combining the digital inputs. **Not available if external input signal mode is selected.** Refer to the Instruction Manual for details.
DIN4	digital input 4		
DIN3	digital input 3		
DIN2	digital input 2		
DIN1	digital input 1		start/stop signal. Factory set as: Start = OFF / stop = ON (set by parameter)
ICOM	common digital input		Can be either positive or negative

9.8 - Communication ports

terminal	description	function / notes
GND	digital ground	RS232C communication Hybrid-Win utility port
RXD	received data	
TXD	transmit data	

terminal	description	function / notes
TXD+		unused
TXD-		
RXD+	data+	RS422 / RS485 communication main machine / PLC port
RXD-	data-	
GND	digital ground	

10 - INSTALLATION NOTES

10.1 - Installation and piping

- The SUT is a stationary hybrid unit. It should be bolted to a flat, vibration-free surface, indoor.
- Ensure that there is at least 100 mm clearance around the unit from any obstructions that may obstruct air intake and exhaust. Install the unit in a location with good air flow so that the heated air can be exhausted.

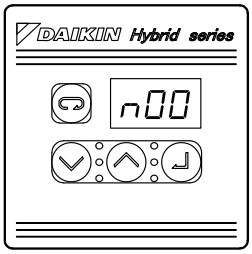
10.2 - Hydraulic fluid

- Use mineral-oil base hydraulic oil. Use of hydraulic oils other than mineral-oil based type (e.g., hydrous/synthetic) is prohibited.

10.3 - Other precautions

- **To ensure the correct operation of the SUT, there must be no valves with open centre spool in rest position in the sub-system of actuators motion control, both at the SUT manifold side and at Customer's side.**
- In the event of a hydraulic unit failure, the system will show an alarm and shut down. If such a failure or malfunction could result in death or pose a danger to human beings, take appropriate safety measures in the facilities.
- Turning the power supply ON/OFF frequently will significantly shorten the life of the controller. Use the start/stop digital inputs to start/stop this hydraulic unit. Leave an interval of at least 5 minutes between operation stops invoked by turning the power supply ON/OFF. Also, when starting and stopping the unit using the start/stop signals, leave an interval of at least 0.5 seconds between a stop command and restarting.
- This hydraulic unit takes approximately 3 seconds to start-up after being powered ON. Depending on the piping conditions, the unit may take longer to increase the pressure to the pressure switch's preset level, resulting in pressure switch signal output. In this case, set the machine up so that it will not accept this alarm output during this period.

11 - DEVICE SETUP



The SUT hybrid unit communicates with the machine using the Modbus-RTU protocol. Configuration of the communication and the hybrid unit can be done from the SUT's operating panel or via software. To configure via software, connect a device with the Hybrid-win software installed to the CN4 port of the SUT located in the unit's control panel, using the appropriate cable kit.

11.1 - Hybrid-win software

The software's graphical interface enables real-time monitoring of operating data, parameter reading and setting, and tracking of alarm and warning history.

The Hybrid-Win software is compatible with Microsoft Windows OS. To connect the Hybrid SUT to a PC, a cable connection kit is required. the kit can be ordered separately (see section 12).

The Hybrid-Win software can be downloaded from the Duplomatic MS website, from the product page.

11.2 - Additional documentation

Detailed instructions on commissioning, configuration and communication protocol are given in the *Instruction Manual PIM00693.* This manual is supplied with the product and is downloadable in digital version from the Reserved Area and from the Product Page of the Duplomatic MS website, using your own credentials.

12 - ACCESSORIES

These accessories are supplied spare and their arrangement on the SUT is in the customer's charge.

ordering code	description
3906500014	Surge protection device (SCHNEIDER ELECTRIC A9L20321)
3906500011	Noise filter (SCHAFFNER FN3025HP-30-71)
3906510010	SUTPC/10 - Kit for Hybrid-Win software connection
3906500015	LS-B12-140/10-D24K1-SPDT - Level switch SPDT 1/2" BSPP (**NOTE**)
3906500012	TS-B12-170-60/10-D24K1-SPDT - Temperature switch 1/2" BSPP - 24V DC switching temperature 60 °C
1561531	P4DL-P/10N - Modular subplate with ISO 4401-05 mounting surface + NBR coupling O-Ring
1561541	P4DL-D3P/10N - Modular subplate with ISO 4401-03 mounting surface + NBR coupling O-Ring
3906510020	Suction adapter flange kit 1" BSPP for SUT00D6021 and SUT00D8021

NOTE: This component is already installed on all the SUT units with tank. It is available as a spare part.

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