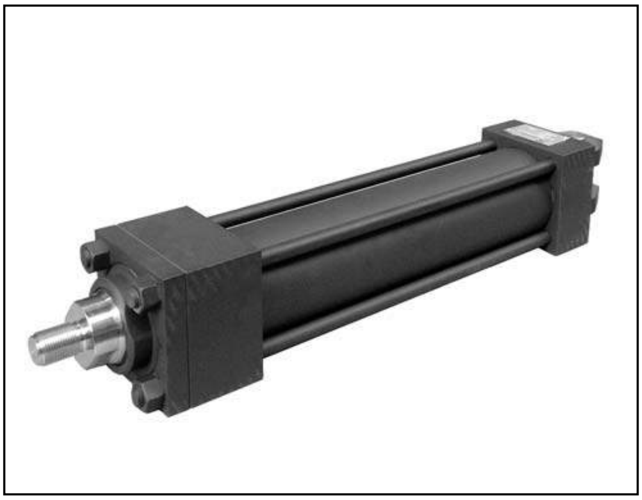
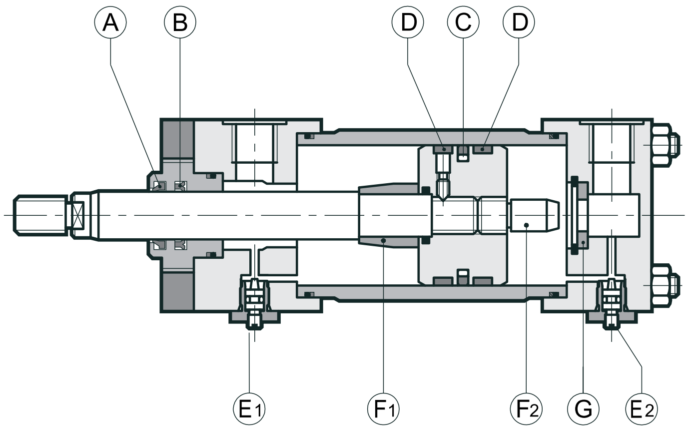


HC2
HYDRAULIC CYLINDERS
HCK2
HYDRAULIC CYLINDERS
ATEX 94/9/CE
SERIES 20

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 94/9/CE 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	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 valves 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.

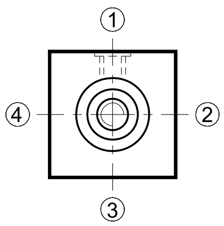
1.4 Connection position

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.

For special requests please consult our technical office.



Front view - piston rod side

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 glycole	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**	**M6**	**M8**	**M12**	**M12**	**M16**	**M16**	**M22**	**M27**	**M30**
	x0.8	x1	x1	x12.5	x12.5	x1.5	x1.5	x1.5	x2	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 40 . 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** 3	**1** 2 3 4	**1** 2 3 4	**1** 3	**1** 2 3 4	**1** 2 3 4	**1** 2 3 4	**1** 2 3 4	**1** 2 3 4	**1** 2 3 4	**1** 3	**1** 3	**1** 3	**1** 2 3 4	**1** 2 3 4	**1** 2 3 4	**1** 2 3 4	**1** 3	**1** 2 3 4	**1** 2 3 4	**1** 2 3 4	**1** 2 3 4	**1** 2 3 4	**1** 2 3 4	**1** 2 3 4	**1** 2 3 4	**1** 2 3 4	**1** 2 3 4
Cushioning	1 **3**	1 2 **3** 4	1 2 **3** 4	1 **3**	1 2 **3** 4	1 2 **3** 4	1 2 **3** 4	1 2 **3** 4	1 2 **3** 4	1 2 **3** 4	**2** 4	**2** 4	1 *3	1 2 **3** 4	1 2 **3** 4	1 2 **3** 4	1 2 **3** 4	1 *3	1 2 **3** 4	1 2 **3** 4	1 2 **3** 4	1 2 **3** 4	1 2 **3** 4	1 2 **3** 4	1 2 **3** 4	1 2 **3** 4	1 2 **3** 4	1 2 **3** 4
Breathers	1 2 **3** 4	1 2 **3** 4	1 2 **3** 4	1 2 **3** 4	1 2 3 **4**	1 2 3 **4**	1 2 3 **4**	1 2 3 **4**	1 2 3 **4**	1 2 3 **4**	2 **4**	2 **4**	1 *3	1 2 **3** 4	1 2 3 **4**	1 2 3 **4**	1 2 **3** 4	1 *3	1 2 3 **4**	1 2 3 **4**	1 2 3 **4**	1 2 3 **4**	1 2 3 **4**	1 2 3 **4**	1 2 3 **4**	1 2 3 **4**	1 2 3 **4**	1 2 3 **4**
end-stroke proximity sensors	**2** 4	1 **2** 3 4	1 **2** 3 4	**2** 4	1 **2** 3 4	1 **2** 3 4	1 **2** 3 4	1 **2** 3 4	1 **2** 3 4	1 **2** 3 4	2 **4**	2 **4**	**3**	1 **2** 3 4	1 **2** 3 4	1 **2** 3 4	1 **2** 3 4		1 **2** 3 4	1 **2** 3 4	1 **2** 3 4	1 **2** 3 4	1 **2** 3 4	1 **2** 3 4	1 **2** 3 4	1 **2** 3 4	1 **2** 3 4	1 **2** 3 4

Positions indicated in bold style are relevant to the standard, the others to the available options.

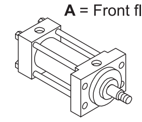
2 - IDENTIFICATION CODE

K = Explosion-proof version according to ATEX 94/9/CE (paragraph 3). Omit if not required.

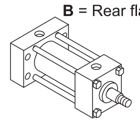
HC		2		-		/			/			-		-			-		-			/			/	20

MOUNTING STYLE

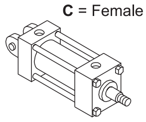
A = Front flange(ME5)



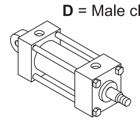
B = Rear flange (ME6)



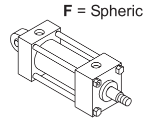
C = Female clevis (MP1)



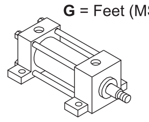
D = Male clevis (MP3)



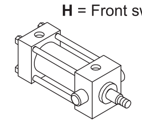
F = Spheric swivel (MP5)



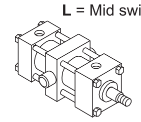
G = Feet (MS2)



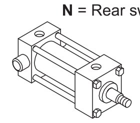
H = Front swinging (MT1)



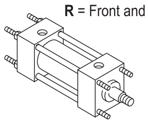
L = Mid swinging (MT4)



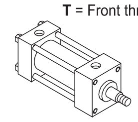
N = Rear swinging (MT2)



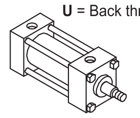
P = Front tie rods (MX3)
Q = Back tie rods (MX2)
R = Front and back tie rods (MX1)



T = Front threaded holes (MX5)



U = Back threaded holes (MX6)



Series (put for spare parts requests)

Dimension XV for •LŽ mounting (omit for other mounting styles)

N° of spacers multiple of 50 mm (omit if not required) see par. 1.7

Rear end connection position (**1**-**4**) (see paragraph 1.4)

Front end connection position (**1**-**4**) (see paragraph 1.4)

Breathers (see paragraph 1.9)
0 = without breathers
S = front and back breathers

Cushioning (see paragraph 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 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 paragraph 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 94/9/CE RATED VERSION

ATEX 94/9/CE 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 paragraph 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 paragraph 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 paragraph 22; Also the same limitations described in that paragraph 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 paragraph 22.2.

3.2 - Classification

Cylinders without end-stroke proximity sensors have this ATEX mark:

Ex II 2GD ck IIC T4 (-20°C Ta +80°C)

EX: Specific marking of explosion protection as ATEX 94/9/CE 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:

Ex II 3GD ck IIC T4 (-20°C Ta +80°C)

EX: Specific marking of explosion protection as ATEX 94/9/CE 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

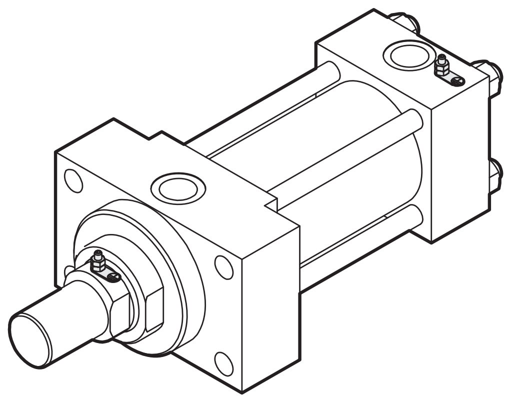
The maximum permissible speed is 0.5 m/s for standard cylinder seals (K) and 1 m/s for actuators with low friction seals (M) or Viton (V).

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).

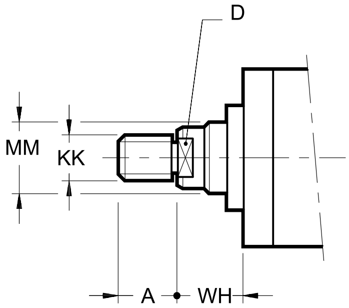


The bottom grounding point must always be connected whereas the connection of the rod grounding point can be avoided in case the whole mechanical stroke is covered during the cylinder operating phase (from the mechanical stop on the cylinder head to the mechanical stop on the bottom), or in case the rod has already been grounded through the mechanical connection between the rod itself and the machine/plan it is installed on.

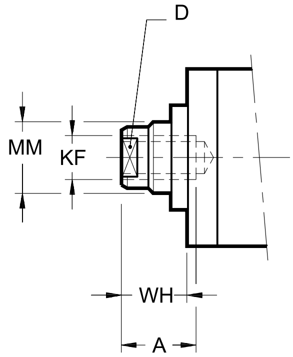
In order to verify such a condition it is necessary to test the equipotentiality of the parts and a maximum resistance equal to 100 as per the EN13463-1 norm.

4 - OVERALL AND MOUNTING DIMENSIONS

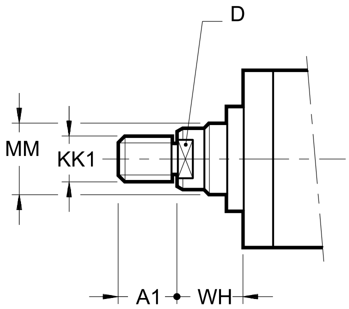
Standard = male thread



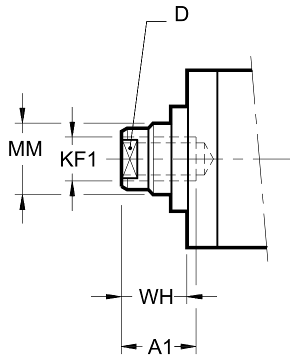
W = female thread



X = light male thread



Y = light female thread

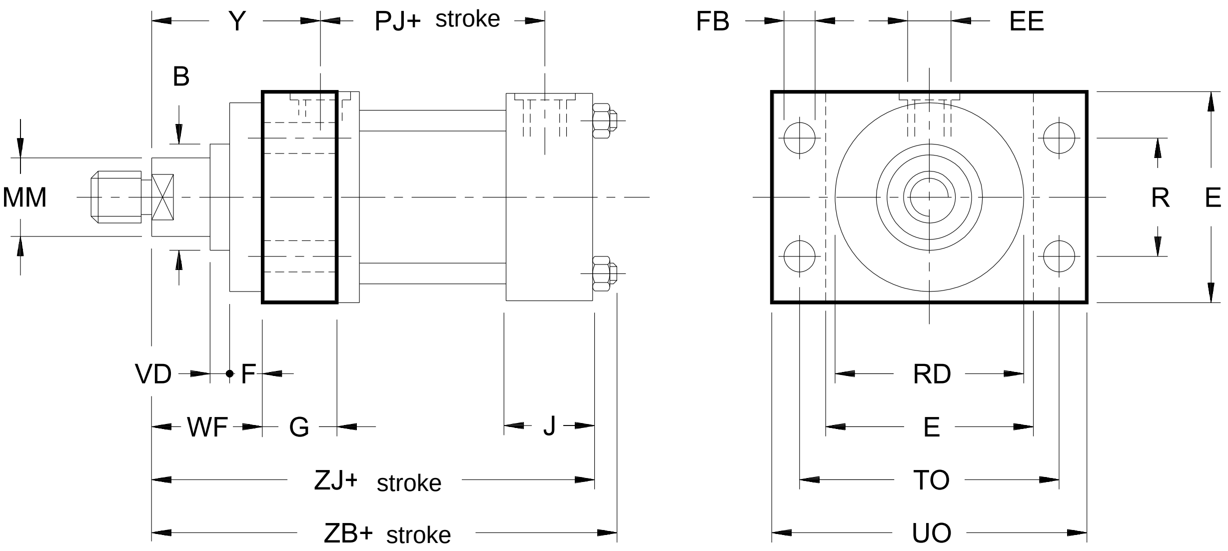


Dimensions in mm

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



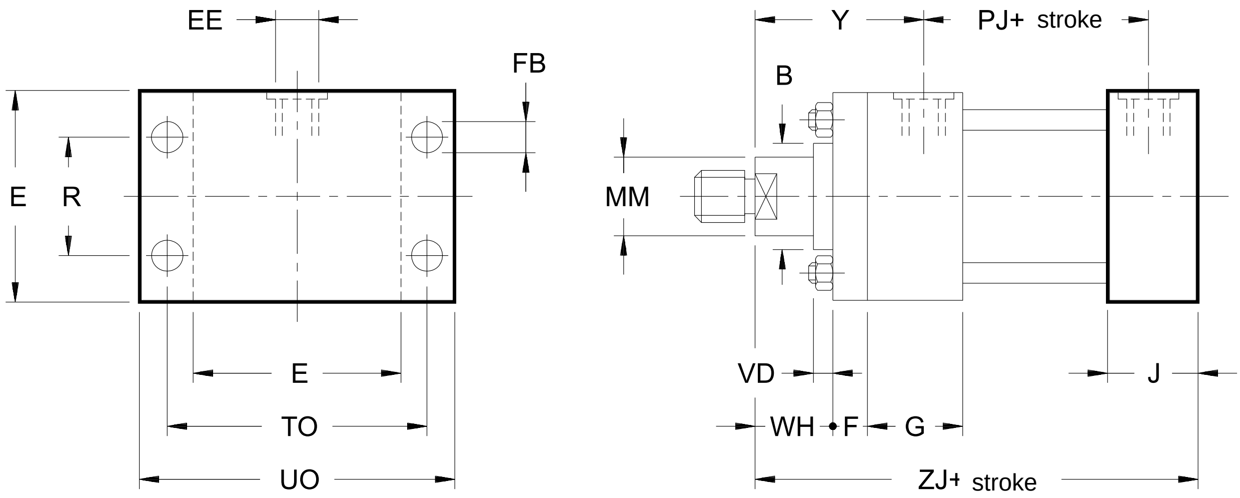
NOTE: The "E" dimension indicated in the table (bores 25 and 32) must be increased of 5 mm, only for the front end, on the oil port side (dimensions not in compliance with ISO standards).

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	6 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



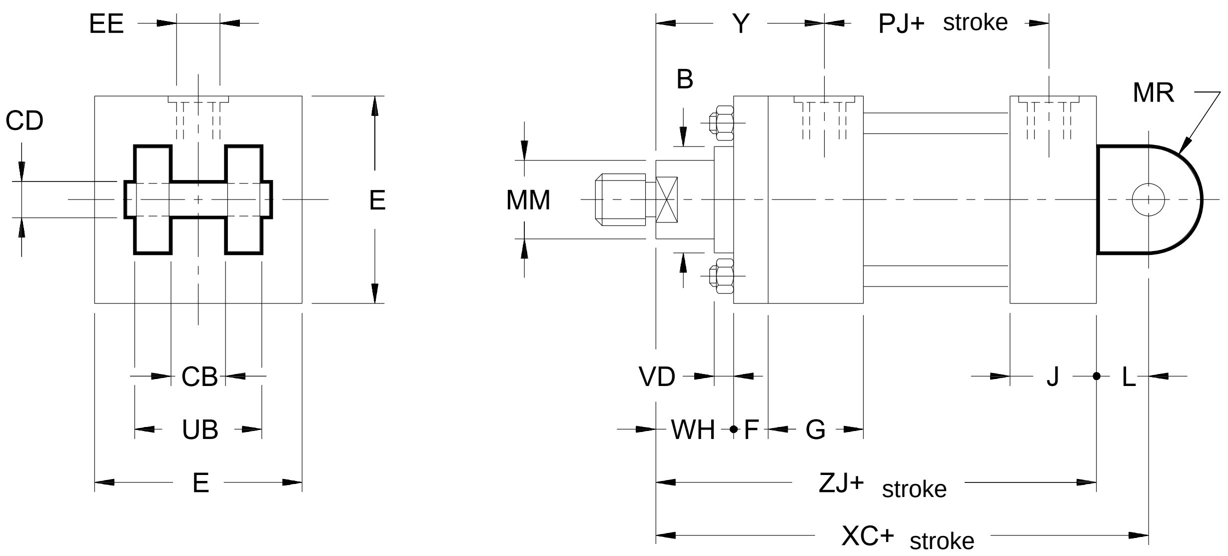
NOTE: The "E" dimension indicated in the table (bores 25 and 32) must be increased of 5 mm, only for the front end, on the oil port side (dimensions not in compliance with ISO standards).

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	6 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)



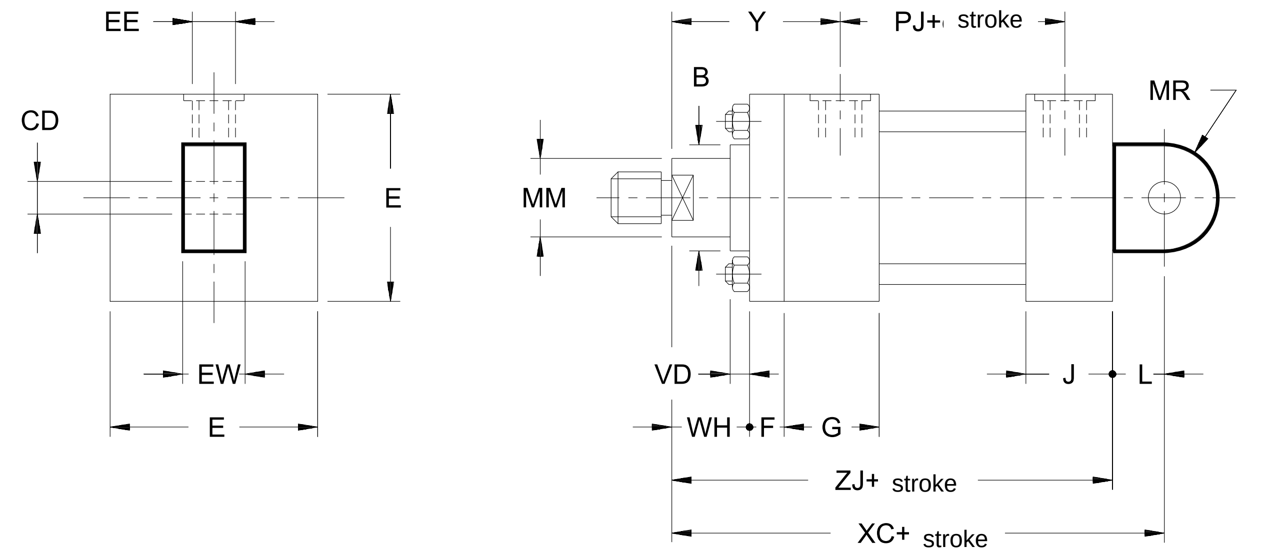
NOTE: The "E" dimension indicated in the table (bores 25 and 32) must be increased of 5 mm, only for the front end, on the oil port side (dimensions not in compliance with ISO standards).

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	6 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



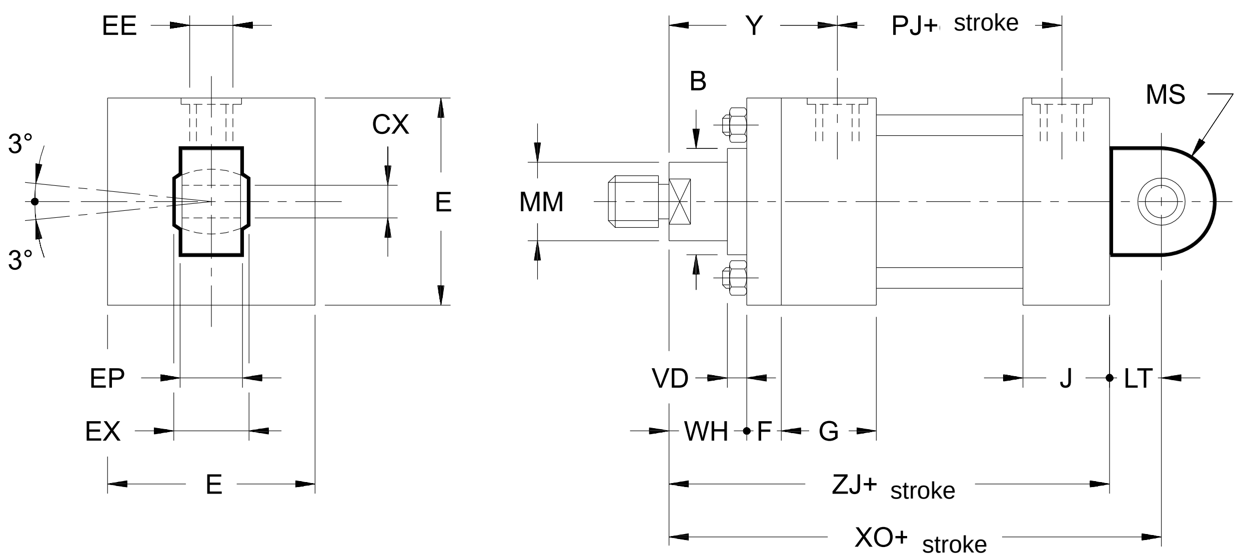
NOTE: The ”E” dimension indicated in the table (bores 25 and 32) must be increased of 5 mm, only for the front end, on the oil port side (dimensions not in compliance with ISO standards).

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	6 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



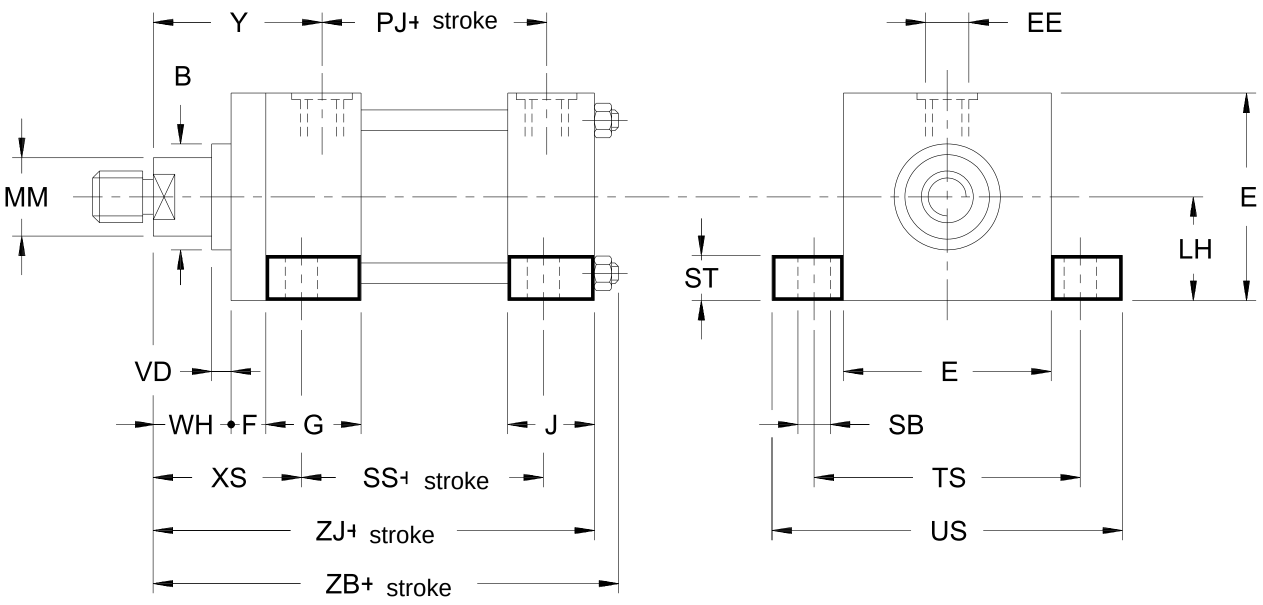
NOTE: The "E" dimension indicated in the table (bores 25 and 32) must be increased of 5 mm, only for the front end, on the oil port side (dimensions not in compliance with ISO standards).

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	6 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



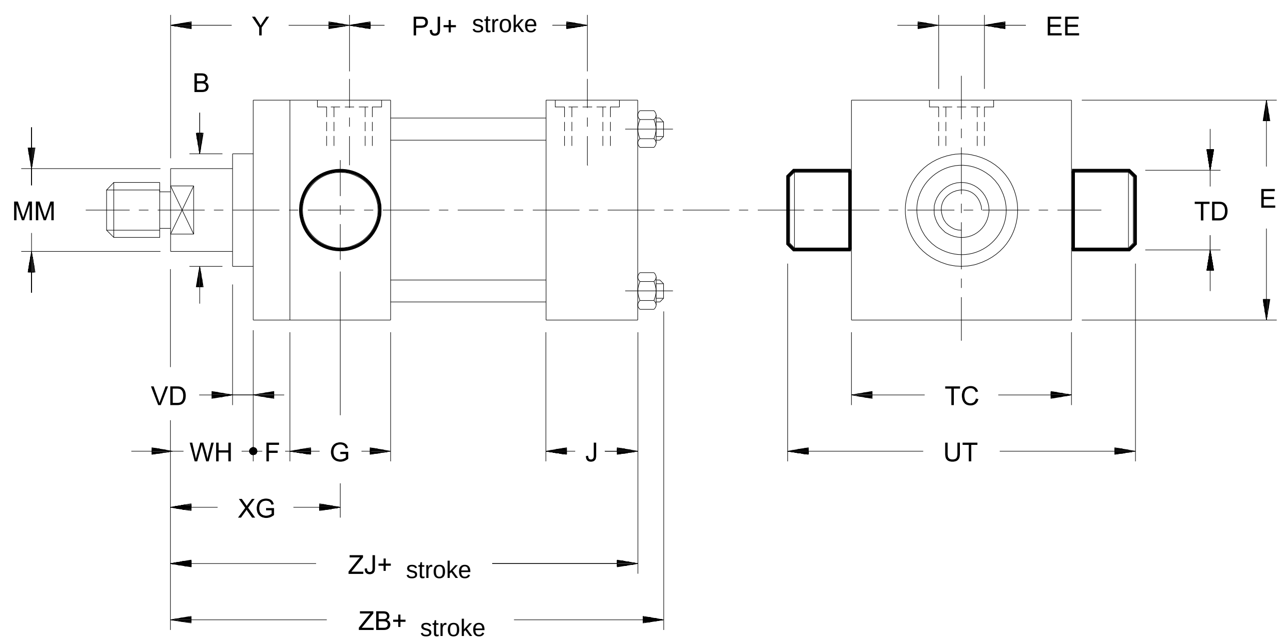
NOTE: The "E" dimension indicated in the table (bores 25 and 32) must be increased of 5 mm, only for the front end, on the oil port side (dimensions not in compliance with ISO standards).

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 10 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	6 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



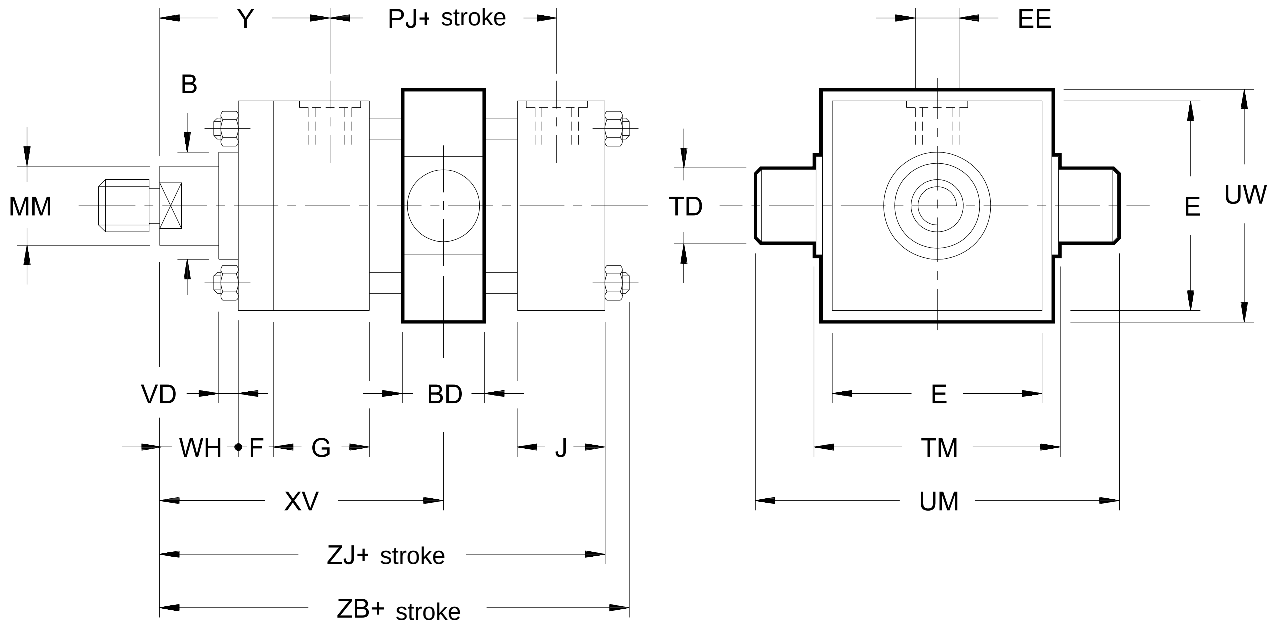
NOTE: The "E" dimension indicated in the table (bores 25 and 32) must be increased of 5 mm, only for the front end, on the oil port side (dimensions not in compliance with ISO standards).

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	6 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 par. 2)

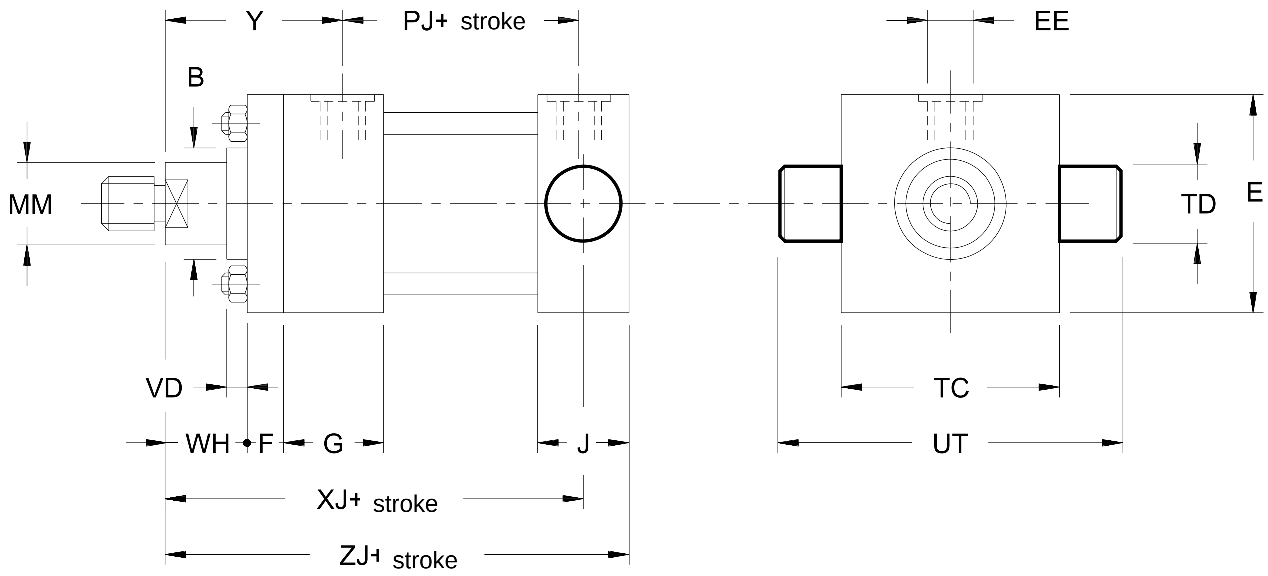
NOTE: The ”E” dimension indicated in the table (bores 25 and 32) must be increased of 5 mm, only for the front end, on the oil port side (dimensions not in compliance with ISO standards).

Dimensions in mm

Bore	MM Ø stelo	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	6 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



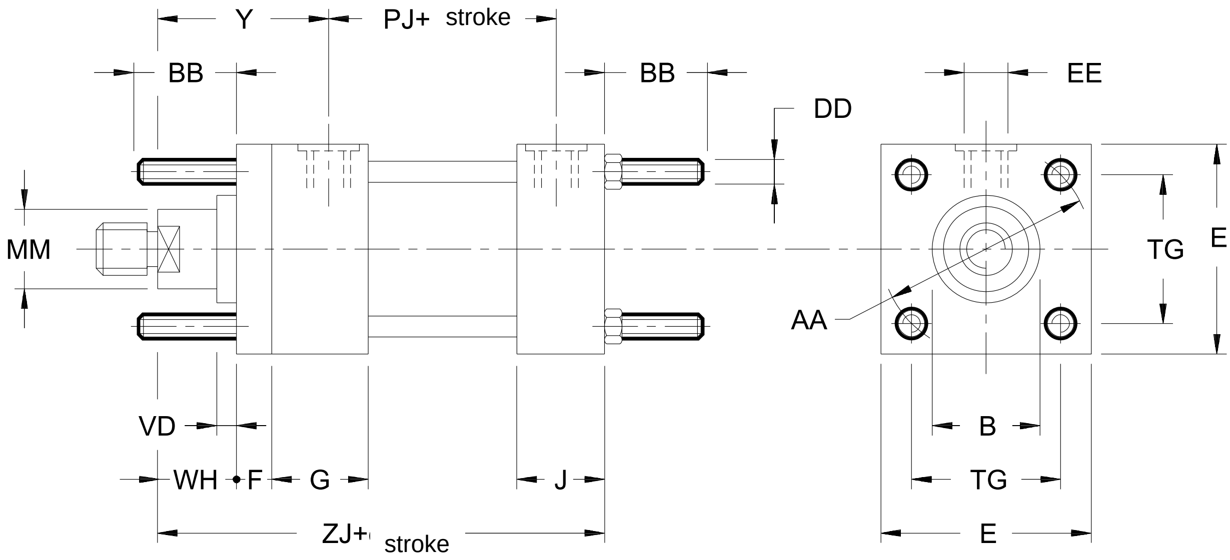
NOTE: The ”E” dimension indicated in the table (bores 25 and 32) must be increased of 5 mm, only for the front end, on the oil port side (dimensions not in compliance with ISO standards).

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	6 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



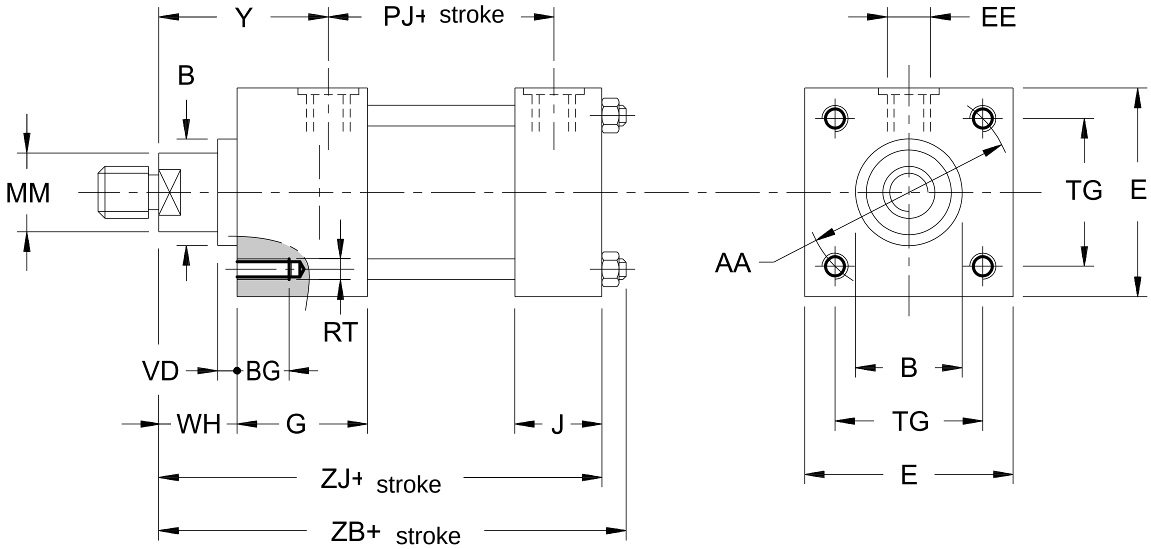
NOTE: The "E" dimension indicated in the table (bores 25 and 32) must be increased of 5 mm, only for the front end, on the oil port side (dimensions not in compliance with ISO standards).

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	6 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



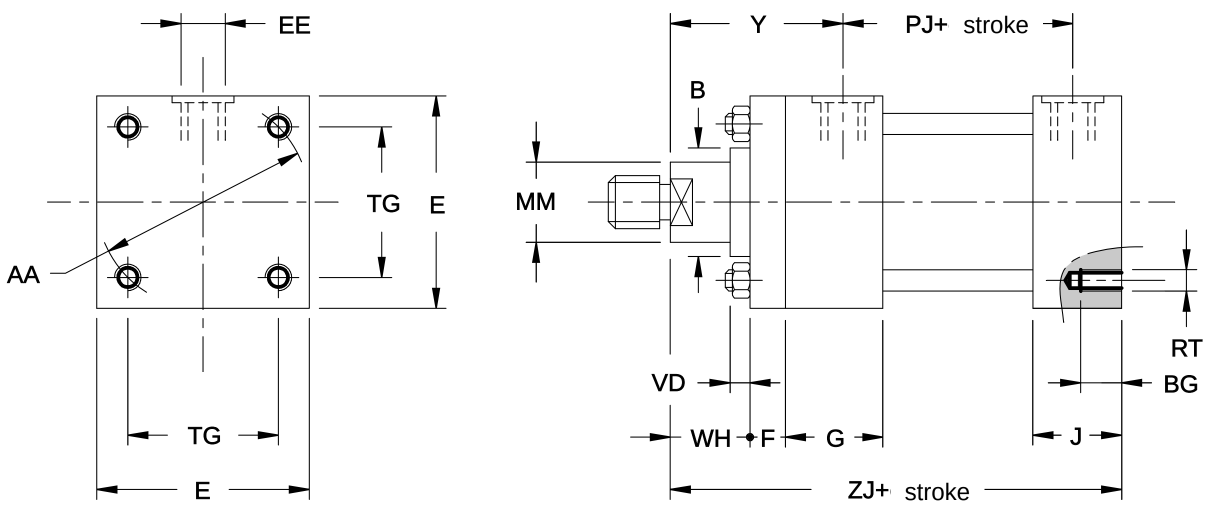
NOTE: The "E" dimension indicated in the table (bores 25 and 32) must be increased of 5 mm, only for the front end, on the oil port side (dimensions not in compliance with ISO standards).

Dimensions in mm

Bore	MM Ø rod	AA	ØB f8	BG	E max	EE BSP	G	J	PJ	RT	TG	VD	WH	Y	ZB	ZJ
25	12 18	40	24 30	8	40 **NOTE**	1/4"	45	35	54	M5x0.8	28.3	6	15	50	121	114
32	14 18 22	47	26 30 34	9	45 **NOTE**	1/4"	45	36	57	M6x1	33.2	12 6 12	25	60	137	128
40	18 22 28	59	30 34 42	12	63	3/8"	55	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"	55	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"	55	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"	65	52	93	M16x2	82.7	5 9 9	31	77	212	190
100	45 56 70	137	60 72 88	24	130	3/4"	69	55	101	M16x2	96.9	7 7 10	35	82	225	203
125	56 70 90	178	72 88 108	27	165	1"	78	71	117	M22x2.5	125.9	6 10 10	35	86	260	232
160	70 90 110	219	88 108 133	32	205	1"	86	63	130	M27x3	154.9	7	32	86	279	245
200	90 110 140	269	108 133 163	40	245	1¼"	103	80	165	M30x3.5	190.2	7	32	98	336	299

16 - OVERALL AND MOUNTING DIMENSIONS ISO **MX6**

U REAR THREADED HOLES



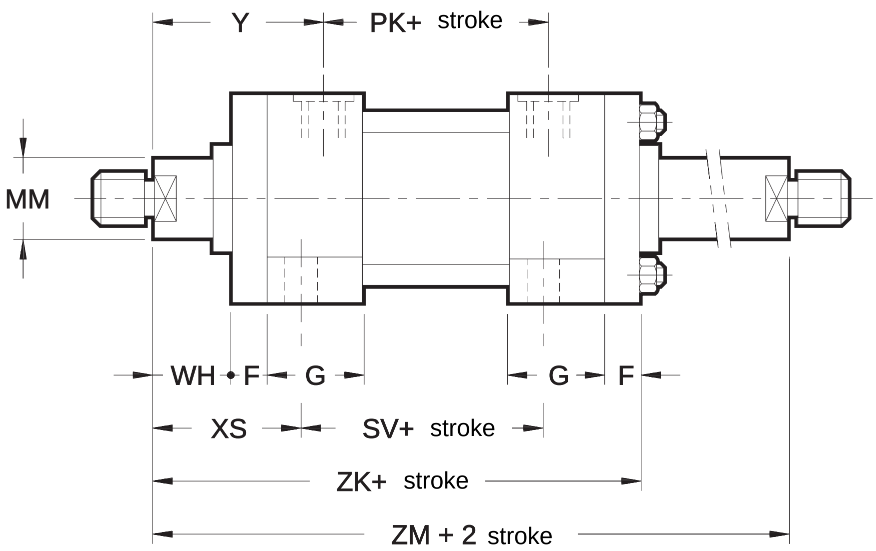
NOTE: The "E" dimension indicated in the table (bores 25 and 32) must be increased of 5 mm, only for the front end, on the oil port side (dimensions not in compliance with ISO standards).

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	6 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	116	131	35	79	86	288	253
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

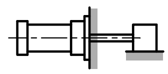
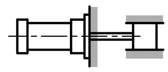
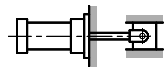
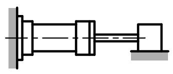
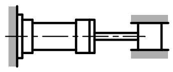
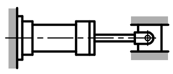
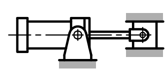
NOTE: Double rod cylinders are developed with two separate rods, fixed together by means of threading. Because of this mounting style, the rod with female threading is less resistant than the other. To simplify the identification of the more resistant rod, the **"M"** marking is stamped on its end. We recommend the use of the weaker rod for the less demanding applications.

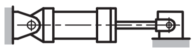
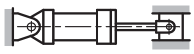
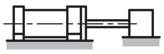
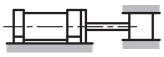
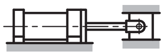
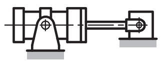
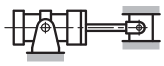
18 - ROD DIAMETER SELECTION

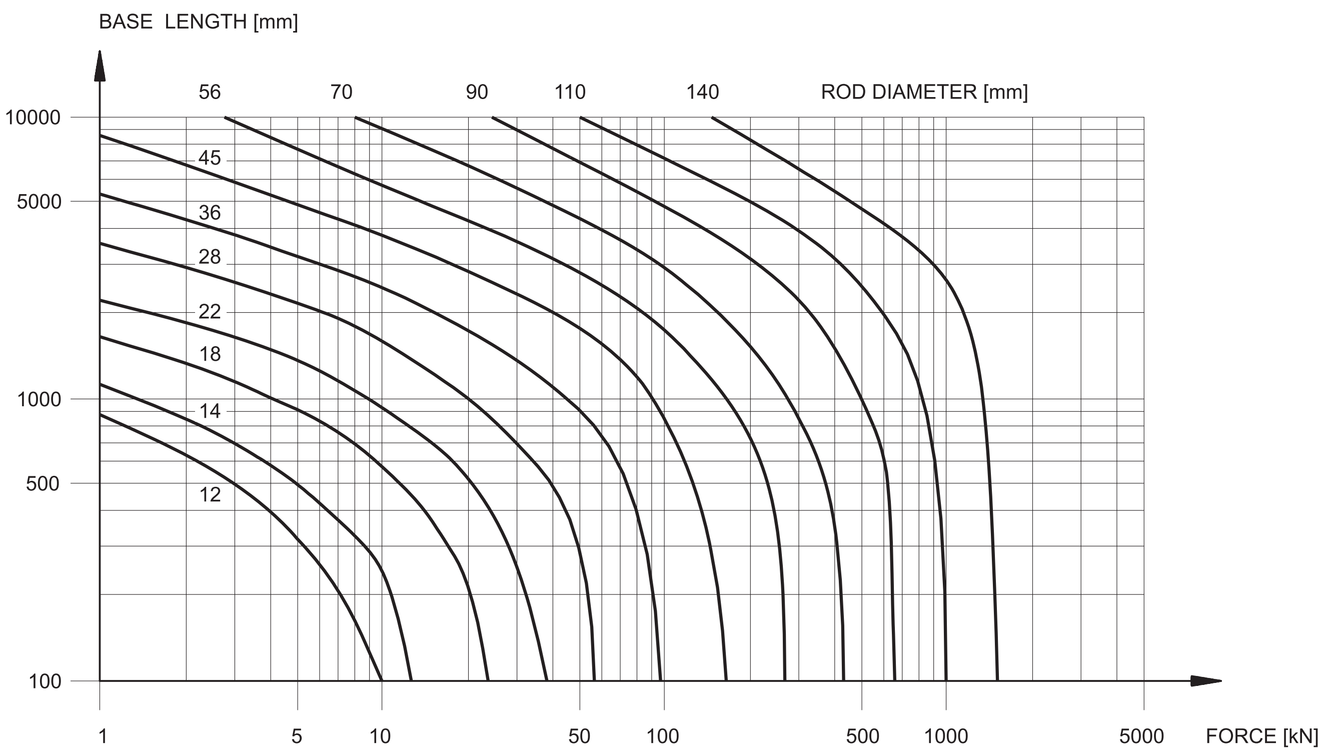
To ensure adequate stability, cylinders must be calculated for maximum compressive load according to the following simplified procedure:

- 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
$$F_s = P \times A_t$$
Pull force
$$F_t = P \times A_a$$

Fs = Force (extension) in N
Ft = Force (retraction) in N
At = Total area in mm²
Aa = Annular area in mm²
P = Pressure in MPa

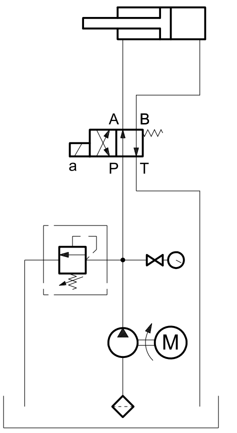
1 bar = 0.1 MPa
1 kgf = 9.81 N

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) $V = \dfrac{Q \times 1000}{A_t \times 60}$

Velocity (retraction) $V = \dfrac{Q \times 1000}{A_a \times 60}$

Force (extension) $F = P \times A_t$

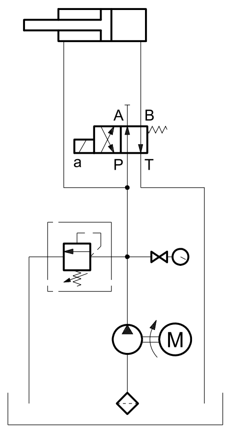
Force (retraction) $F = P \times A_a$

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) $V = \dfrac{Q \times 1000}{A_s \times 60}$

Velocity (retraction) $V = \dfrac{Q \times 1000}{A_a \times 60}$

Force (extension) $F = P \times A_s$

Force (retraction) $F = P \times A_a$

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:

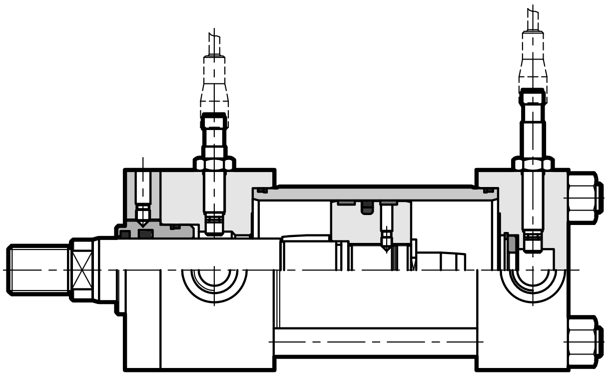
$$Q_d = \frac{V \times A_t \times 60}{1000}$$

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	1.2	1.3	1.4	1.4	1.4	1.5	0.04
	18	1.2	1.3	1.4	1.4	1.4	1.5	0.06
32	14	1.6	1.8	1.9	1.9	1.7	1.9	0.06
	18	1.6	1.8	1.9	1.9	1.7	1.9	0.07
	22	1.7	1.8	1.9	1.9	1.7	1.9	0.08
40	18	3.7	3.9	4.6	4.2	3.9	4.6	0.1
	22	3.7	3.9	4.6	4.2	3.9	4.6	0.11
	28	3.8	4	4.7	4.3	4	4.7	0.12
50	22	5.9	6.4	7.1	7.1	6.3	7.9	0.14
	28	6	6.5	7.2	7.2	6.4	8	0.17
	36	6.1	6.6	7.3	7.3	6.5	8.1	0.18
63	28	8.5	9.7	10	10.1	8.8	10.5	0.19
	36	8.6	9.8	10.1	10.3	8.9	10.6	0.22
	45	8.7	9.9	10.2	10.4	9.1	10.7	0.26
80	36	16	17.2	18.8	19.5	16.6	19	0.27
	45	16.2	17.4	19	19.6	16.7	20	0.32
	56	16.3	17.6	19.1	19.8	16.9	22	0.39
100	45	22	23	25	28.1	22.8	26	0.4
	56	22.5	24	25.5	28.5	23.1	27	0.48
	70	23	25	26	29	23.4	28	0.58
125	56	41.5	44	47.5	53	42.5	48	0.65
	70	42.5	44.5	48	54	43	49	0.76
	90	44	45	49	55	44	50	0.96
160	70	69	72	79	89.5	71	84	1
	90	70	73	80	91	72	85	1.2
	110	71	74	81	92	72.5	86	1.4
200	90	122	128.5	137	157	127	152	1.6
	110	123	129.5	139	158	128.5	153	1.8
	140	124	131	140	159	129.5	155	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

K = Explosion-proof version according to ATEX 94/9/CE (paragraph 3). Omit if not required.

H	C		2		-	F	P			-	

For the remaining part of the code refer to paragraph 2, starting from the de“nition of bore/rod

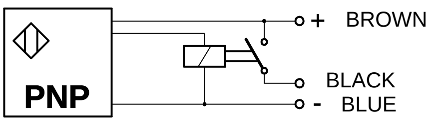
Pos. proximity sensor of the rear end (**1-4**) (see par. 1.4)
0 = without rear proximity sensor

Mounting style (see par. 2)

Pos. proximity sensor of the front end (**1-4**) (see par. 1.4)
0 = without front proximity sensor

End-stroke proximity sensor

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 CEI EN 60529 (atmospheric ag.)		IP68
Piston position LED (**NOTE**)		NO (it•s on the connector)

22.3 - 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 mm² - 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

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 zoneŽ 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 par. 22), rather than magnetic sensors.

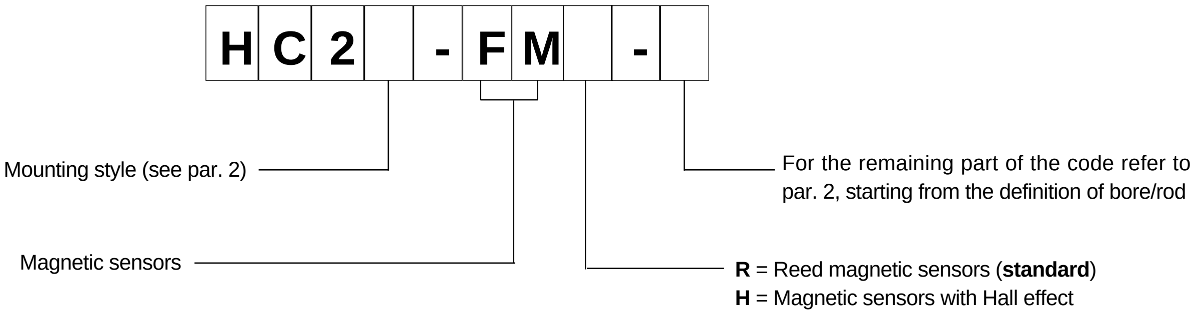
Magnetic sensors are available for bores Ø25 to Ø125 included. For cylinders with strokes under 80 mm and for cylinders with mid swinging mounting type, we recommend to consult our technical office, because, in some applications, magnetization problems of cylinder parts could happen, affecting the correct functioning of the system. Moreover we recommend to use these cylinders with operating pressure lower than 160 bar (peak free) and not to use them as mechanical stop; for this reason, consider a stroke of 15÷20 mm more than necessary.

Cylinders are supplied with 2 magnetic sensors, already mounted on tie rods, which can be of two types:

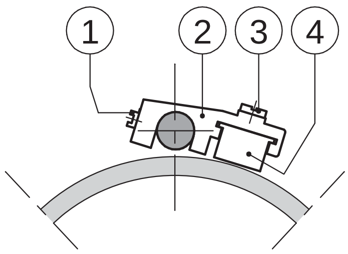
Reed magnetic sensors (**standard**): they are sensors with normally open contact, which commute exploiting the magnetic field generated by the plastoferrite ring inserted in the piston. They have a long electric life and a switching power which allows to control voltage loads directly.

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

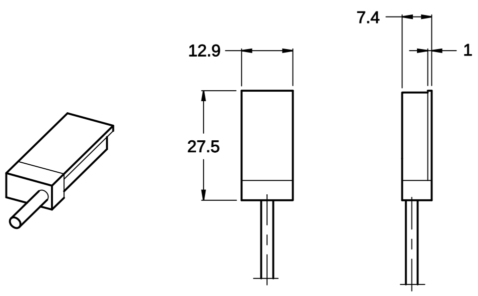


23.2 - Mounting and overall dimensions

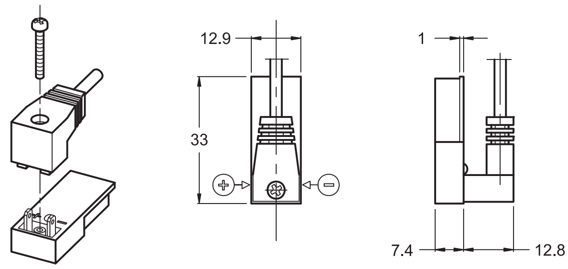


1	Bracket fastening screw
2	Socket for fastening to the tie rod
3	Bracket for fastening to the tie rod
4	Sensor fastening screw
5	Magnetic sensor

Reed sensors for Ø 25 and Ø 32 bore and sensors with Hall effect



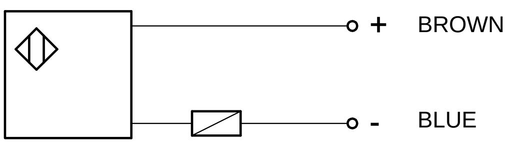
Reed sensors for Ø 40 ÷ Ø 125 bore



23.3 - Technical Characteristics And Electrical Connection

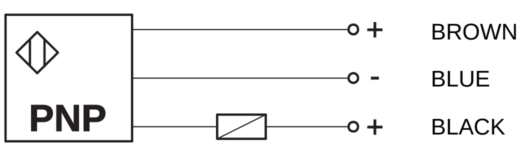
Reed sensors (FMR)

		Reed sensor without connector (for 25 and 32 bore)	Reed sensor with connector (for 40, 50, 63, 80, 100 and 125 bore)
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



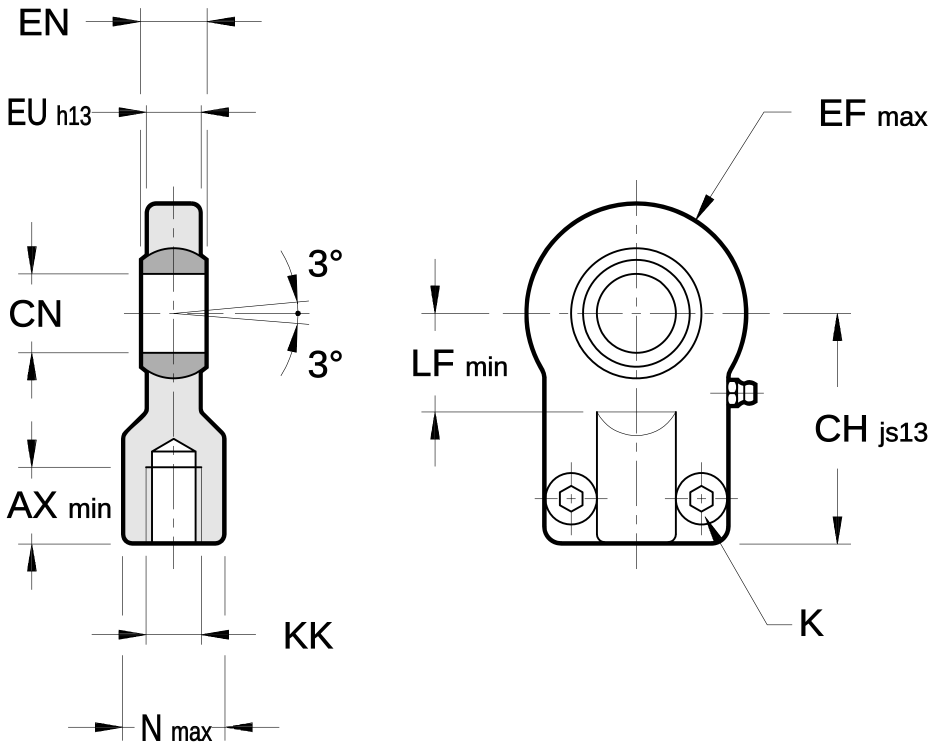
Hall effect sensors (FMH)

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 / DIN24555

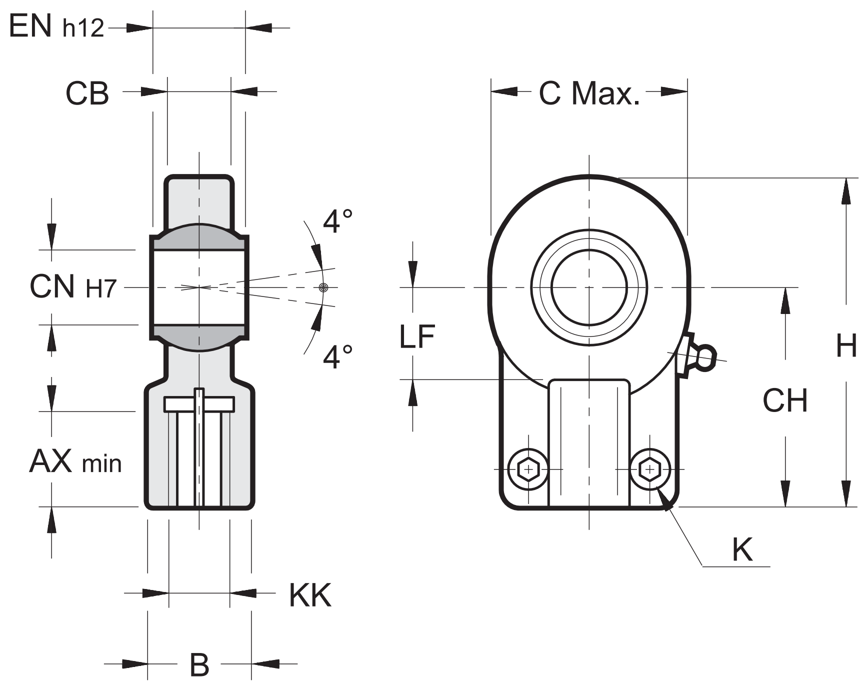


Dimensions in mm

Type	Ø cylinder rod		AX	CH	Ø CN	EF	EN	EU	KK	LF	N	K bolt	Torque	Max load	Mass
	standard thread	light thread	min	js13		max		h13		min	max	UNI 5931	Nm	kN	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

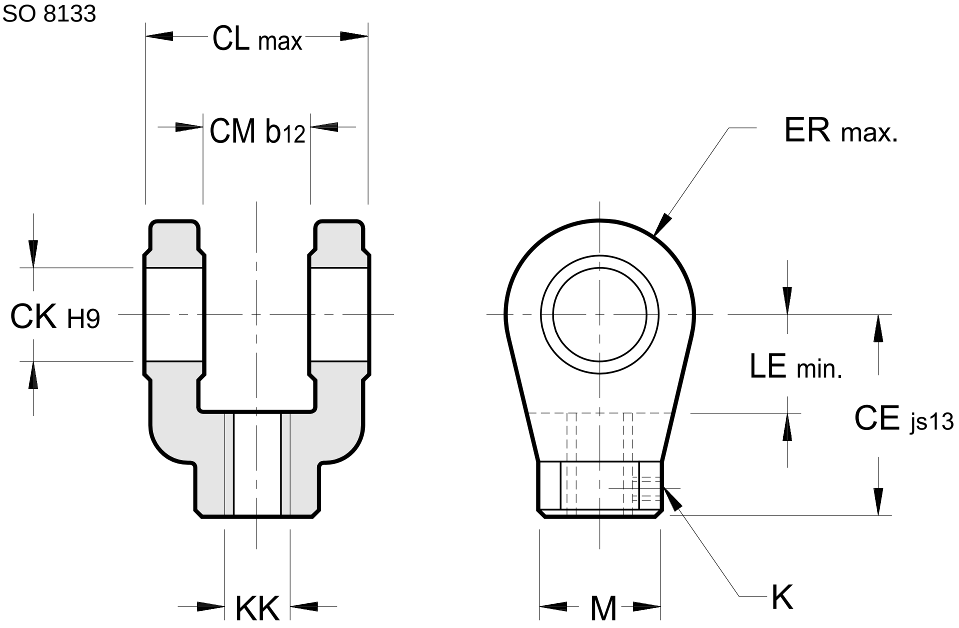


Dimensions in mm

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

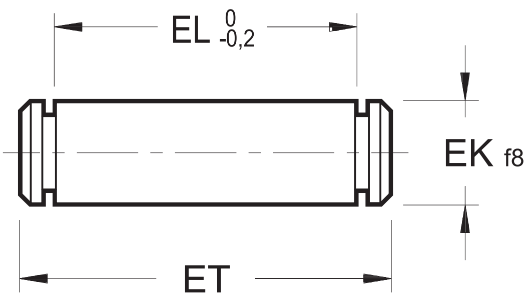


Dimensions in mm

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

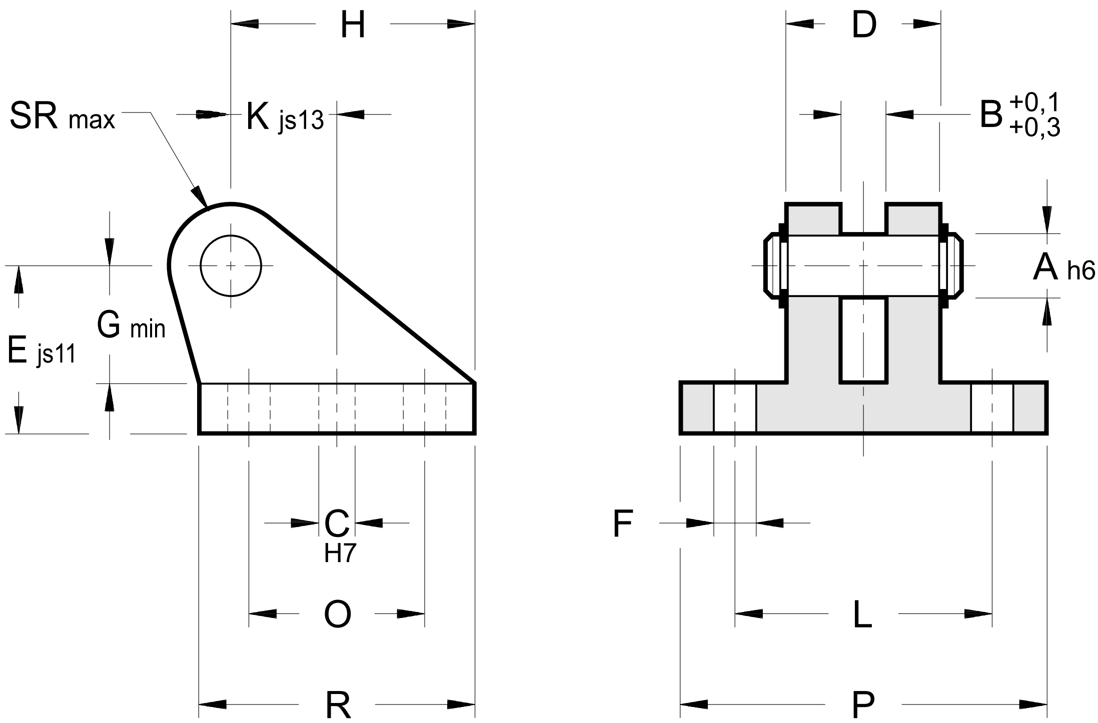


Dimensions in mm

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)

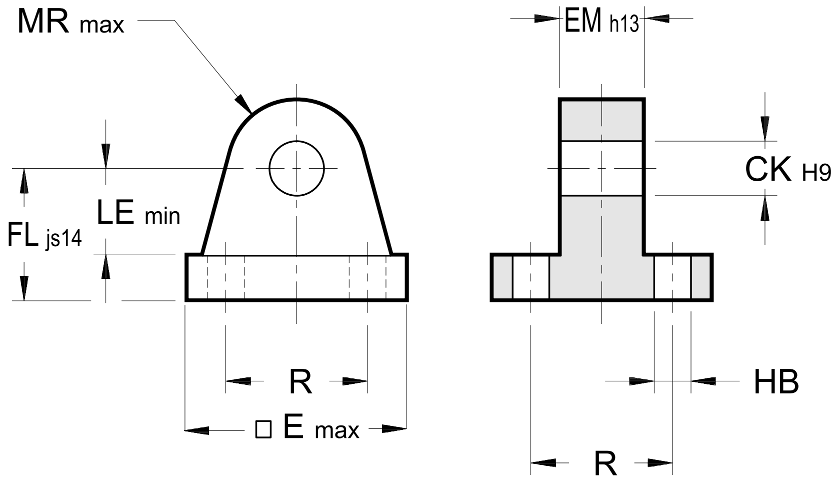


Dimensions in mm

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	32.2	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

S	K	/	H	C	2	-		/		/		-		/	20

- Seal kit
- Bore (mm)
- Rod (mm)
- Double rod (omit if not required)
- Seals: **K** = standard (nitrile + polyurethane)
  M = low friction (nitrile + PTFE)
  V = high temperature (viton + PTFE)
- Series no. indicated on cylinder

NOTE: the seal kit includes all the seals of a cylinder with cushionings.

DUPLOMATIC OLEODINAMICA

DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

HC3

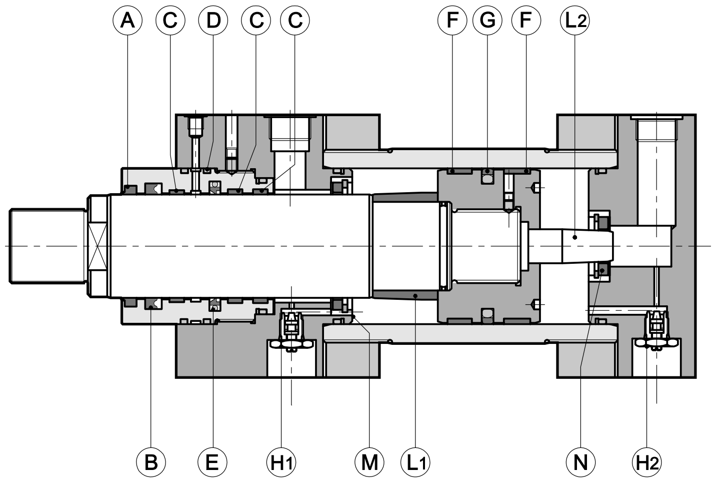
HYDRAULIC CYLINDERS

HCK3

HYDRAULIC CYLINDERS
ATEX 94/9/CE
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 94/9/CE 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.

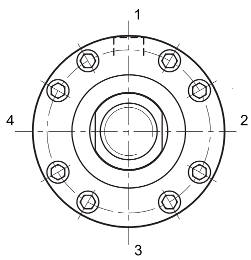
Connections which are oversized compared to those shown in the dimensional tables are available upon request. For further information and for the order identification code, please consult our technical office.

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.

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 glycole	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 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: 1/8Ž BSP for bore up to Ø 100 included - 1/4Ž 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 40 . The rod is chromed.

2 - IDENTIFICATION CODE

K = Explosion-proof version according to ATEX 94/9/CE (paragraph 3). Omit if not required.

HC		3		-	/		/		-		-			-		-	/		-		/		/	10

Series (indicate for spare parts requests)

Dimension XV for •LŽ 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)

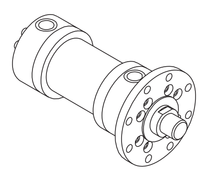
Stroke (mm) - For cylinders with spacers indicate the working stroke.

Double rod threading (omit if not required).
See single rod for dimensions

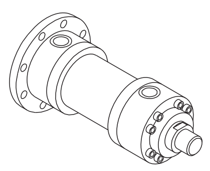
Double rod (omit if not required)
See single rod for dimensions. Not available with mounting style B - D - F.

Rod threading: Male thread (**standard**)
W = Female thread (see par. 4)

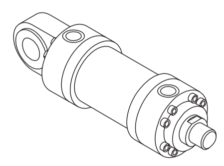
MOUNTING STYLE



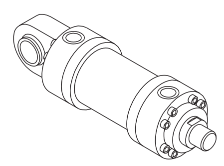
A= Front flange (MF3)



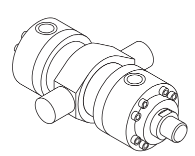
B= Rear flange (MF4)



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 94/9/CE RATED VERSION

ATEX 94/9/CE 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:

Ex II 2GD ck IIC T4 (-20°C Ta +80°C)

EX: Specific marking of explosion protection as ATEX 94/9/CE 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:

Ex II 3GD ck IIC T4 (-20°C Ta +80°C)

EX: Specific marking of explosion protection as ATEX 94/9/CE 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

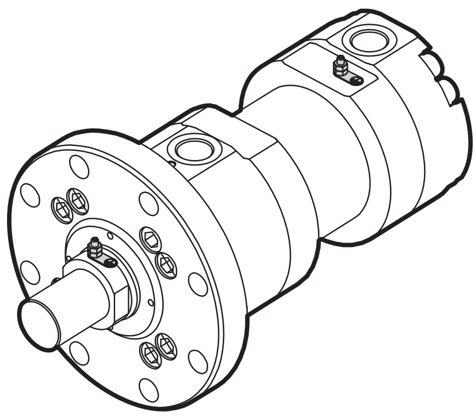
The maximum permissible speed is 0.5 m/s for standard cylinder seals (K) and 1 m/s for actuators with low friction seals (M) or Viton (V).

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).

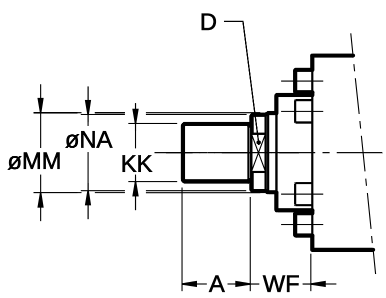


The bottom grounding point must always be connected whereas the connection of the rod grounding point can be avoided in case the whole mechanical stroke is covered during the cylinder operating phase (from the mechanical stop on the cylinder head to the mechanical stop on the bottom), or in case the rod has already been grounded through the mechanical connection between the rod itself and the machine/plan it is installed on.

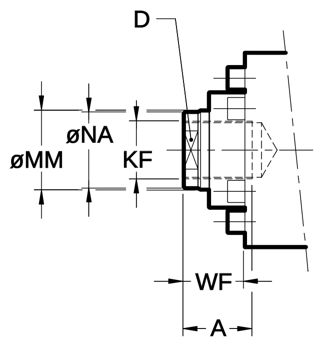
In order to verify such a condition it is necessary to test the equipotentiality of the parts and a maximum resistance equal to 100 as per the EN13463-1 norm.

4 - OVERALL AND MOUNTING DIMENSIONS

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.

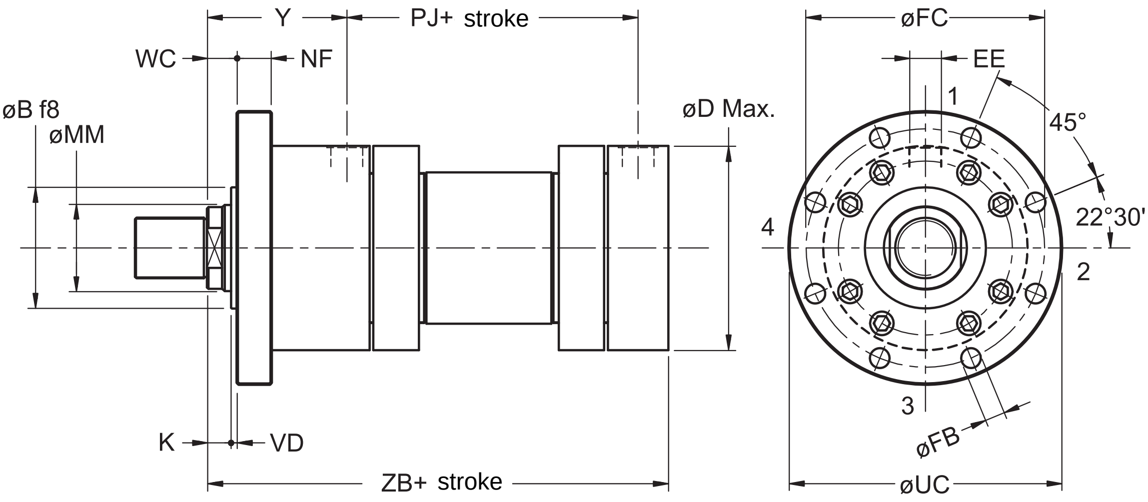
dimensions in mm

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



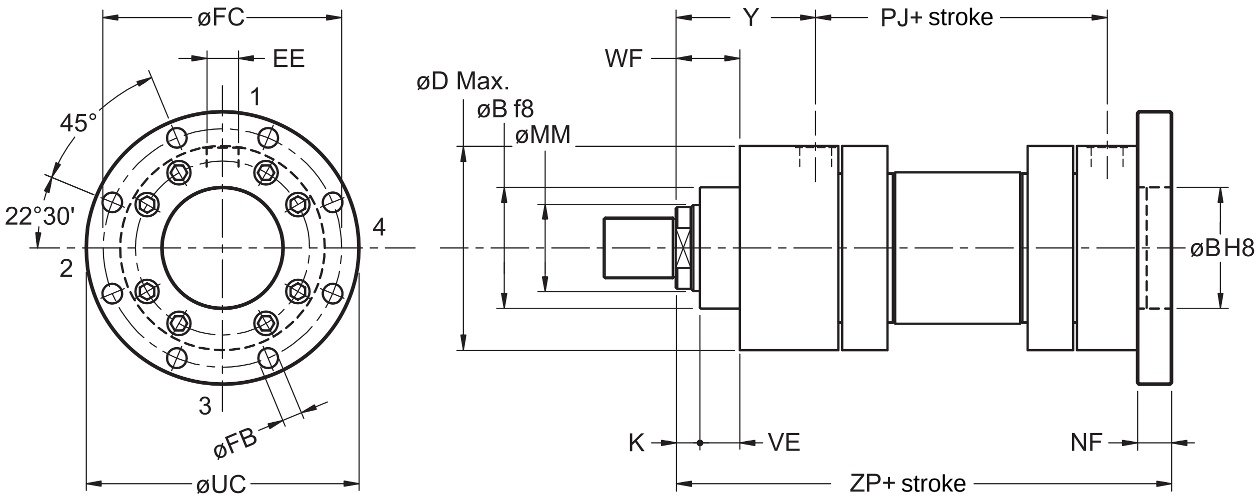
NOTE: Ø 400 bore has 12 equally spaced Ø FB holes in the mounting flange

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	355	800	10	63	310	775

6 - OVERALL AND MOUNTING DIMENSIONS ISO MF4

B BACK FLANGE

dimensions in mm



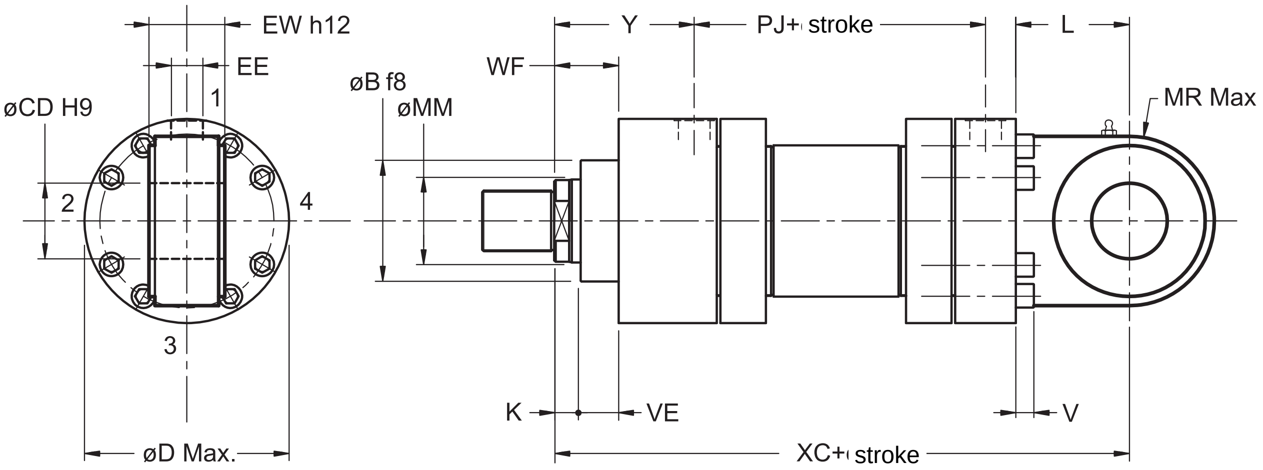
NOTE: Ø 400 bore has 12 equally spaced ØFB holes in the mounting flange

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	355	800	110	163	310	855

7 - OVERALL AND MOUNTING DIMENSIONS ISO **MP3**

D MALE CLEVIS
(with bushing)

dimensions in mm

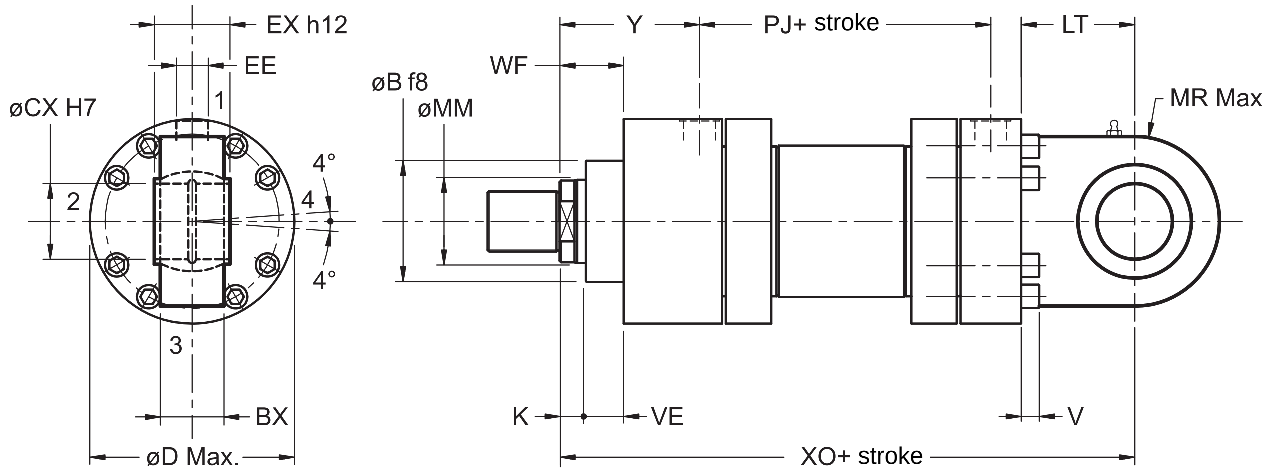


Bore	MM Ø rod	Ø B f8	Ø CD H9	Ø D max	EE BSP	EW h12	K	L	MR max	PJ	V	VE	WF	XC	Y
50	32 36	63	32	105	1/2”	32	18	61	35	120	8	29	47	305	98
63	40 45	75	40	122	3/4”	40	21	74	50	133	10	32	53	348	112
80	50 56	90	50	145	3/4”	50	24	90	61.5	155	12	36	60	395	120
100	63 70	110	63	175	1”	63	27	102	72.5	171	16	41	68	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	355	42	110	163	1075	310

8 - OVERALL AND MOUNTING DIMENSIONS ISO MP5

F SPHERIC SWIVEL

dimensions in mm

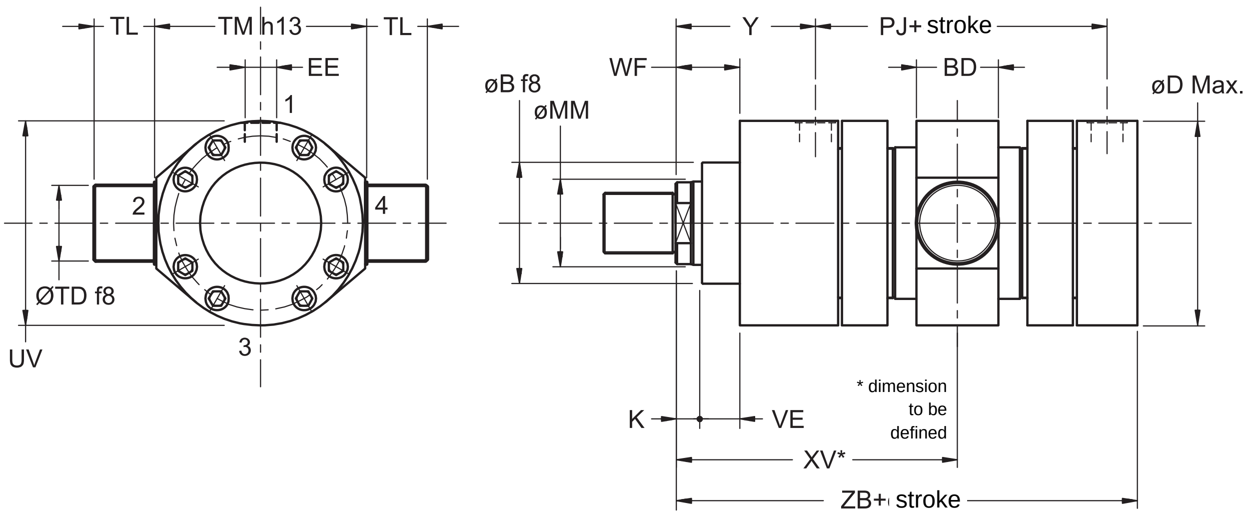


Bore	MM Ø rod	ØB f8	BX	ØCX H7	ØD max	EE BSP	EX h12	K	LT	MS max	PJ	V	VE	WF	XO	Y
50	32 36	63	27	32	105	1/2”	32	18	61	40	120	8	29	47	305	98
63	40 45	75	35	40	122	3/4”	40	21	74	50	133	10	32	53	348	112
80	50 56	90	40	50	145	3/4”	50	24	90	63	155	12	36	60	395	120
100	63 70	110	50	63	175	1”	63	27	102	71	171	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	355	42	110	163	1075	310

9 - OVERALL AND MOUNTING DIMENSIONS ISO **MT4**

L MID SWINGING

dimensions in mm

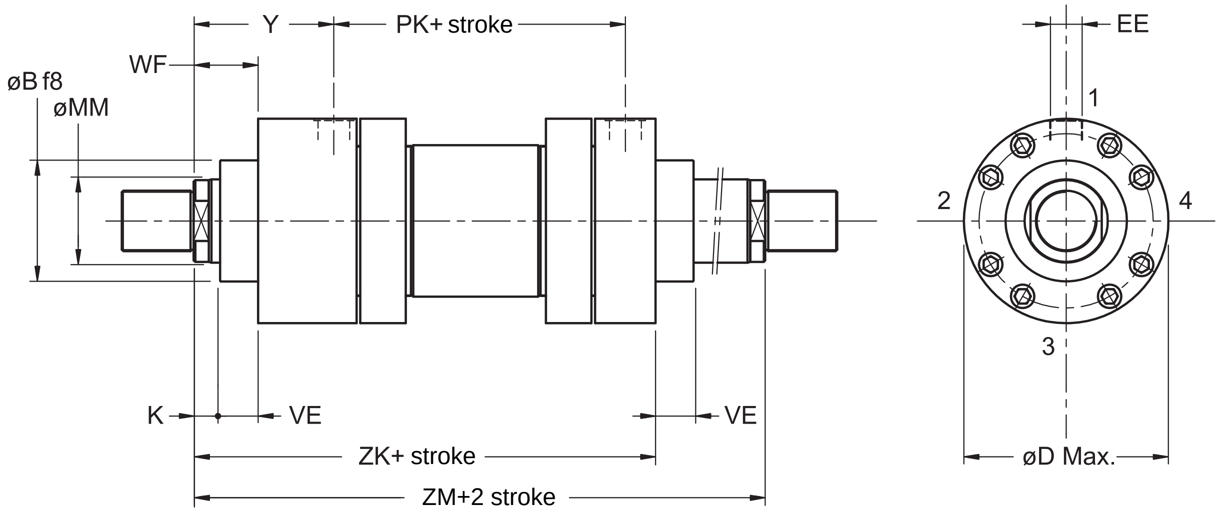


Bore	MM Ø rod	ØB f8	BD	CORSA mm	ØD max	EE BSP	K	PJ	ØTD f8	TL	TM h13	ØUV	VE	WF	XV min	XV max + stroke	Y	ZB
50	32 36	63	38	45	105	1/2”	18	120	32	25	112	105	29	47	180	144	98	244
63	40 45	75	48	45	122	3/4”	21	133	40	32	125	122	32	53	195	160	112	274
80	50 56	90	58	60	145	3/4”	24	155	50	40	150	145	36	60	220	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	355	250	200	630	628	110	163	675	340	310	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”	355	110	163	310	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**Ž marking is stamped on its end.

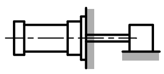
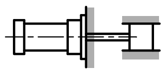
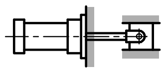
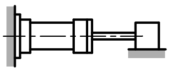
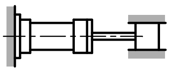
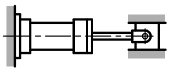
We recommend the use of the weaker rod for the less demanding applications.

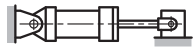
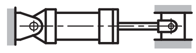
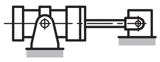
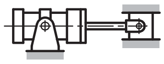
11 - ROD DIAMETER SELECTION

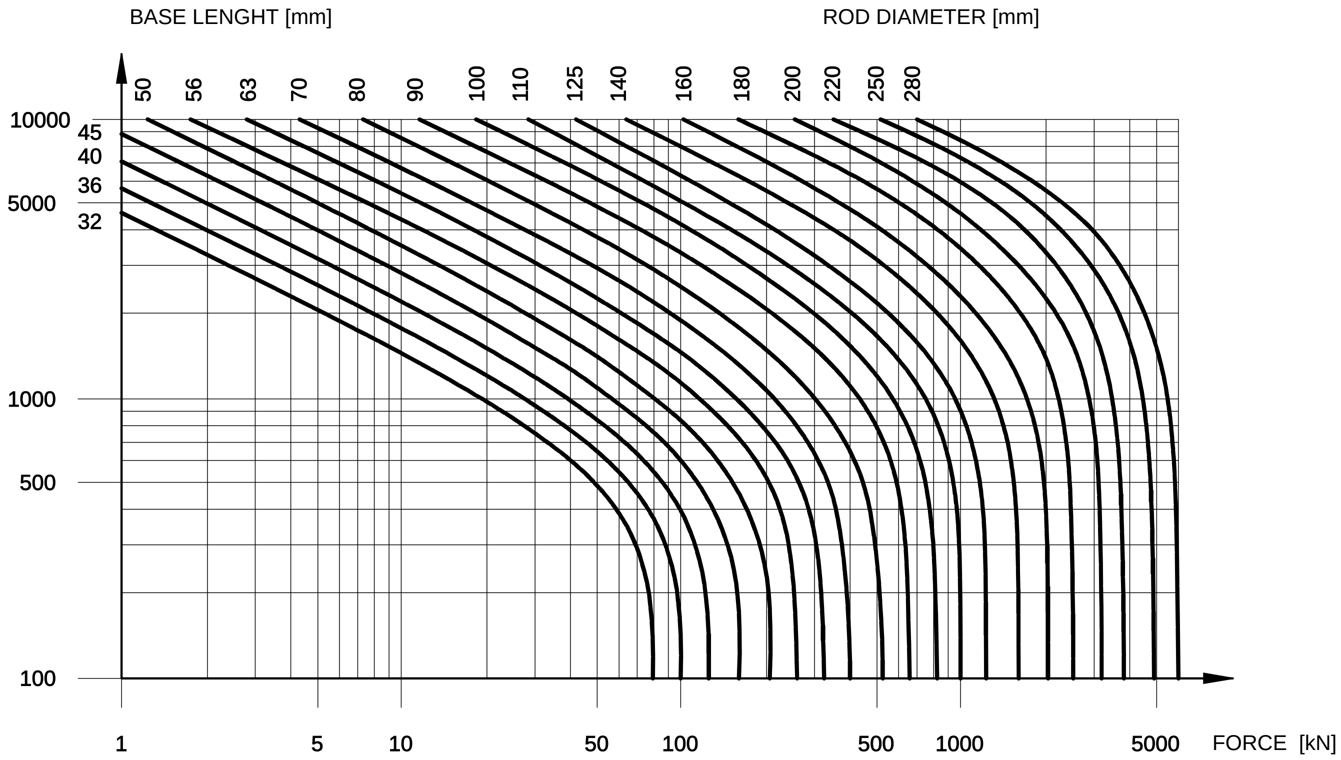
To ensure adequate stability, cylinders must be calculated for maximum compressive load according to the following simplified procedure:

- 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

$$F_s = P \cdot A_t$$

Pull force

$$F_t = P \cdot A_a$$

Bore mm	Ø rod mm	Total area mm^2	Annular area mm^2
50	32	1964	1159
	36		946
63	40	3117	1861
	45		1527
80	50	5027	3063
	56		2564
100	63	7854	4737
	70		4006
125	80	12272	7245
	90		5910
140	90	15394	9032
	100		7540
160	100	20106	12252
	110		10603
180	110	25447	15943
	125		13175
200	125	31416	19144
	140		16022
250	160	49087	28981
	180		23640
320	200	80425	49009
	220		42412
400	250	125664	76576
	280		64089

Fs = Force (extension) in N
Ft = Force (retraction) in N
At = Total area in mm^2
Aa = Annular area in mm^2
P = Pressure in MPa

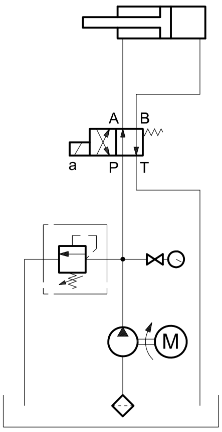
1 bar = 0.1 MPa
1 kgf = 9.81 N

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) $V = \dfrac{Q \cdot 1000}{At \cdot 60}$

Velocity (retraction) $V = \dfrac{Q \cdot 1000}{Aa \cdot 60}$

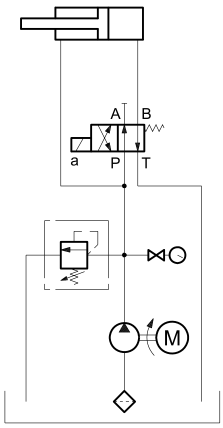
Force (extension) $F = P \cdot At$

Force (retraction) $F = P \cdot Aa$

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) $V = \dfrac{Q \cdot 1000}{As \cdot 60}$

Velocity (retraction) $V = \dfrac{Q \cdot 1000}{Aa \cdot 60}$

Force (extension) $F = P \cdot As$

Force (retraction) $F = P \cdot Aa$

V = Velocity in m/s
Q = Flow rate in l/min
At = Total area (piston bore) in mm^2
Aa = Annular area (At - As) in mm^2
F = Force in N
P = Pressure in MPa
As = Rod area (At - Aa) in mm^2
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

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 Mounting style A -B	 D - F	 L	Mass for 10 mm stroke
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

S K / H C 3 - ☐ / ☐ / ☐ - ☐ / 10

Seal kit (SK)

Bore (mm)

Rod (mm)

Double rod (omit if not required)

Seals:
K = standard (nitrile + polyurethane)
M = low friction (nitrile + PTFE)
V = high temperature (viton + PTFE)

Series no. indicated on cylinder (10)

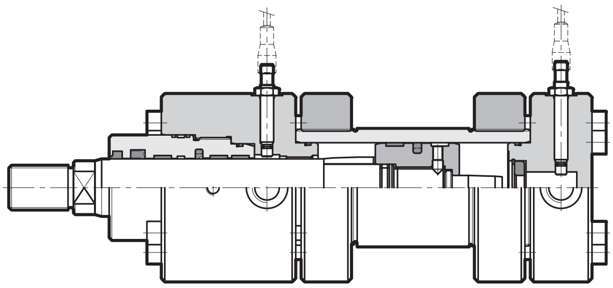
NOTE: the seal kit includes all the seals of a full-options cylinder (cushionings and external drain).

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

K = Explosion-proof version according to ATEX 94/9/CE (paragraph 3). Omit if not required.

H	C		3		-	F	P			-	

For the remaining part of the code refer to paragraph 2, starting from the de“nition of bore/rod

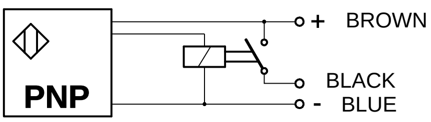
Pos. proximity sensor of the rear end (**1-4**) (see par. 1.4)
0 = without rear proximity sensor

Mounting style (see par. 2)

Pos. proximity sensor of the front end (**1-4**) (see par. 1.4)
0 = without front proximity sensor

End-stroke proximity sensor

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 CEI 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 mm² - length 5 mt.
Cable material: polyurethane resin (oil resistant)

The connector has two LEDs, one green and one yellow.

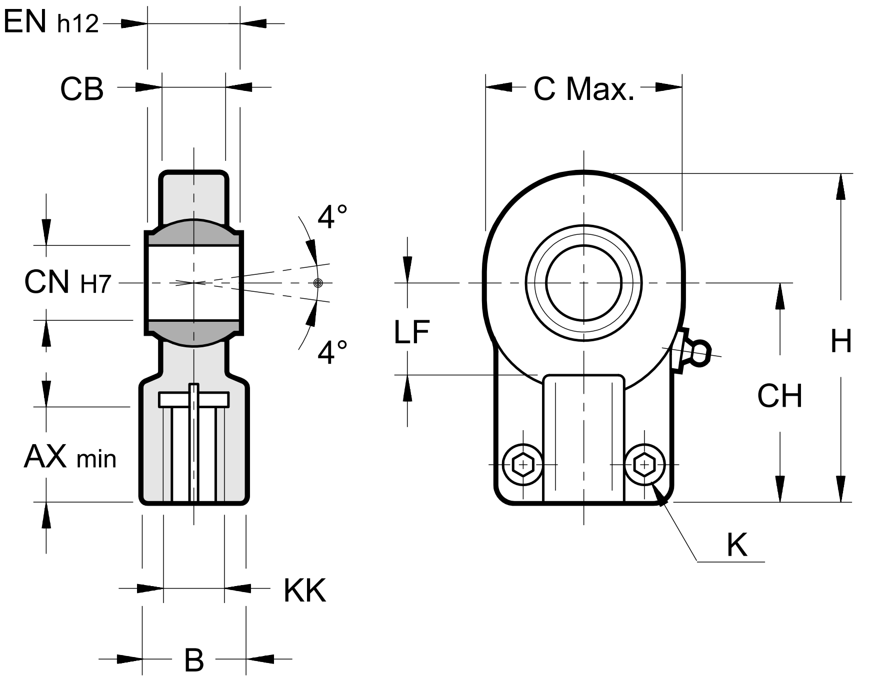
GREEN: Connector power supply.
The LED burn when the connector is supplied.

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

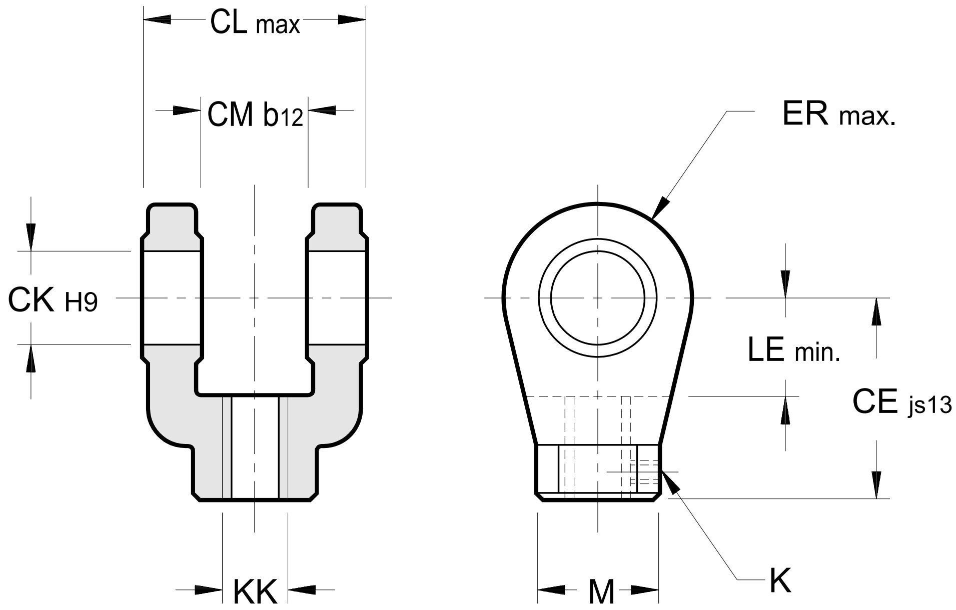
Dimensions in mm



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



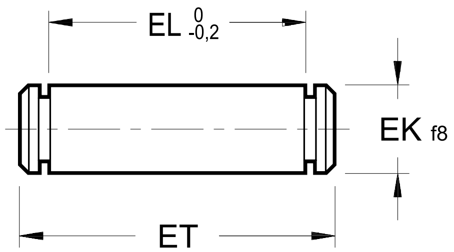
Dimensions in mm

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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DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

CRE

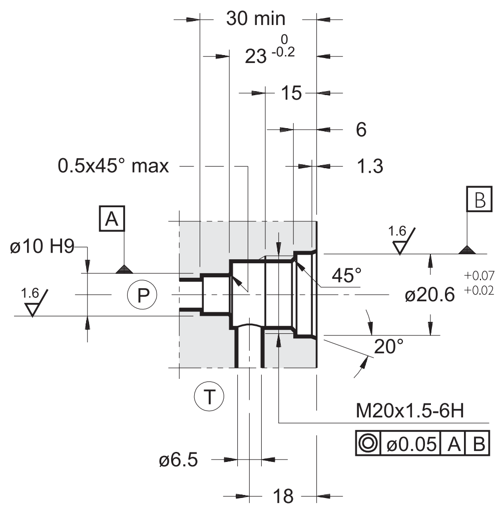
DIRECT OPERATED PRESSURE CONTROL VALVE WITH ELECTRIC PROPORTIONAL CONTROL

SERIES 20

CARTRIDGE TYPE

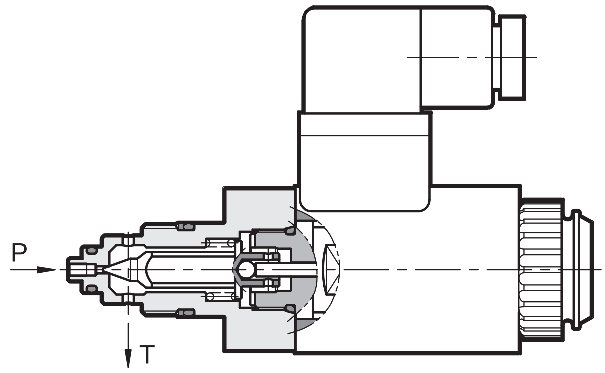
p max **350** bar
Q max **1,5** l/min

SEAT DIMENSIONS: D-10A



NOTE: Provide seat for optional restrictor in T line

OPERATING PRINCIPLE



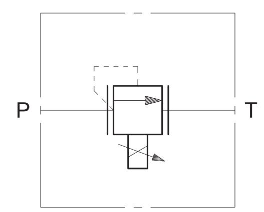
- The CRE valve is a direct operated pressure control valve with electric proportional control with cartridge execution which can be used in blocks and panels with type D-10A seat.
- The valve is suitable as a pilot stage for remote control of two stage pressure control and reducing valves.
- Pressure adjustment can be continuous in proportion to the current supplied to the solenoid.
- The valve can be controlled directly by a current control power supply unit or by means of the relative electronic control units to exploit valve performance to the full (see paragraph 8).
- The valve is available in three pressure control ranges up to 250 bar.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control cards)

Maximum operating pressure: - P port - T port	bar	 350 2
Minimum controlled pressure	see p-Q diagram	
Nominal flow Maximum flow	l/min	0,5 1,5
Step response	see paragraph 5	
Hysteresis (with PWM 200 Hz)	% of p nom	< 5%
Repeatability	% of p nom	< ±1,5%
Electrical characteristic	see paragraph 4	
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	
Recommended viscosity	cSt	25
Mass:	kg	0,54

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

C	R	E	-		/	20		-		K1

Pressure control valve cartridge type

Electrical proportional control

Pressure control range
070 = up to 70 bar
140 = up to 140 bar
250 = up to 250 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 12 VCC
D24 = Nominal solenoid voltage 24 VCC

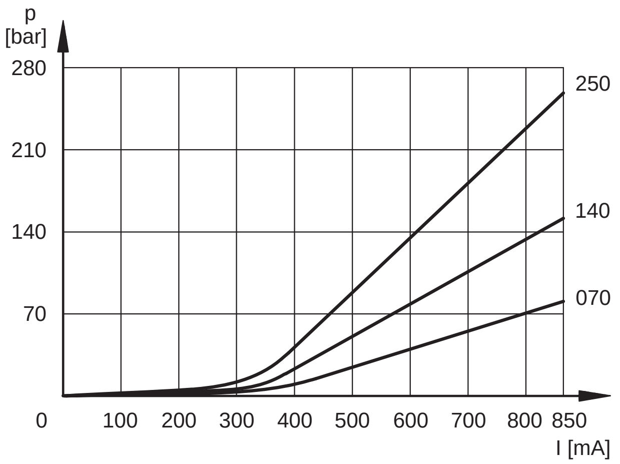
Coil electrical connection: plug for connector type DIN 43650 (**standard**)

2 - CHARACTERISTIC CURVES (measured with viscosity of 36 cSt at 50°C)

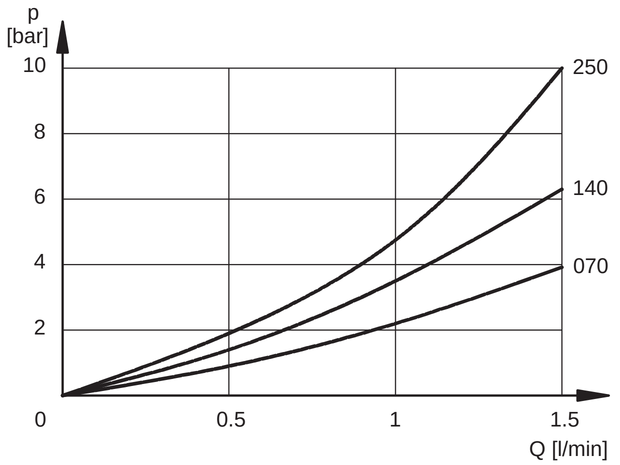
Typical control curves according to the current supplied to the solenoid, measured with input flow rate Q=0,5 l/min.

The curves are obtained without any hysteresis and linearity compensation and they are measured without any backpressure in T.

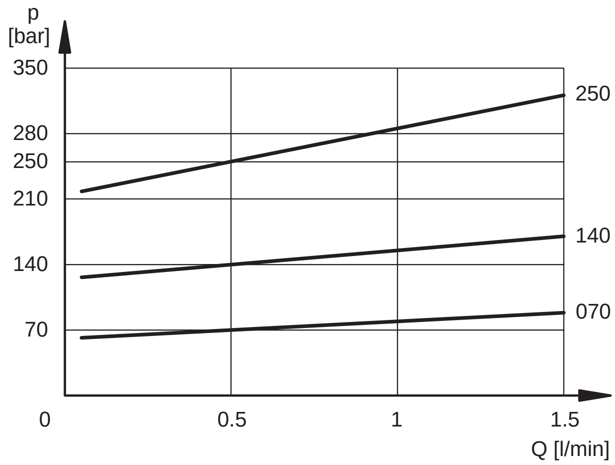
PRESSURE CONTROL p = f (I)



MINIMUM CONTROLLED PRESSURE p min = f (Q)



PRESSURE VARIATION p max = 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 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)		3.66	16.6
MAXIMUM CURRENT	A	1.9	0.85
DUTY CYCLE		100%	
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2004/108/CEE		
CLASS OF PROTECTION: Atmospheric agents (CEI EN 60529)	IP 65		

5 - 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 step response times measured with a valve of pressure range up to 140 bar and with input flow rate Q = 0,5 l/min.

REFERENCE SIGNAL STEP	0 100%	100 0%
Step response [ms]	80	40

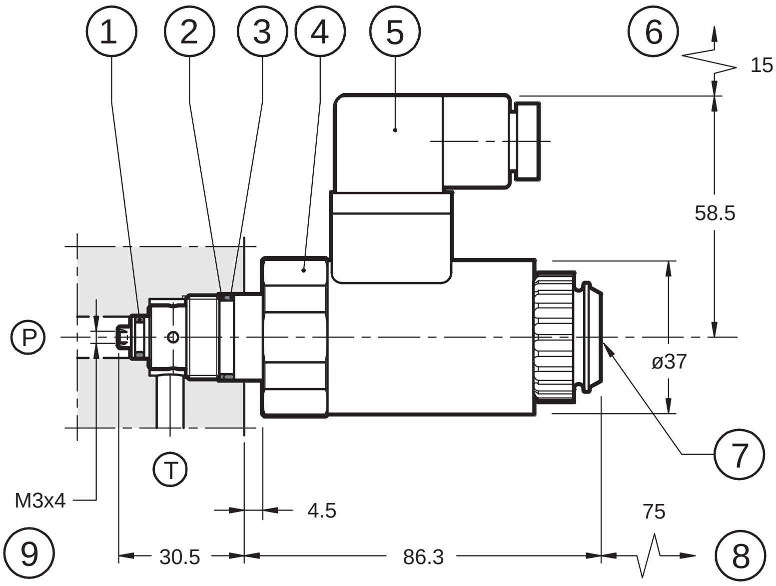
6 - INSTALLATION

We recommend to install the CRE 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 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 (see par. 7). 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.

7 - OVERALL AND MOUNTING DIMENSIONS



dimensions in mm

1	OR type 2025 (6.07x1.78)
2	PARBAK type 8-017 (18.01x1.14x1.35)
3	OR type 2068 (17.17x1.78)
4	Hex: spanner 36, torque 45 ÷ 50 Nm
5	DIN 43650 electric connector
6	Connector removal space
7	Breather (male hexagonal spanner 4)
8	Coil removal space
9	Seat for optional calibrated flow restrictor

NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (7) placed at the end of the solenoid tube.

* The measurement 4,5 mm can be reduced to 0,5 mm by increasing the axial dimensions of the D-10A, seat by 4 mm.

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. 89 250
EDM-M142	for solenoid 12V DC		
UEIK-11	for solenoid 24V DC	Eurocard type	see cat. 89 300

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PRED3

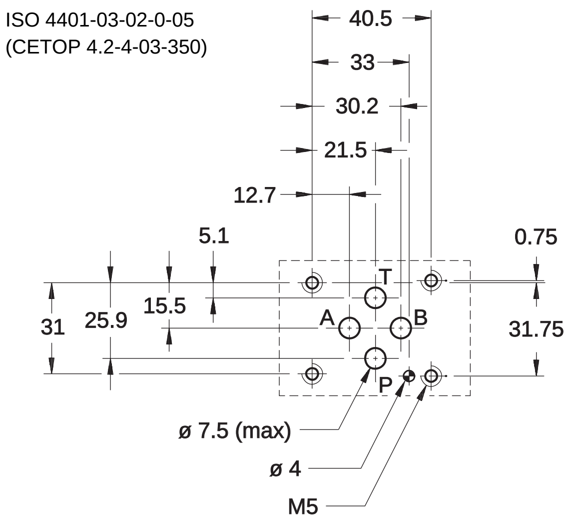
DIRECT OPERATED PRESSURE CONTROL VALVE WITH ELECTRIC PROPORTIONAL CONTROL

SERIES 10

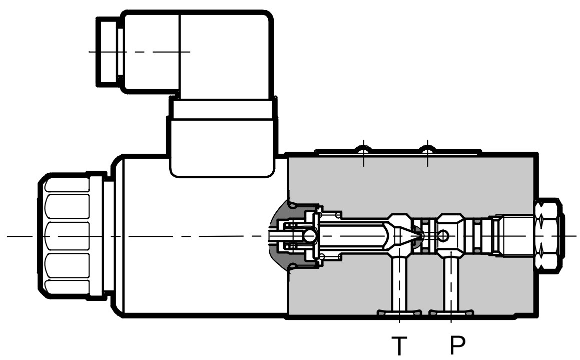
SUBPLATE MOUNTING
ISO 4401-03 (CETOP 03)

p max **350** bar
Q max **5** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



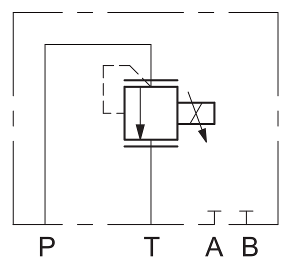
- The PRED3 valve is a direct operated pressure control valve with electric proportional control and mounting interface in compliance with ISO 4401 (CETOP RP 121H) standards.
- It is suitable to pilot two-stage valves, or for pressure control in hydraulic circuits.
- Pressure can be modulated continuously 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. 8).
- The valve is available in four pressure control ranges up to 350 bar.

PERFORMANCES

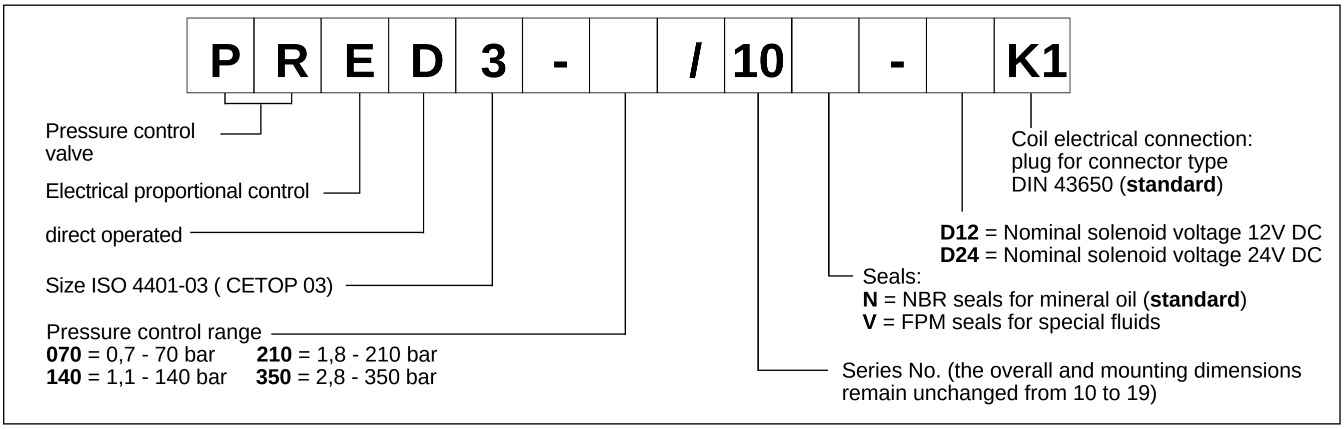
(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control cards)

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 5
Step response	see paragraph 5	
Hysteresis (with PWM 200 Hz)	% of p nom	< 5%
Repeatability	% of p nom	< ±1,5%
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	1,4

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

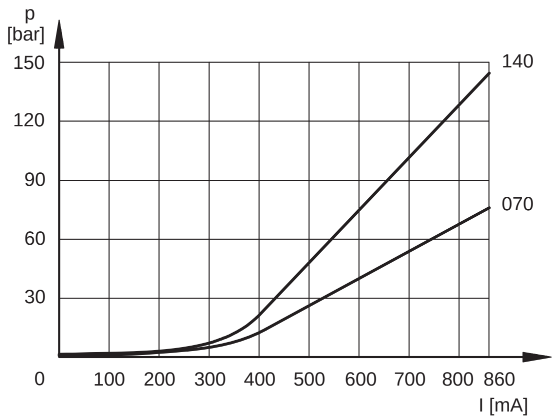


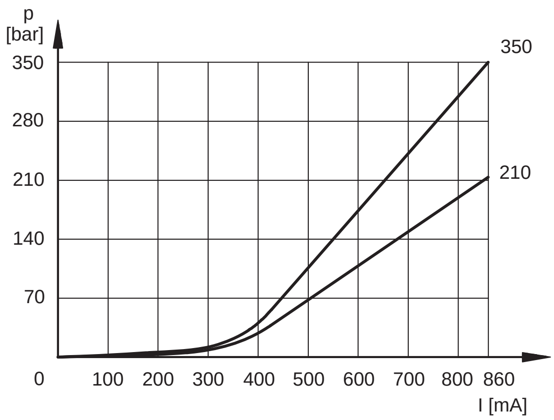
2 - CHARACTERISTIC CURVES (measured with viscosity of 36 cSt at 50°C)

Typical control curves according to the current supplied to the solenoid for pressure control ranges: 070, 140, 210, 350, measured with input flow rate Q =1 l/min.

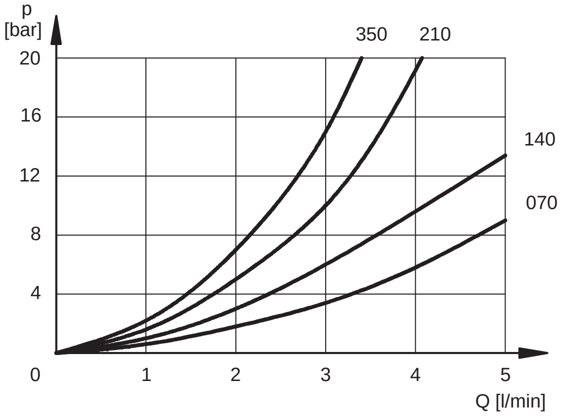
The curves are obtained without any hysteresis and linearity compensation and they are measured without any backpressure in T. The full scale pressure is set in factory with a flow rate of 1 l/min. In case of higher flow rate, the full scale pressure will increase considerably (see diagram pmax = f (Q)).

PRESSURE CONTROL p = f(I)

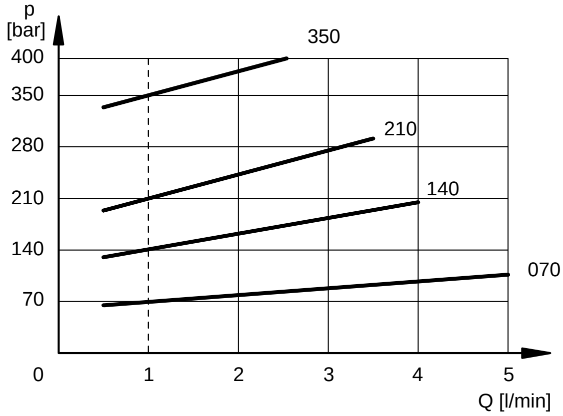




MINIMUM CONTROLLED PRESSURE p min = f (Q)



PRESSURE VARIATION p max = f (Q)



Q = 1 lt/min
factory setting

3 - 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 - 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)		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		

5 - 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 step response times measured with a valve of pressure range up to 140 bar and with an input flow rate of Q = 2 l/min.

REFERENCE SIGNAL STEP	0 100%	100 0%
Step response [ms]	80	40

6 - INSTALLATION

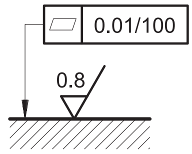
We recommend to install the PRED3 valve either in horizontal position, or vertical position with the solenoid downward. If the valve is installed in vertical position and with the solenoid upward, you must consider possible variations of the minimum controlled pressure, if compared to what is indicated in paragraph 2.

Ensure that there is no air in the hydraulic circuit. In 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 (see par. 7). At the end of the operation, make sure of having screwed correctly the drain screw.

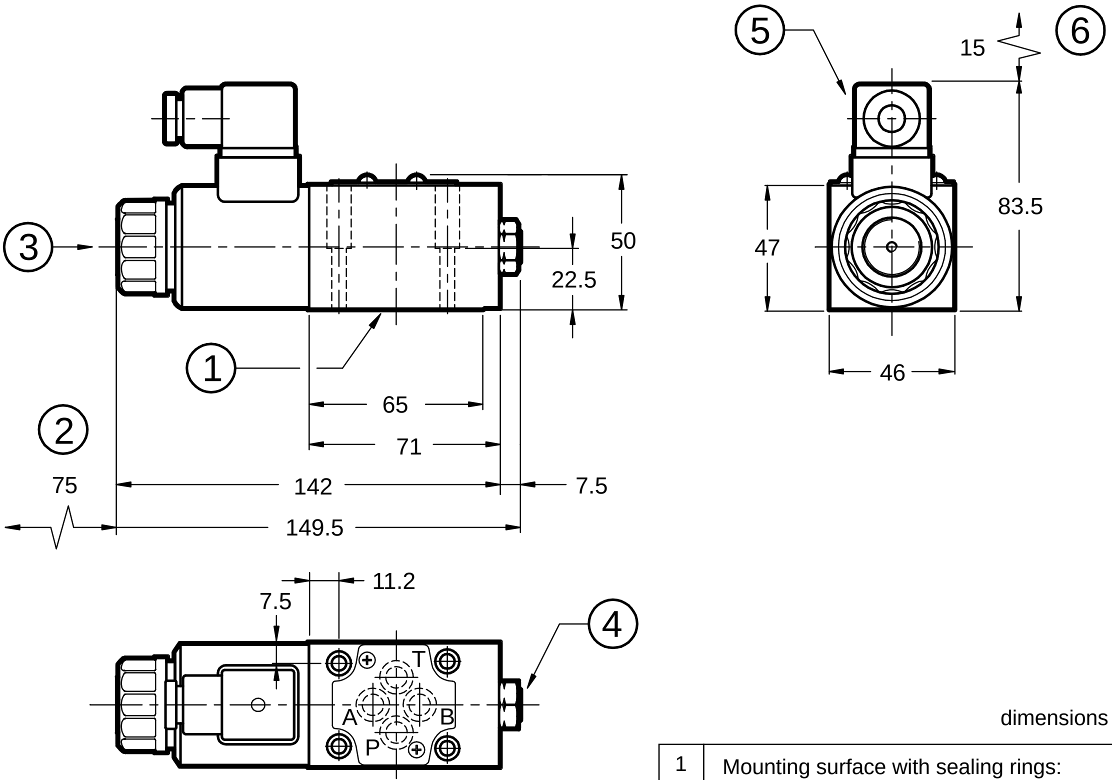
Connect the valve T port directly to the tank. Add any backpressure value detected in the T line to the controlled pressure value. Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.

Surface finishing



7 - OVERALL AND MOUNTING DIMENSIONS



dimensions in mm

Fastening bolts: 4 bolts SHC M5x30 - ISO 4762

Torque: 5 Nm

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.

1	Mounting surface with sealing rings: 4 OR type 2037 - 90 shore (9.25 x 1.78)
2	Coil removal space
3	Breather (male hexagonal spanner 4)
4	Factory setting sealing (we recommend not unscrewing the nut)
5	DIN 43650 electric connector (included in the delivery)
6	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. 89 250
EDM-M142	for solenoid 12V DC		
UEIK-11	for solenoid 24V DC	Eurocard type	see cat. 89 300

9 - SUBPLATES (see catalogue 51 000)

PMMD-AI3G with ports on rear
PMMD-AL3G with side ports
Ports dimensions: P, T, A, B: 3/8Ž BSP thread

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Fax +39 0331.895.339
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PRED3G

PRESSURE CONTROL VALVE WITH PROPORTIONAL CONTROL AND INTEGRATED ELECTRONICS

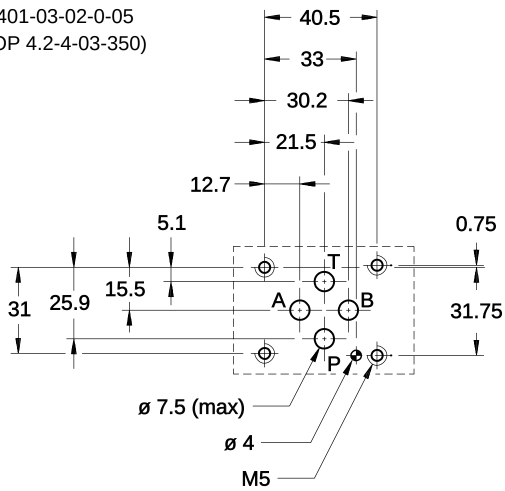
SERIES 11

SUBPLATE MOUNTING
ISO 4401-03 (CETOP 03)

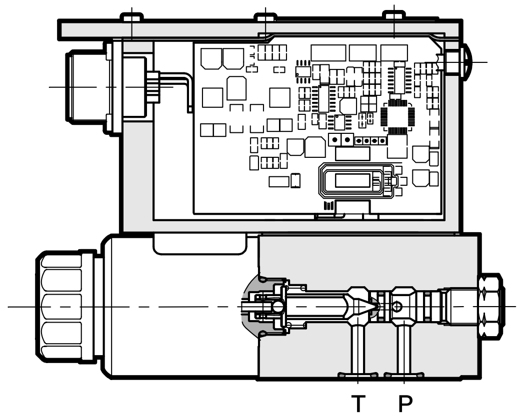
p max **350** bar
Q max **5** l/min

MOUNTING INTERFACE

ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)



OPERATING PRINCIPLE

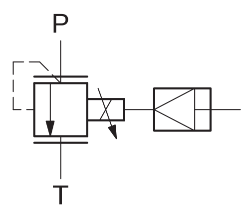


- The PRED3G valve is a direct operated pressure control valve with integrated electric proportional control and mounting interface in compliance with ISO 4401 (CETOP RP 121H) standards.
- It is suitable to pilot two-stage valves, for pressure control in hydraulic circuits.
- Pressure can be modulated continuously in proportion to the reference signal.
- The valve is controlled directly by an integrated digital amplifier (see par. 4).
- The valve is available in four pressure control ranges up to 350 bar.

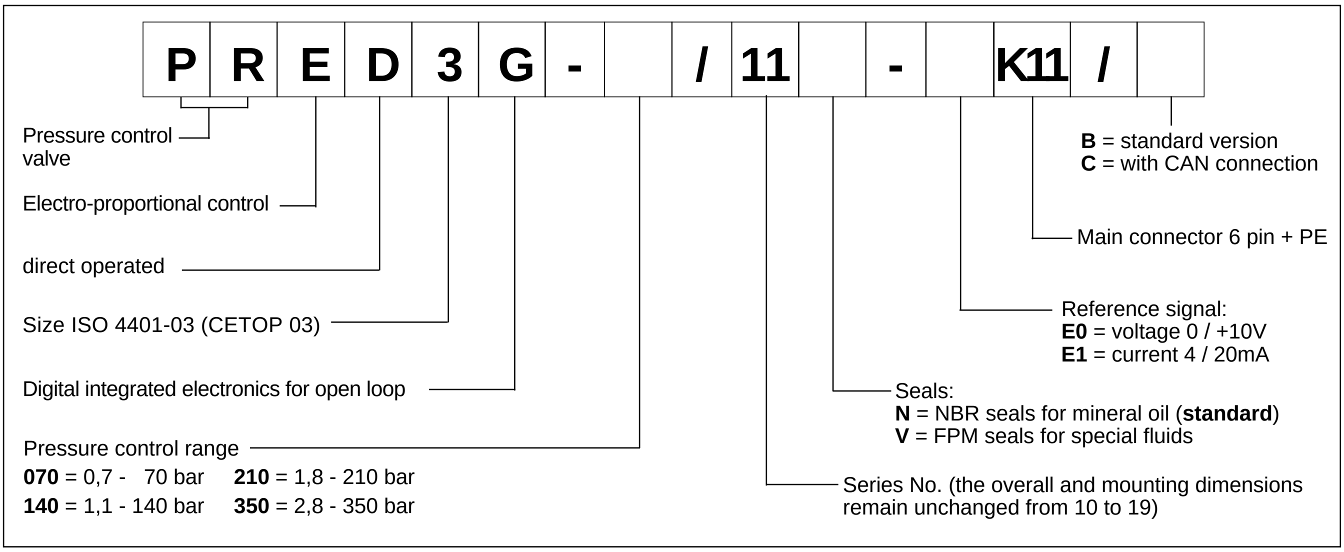
PERFORMANCES (obtained with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronics)

Maximum operating pressure: - P port - T port	bar	 350 2
Minimum controlled pressure	see diagram p min = f(Q)	
Nominal flow Maximum flow (see diagram p min = f(Q))	l/min	1 5
Step response	see paragraph 3	
Hysteresis	% of p nom	< 3%
Repeatability	% of p nom	< ±1%
Electrical characteristic	see paragraph 4.3	
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	
Recommended viscosity	cSt	25
Mass:	kg	2

HYDRAULIC SYMBOL



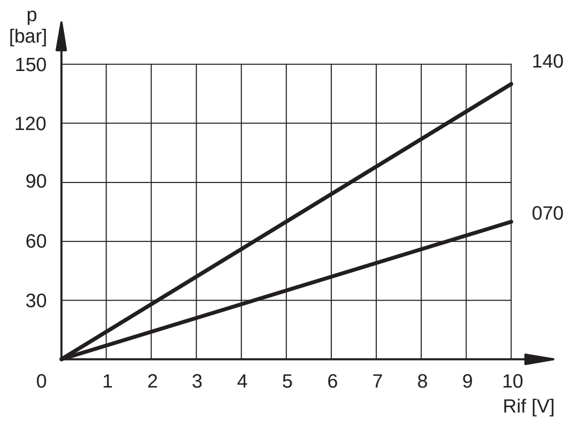
1 - IDENTIFICATION CODE

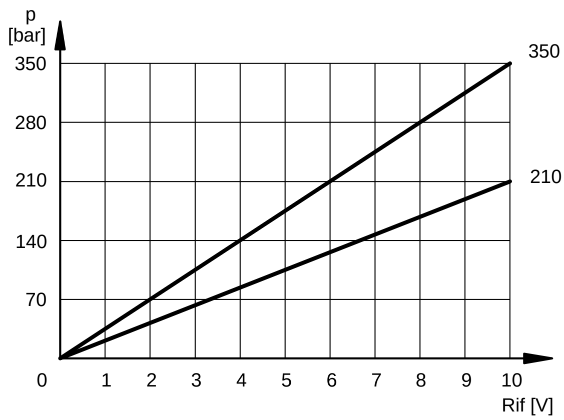


2 - CHARACTERISTIC CURVES (measured with viscosity of 36 cSt at 50°C)

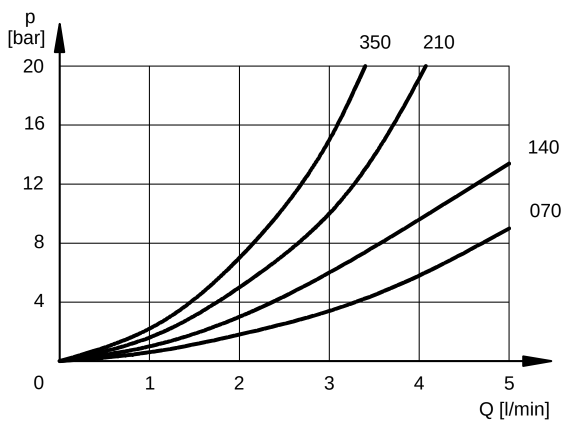
Typical control curves according to the current supplied to the solenoid for pressure control ranges: 070, 140, 210, 350, measured with input flow rate Q=1 l/min. The curves are obtained after linearization in factory of the characteristic curve through the digital amplifier, and they are measured without 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)

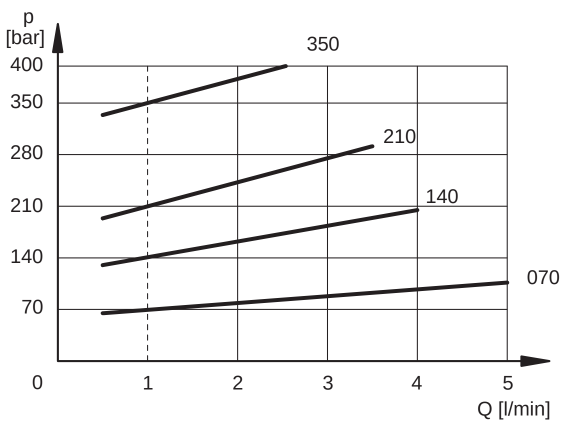




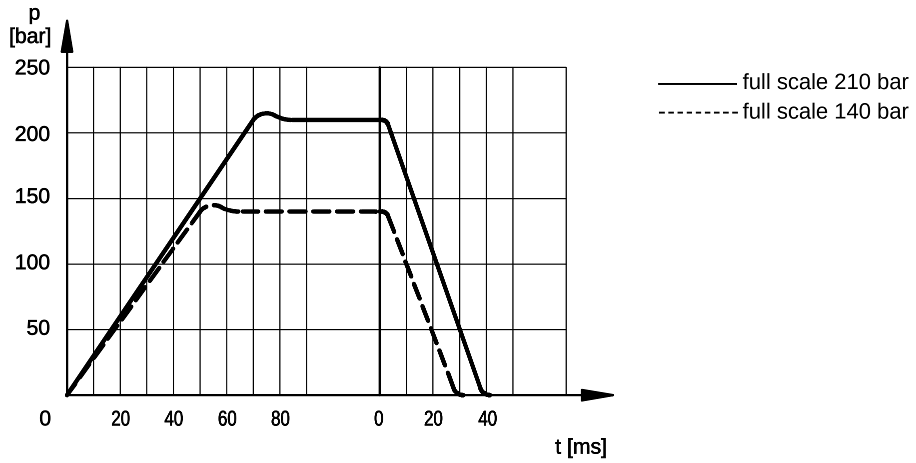
MINIMUM CONTROLLED PRESSURE pmin = f (Q)



PRESSURE VARIATION pmax = f (Q)



3 - RESPONSE TIMES (obtained with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronics)



NOTE: Response times are obtained by using valves with a full scale of 140 and 210 bar, with an input flow rate of 2 l/min and a pressure oil volume of 0,5 lt. The response time is affected both by the flow rate and the oil volume in the pipework.

4 - ELECTRICAL CHARACTERISTICS

4.1 - Digital integrated electronics

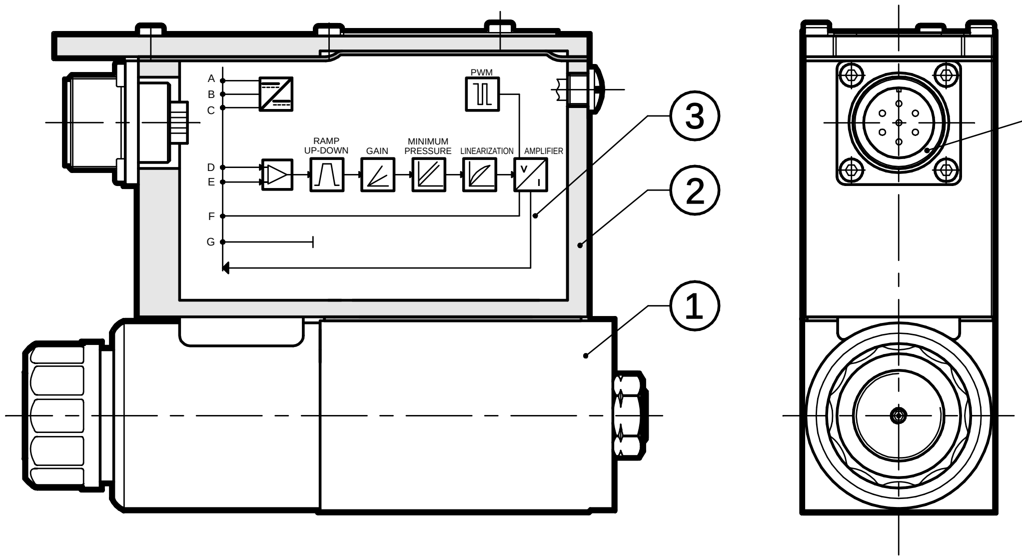
The proportional valve is controlled by a digital amplifier (driver), which incorporates a microprocessor that controls, via software, all the valve functions, such as:
- continuous converting (0,5ms) of the voltage reference signal (E0) or of the current reference signal (E1) in a digital value
- generation of up and down ramps (see note)
- gains limit (see note)
- compensation of the dead band
- linearization of the characteristic curve
- regulation of the current to the solenoid
- dynamic regulation of PWM frequency
- protection of the solenoid outputs against possible short circuits

NOTE: these parameters can be set through the connection to the CAN connector, by means of a personal computer and relevant software (see par. 5.3)

The digital driver enables the valve to reach better perfomance compared to the analogic version, such as:

- reduced hysteresis and improved repeatability
- reduced response times
- linearization of the characteristic curve which is optimised in factory for each valve
- complete interchangeability in case of valve replacement
- possibility to set, via software, the functional parameters
- possibility to interface a CAN-Open network
- possibility to perform a diagnostic program by means of the CAN connection
- high immunity to electromagnetic troubles

4.2 - Functional block diagram



1	Valve with proportional solenoid	3	Digital card
2	Electronics envelope	4	Main connector

4.3 - Electrical characteristics

NOMINAL VOLTAGE	V DC	24 (from 19 to 35 VDC, ripple max 3 Vpp)
ABSORBED POWER	W	50
MAXIMUM CURRENT	A	1,88
DUTY CYCLE		100%
VOLTAGE SIGNAL (E0)	V DC	0 ÷ 10 (Impedence Ri > 50K)
CURRENT SIGNAL (E1)	mA	4 ÷ 20 (Impedence Ri = 500)
ALARMS		Overload and electronics overheating
COMMUNICATION		Interface of the optoisolated industrial Field-bus type CAN-Bus ISO 11898
MAIN CONNECTOR		7 - pin MIL-C-5015-G (DIN 43563)
CAN-BUS CONNECTOR		M12-IEC 60947-5-2
ELECTROMAGNETIC COMPATIBILITY ((EMC) emissions CEI EN 61000-6-4 immunity CEI EN 61000-4-2		According to 2004/108/CE standards
PROTECTION AGAINST ATMOSPHERIC AGENTS :		IP67 (CEI EN 60529 standards)

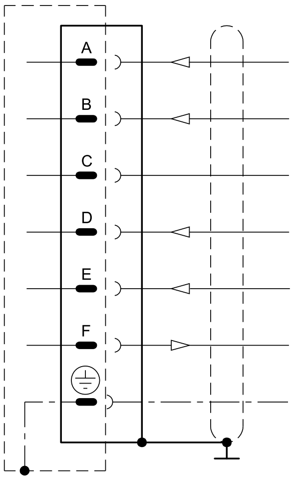
5 - OPERATING MODALITIES

The digital driver of PRED3G valve may be used with different functions and operating modalities, depending on the requested performances.

5.1 - Standard version with voltage reference signal (E0)

This is the most common version; it makes the valve completely interchangeable with the traditional proportional valves with analog type integrated electronics. The valve has only to be connected as indicated below.
This version doesn•t allow the setting of the valve parameters, for example the ramps must be performed in the PLC program, as well as the reference signal limit.

Connection scheme (B version - E0)



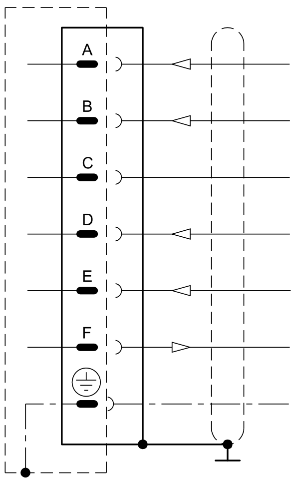
Pin	Values	Function	NOTE
A	24 V DC	Voltage	from 19 to 35V DC (ripple max 3 Vpp)(see **NOTE 2**)
B	0 V	Power supply (zero)	0 V
C	----	Not used	----
D	0 ÷ 10 V	Input rated command	Impedence R_i > 50 k
E	0 V	Input rated command	----
F	0 ÷ 10 V	Test point coil current	0 ÷ 100% I_{MAX} (see **NOTE 1**)
PE	GND	Protective ground	----

NOTE: If only one input signal is available (single-end), then the pin B (0V power supply) and the pin E (0V reference signal) must be connected through a jumper and both connected to GND, electric panel side.

5.2 - Standard version with current reference signal (E1)

This version has characteristics which are similar to the previous one, with the difference that in this case the reference signal is supplied in current 4 - 20 mA. With the 4 mA signal the valve is at zero value, while with 20 mA signal the valve is at the maximum setting value.

Connection scheme (B version - E1)



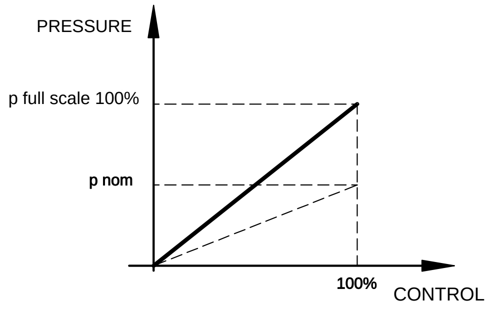
Pin	Values	Function	NOTE
A	24 VDC	Voltage	from 19 to 35V DC (ripple max 3 Vpp)(see **NOTE 2**)
B	0 V	Power supply (zero)	0 V
C	----	Not used	----
D	4 ÷ 20 mA	Input signal	Impedence R_i = 500
E	0 V	Zero reference	----
F	0 ÷ 10 V	Test point coil current	0 ÷ 100% I_{MAX} (see **NOTE 1**)
PE	GND	Protective ground	----

NOTE for the wiring: connections must be made via the 7-pin plug mounted on the amplifier. Recommended cable sizes are 0,75 mm^2 for cables up to 20 m and 1,00 mm^2 for cables up to 40m, for power supply. The signal cables must be 0,50 mm^2. A suitable cable would have 7 cores, a separate screen for the signal wires and an overall screen.

NOTE 1: Read the test point pin F in relation to pin B (0V)
NOTE 2: Envisage an external fuse on pin A (24V DC) to shield the card. Fuse specifications: 5A/50V fast type.

5.3 - Version with parameters set by CAN connector (version C)

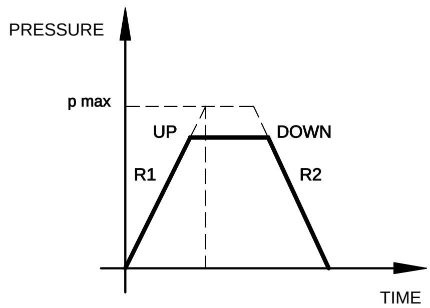
This version allow to set some parameters of the valve connecting a PC to the CAN connector.
To do this, you have to order the interface device for USB port **CANPC-USB/20** (code 3898101002), complete of the configuration software CANPC-SOF/R001, a communication cable (lenght 3 mt) and a hardware converter needed to connect the valve to the USB port. The software is Microsoft Windows XP© compliant.



The parameters that can be set are described below:

Nominal pressure
The •nominal pressureŽ parameter limits the maximum current to the solenoid, therefore it sets the desired nominal pressure corresponding to the positive value of the input reference (10 V or 20 mA).
Default value = 100% of full scale
Range: from 100% to 50% of full scale

PWM Frequency
Sets the PWM frequency, which is the pulsating frequency of the control current. The PWM decrease improves the valve accuracy, decreasing the regulation stability.
The PWM increase improves the regulation stability, causing a higher hysteresis.
Default value = 300 Hz
Range 50 ÷ 500 Hz



Ramps
Increase time of Ramp R1: sets the current increase time for a variation from 0 to 100% of the input reference.
Decrease time of Ramp R2: sets the current decrease time for a variation from 0 to 100% of the input reference.
Min time = 0,001 sec.
Max time = 40,000 sec.
Default time = 0,001 sec.

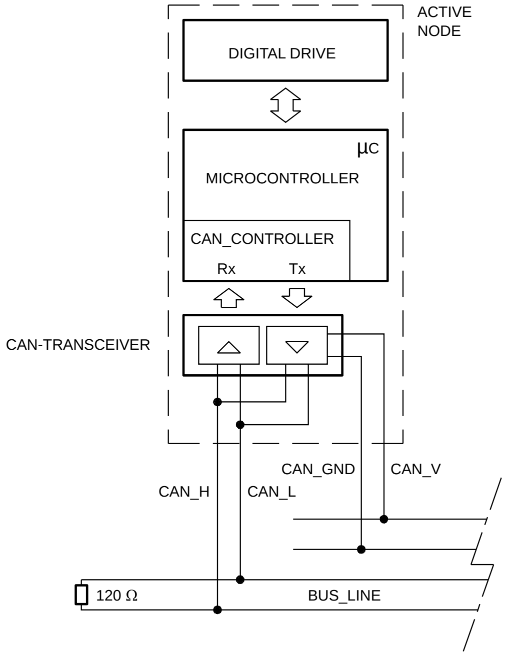
Diagnostics
Provides several information parameters, such as:
The electronic driver status (Working or Broken)
The active regulation
Input reference
Current value

5.4 - Version with CAN-Bus interface (version C)

This version allows the valve piloting through the industrial field bus CAN-Open, according to ISO 11898 standards.
The CAN connector must be connected (see scheme) as a slave node of the CAN-Open bus, while the main connector is wired only for the power supply (pin A and B + earth)

The most important characteristics of a CAN - Open connection are:
- Parameter storage also in PLC
- Parameters setting in real-time (PDO communication)
- On-line valve diagnostics
- Easy wiring with the serial connection
- Communication program according to international standards

For detailed information on the CAN-Open communication software, see cat. 89 800.



CAN connector connection scheme

Pin	Values	Function
1	CAN_SHLD	monitor
2	CAN +24VDC	BUS + 24 VDC (max 30 mA)
3	CAN 0 DC	BUS 0 VDC
4	CAN_H	BUS line (high signal)
5	CAN_L	BUS line (low signal)

N.B. : insert a 120 Ω resistance on pin 4 and pin 5 of the CAN connector when the valve is the end-knot of the CAN network.

6 - INSTALLATION

We recommend to install the PRED3G 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 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 that the solenoid tube is always filled with oil (see paragraph 8). At the end of the operation, make sure of having correctly replaced the drain screw.

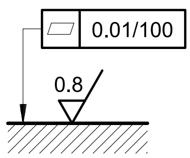
Connect the valve T port directly to the tank. Add any backpressure value detected in the T line to the controlled pressure value. Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.

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.

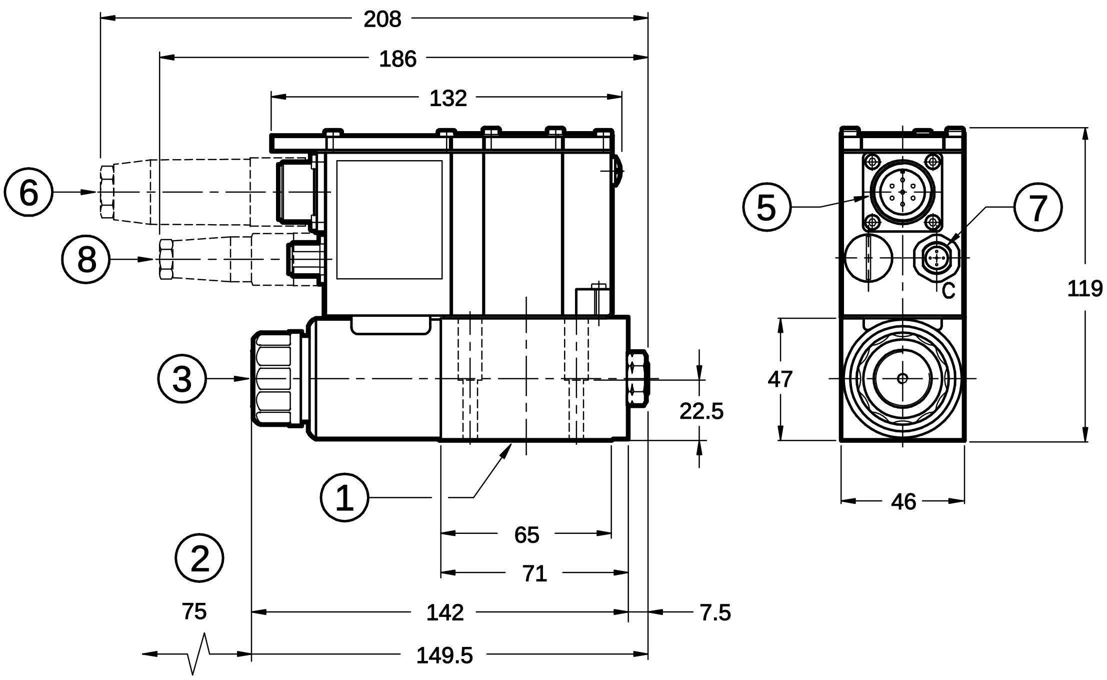
7 - HYDRAULIC FLUIDS

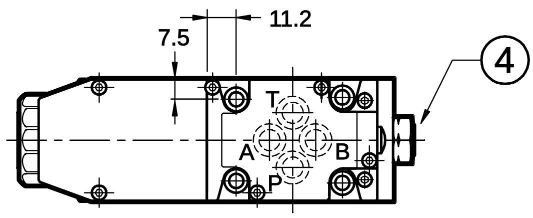
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures 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.

Surface finishing



8 - OVERALL AND MOUNTING DIMENSIONS





dimensions in mm

1	Mounting surface with sealing rings: 4 OR type 2037 - 90 shore (9.25 x 1.78)
2	Coil removal space
3	Breather (male hexagonal spanner 4)
4	Factory sealing setting (we recommend not unscrewing the nut)
5	Main connection
6	Electrical connector 7 pin DIN 43563 - IP67 PG11 EX7S/L/10 code 3890000003 (**to be ordered separately**)
7	CAN-Bus connection **(only for version C)**
8	Electrical connector 5 pin M12 - IP67 PG7 EC5S/M12L/10 code 3491001001 only for version C (**to be ordered separately**)

Fastening bolts: 4 bolts M5x30

Torque: 5 Nm

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.

9 - SUBPLATES (See catalogue 51 000)

PMMD-AI3G rear ports
PMMD-AL3G side ports
Ports dimensions: P, T, A, B: 3/8Ž BSP

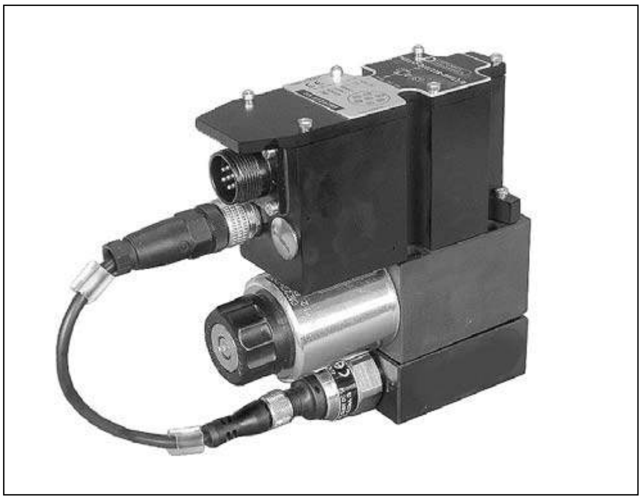
DUPLOMATIC OLEODINAMICA

DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

PRED3J

PRESSURE CONTROL VALVE IN CLOSED LOOP WITH DIRECT PROPORTIONAL CONTROL AND INTEGRATED ELECTRONICS

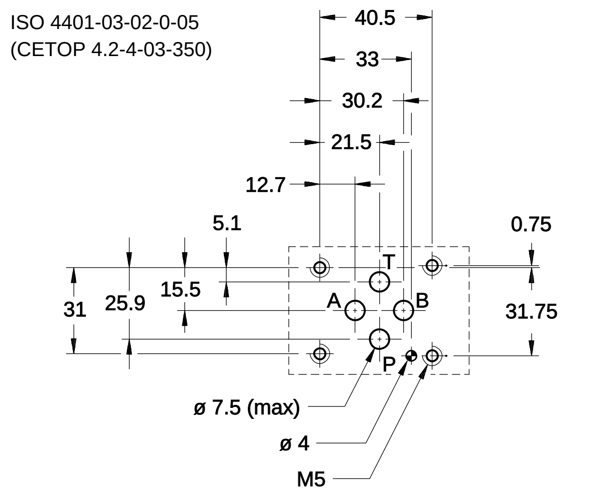
SERIES 11



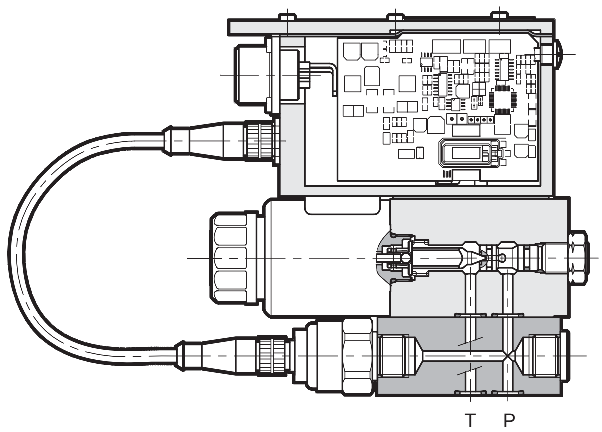
SUBPLATE MOUNTING
ISO 4401-03 (CETOP 03)

p max **350** bar
Q max **5** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE

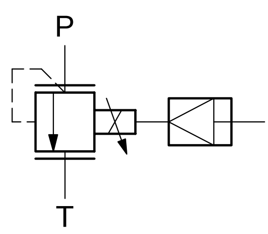


- The PRED3J valve is a direct operated pressure control valve with integrated electric proportional control and mounting interface in compliance with ISO 4401 (CETOP RP 121H) standards.
- It is suitable to pilot two-stage valves, for pressure control in hydraulic circuits.
- Pressure can be modulated continuously in proportion to the reference signal.
- The valve is controlled directly by an integrated digital amplifier (see par. 4).
- The valve is available in three pressure control ranges up to 350 bar.

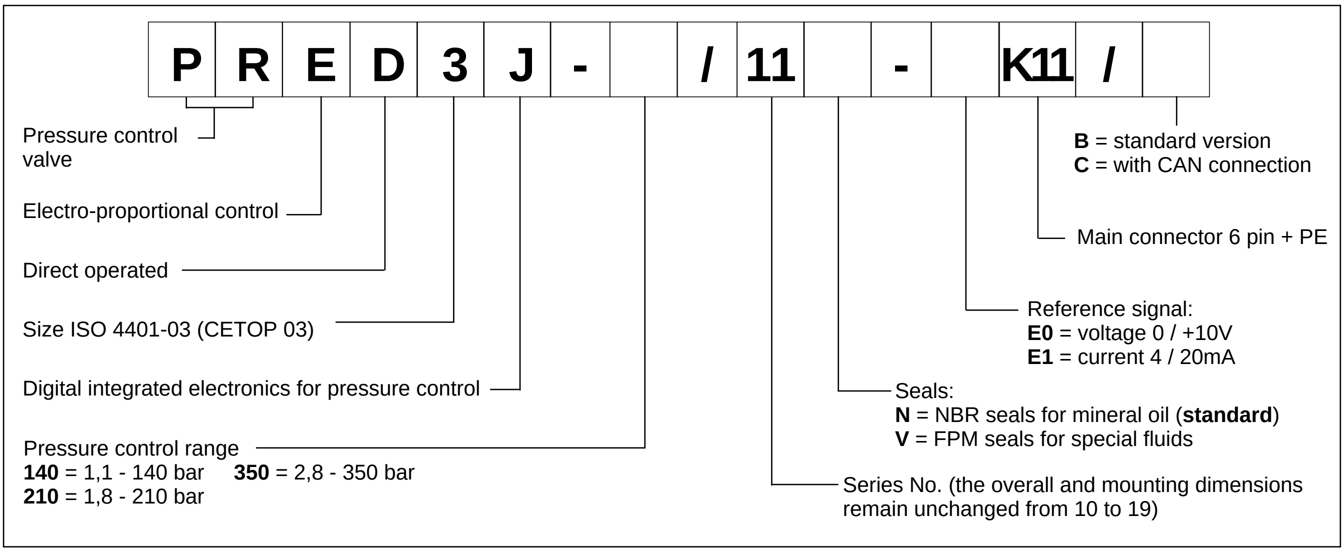
PERFORMANCES
(obtained with mineral oil with viscosity of 36 cSt at 50°C and digital integrated electronics)

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 5
Step response	see paragraph 3	
Hysteresis	% of p nom	< 1%
Repeatability	% of p nom	< ± 0,5%
Electrical characteristic	see paragraph 4.3	
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	2,5

HYDRAULIC SYMBOL



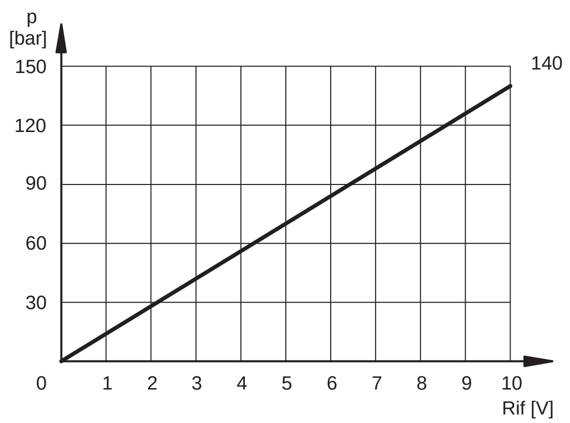
1 - IDENTIFICATION CODE

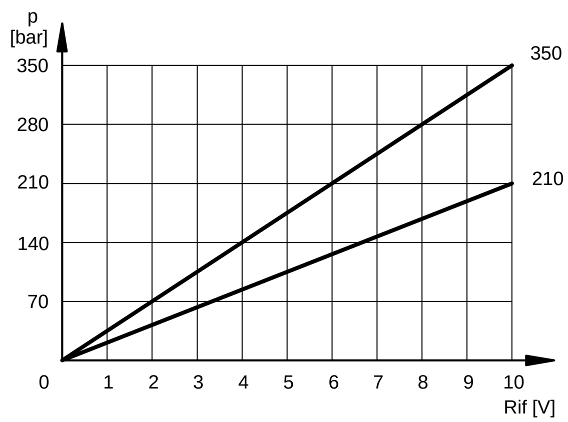


2 - CHARACTERISTIC CURVES (measured with viscosity of 36 cSt at 50°C)

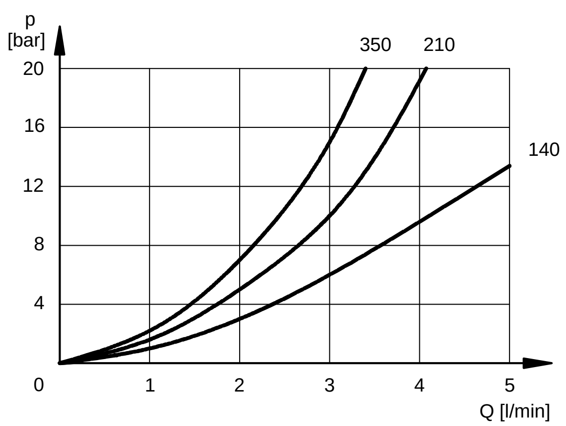
Typical control curves according to the current supplied to the solenoid for pressure control ranges: 140, 210 and 350, measured with input flow rate Q = 1 l/min.
The curves are obtained after linearization in factory of the characteristic curve through the digital amplifier, and they are measured without any backpressure in T.

PRESSURE CONTROL p=f (I)

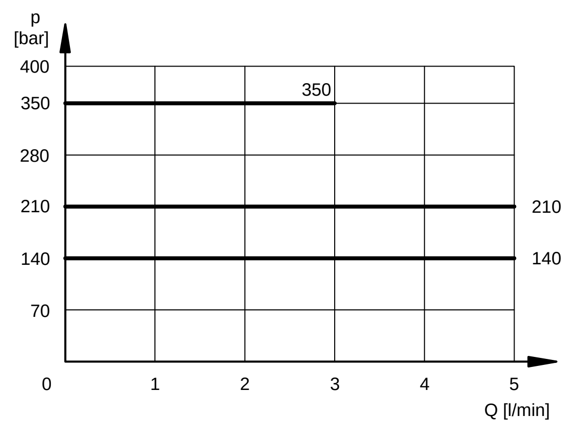




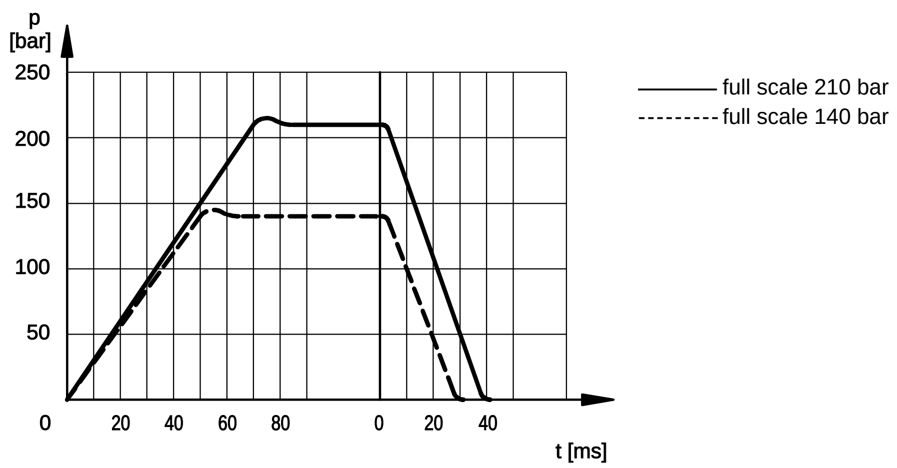
MINIMUM CONTROLLED PRESSURE pmin = f (Q)



PRESSURE VARIATION pmax = f (Q)



3 - STEP RESPONSE (obtained with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronics)



NOTE: Response times are obtained by using valves with a full scale of 140 and 210 bar, with an input flow rate of 2 l/min and a pressure oil volume of 0,5 lt. The response time is affected both by the flow rate and the oil volume in the pipework.

4 - ELECTRICAL CHARACTERISTICS

4.1 - Digital integrated electronics

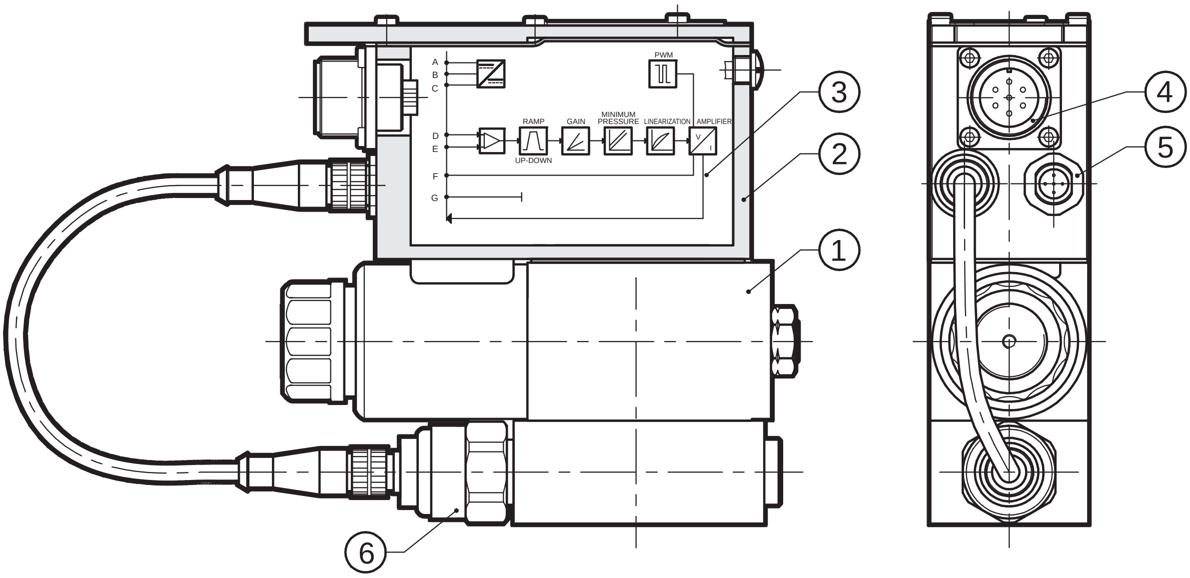
The proportional valve is controlled by a digital amplifier (driver), which incorporates a microprocessor that controls, via software, all the valve functions, such as:
- continuous converting (0,5ms) of the voltage reference signal (E0) or of the current reference signal (E1) in a digital value
- generation of up and down ramps (see **NOTE**)
- gains limit (see **NOTE**)
- compensation of the dead band
- linearization of the characteristic curve
- regulation of the current to the solenoid
- dynamic regulation of PWM frequency
- protection of the solenoid outputs against possible short circuits

NOTE: these parameters can be set through the connection to the CAN connector, by means of a personal computer and relevant software (see paragraph 5.3).

The digital driver enables the valve to reach better performances compared to the analogic version, such as:

- reduced hysteresis and improved repeatability
- reduced response times
- linearization of the characteristic curve which is optimised in factory for each valve
- complete interchangeability in case of valve replacement
- possibility to set, via software, the functional parameters
- possibility to interface a CAN-Open network
- possibility to perform a diagnostic program by means of the CAN connection
- high immunity to electromagnetic troubles

4.2 - Functional block diagram



1	Valve with proportional solenoid	4	Main connector
2	Electronics envelope	5	CAN connector
3	Digital card	6	Pressure transducer

4.3 - Electrical characteristics

NOMINAL VOLTAGE	V DC	24 (from 19 to 30 VDC, ripple max 3 Vpp)
ABSORBED POWER	W	50
MAXIMUM CURRENT	A	1,88
DUTY CYCLE		100%
VOLTAGE SIGNAL (E0)	V DC	0 ÷ 10 (Impedance Ri > 50K)
CURRENT SIGNAL (E1)	mA	4 ÷ 20 (Impedance Ri = 500)
ALARMS		Overload and electronics overheating
COMMUNICATION		Interface of the optoisolated industrial Field-bus type CAN-Bus ISO 11898
MAIN CONNECTOR		7 - pin MIL-C-5015-G (DIN 43563)
CAN-BUS CONNECTOR		M12-IEC 60947-5-2
ELECTROMAGNETIC COMPATIBILITY (EMC) emissions IEC EN 61000-6-4 immunity IEC EN 61000-4-2		According to 2004/108/EC standards
PROTECTION AGAINST ATMOSPHERIC AGENTS		IP65 / IP67 (IEC EN 60529 standards)

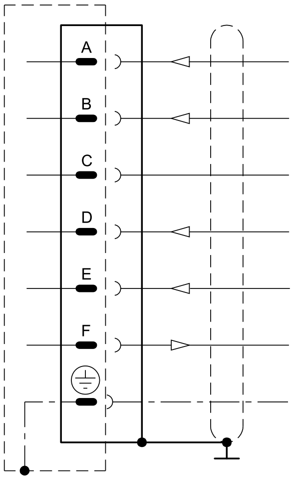
5 - OPERATING MODALITIES

The digital driver of PRED3J valve may be used with different functions and operating modalities, depending on the requested performances.

5.1 - Standard version with voltage reference signal (E0)

This is the most common version; it makes the valve completely interchangeable with the traditional proportional valves with analog type integrated electronics. The valve has only to be connected as indicated below.
This version doesn•t allow the setting of the valve parameters, for example the ramps must be performed in the PLC program, as well as the reference signal limit.

Connection scheme (B version - E0)



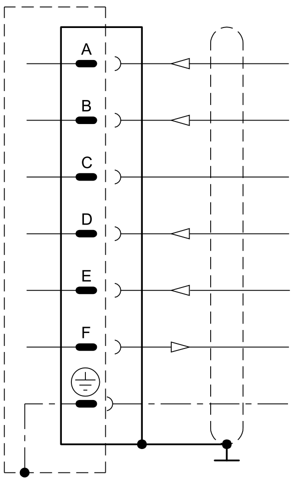
Pin	Values	Function	NOTE
A	24V DC	Voltage	from 19 to 30V DC (ripple max 3 Vpp) (see **NOTE 2**)
B	0 V	Power supply (zero)	0 V
C	----	Not used	----
D	0 ÷ 10 V	Input rated command	Impedance R_i > 50 k
E	0 V	Input rated command	----
F	0 ÷ 10 V	Pressure test point	0 ÷ 100% nominal pressure (see **NOTE 1**)
PE	GND	Protective ground	----

NOTE: the pin B (0V power supply) and the pin E (0V reference signal) must be connected through a jumper and both connected to GND, electric panel side.

5.2 - Standard version with current reference signal (E1)

This version has characteristics which are similar to the previous one, with the difference that in this case the reference signal is supplied in current 4 - 20 mA. With the 4 mA signal the valve is at zero value, while with 20 mA signal the valve is at the maximum setting value.

Connection scheme (B version - E1)



Pin	Values	Function	NOTE
A	24V DC	Voltage	from 19 to 30V DC (ripple max 3 Vpp) (see **NOTE 2**)
B	0 V	Power supply (zero)	0 V
C	----	Not used	----
D	4 ÷ 20 mA	Input signal	Impedance R_i = 500
E	0 V	Zero reference	----
F	0 ÷ 10 V	Pressure test point	0 ÷ 100% nominal pressure (see **NOTE 1**)
PE	GND	Protective ground	----

NOTE for the wiring: connections must be made via the 7-pin plug mounted on the amplifier. Recommended cable sizes are 0,75 mm^2 for cables up to 20m and 1,00 mm^2 for cables up to 40m, for power supply. The signal cables must be 0,50 mm^2 . A suitable cable would have 7 cores, a separate screen for the signal wires and an overall screen.

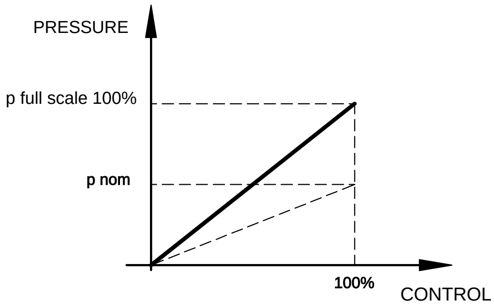
NOTE 1: Read the test point pin F in relation to pin B (0V).

NOTE 2: Foresee a 5A/50V fast acting external fuse on the A pin (24 V CC) in order to protect the electronics.

5.3 - Version with parameters set by means of CAN connector (version C)

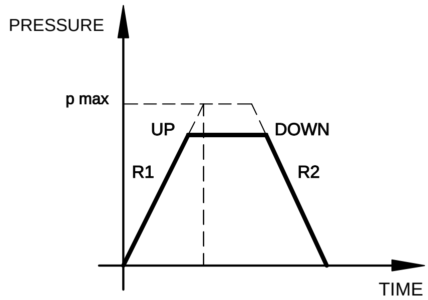
This version allow to set some parameters of the valve connecting a PC to the CAN connector.
To do this, you have to order the interface device for USB port **CANPC-USB/20** (code 3898101002), complete of the configuration software, a communication cable (length 3 mt) and a hardware converter needed to connect the valve to the USB port. The software is Microsoft XP© compliant.

The parameters that can be set are described below:



Nominal pressure
The •nominal pressureŽ parameter sets the desired nominal pressure in bar, which the maximum reference value should be corresponding to (10 V or 20 mA).
Default value = 100% of full scale
Range: from 100% to 50% of full scale

PWM Frequency
Sets the PWM frequency, which is the pulsating frequency of the control current. The PWM decrease improves the valve accuracy, decreasing the regulation stability.
The PWM increase improves the regulation stability, causing a higher hysteresis.
Default value = 300 Hz
Range 50 ÷ 500 Hz



Ramps
Increase time of Ramp R1: sets the current increase time for a variation from 0 to 100% of the input reference.
Decrease time of Ramp R2: sets the current decrease time for a variation from 0 to 100% of the input reference.
Min time = 0,001 sec.
Max time = 40,000 sec.
Default time = 0,001 sec.

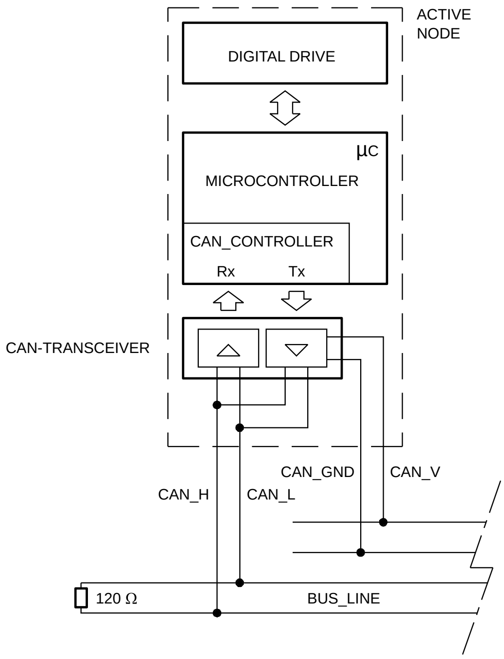
Diagnostics
Provides several information parameters, such as:
The electronic driver status (Working or Broken)
The active regulation
Input reference
Current value

5.4 - Version with CAN-Bus interface

This version allows the valve piloting through the industrial field bus CAN-Open, according to ISO 11898 standards.
The CAN connector must be connected (see scheme) as a slave node of the CAN-Open bus, while the main connector is wired only for the power supply (pin A and B + earth)

The most important characteristics of a CAN - Open connection are:
- Parameter storage also in PLC
- Parameters setting in real-time (PDO communication)
- On-line valve diagnostics
- Easy wiring with the serial connection
- Communication program according to international standards

For detailed information on the CAN-Open communication software, see cat. 89 800.



CAN connector connection scheme

Pin	Values	Function
1	CAN_SHLD	Shield
2	CAN +24V DC	BUS + 24V DC (max 30 mA)
3	CAN 0 DC	BUS 0V DC
4	CAN_H	BUS line (high signal)
5	CAN_L	BUS line (low signal)

NOTE: If the valve is the closing node of the CAN web, insert a 120 resistance on the connector pins n° 4 and 5.

6 - INSTALLATION

We recommend to install the PRED3J 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 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 that the solenoid tube is always filled with oil (see paragraph 8). At the end of the operation, make sure of having correctly replaced the drain screw.

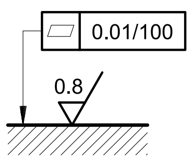
Connect the valve T port directly to the tank. Add any backpressure value detected in the T line to the controlled pressure value. Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.

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.

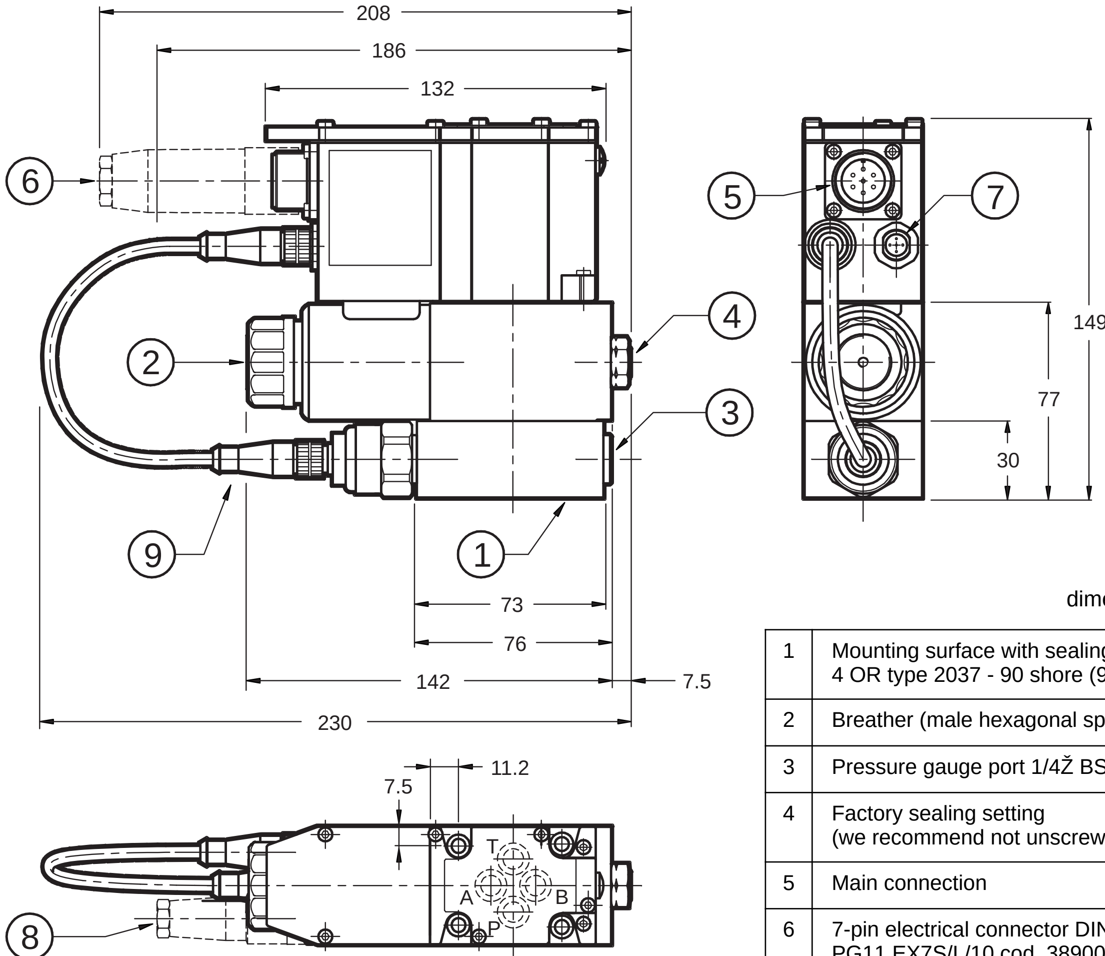
7 - HYDRAULIC FLUIDS

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.

Surface finishing



8 - OVERALL AND MOUNTING DIMENSIONS



dimensions in mm

1	Mounting surface with sealing rings: 4 OR type 2037 - 90 shore (9.25 x 1.78)
2	Breather (male hexagonal spanner 4)
3	Pressure gauge port 1/4Ž BSP
4	Factory sealing setting (we recommend not unscrewing the nut)
5	Main connection
6	7-pin electrical connector DIN 43563 - IP67 PG11 EX7S/L/10 cod. 3890000003 (**to be ordered separately**)
7	**for version C only**: CAN-Bus connection
8	**for version C only:** Electrical connector 5 pin M12 - IP67 PG7 EC5S/M12L/10 code 3491001001 (**to be ordered separately**)
9	Cable with connectors for pressure feedback

Fastening bolts: 4 bolts M5x60

Torque: 5 Nm

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.

9 - SUBPLATES (see catalogue 51 000)

PMMD-AI3G rear ports
PMMD-AL3G side ports
Ports dimensions: P, T, A, B: 3/8Ž BSP

DUPLOMATIC OLEODINAMICA

DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

PRE3

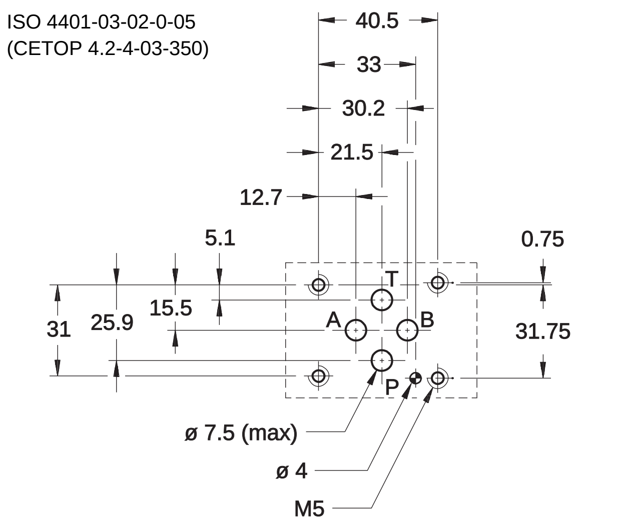
PILOT OPERATED PRESSURE CONTROL VALVE WITH ELECTRIC PROPORTIONAL CONTROL

SERIES 12

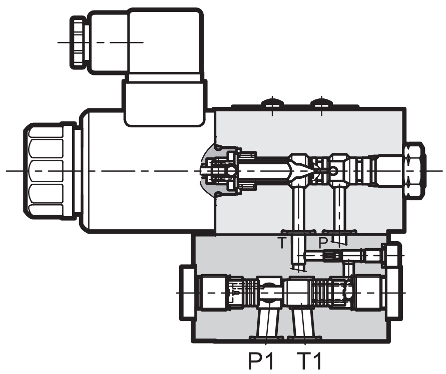
SUBPLATE MOUNTING
ISO 4401-03 (CETOP 03)

p max **350** bar
Q max **40** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE

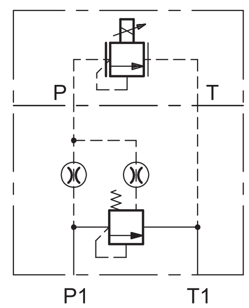


- The PRE3 is a pilot operated pressure control valve with electric proportional control and mounting interface in compliance with ISO 4401 (CETOP RP 121H) standards.
- It is suitable to modulate the pressure in hydraulic circuits.
- The valve can be controlled directly by a current control supply unit or by an electronic control unit to exploit valve performance to the full (see at paragraph 8).
- Pressure adjustment can be continuous in proportion to the current supplied to the solenoid.
- Four 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 cards)

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 paragraph 5	
Hysteresis (with PWM 200 Hz)	% of p nom	< 5%
Repeatability	% of p nom	< ±1,5%
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	3,5

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

P	R	E	3	-		/	12		-		K1

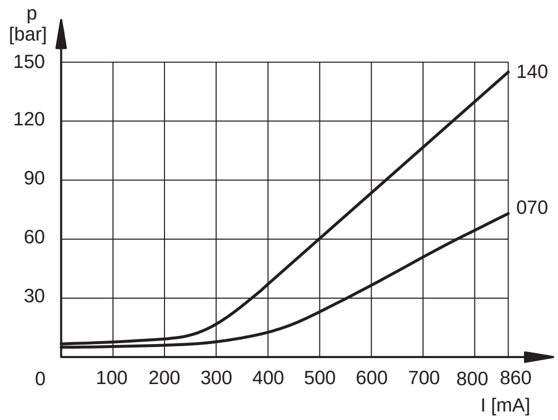
- PRE: Pressure control valve
- 3: Electrical proportional control
- -: Size ISO 4401-03 (CETOP 03)
- Pressure control range
  070 = 7 - 70 bar **210** = 8 - 210 bar
  140 = 7 - 140 bar **350** = 10 - 350 bar
- /12: Series No. (the overall and mounting dimensions remain unchanged from 10 to 19)
- Seals:
  N = NBR seals for mineral oil (**standard**)
  V = FPM seals for special fluids
- **D12** = Nominal solenoid voltage 12V DC
  D24 = Nominal solenoid voltage 24V DC
- K1: Coil electrical connection: for connector type DIN 43650 (**standard**)

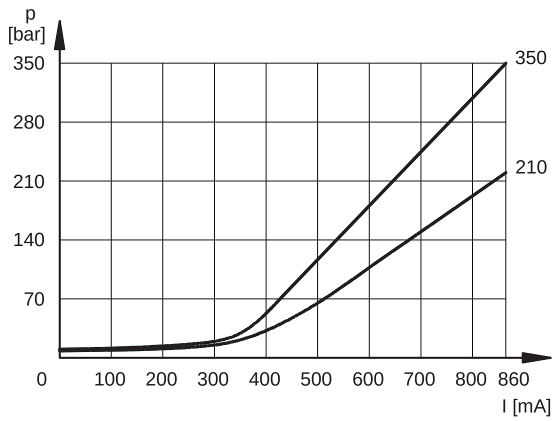
2 - CHARACTERISTIC CURVES (measured with viscosity of 36 cSt at 50°C)

Typical control curves according to the current supplied to the solenoid (D24 version with maximum current 860 mA) for pressure control ranges: 070, 140, 210, 350, measured with input flow rate Q=10 l/min.

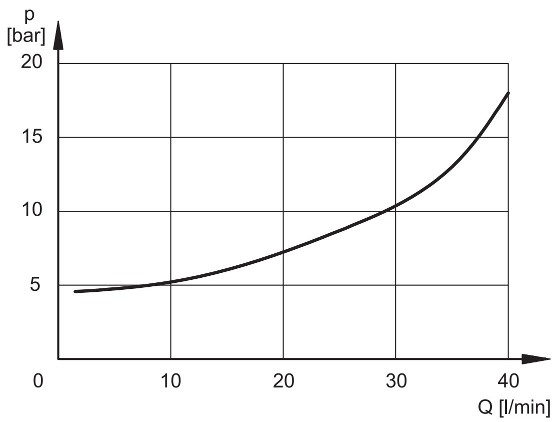
The curves are obtained without any hysteresis and linearity compensation and they are measured without any backpressure in T.
The full scale pressure is set in factory with a flow rate of 10 l/min. In case of higher flow rate, the full scale pressure will increase considerably (see diagram pmax = f (Q)).

PRESSURE CONTROL p=f (I)

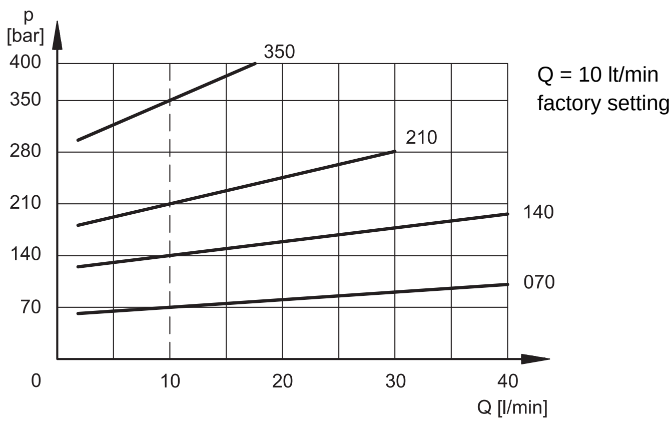




MINIMUM CONTROLLED PRESSURE pmin = f (Q)



PRESSURE VARIATION pmax = 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 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)		3.66	17.6
MAXIMUM CURRENT	A	1.88	0.86
DUTY CYCLE	100%		
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2004/108/CE		
PROTECTION FROM: Atmospheric agents (CEI 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 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 step response times measured with a valve of pressure range up to 140 bar and with input flow rate Q = 10 l/min.

REFERENCE SIGNAL STEP	0 100%	100 0%
Step response [ms]	80	40

6 - INSTALLATION

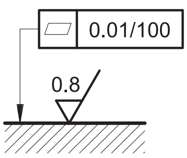
We recommend to install the PRE3 valve either in horizontal position, or vertical position with the solenoid downward. If the valve is installed in vertical position and with the solenoid upward, you must consider possible variations of the minimum controlled pressure, if compared to what is indicated in 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 (see par. 7). At the end of the operation, make sure of having screwed correctly the drain screw.

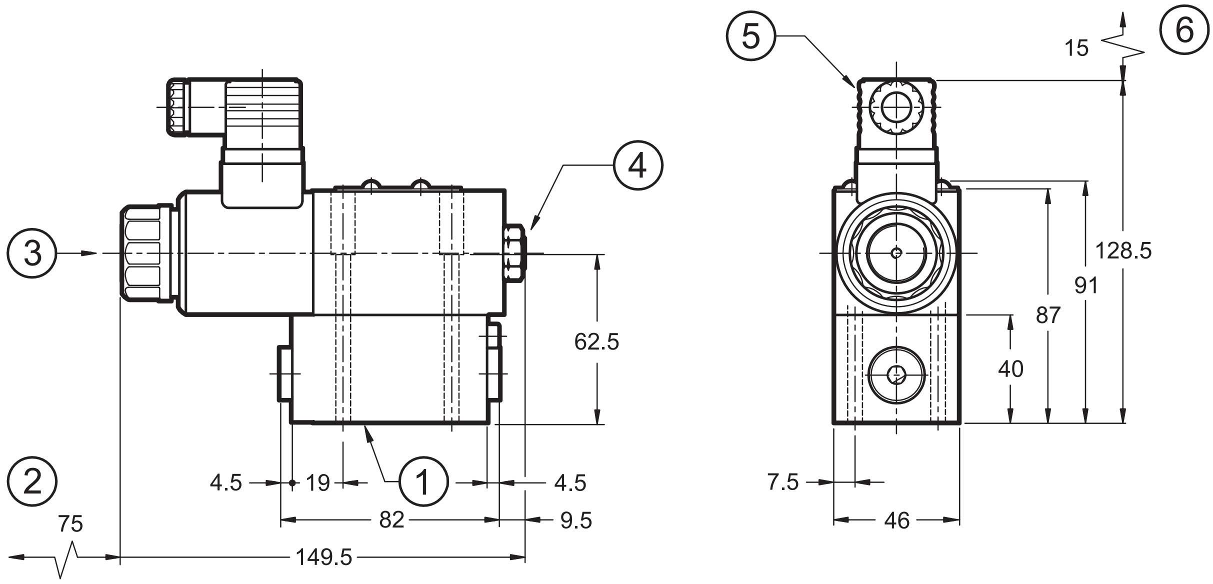
Connect the valve T port directly to the tank. Add any backpressure value detected in the T line to the controlled pressure value. Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.

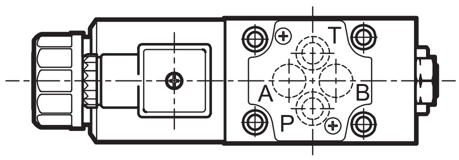
Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.

Surface finishing



7 - OVERALL AND MOUNTING DIMENSIONS





dimensions in mm

Fastenings bolts: 4 screws SHC M5x70 - ISO 4762
Tightening torque: 5 Nm

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.

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	Factory setting sealing (we recommend not unscrewing the nut)
5	DIN 43650 electric connector (included in the delivery)
6	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. 89 250
EDM-M142	for solenoid 12V DC		
UEIK-11	for solenoid 24V DC	Eurocard type	see cat. 89 300

9 - SUBPLATES (see catalogue 51 000)

PMMD-AI3G with ports on rear
PMMD-AL3G with side ports
Ports dimensions P, T, A and B: 3/8Ž BSP thread

DUPLOMATIC OLEODINAMICA
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20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

PRE3G

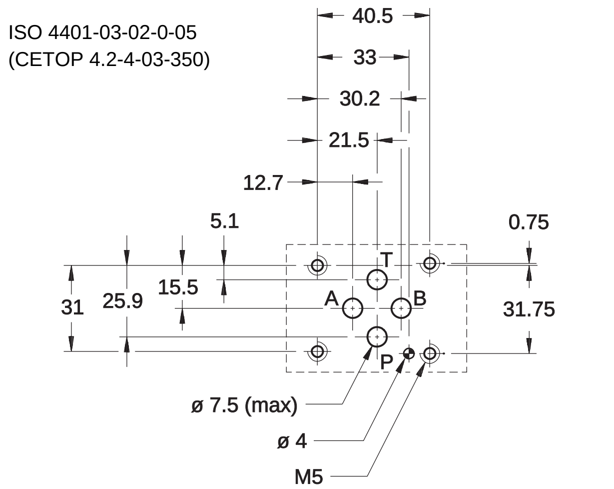
PILOT OPERATED PRESSURE CONTROL VALVE WITH PROPORTIONAL CONTROL AND INTEGRATED ELECTRONICS

SERIES 12

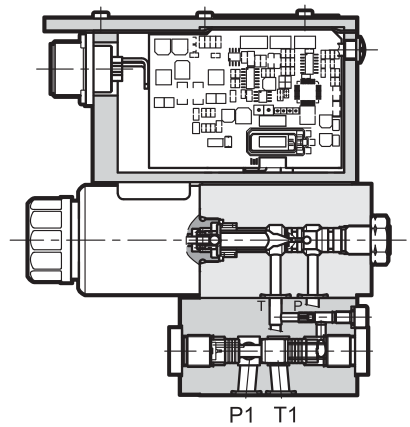
SUBPLATE MOUNTING
ISO 4401-03 (CETOP 03)

p max **350** bar
Q max **40** l/min

MOUNTING SURFACE



OPERATING PRINCIPLE



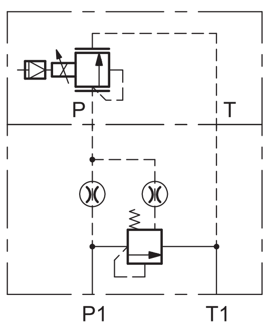
- The PRE3G valve is a pilot operated pressure control valve with integrated electric proportional control and mounting interface in compliance with ISO 4401 (CETOP RP 121H) standards, controlled directly by an integrated digital amplifier (see par. 4).
- It is suitable to modulate the pressure in hydraulic circuits.
- Pressure adjustment can be continuous in proportion to the current supplied to the solenoid.
- Four pressure control ranges up to 350 bar are available.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and digital integrated electronics)

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 paragraph 3	
Hysteresis	% of p nom	< 3%
Repeatability	% of p nom	< ±1%
Electrical characteristic	see paragraph 4.3	
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	3,8

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

P	R	E	3	G	-		/	12		-		K11	/	

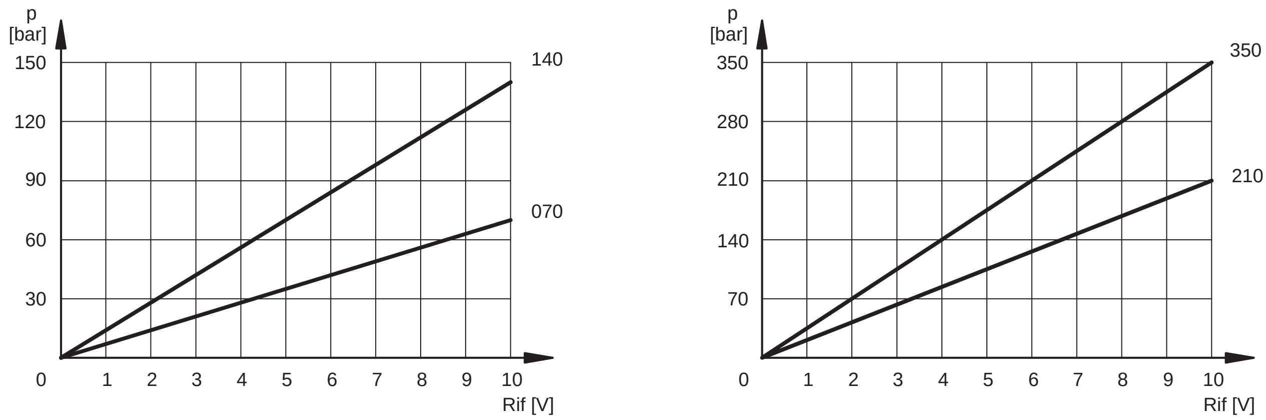
- Pressure control valve
- Electrical proportional control
- Size ISO 4401-03 (CETOP 03)
- Digital integrated electronics for open loop
- Pressure control range
  070 = 7 - 70 bar **210** = 8 - 210 bar
  140 = 7 - 140 bar **350** = 10 - 350 bar
- Series No. (the overall and mounting dimensions remain unchanged from 10 to 19)
- Seals:
  N = NBR seals for mineral oil (**standard**)
  V = FPM seals for special fluids
- Reference signal:
  E0 = voltage 0 / +10V
  E1 = voltage 4 / 20 mA
- Main connector 6 pin + PE
- **B** = standard version
  C = with CAN connection

2 - CHARACTERISTIC CURVES (measured with viscosity of 36 cSt at 50°C)

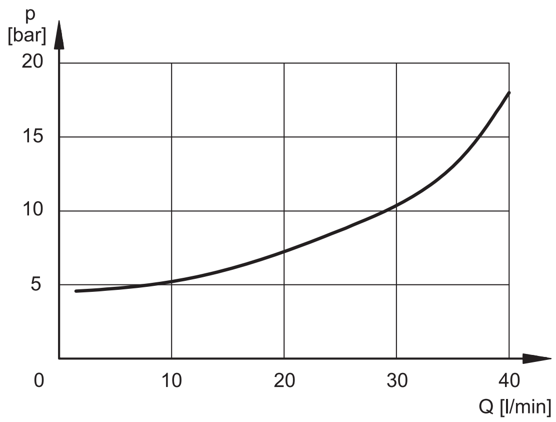
Typical control curves according to the current supplied to the solenoid (D24 version with maximum current 860 mA) for pressure control ranges: 070, 140, 210, 350, measured with input flow rate Q = 10 l/min.

The curves are 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 10 l/min. In case of higher flow rate, the full scale pressure will increase considerably (see diagram pmax = f (Q)).

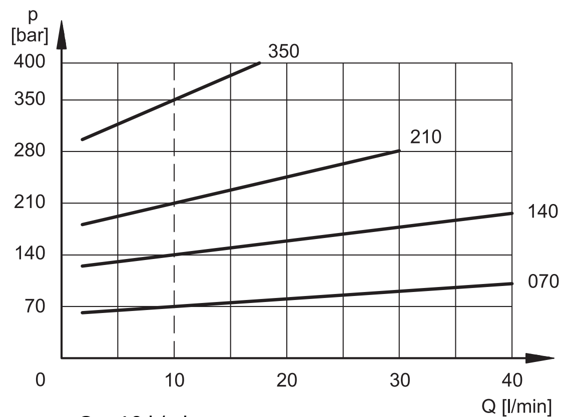
PRESSURE CONTROL p = f (I)



MINIMUM CONTROLLED PRESSURE pmin = f (Q)

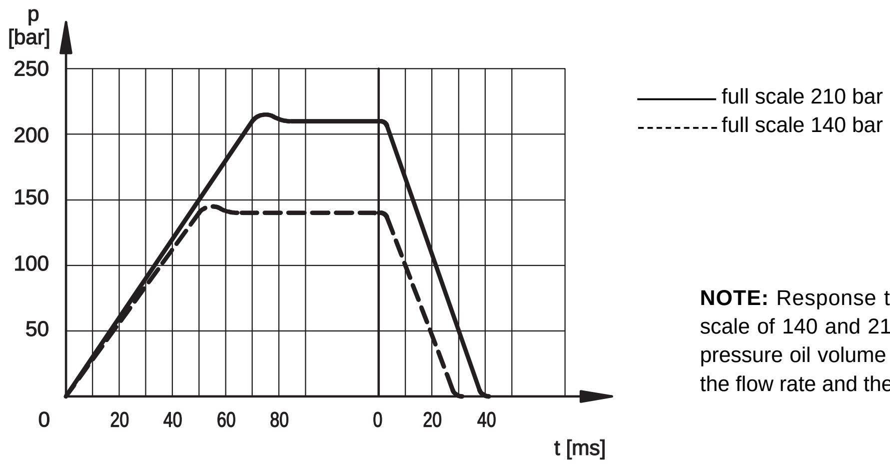


PRESSURE VARIATION pmax = f (Q)



Q = 10 lt/min
factory setting

3 - RESPONSE TIMES (obtained with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronics)



NOTE: Response times are obtained by using valves with a full scale of 140 and 210 bar, with an input flow rate of 10 l/min and a pressure oil volume of 0,5 lt. The response time is affected both by the flow rate and the oil volume in the pipework.

4 - ELECTRICAL CHARACTERISTICS

4.1 - Digital integrated electronics

The proportional valve is controlled by a digital amplifier (driver), which incorporates a microprocessor that controls, via software, all the valve functions, such as:

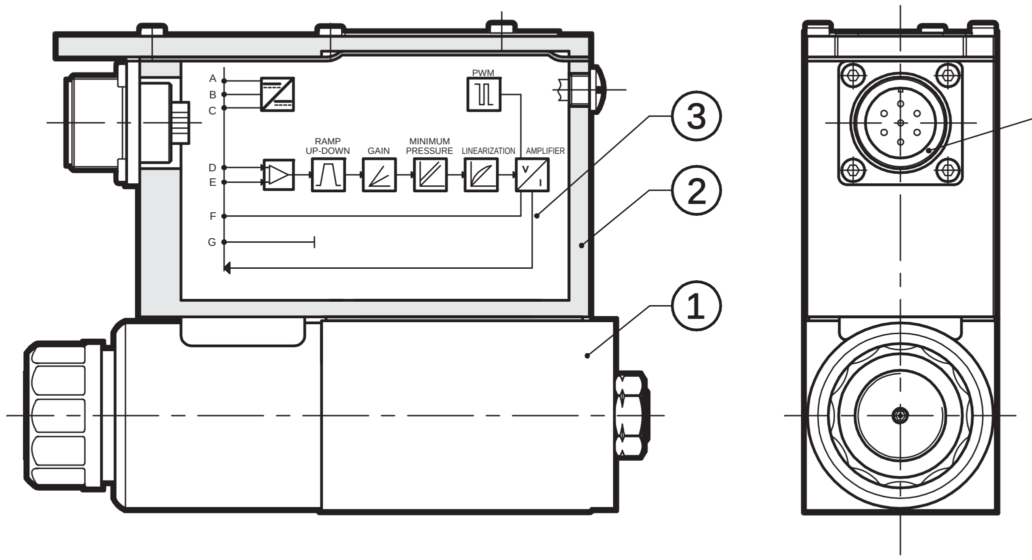
- continuous converting (0,5 ms) of the voltage reference signal (E0) or of the current reference signal (E1) in a digital value
- generation of up and down ramps (see **NOTE**)
- gains limit (see **NOTE**)
- compensation of the dead band
- linearization of the characteristic curve
- regulation of the current to the solenoid
- dynamic regulation of PWM frequency
- protection of the solenoid outputs against possible short circuits

NOTE: these parameters can be set through the CAN connection, using a PC and the dedicated software (see paragraph 5.3)

The digital driver enables the valve to reach better performance compared to the analogic version, such as:

- reduced hysteresis and improved repeatability
- better response times
- linearization of the characteristic which is optimised in factory for each valve
- complete interchangeability in case of valve replacement
- opportunity to set several parameters via software
- possibility to interface a CAN-Open network
- opportunity to run a diagnostic program via the CAN connection
- high immunity to electromagnetic troubles

4.2 - Functional block diagram



1	Valve with proportional solenoid	3	Digital card
2	Electronics envelope	4	Main connector

4.3 - Electrical characteristics

NOMINAL VOLTAGE	V DC	24 (from 19 to 35 VDC, ripple max 3 Vpp)
ABSORBED POWER	W	50
MAXIMUM CURRENT	A	1,88
DUTY CYCLE		100%
VOLTAGE SIGNAL (E0)	V DC	0 ÷ 10 (Impedance Ri > 50K)
CURRENT SIGNAL (E1)	mA	4 ÷ 20 (Impedance Ri = 500)
ALARMS		Overload and electronics overheating
COMMUNICATION		Interface of the optoisolated industrial Field-bus type CAN-Bus ISO 11898
MAIN CONNECTOR		7 - pin MIL-C-5015-G (DIN 43563)
CAN-BUS CONNECTOR		M12-IEC 60947-5-2
ELECTROMAGNETIC COMPATIBILITY ((EMC) emissions CEI EN 61000-6-4 immunity CEI EN 61000-6-2		According to 2004/108/CE standards
PROTECTION AGAINST ATMOSPHERIC AGENTS		IP65 / IP67 (CEI EN 60529 standards)

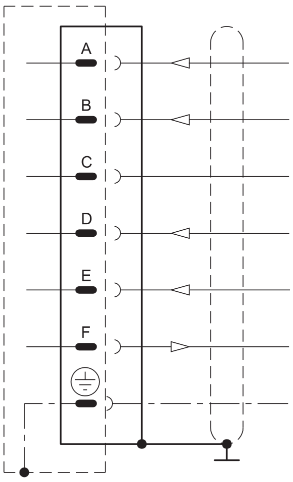
5 - OPERATING MODALITIES

The digital driver of PRE3G valve may be used with different functions and operating modalities, depending on the requested performances.

5.1 - Standard version with voltage reference signal (E0)

This is the most common version; it makes the valve completely interchangeable with the traditional proportional valves with analog type integrated electronics. The valve has only to be connected as indicated below.
This version doesn•t allow the setting of the valve parameters, for example the ramps must be performed in the PLC program, as well as the reference signal limit.

Connection scheme B version - (E0)



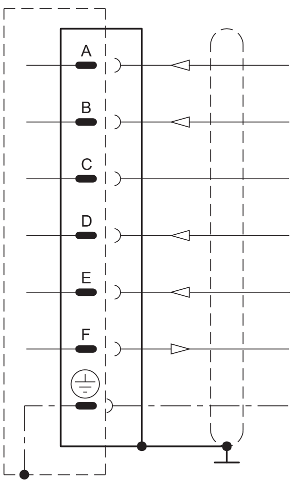
Pin	Values	Function	NOTE
A	24 VDC	Voltage	from 19 to 35 VDC (ripple max 3 Vpp) (see **NOTE 2**)
B	0 V	Power supply (zero)	0 V
C	----	Not used	----
D	0 ÷ 10 V	Input rated command	Impedance R_i > 50 k
E	0 V	Input rated command	----
F	0 ÷ 10 V	Test point coil current	0 ÷ 100% I_{MAX} (see **NOTE 1**)
PE	GND	Protective ground	----

NOTE: if only one input signal (single-end) is available, the Pin B (0V power supply) and the Pin E (0V reference signal) must be connected through a jumper and both connected to GND, electric panel side.

5.2 - Standard version with current reference signal (E1)

This version has characteristics which are similar to the previous one, with the difference that in this case the reference signal is supplied in current 4 - 20 mA. With the 4 mA signal the valve is at zero value, while with 20 mA signal the valve is at the maximum setting value.

Connection scheme (B version - E1)



Pin	Values	Function	NOTE
A	24 VDC	Voltage	from 19 to 35 VDC (ripple max 3 Vpp) (see **NOTE 2**)
B	0 V	Power supply (zero)	0 V
C	----	Not used	----
D	4 ÷ 20 mA	Input signal	Impedance R_i = 500
E	0 V	Zero reference	----
F	0 ÷ 10 V	Test point coil current	0 ÷ 100% I_{MAX} (see **NOTE 1**)
PE	GND	Protective ground	----

NOTE for the wiring: connections must be made via the 7-pin plug mounted on the amplifier. Recommended cable sizes are 0,75 mm^2 for cables up to 20m and 1,00 mm^2 for cables up to 40m, for power supply. The signal cables must be 0,50 mm^2 . A suitable cable would have 7 cores, a separate screen for the signal wires and an overall screen.

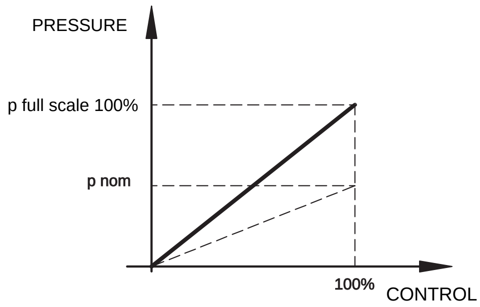
NOTE 1: read the test point Pin F in relation to Pin B (0V)

NOTE 2: forecast on Pin A (24 VDC) an external fuse for electronic protection. Fuse characteristics: 5A/50V quick type.

5.3 - Version with parameters set by means of CAN connector (version C)

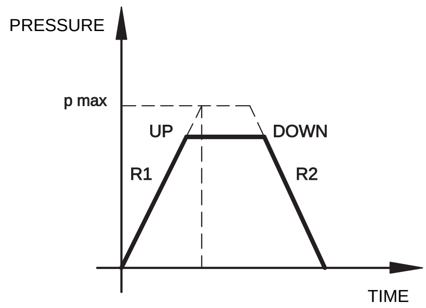
This version enables the setting of some parameters of the valve, by connecting the CAN connector to a traditional computer.
To do this, the following devices are to be ordered separately:
- interface device for USB port **CANPC-USB/20** - cod. 3898101002, with the relevant configuration software, with a communication cable (L = 3 meters) and a hardware converter for connecting the valve at PC USB port. The software is Microsoft XP© and Windows Vista compliant.
The parameters that can be set are described below:

Nominal pressure
The •nominal pressureŽ parameter limits the maximum current to the solenoid, therefore it sets the desired nominal pressure corresponding to the positive value of the input reference (10 V or 20 mA).
Default value = 100% of full scale
Range: from 100% to 50% of full scale



PWM Frequency
Sets the PWM frequency, which is the pulsating frequency of the control current. The PWM decrease improves the valve accuracy, decreasing the regulation stability.
The PWM increase improves the regulation stability, causing a higher hysteresis.
Default value = 300 Hz
Range 50 ÷ 500 Hz

Ramps
Increase time of Ramp R1: sets the current increase time for a variation from 0 to 100% of the input reference.
Decrease time of Ramp R2: sets the current decrease time for a variation from 0 to 100% of the input reference.
Min time = 0,001 sec.
Max time = 40,000 sec.
Default time = 0,001 sec.



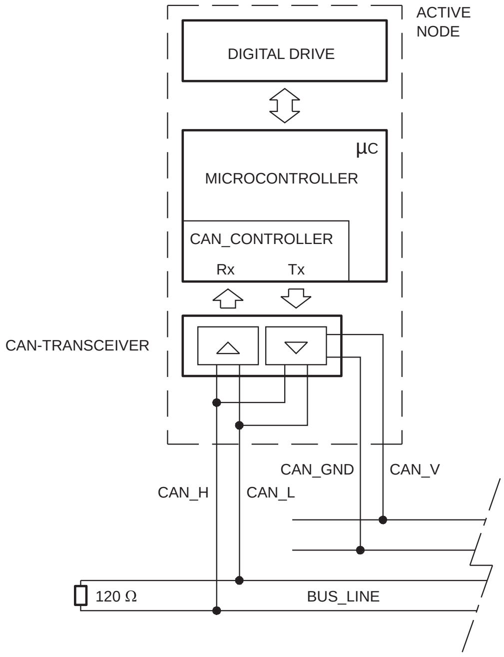
Diagnostics
Provides several information parameters, such as:
The electronic driver status (Working or Broken)
The active regulation
Input reference
Current value

5.4 - Version with CAN-Bus interface (version C)

This version allows the valve piloting through the industrial field bus CAN-Open, according to ISO 11898 standards.
The CAN connector must be connected (see scheme) as a slave node of the CAN-Open bus, while the main connector is wired only for the power supply (pin A and B + earth)

The most important characteristics of a CAN - Open connection are:
- Parameter storage also in PLC
- Parameters setting in real-time (PDO communication)
- On-line valve diagnostics
- Easy wiring with the serial connection
- Communication program according to international standards

For detailed information on the CAN-Open communication software, see cat. 89 800.



CAN connector connection scheme

Pin	Values	Function
1	CAN_SHLD	monitor
2	CAN +24VDC	BUS + 24 VDC (max 30 mA)
3	CAN 0 DC	BUS 0 VDC
4	CAN_H	BUS line (high signal)
5	CAN_L	BUS line (low signal)

NOTE: insert a 120 resistance on pin 4 and pin 5 of the CAN connector when the valve is the closure knot of the CAN network.

6 - INSTALLATION

We recommend to install the PRE3G 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 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 that the solenoid tube is always filled with oil (see paragraph 8). 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.

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).

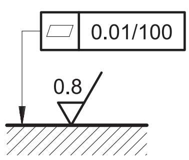
For fluids HFDR type (phosphate esters) use FPM seals (code V).

For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

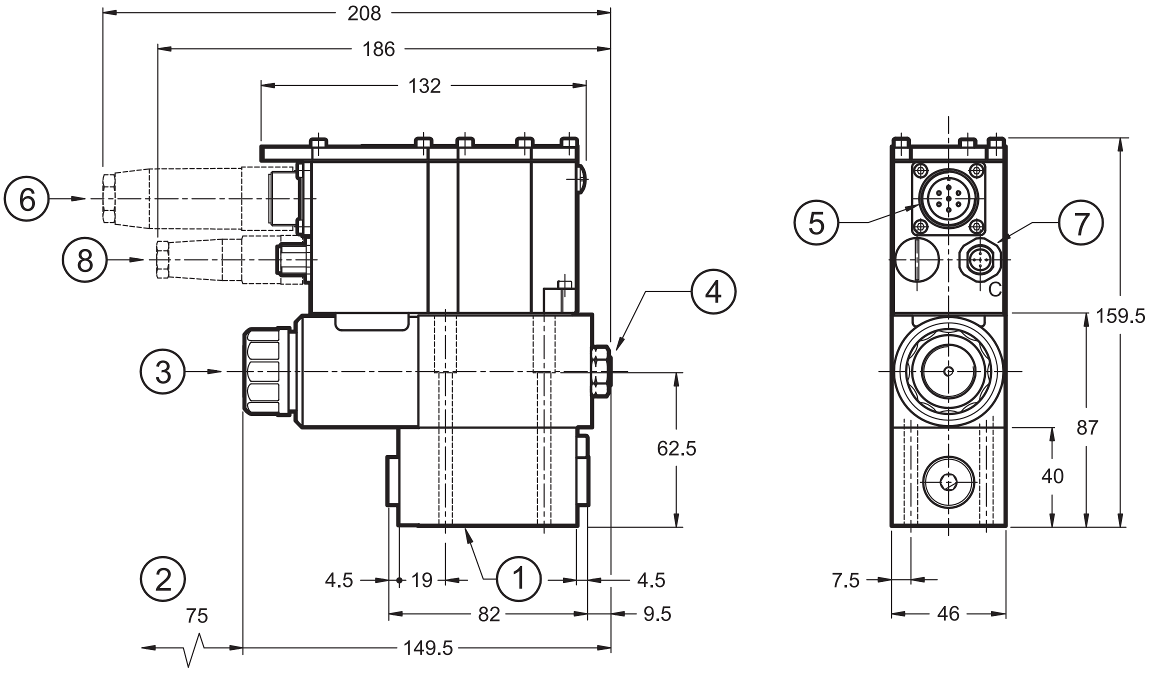
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

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

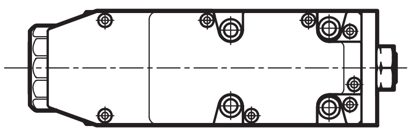
Surface finishing



8 - OVERALL AND MOUNTING DIMENSIONS



dimensions in mm



Fastenings bolts: 4 SHC screws M5x70 - ISO 4762
Tightening torque: 5 Nm

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.

1	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) - 90 Shore
2	Coil removal space
3	Breather (male hexagon spanner 4)
4	Factory setting sealing (we recommend not unscrewing the nut)
5	Main connection
6	Electrical connector 7 pin DIN 43563 - IP67 PG11 EX7S/L/10 cod. 3890000003 (**to be ordered separately**)
7	CAN-Bus connection (**only for version C**)
8	Electrical connector 5 pin M12 - IP67 PG7 EC5S/M12L/10 cod. 3491001001 only for version C (**to be ordered separately**)

9 - SUBPLATES (see catalogue 51 000)

PMMD-AI3G with ports on rear
PMMD-AL3G with side ports
Ports dimensions P, T, A, B: 3/8Ž BSP thread

DUPLOMATIC OLEODINAMICA

DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

PRE*

PILOT OPERATED PRESSURE RELIEF VALVES WITH PROPORTIONAL CONTROL

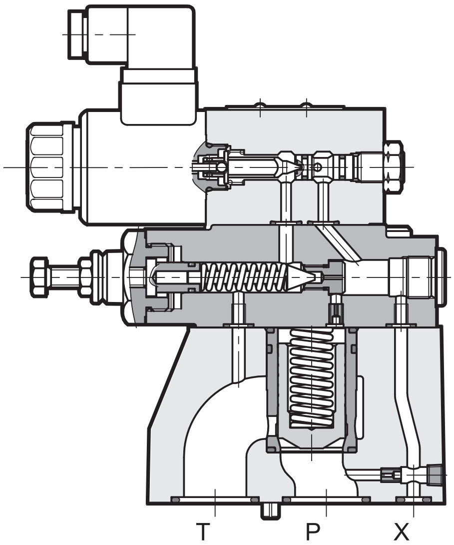
SERIES 10

SUBPLATE MOUNTING

p max **350** bar

Q max (see table of performances)

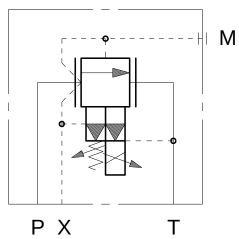
OPERATING PRINCIPLE



- PRE* valves are pilot operated pressure relief valves with electric proportional control and mounting interface in compliance with ISO 6264 standards (CETOP RP 121H).
- These valves are normally 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.
- Pressure can be modulated continuously in proportion to the current supplied to the solenoid.
- These valves can be controlled directly by a current control supply unit or by means of the relevant electronic control units to exploit valve performance to the full (see par. 10).
- 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 four pressure control ranges up to 350 bar.

PERFORMANCES (obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control cards)		PRE10	PRE25	PRE32
Maximum operating pressure:	bar	350		
Minimum controlled pressure		see p-Q diagram		
Maximum flow	l/min	200	400	500
Step response		see paragraph 5		
Hysteresis	% of p nom	< 5%		
Repeatability	% of p nom	< ±1,5%		
Electrical characteristic		see paragraph 7		
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		-		/	10		-		K1

Pilot operated pressure relief valve

Electric proportional control

Size: **10** = ISO 6264-06 (CETOP R06)
25 = ISO 6264-08 (CETOP R08)
32 = ISO 6264-10 (CETOP R10)

Pressure control range:
070 = up to 70 bar
140 = up to 140 bar
210 = up to 210 bar
350 = up to 350 bar

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

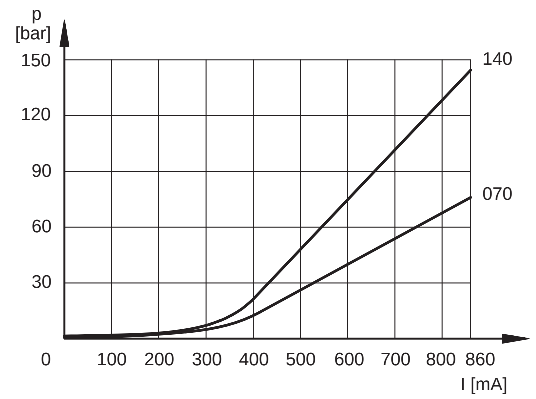
Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

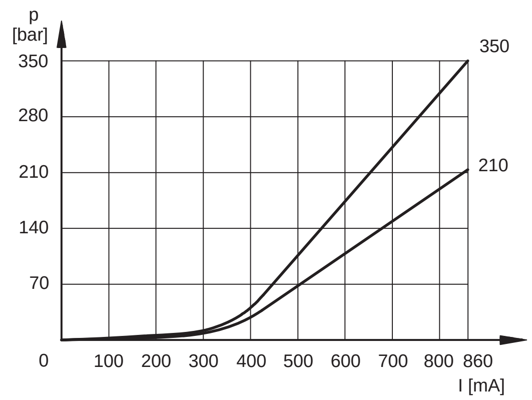
D12 = Nominal solenoid voltage 12V DC
D24 = Nominal solenoid voltage 24V DC

Coil electrical connection: plug for connector type DIN 43650 (**standard**)

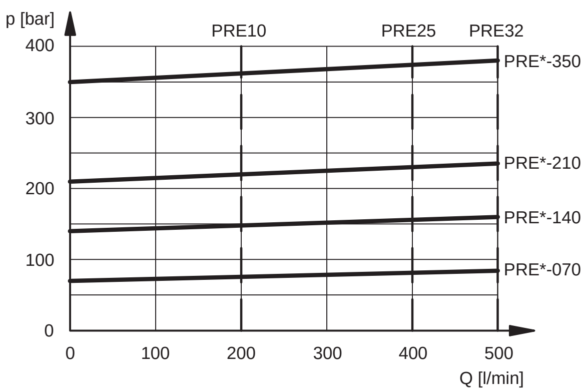
2 - CHARACTERISTIC CURVES (measured with viscosity of 36 cSt at 50°C)

PRESSURE CONTROL p=f (I)

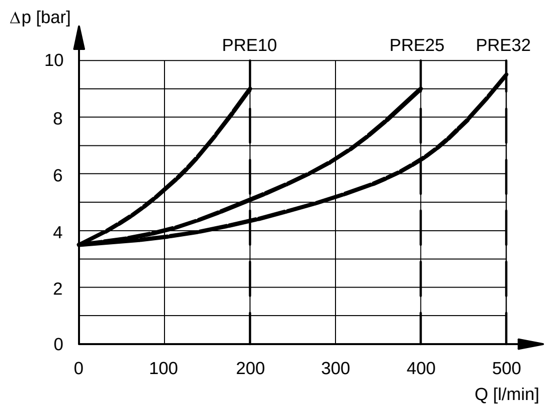




PRESSURE CONTROL p=f (Q)



PRESSURE DROP p = 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 - 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)		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		

5 - 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 step response times measured with input flow rate of Q = 50 l/min.

REFERENCE SIGNAL STEP	0 100%	100 0%
Step response [ms]	120	90

6 - INSTALLATION

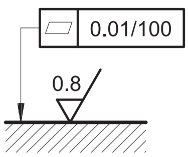
We recommend to install the PRE* valve either in horizontal position, or vertical position with the solenoid downward. If the valve is installed in vertical position and with the solenoid upward, you must consider possible variations of the minimum controlled pressure, if compared to what is indicated in paragraph 2.

Ensure 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 (see par. 4 - 5 - 6). At the end of the operation, make sure of having correctly screwed the drain screw.

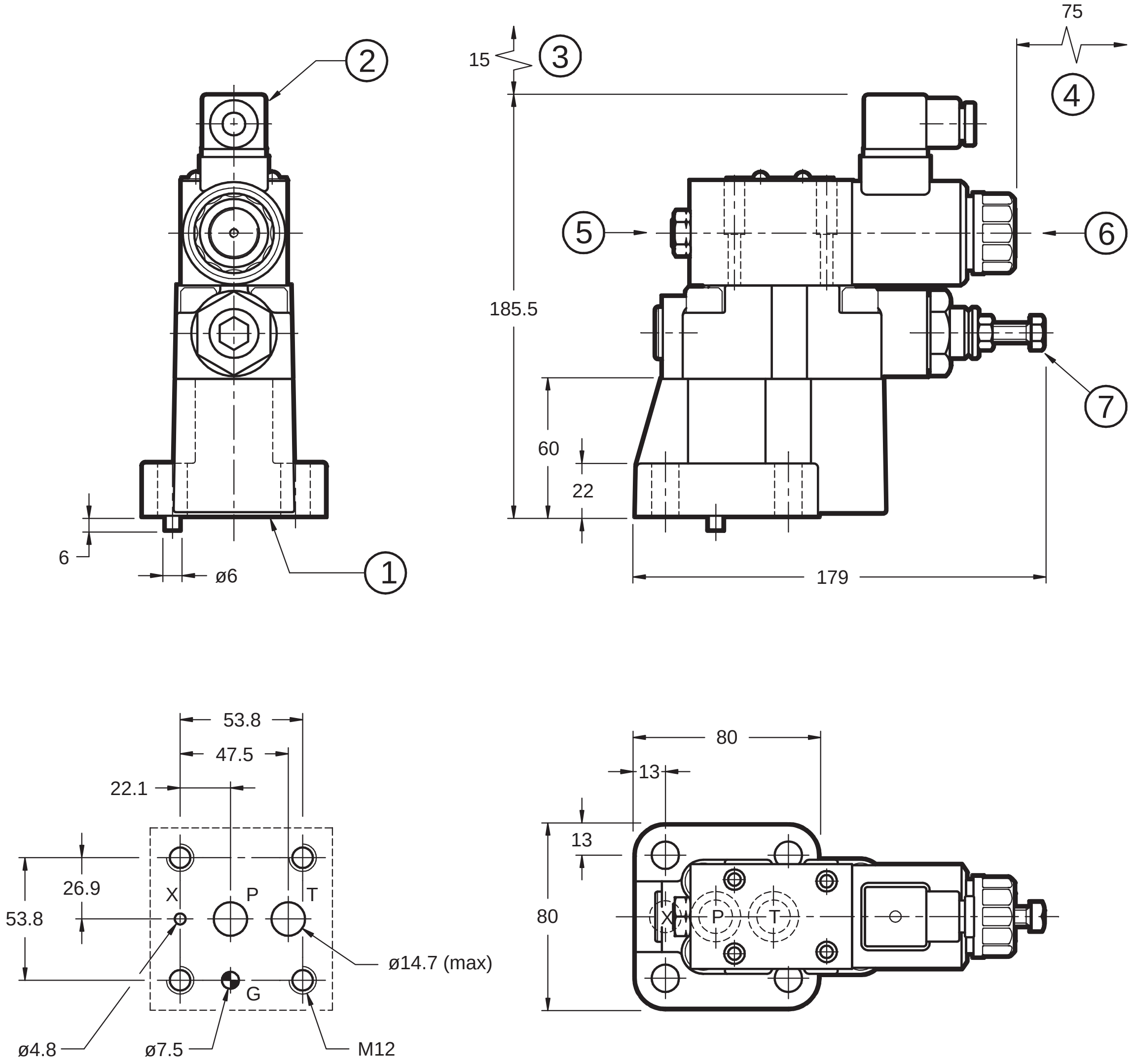
Connect the T port on the valve directly to the tank. Add any backpressure value detected in the T line to the controlled pressure value. Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.

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.

Surface finishing



7 - PRE10 OVERALL AND MOUNTING DIMENSIONS



Mounting interface: ISO 6264-06-09-*-97
(CETOP 4.4.2-2-R06-350)

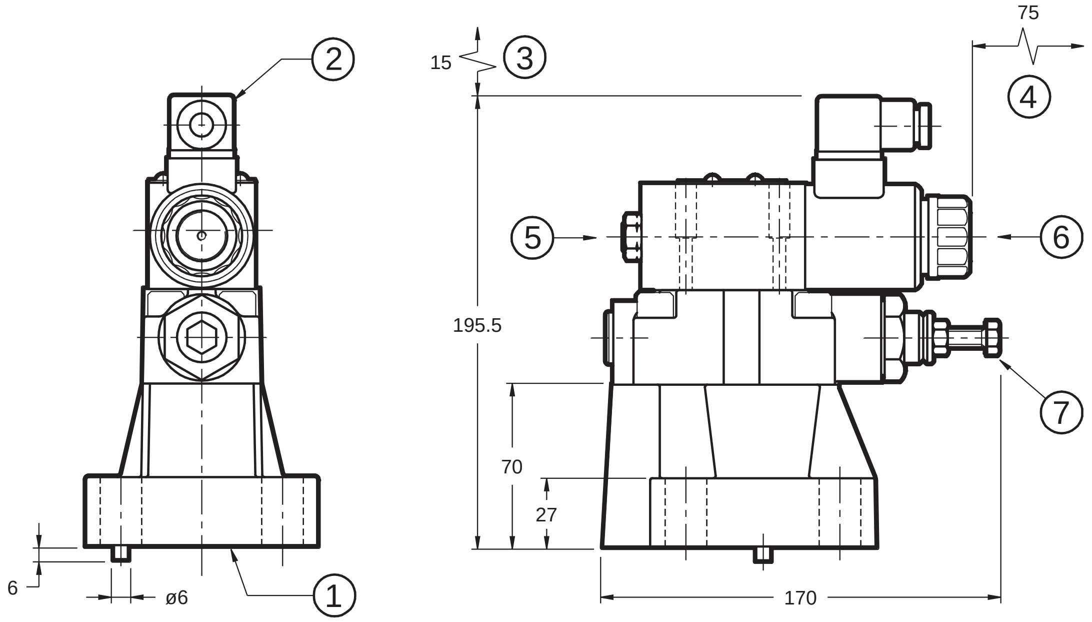
dimensions in mm

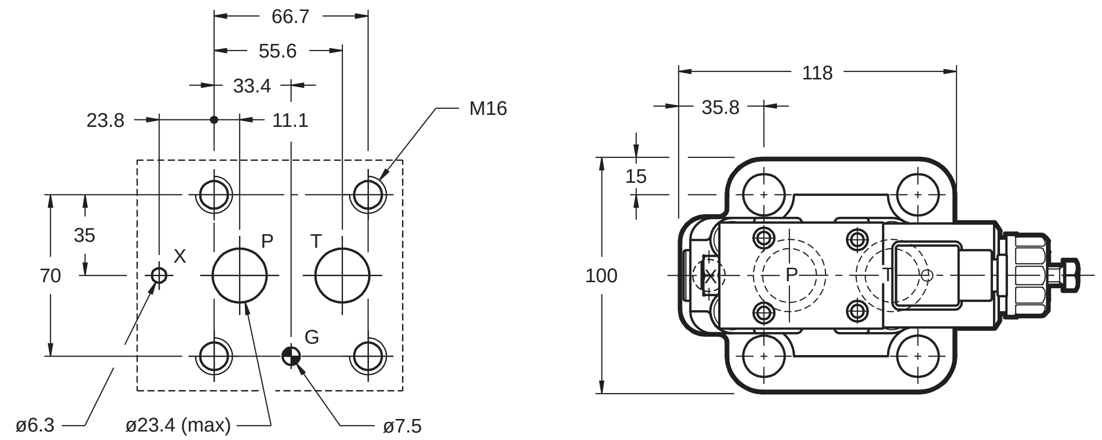
1	Mounting surface with sealing rings: n° 2 OR type 123 - 90 shore (17.86 x 2.62) n° 1 OR type 109 - 90 shore (9.13 x 2.62)
2	DIN 43650 electric connector
3	Connector removal space
4	Coil removal space
5	Factory setting sealing (we recommend not unscrewing the nut)
6	Breather (male hexagonal spanner 4)
7	Pressure relief valve (factory set)

Fastening bolts: 4 bolts M12x40 - ISO 4762
Torque: 69 Nm

NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (6) placed at the end of the solenoid tube.

8 - PRE25 OVERALL AND MOUNTING DIMENSIONS





dimensions in mm

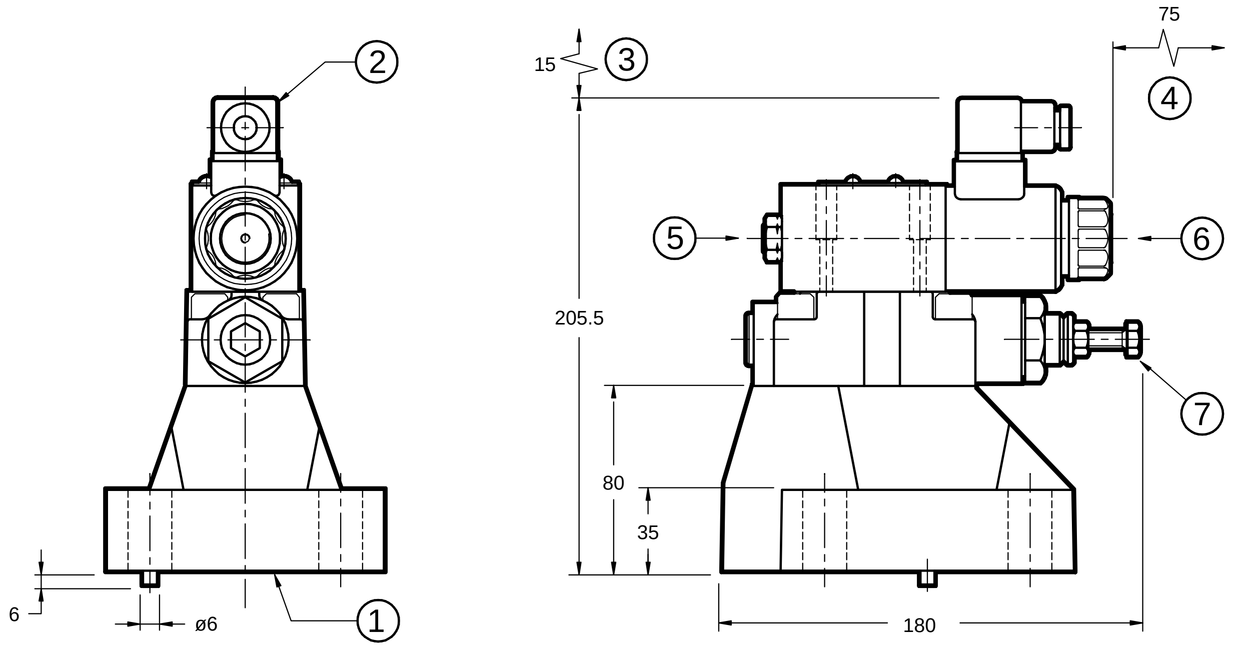
Mounting interface: ISO 6264-08-13-*-97
(CETOP 4.4.2-2-R08-350)

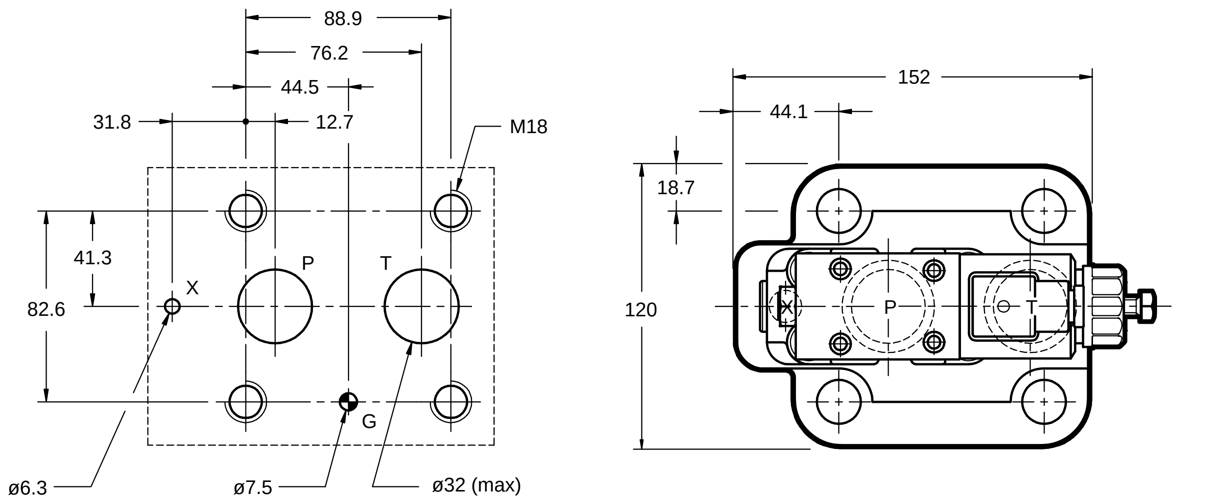
1	Mounting surface with sealing rings: 2 OR type 3118 - 90 shore (29.82 x 2.62) 1 OR type 109 - 90 shore (9.13 x 2.62)
2	DIN 43650 electric connector
3	Connector removal space
4	Coil removal space
5	Factory setting sealing (we recommend not unscrewing the nut)
6	Breather (male hexagonal spanner 4)
7	Pressure relief valve (factory set)

Fastening bolts: 4 bolts M16x50 - ISO 4762
Torque: 170 Nm

NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (6)placed at the end of the solenoid tube.

9 - PRE32 OVERALL AND MOUNTING DIMENSIONS





dimensions in mm

Mounting interface: ISO 6264-10-17-*-97
(CETOP 4.4.2-2-R10-350)

1	Mounting surface with sealing rings: 2 OR type 4137 - 90 shore (34.52 x 3.53) 1 OR type 109 - 90 shore (9.13 x 2.62)
2	DIN 43650 electric connector
3	Connector removal space
4	Coil removal space
5	Factory setting sealing (we recommend not unscrewing the nut)
6	Breather (male hexagonal spanner 4)
7	Pressure relief valve (factory set)

Fastening bolts: N. 4 bolts M18x60 - ISO 4762
Torque: 235 Nm

NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (6) placed at the end of the solenoid tube.

10 - ELECTRONIC CONTROL UNITS

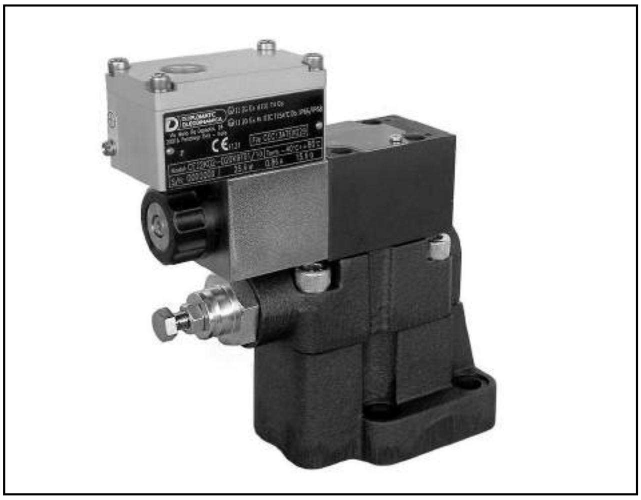
EDC-112	for solenoid 24V DC	plug version	see cat.89 120
EDC-142	for solenoid 12V DC		
EDM-M112	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250
EDM-M142	for solenoid 12V DC		
UEIK-11	for solenoid 24V DC	Eurocard type	see cat. 89 300

11 - SUBPLATES (see cat. 51 000)

	PRE10	**PRE25**	**PRE32**
Type	PMRQ3-AI4G rear ports	PMRQ5-AI5G rear ports	PMRQ7-AI7G rear ports
P, T ports dimensions	P: 1/2Ž BSP T: 3/4Ž BSP	1Ž BSP	1Ž ¼ BSP
X port dimensions	1/4Ž BSP	1/4Ž BSP	1/4Ž BSP

DUPLOMATIC OLEODINAMICA

DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com



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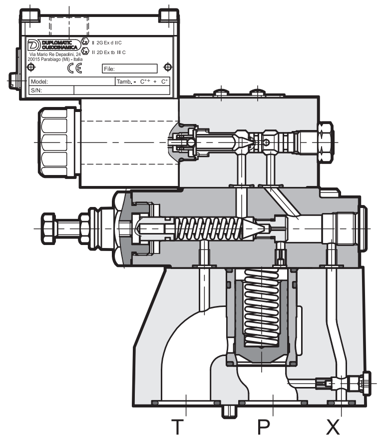

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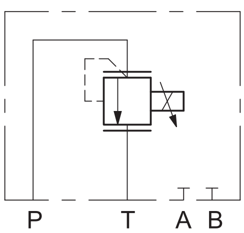

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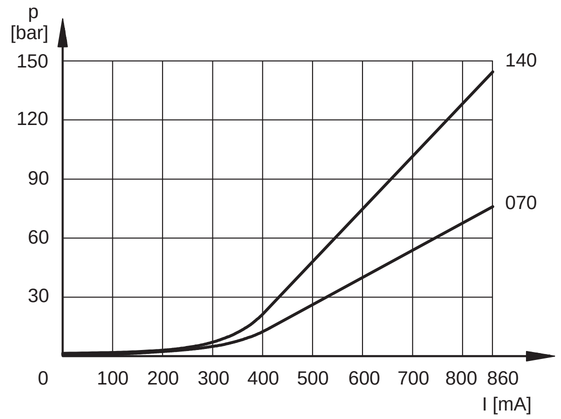

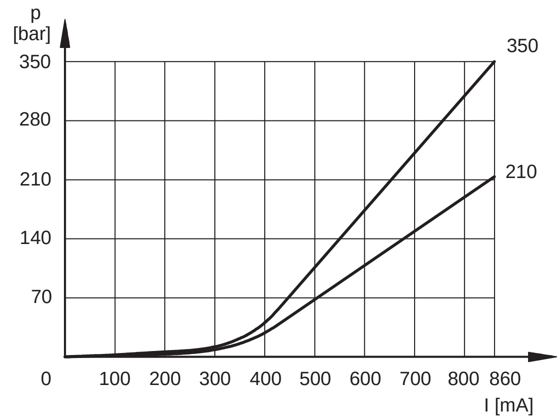

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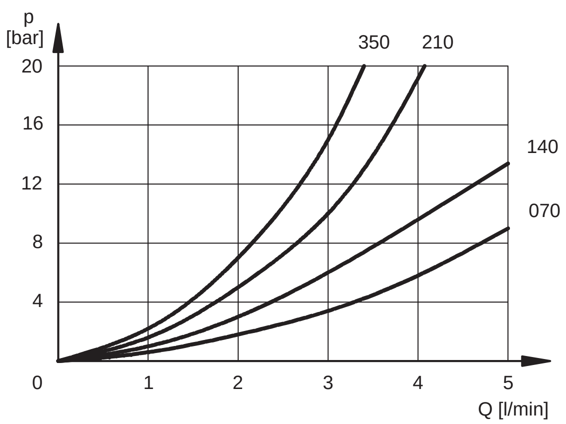

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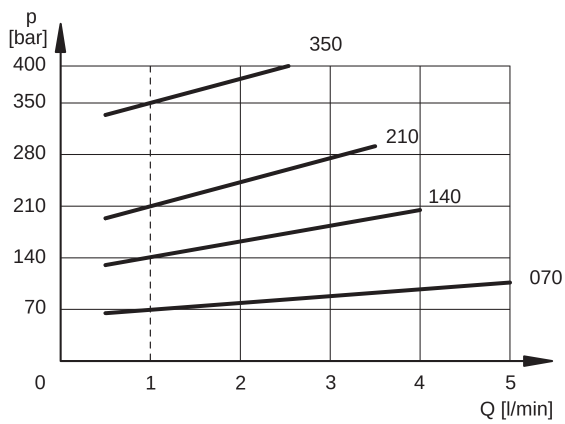

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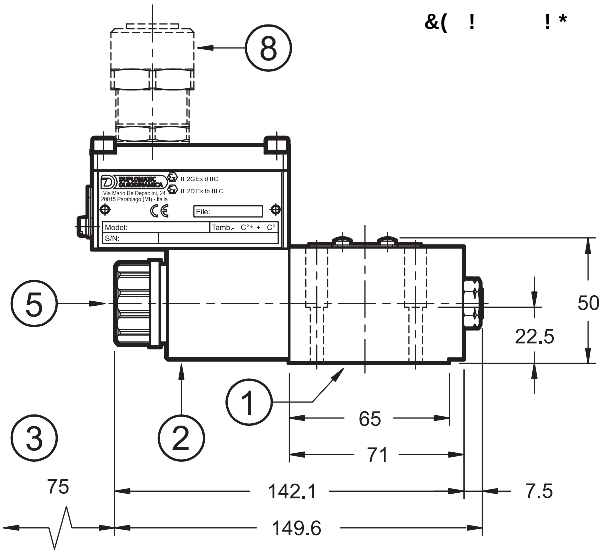

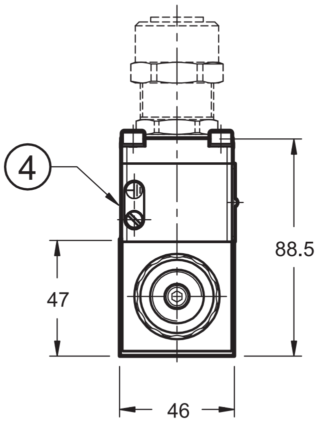

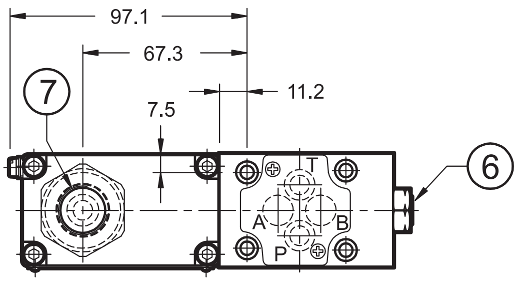

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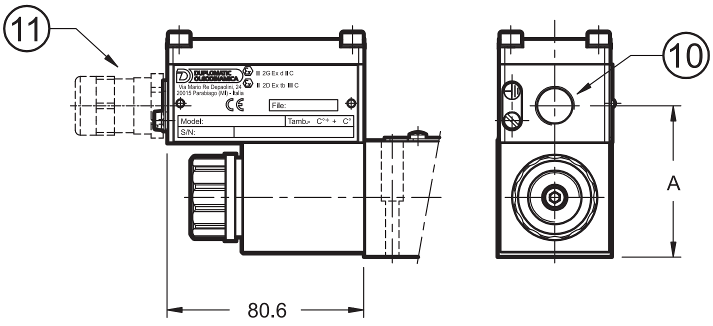

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	+7C>;?3= 8@C DFAA=7>7?E3CJ 73CE: 5@??75E;@?
	C73E:7C ==7? <7J
	35E@CJ D7EE;?9 D73=;?9 H7 C75@>>7?6 ?@E F?D5C7H;?9 E:7 ?FE
	,AA7C A@CE 8@C 534=7 9=3?6
	34=7 9=3?6 FAA7C A@CE D:@H? +@ 47 @C67C76 D7A3C3E7=J D77 A3C39C3A:

*;67 A@CE EJ/	;>7?D;@?
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$%* 3E E:7 8;CDE DE3CE FA @C 38E7C 3 =@?9 A7C;@6 @8 ?@ FD7 ;E ;D ?757DD3CJ E@ G7?E E:7 3;C E:C@F9: E:7 4C73E:7C A=3576 3E E:7 7?6 @8 E:7 D@=7?@;6 EF47

3DE7?;?9 @8 D;?9=7 G3=G7 * D5C7HD $ I !*&
+;9:E7?;?9 E@CBF7 %> D5C7HD
+:C736D @8 >@F?E;?9 :@=7D $ I
*73=;?9 C;?9D % &) EJA7 I D:@C7

PRE(D)*KD2
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@C G3=G7D DF;E34=7 8@C 3AA=;53E;@? 3?6 ;?DE3==3E;@? ;? A@E7?E;3==J 7IA=@D;G7 3E>@DA:7C7D 355@C6;?9 E@ + / 6;C75E;G7 AC7D 57CE;8;53E7D E:7 5@>4;?3E;@? G3=G7 5@@ **C96 5@@<H 2<F2HB :>4<D56B C96 564<2A2C:?> ?7 4?>7?A=:CH C? C96 5:A64C:E6 2>5 C96 ?@6A2C:> =2:>C6>2>46 =2>D2< C92C 4?>C2:>B 2<< C96 :>7?A=2C:?> >66565 7?A 2 4?AA64C DB6 ?7 C96 E2<E6 :> @?C6>C:2<<H 6G@<?B:E6 6>E:A?>**

@;=D 3DD7>4=76 @? E:7D7 G3=G7D :3G7 477? D7A3C3E7=J 57CE;8;76 355@C6;?9 E@ + / 6;C75E;G7 3?6 D@ E:7J 3C7 DF;E34=7 8@C FD7 7IA=@D;G7 3E>@DA:7C7D

,2<E6 * . 4<2BB:7:42C:?>

+:7 G3=G7D 53? 47 FD76 8@C 3AA=;53E;@?D 3?6 ;?DE3==3E;@?D ;? A@E7?E;3==J 7IA=@D;G7 3E>@DA:7C7D E:3E 83== H;E:;? 7;E:7C E:7 + / !! 5=3DD;8;53E;@? H;E: E:7 8@==@H >3C<;?9

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!! C@FA !! 8@C DFC8357 A=3?ED

3E79@CJ :;9: AC@E75E;@? 7=;9;4=7 8@C K@?7 E:7C78@C7 3=D@ 7=;9;4=7 8@C 53E79@CJ K@?7

+JA7 @8 3E>@DA:7C7 H;E: 93D7D G3A@FCD >;DED

!! 3D 9C@FA E:7C78@C7 3=D@ 7=;9;4=7 8@C 9C@FA !! 3?6 !!

+ +7>A7C3EFC7 5=3DD >3I DFC8357 E7>A7C3EFC7

4 '# AC@E75E;@? =7G7= 8@C 7=75EC;53= 67G;57D

L +3 L >4;7?E E7>A7C3EFC7 C3?97 8@C G3=G7D H;E: 4@E: % 3?6 - D73=D

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!! C@FA !! 8@C DFC8357 A=3?ED

3E79@CJ :;9: AC@E75E;@? 7=;9;4=7 8@C K@?7 E:7C78@C7 3=D@ 7=;9;4=7 8@C 53E79@CJ K@?7

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4 '# AC@E75E;@? =7G7= 8@C 7=75EC;53= 67G;57D

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+JA7 @8 3E>@DA:7C7 H;E: 93D7D G3A@FCD >;DED

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3E79@CJ :;9: AC@E75E;@? 7=;9;4=7 8@C K@?7 E:7C78@C7 3=D@ 7=;9;4=7 8@C 53E79@CJ K@?7

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!!! FDED 9C@FA E:7C78@C7 3=D@ 7=;9;4=7 8@C 9C@FA !!! 3?6 !!!

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%@6A2C:>8 C6=@6A2CDA6B

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+:7 G3=G7D 3C7 5=3DD;8;76 ;? + E7>A7C3EFC7 5=3DD + L E:7C78@C7 E:7J 3C7 7=;9;4=7 8@C @A7C3E;@? 3=D@ 3E :;9:7C 5=3DD E7>A7 + 8@C 93D 3?6 + L 8@C 6FDE

PRE(D)*KD2
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+:7 8=F;6 E7>A7C3EFC7 >FDE 47 47EH77? L 8@C 4@E: G3=G7D H;E: % 3?6 - D73=D 3?6 L 8@C G3=G7D H;E: %# D73=D

+:7 G3=G7D 3C7 5=3DD;8;76 ;? + E7>A7C3EFC7 5=3DD + L E:7C78@C7 E:7J 3C7 DF;E34=7 8@C @A7C3E;@? ;? E:7 + E7>A7C3EFC7 5=3DD + + + 8@C 93D 3?6 + L 8@C 6FDED

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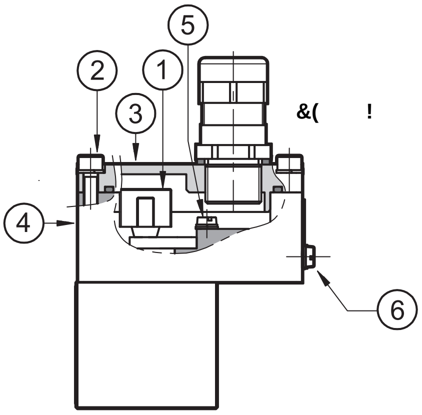
&? E:7 7IE7C?3= 4@6J @8 E:7 5@;= E:7C7 ;D 3 9C@F?6;?9 A@;?E $ D5C7H E:3E 3==@H E@ 7?DFC7 7BF;A@E7?E;3=;EJ 47EH77? E:7 G3 97?7C3= 9C@F?6;?9 =;?7 @8 E:7 DJDE7> 5@??75E;?9 E:;D A@;?E E@ E:7 C79F=3E;@? @8 E:7 % DE3?63C6 E:3E ;>A@D7 E@ G7C;8J E:7 7BF;A @8 E:7 7=7>7?ED ;?5=F676 ;? 3 A@E7?E;3==J 7IA=@D;G7 7?G;C@?>7?E E:7 >3I;>F> C7D;DE3?57 47EH77? E:7 7=7>7?ED >FDE 47 S 9F3C3?E776

E E:7 7?6 @8 E:7 7=75EC;53= H;C;?9 ;E ;D ?757DD3CJ E@ C73DD7>4=7 E:7 5@G7C @? E:7 4@I 5:75<;?9 E:7 5@CC75E A@D;E;@?;?9 @8 E: ;? E:7 5@G7C D73E 3?6 83DE7?;?9 E:7 $ D5C7HD H;E: 3 E@CBF7 @8 Y %>

=75EC;53= H;C;?9 >FDE 47 6@?7 8@==@H;?9 E:7 ;?DECF5E;@?D @8 E:7 CF=7D ;? 5@>A=;3?57 H;E: + /]DE3?63C6D



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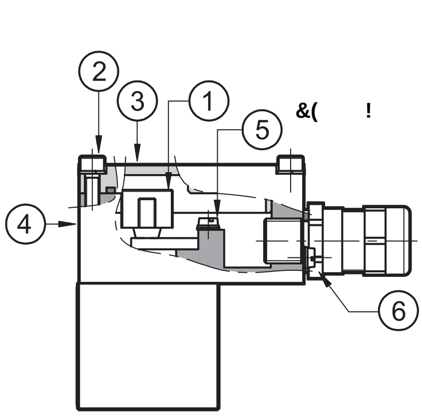

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PRE(D)*KD2
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34=7D 8@C H;C;?9 >FDE 47 ?@? 3C>@FC76 534=7D H;E: 7IE7C?3= 5@G7C;?9 D:73E: 3?6 >FDE 47 DF;E34=7 8@C FD7 ;? 7?G;C@?>7?ED H;E: 8C@> L E@ L 8@C G3=G7D 7;E:7C H;E: % @C - D73=D @C 8C@> L E@ L 8@C G3=G7D H;E: %# D73=D

34=7 9=3?6D H:;5: >FDE 47 @C67C76 D7A3C3E7=J D77 A3C39C3A: 3==@H E@ FD7 534=7D H;E: 7IE7C?3= 6;3>7E7C 47EH77? 3?6 >>

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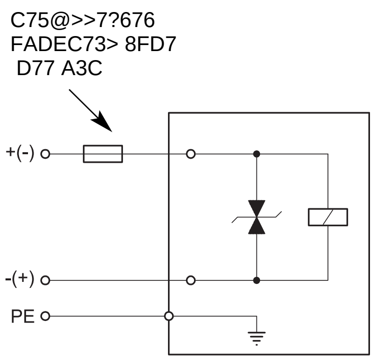

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!? @C67C E@ D3879F3C6 E:7 7=75EC@?;5 67G;57 E@ H:;5: E:7 G3=G7 ;D 5@??75E76 E:7C7 ;D 3 AC@E75E;@? 5;C5F;E ;? E:7 5@;= E:3E C76 H:;5: 53? @55FC H:7? ;?6F5E3?57D 3C7 DH;E5:76 @88

+:7 E34=7 D:@HD E:7 EJA7 @8 8FD7 C75@>>7?676 355@C6;?9 E@ E:7 ?@>;?3= G@=E397 @8 E:7 G3=G7 3?6 E@ E:7 G3=F7 @8 E:7 G@=E397

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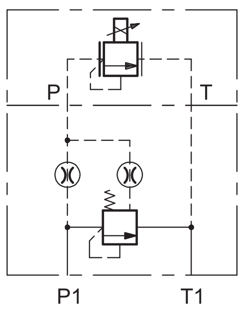

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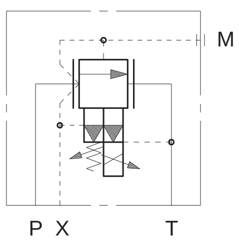

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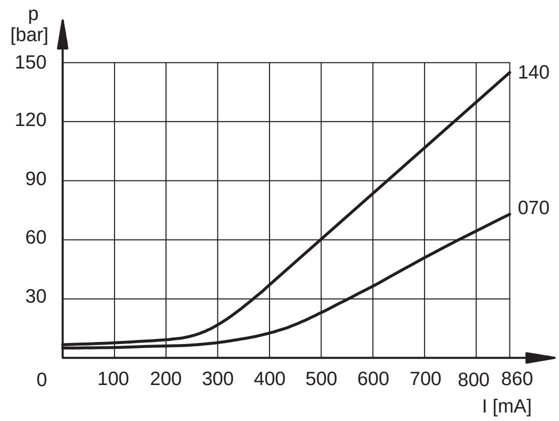

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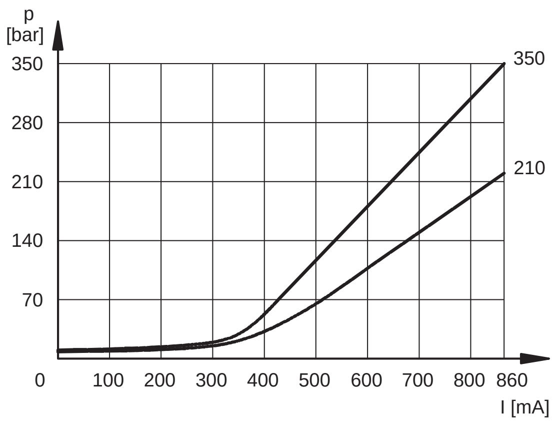

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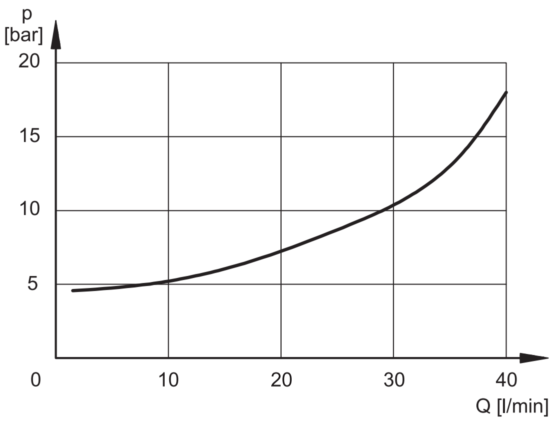

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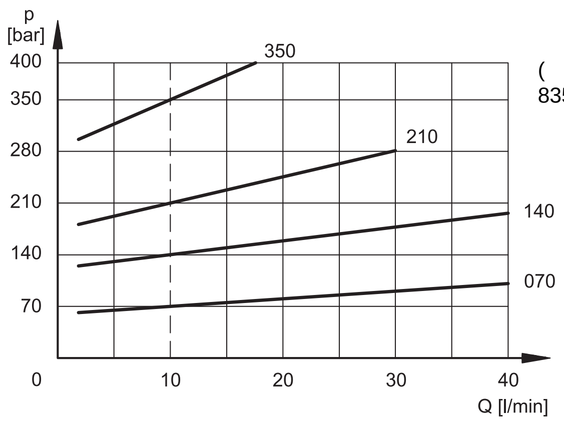

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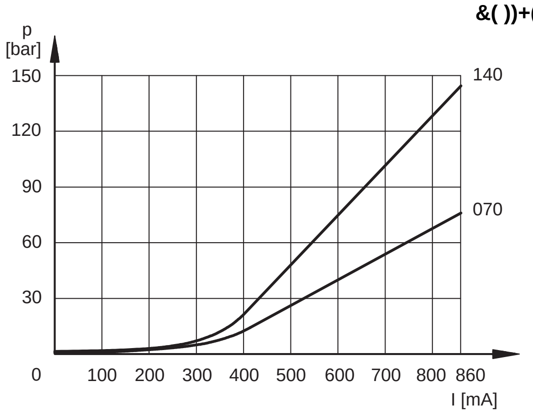

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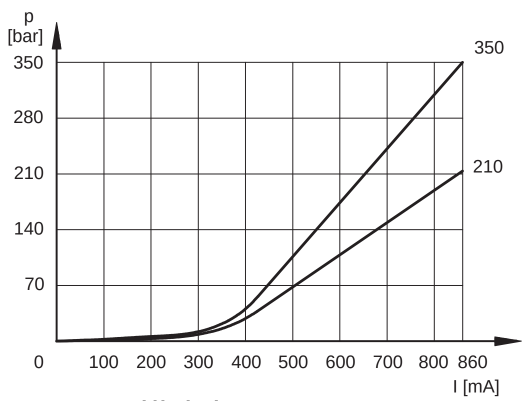

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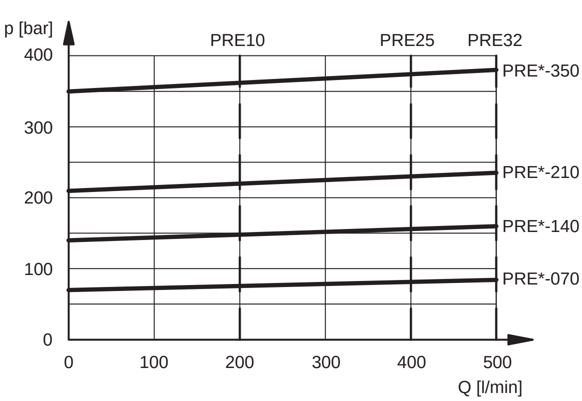

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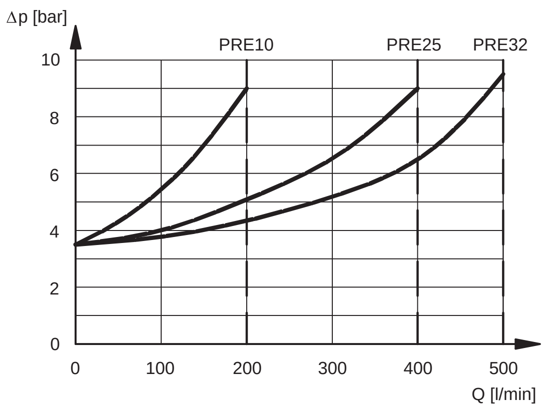

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*E7A C7DA@?D7 ;D E:7 E;>7 E3<7? 8@C E:7 G3=G7 E@ C735: @8 E AC7DDFC7 G3=F7 8@==@H;?9 3 DE7A 5:3?97 @8 C787C7?57 D;9?3=

+:7 E34=7 ;==FDEC3E7D EJA;53= DE7A C7DA@?D7 E;>7D >73DFC76 H;E @8 AC7DDFC7 C3?97 FA E@ 43C 3?6 H;E: ;?AFE 8=@H C3E7 @8 (8@C ') " (= >;? 8@C ') " 3?6 (= >;? 8@C ') " ') " 3?6 ') "

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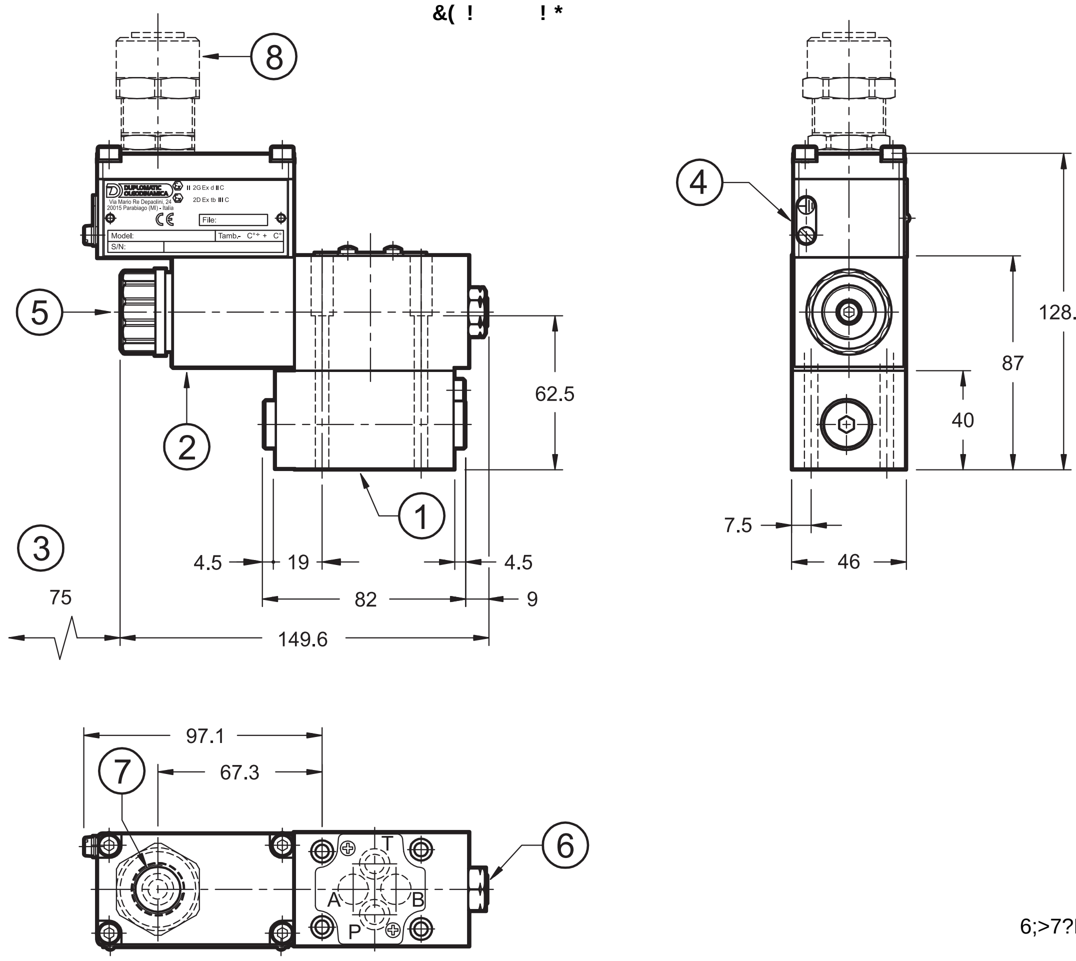

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$%* 8@C D;67 A@CE 534=7 9=3?6 D77 A3C39C3A:

	$@F?E;?9 DFC8357 H;E: D73=;?9 C;?9D
	IA=@D;@? AC@@8 5@;=
	@;= C7>@G3= DA357
	+7C>;?3= 8@C DFAA=7>7?E3CJ 73CE: 5@??75E;@?
	C73E:7C ==7? <7J
	35E@CJ D7EE;?9 D73=;?9 H7 C75@>>7?6 ?@E F?D5C7H;?9 E:7 ?FE
	,AA7C A@CE 8@C 534=7 9=3?6
	34=7 9=3?6 FAA7C A@CE D:@H? +@ 47 @C67C76 D7A3C3E7=J D77 A3C39C3A:

3DE7?;?9 @8 D;?9=7 G3=G7 D5C7HD * $ I !*&
+;9:E7?;?9 E@CBF7 %> D5C7HD
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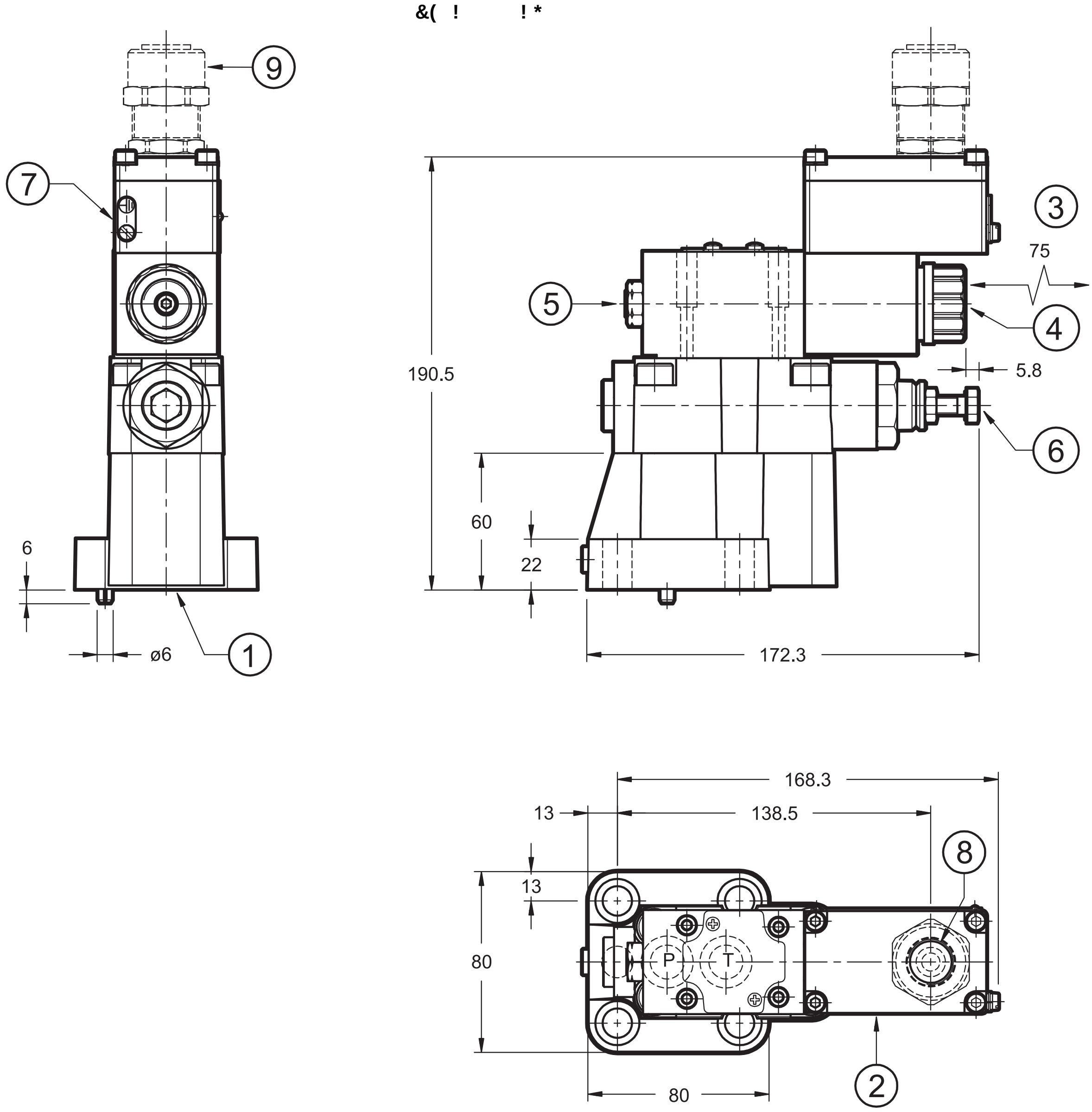

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	C73E:7C ==7? <7J
	35E@CJ D7EE;?9 D73=;?9 H7 C75@>>7?6 ?@E F?D5C7H;?9 E:7 ?FE
	'C7DDFC7 C7=;78 G3=G7 835E@CJ D7E
	+7C>;?3= 8@C DFAA=7>7?E3CJ 73CE: 5@??75E;@?
	,AA7C A@CE 8@C 534=7 9=3?6
	34=7 9=3?6 FAA7C A@CE D:@H? +@ 47 @C67C76 D7A3C3E7=J D77 A3C39C3A:

$%* 3E E:7 8;CDE DE3CE FA @C 38E7C 3 =@?9 A7C;@6 @8 ?@ FD7 ;E ;D ?757DD3CJ E@ G7?E E:7 3;C E:C@F9: E:7 4C73E:7C A=3576 3E E:7 7?6 @8 E:7 D@=7?@;6 EF47
$%* 8@C D;67 A@CE 534=7 9=3?6 D77 A3C39C3A:

3DE7?;?9 @8 D;?9=7 G3=G7 D5C7HD $ I !*&
+;9:E7?;?9 E@CBF7 %> D5C7HD
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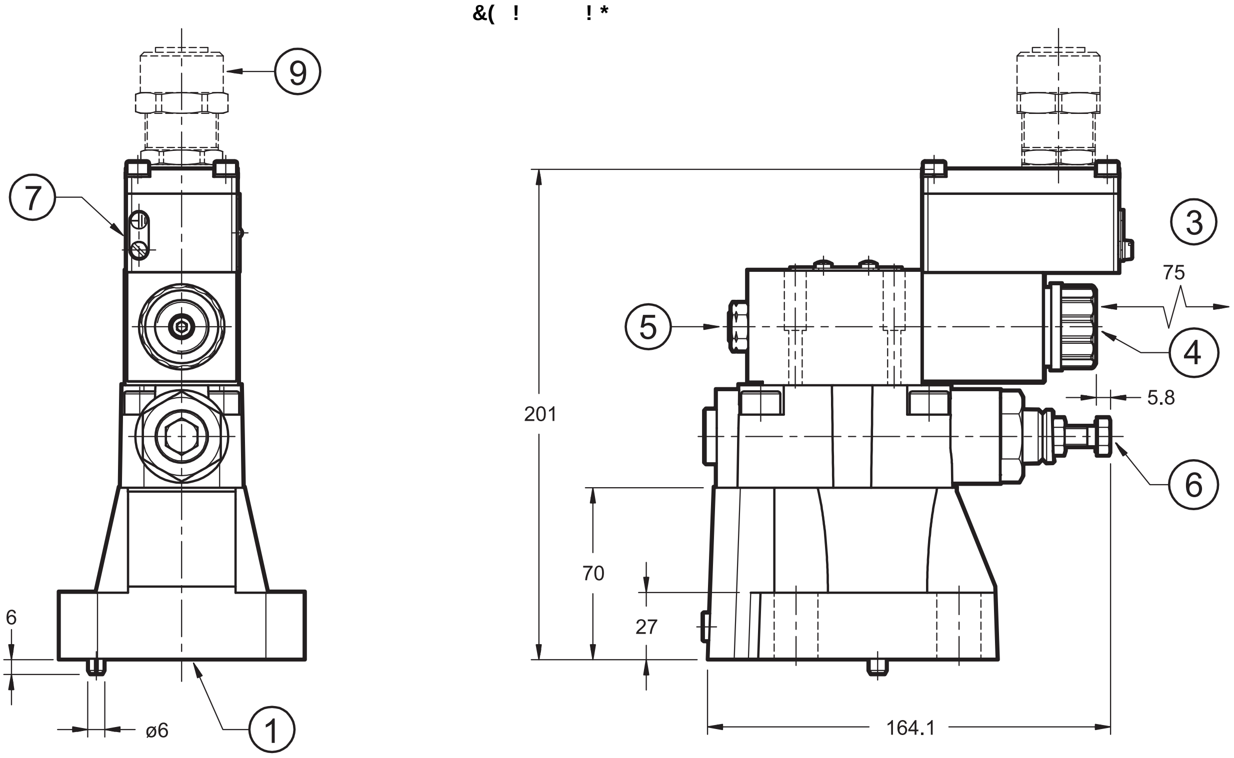

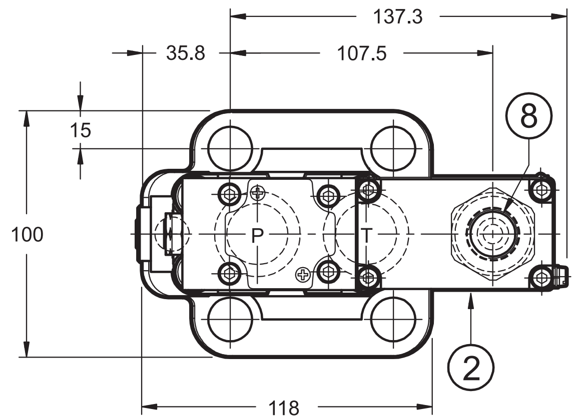

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	@;= C7>@G3= DA357
	C73E:7C ==7? <7J
	35E@CJ D7EE;?9 D73=;?9 H7 C75@>>7?6 ?@E F?D5C7H;?9 E:7 ?FE
	'C7DDFC7 C7=;78 G3=G7 835E@CJ D7E
	+7C>;?3= 8@C DFAA=7>7?E3CJ 73CE: 5@??75E;@?
	,AA7C A@CE 8@C 534=7 9=3?6
	34=7 9=3?6 FAA7C A@CE D:@H? +@ 47 @C67C76 D7A3C3E7=J D77 A3C39C3A:

$%* 3E E:7 8;CDE DE3CE FA @C 38E7C 3 =@?9 A7C;@6 @8 ?@ FD7 ;E ;D ?757DD3CJ E@ G7?E E:7 3;C E:C@F9: E:7 4C73E:7C A=3576 3E E:7 7?6 @8 E:7 D@=7?@;6 EF47

$%* 8@C D;67 A@CE 534=7 9=3?6 D77 A3C39C3A:

3DE7?;?9 @8 D;?9=7 G3=G7 * D5C7HD $ I !*&
+;9:E7?;?9 E@CBF7 %> D5C7HD
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*73=;?9 C;?9D % &) EJA7 I D:@C7 % &)]EJA7 I D:@C7

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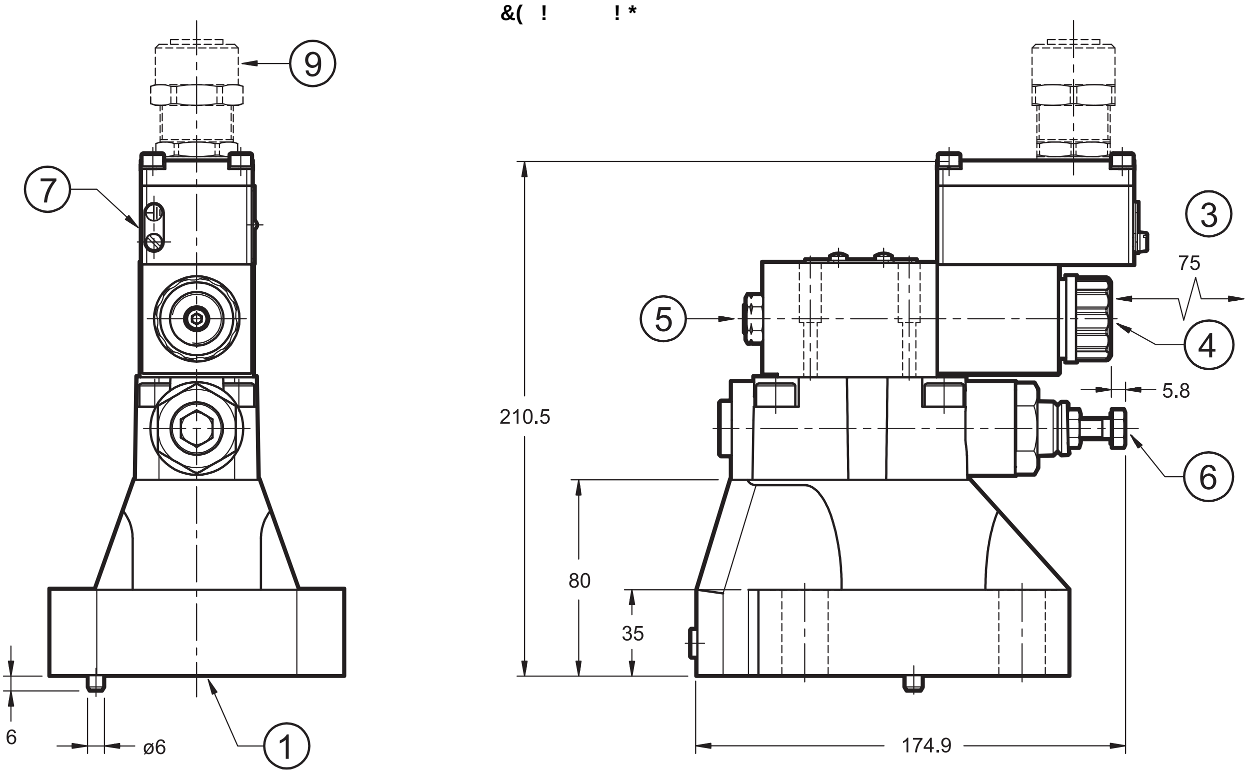

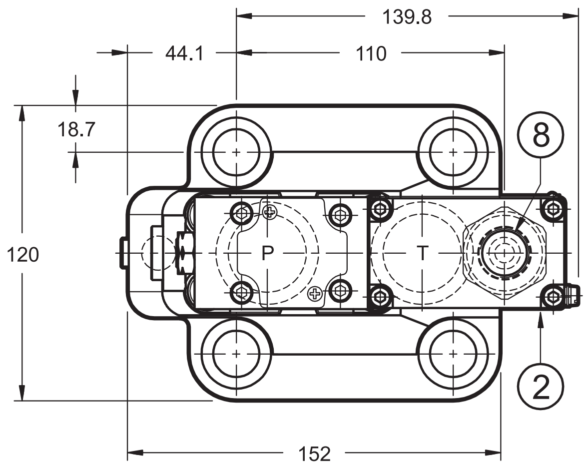

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	IA=@D;@? AC@@8 5@;=
	@;= C7>@G3= DA357
	C73E:7C ==7? <7J
	35E@CJ D7EE;?9 D73=;?9 H7 C75@>>7?6 ?@E F?D5C7H;?9 E:7 ?FE
	'C7DDFC7 C7=;78 G3=G7 835E@CJ D7E
	+7C>;?3= 8@C DFAA=7>7?E3CJ 73CE: 5@??75E;@?
	,AA7C A@CE 8@C 534=7 9=3?6
	34=7 9=3?6 FAA7C A@CE D:@H? +@ 47 @C67C76 D7A3C3E7=J D77 A3C39C3A:

$%* 3E E:7 8;CDE DE3CE FA @C 38E7C 3 =@?9 A7C;@6 @8 ?@ FD7 ;E ;D ?757DD3CJ E@ G7?E E:7 3;C E:C@F9: E:7 4C73E:7C A=3576 3E E:7 7?6 @8 E:7 D@=7?@;6 EF47

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3DE7?;?9 @8 D;?9=7 G3=G7 % * D5C7HD $ I !*&
+;9:E7?;?9 E@CBF7 %> D5C7HD
+:C736D @8 >@F?E;?9 :@=7D $ I
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PRE(D)*KD2
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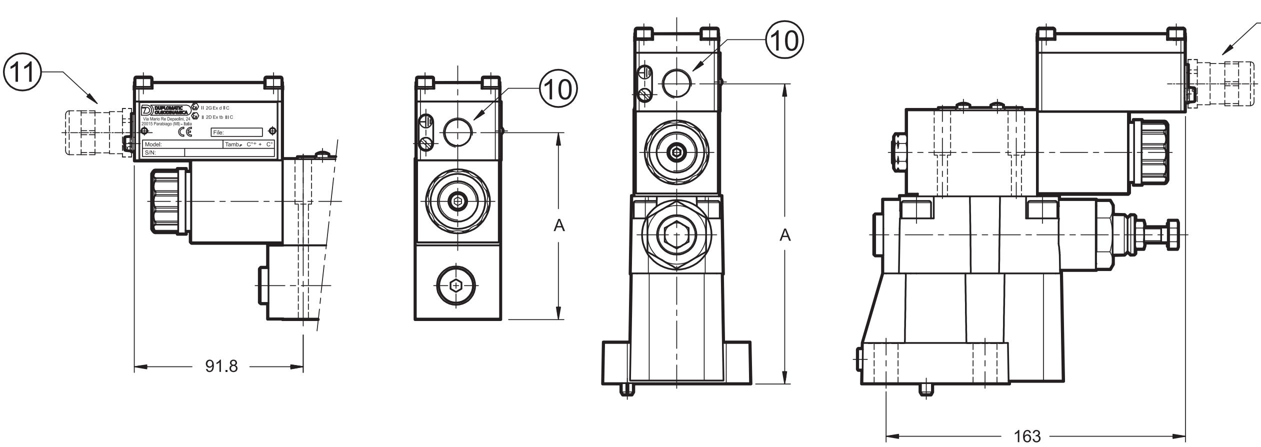

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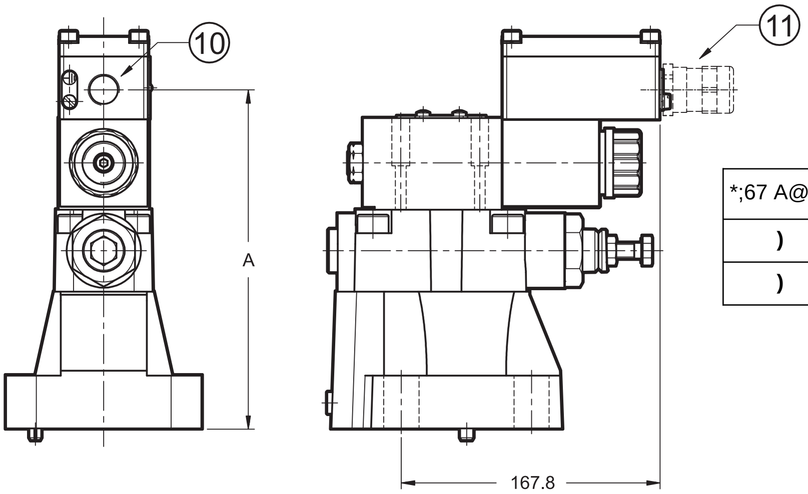

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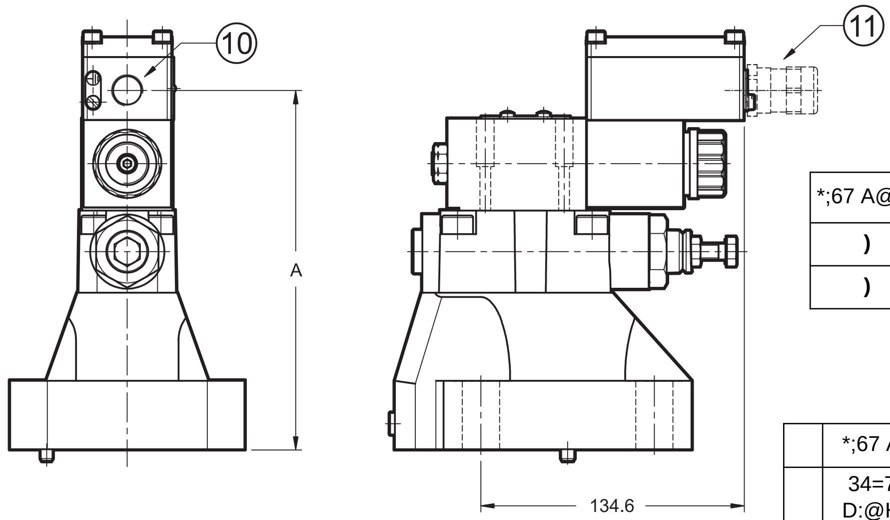

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PRE(D)*KD2

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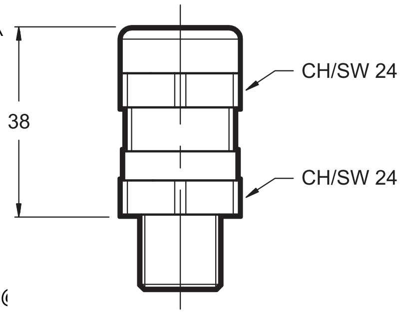
34=7 9=3?6D >FDE 47 @C67C76 D7A3C3E7=J FA=@>3E;5 @887CD D@>7 EJA7D @8 534=7 9=3?6D H;E: E:7 8@==@H;?9 873EFC7D

M G7CD;@? 8@C ?@? 3C>@FC76 534=7 7IE7C?3= D73= @? E:7 534=7 DF;E34=7 8@C P Y^
M 355@C6;?9 E@ + / !!   6;C75E;G7 57CE;8;76
M 534=7 9=3?6 >3E7C;3= ?;5<7= 4C3DD
M CF447C E;A >3E7C;3= D;=;5@?7
M 3>4;7?E E7>A7C3EFC7 C3?97   R Y   R
M AC@E75E;@? 679C77 !' !'



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-7CD;@? H;E: $ I !*& >3=7 E:C736 DF;E34=7 8@C 5@;=D H;E: + 3?6 * 5@??75E;@? EJA7D ;E ;D DFAA=;76 7BF;AA76 H;E: D;=;5@?7 D73= E:3E >FDE 47 3DD7>4=76 47EH77? E:7 534=7 9=3?6 3?6 E:7 5@;= 5@G7C D@ 3D E@ 7?DFC7 !' !' AC@E75E;@? 679C77

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-7CD;@? H;E: V %'+ %*! 7I %*! DF;E34=7 8@C 5@;=D H;E: + 5@??75E;@? EJA7 ;? @C67C E@ 7?DFC7 !' !' AC@E75E;@? 679C77 +:7 5FDE@>7C >FDE 3AA=J #& +!+ N O E:C736=@5<7C @C D;>;=3C 47EH77? E:7 534=7 9=3?6 5@??75E;@? E:C 3?6 E:7 5@;= 5@G7C

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6B4A:@C:?> ! $

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-7CD;@? H;E: $ I !*& >3=7 E:C736 DF;E34=7 8@C 5@;=D H;E: + 5@??75E;@? EJA7 ;E ;D DFAA=;76 7BF;AA76 H;E: D;=;5@?7 D73= E:3E >FDE 47 3DD7>4=76 47EH77? E:7 534=7 9=3?6 3?6 E:7 5@;= 5@G7C D@ 3D E@ 7?DFC7 !' !' AC@E75E;@? 679C77

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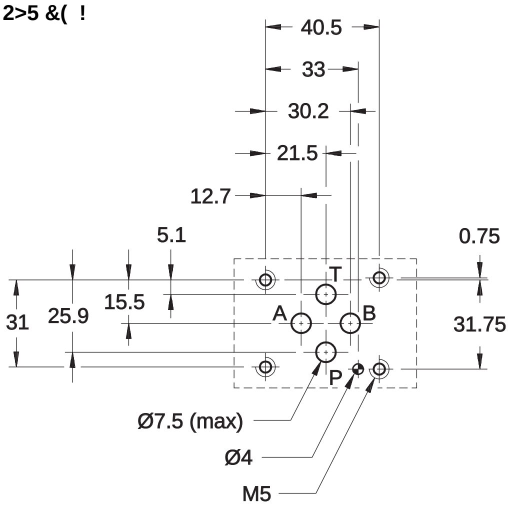

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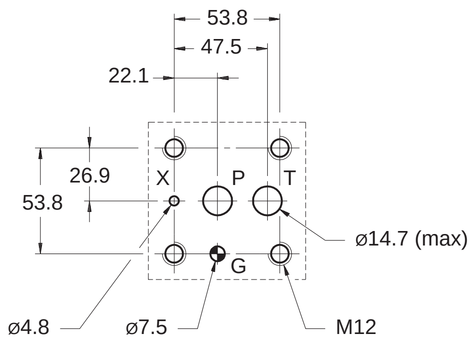

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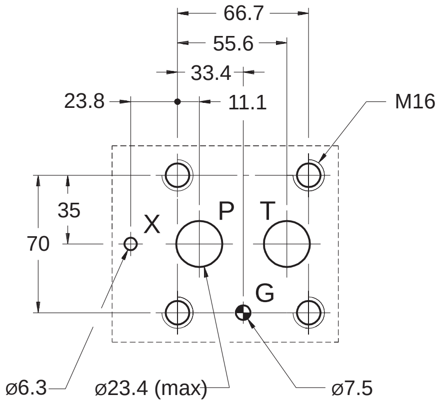

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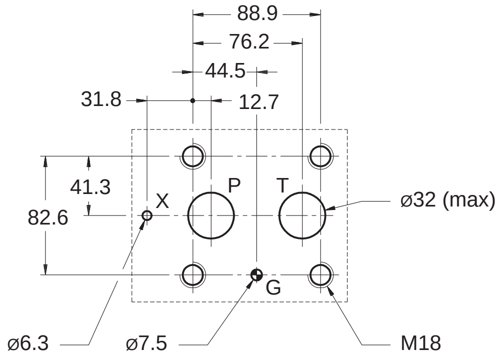

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,D7 >;?7C3= @;= 43D76 :J6C3F=;5 8=F;6D # @C $ EJA7 355@C6;?9 E@ !*& @C E:7D7 8=F;6D FD7 %) D73=D 5@67 % @C 8=F;6D) EJA7 A:@DA:3E7 7DE7CD FD7 '$ D73=D 5@67 - @C E:7 FD7 @8 @E:7C <;?6D @8 8=F;6 DF5: 3D A=73D7 5@?DF=E @FC E75:?;53 67A3CE>7?E ,D;?9 8=F;6D 3E E7>A7C3EFC7D ::9:7C E:3? L 53FD7D 3 83DE7C 679C363E;@? @8 E:7 8=F;6 3?6 @8 E:7 D73=D 5:3C35E7C;DE;5D

+:7 8=F;6 >FDE 47 AC7D7CG76 ;? ;ED A:JD;53= 3?6 5:7>;53= 5:3C35E7C;DE;5D

$)* "" * %$

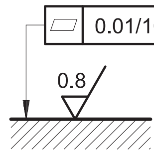
.7 C75@>>7?6 E@ ;?DE3== E:7 G3=G7D 7;E:7C ;? :@C;K@?E3= A@D;E;@? @C G7CE;53= A@D;E;@? H;E: E:7 D@=7?@;6 6@H?H3C6 !8 E:7 G7CE;53= A@D;E;@? 3?6 H;E: E:7 D@=7?@;6 FAH3C6 J@F >FDE 5@?D;67C A@DD;4=7 G3C;3E;@?D @8 E:7 >;?;>F> 5@?EC@==76 AC7DDFC7 ;D ;?6;53E76 ;? A3C39C3A:D 3?6

?DFC7 E:3E E:7C7 ;D ?@ 3;C ;? E:7 :J6C3F=;5 5;C5F;E !? A3CE;5F=3C 3AA=;53E;@?D ;E 53? 47 ?757DD3CJ E@ G7?E E:7 3;C 4J FD;?9 E:7 3A D5C7H ;? E:7 D@=7?@;6 EF47 E E:7 7?6 @8 E:7 @A7C3E;@? >3<7 DFC7 @8 :3G;?9 5@CC75E=J D5C7H76 E:7 6C3;? D5C7H

@??75E E:7 + A@CE @? E:7 G3=G7 6;C75E=J E@ E:7 E3?< 66 3?J 435<AC7DDFC7 G3=F7 67E75 =;?7 E@ E:7 5@?EC@==76 AC7DDFC7 G3=F7 $3I;>F> 36>;DD;4=7 435<AC7DDFC7 ;? E:7 + = @A7C3E;@?3= 5@?6;E;@?D ;D 43C

-3=G7D 3C7 8;I76 4J >73?D @8 D5C7HD @C E;7 C@6D @? 3 8=3E DFC8357 H;E: A=3?3C;EJ 3?6 C@ E@ @C 47EE7C E:3? E:@D7 ;?6;53E76 ;? E:7 C7=3E;G7 DJ>4@=D !8 >;?;>F> G3=F7D 3C7 ?@E @ 53? 73D;=J =73< 47EH77? E:7 G3=G7 3?6 DFAA@CE DFC8357

*FC8357 8;?;D:;?9



" *(%$ %$*(%" +$ *)

##	8@C D@=7?@;6 -	!% % C3;= >@F?E;?9	D77 53E
##	8@C D@=7?@;6 -		

$%* 6<64CA?>:4 4?>CA?< D>:CB ?776A65 2A6 >?C 46AC:7:65 244?A5:>8 C? * . :A64C:E6 C96A67?A6 C96H =DBC 36 :>BC2<<65 ?DCB:56 C96 4<2BB:7:65 2A62

)+ &" *) D77 53E3=@9F7

	&(!	&(!	&(!	&(!	&(!
+JA7 H;E: C73C A@CED	'$$!	'$$!	'$)(!	'$)(!	'$)(!
+JA7 H;E: D;67 A@CED	'$$ #	'$$ #			
' + A@CED 6;>7?D;@?D	V *'	V *'	' V *' + V *'	V *'	V [*'
/ A@CE 6;>7?D;@?D			V *'	V *'	V *'

$%* *F4A=3E7D E@ 47 @C67C76 D7A3C3E7=J 6@ ?@E 5@?E3;? ?7;E:7C 3=F>;?;F> ?@C >39?7D;F> 3E 3 ::9:7C C3E7 E:3? E:7 G3=F7 3==@H76 355@C6;?9 E@ + / 6;C75E;G7 8@C 53E79@CJ

+:7 FD7C >FDE E3<7 53C7 3?6 >3<7 3 5@>A=7E7 3DD7DD>7?E @8 E:7 ;9?;E;@? C;D< E:3E 53? @55FC 8C@> E:7 C7=3E;G7 FD7 ;? A@E7?E;3 7?G;C@?>7?ED

DUPLOMATIC OLEODINAMICA
DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

PRE*G

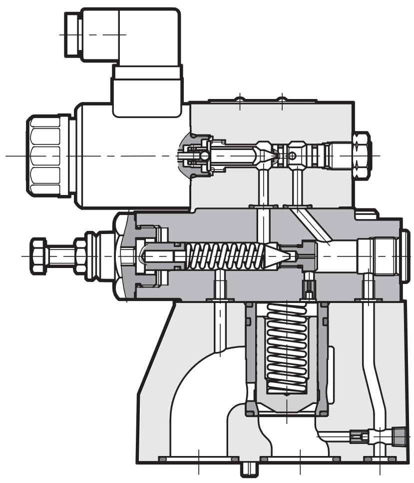
PILOT OPERATED PRESSURE RELIEF VALVES WITH PROPORTIONAL CONTROL AND INTEGRATED ELECTRONICS

SERIES 11

SUBPLATE MOUNTING

p max **350** bar
Q max (see table of performances)

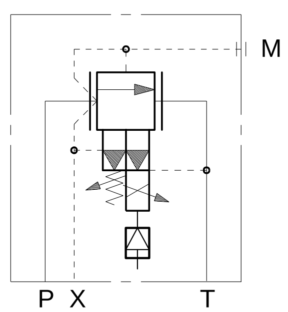
OPERATING PRINCIPLE



- The PRE*G valves are pilot operated pressure relief valves with integrated electric proportional control and mounting interface in compliance with ISO 6264 (CETOP RP 121H) standards.
- These valves are normally 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.
- Pressure can be modulated continuously in proportion to the reference signal.
- The valves are controlled directly by an integrated digital amplifier (see paragraph 4).
- 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 with flow rates up to 500 l/min and in four pressure control ranges up to 350 bar.

PERFORMANCES (obtained with mineral oil with viscosity of 36 cSt at 50°C and digital integrated electronics)		**PRE10G**	**PRE25G**	**PRE32G**
Maximum operating pressure:	bar	350		
Minimum controlled pressure		see p-Q diagram		
Maximum flow	l/min	200	400	500
Step response		see paragraph 3		
Hysteresis	% of p nom	< 3%		
Repeatability	% of p nom	< ±1%		
Electrical characteristic		see paragraph 4		
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			
Recommended viscosity	cSt	25		
Mass:	kg	5,5	6,3	8,5

HYDRAULIC SYMBOL



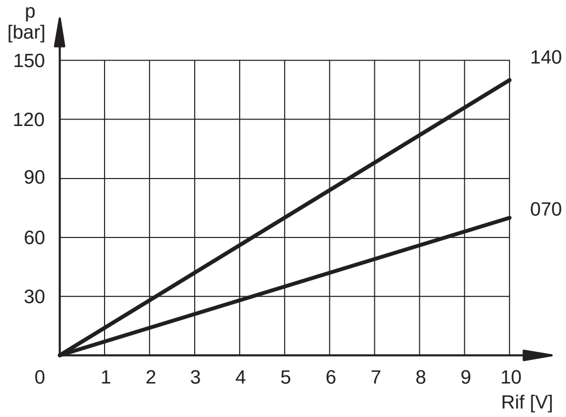
1 - IDENTIFICATION CODE

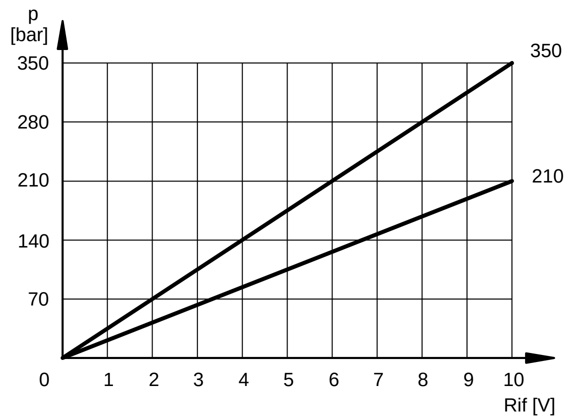
P	R	E		G	-		/	11		-		K11	/	

- Pilot operated pressure relief valve
- Electro-proportional control
- Size: **10** = ISO 6264-06 (CETOP R06); **25** = ISO 6264-08 (CETOP R08); **32** = ISO 6264-10 (CETOP R10)
- Digital integrated electronics for open loop
- Pressure control range
  - **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 oil (**standard**)
  - **V** = FPM seals for special fluids
- Reference signal:
  - **E0** = voltage 0 / +10V
  - **E1** = current 4 / 20mA
- Main connector 6 pin + PE
- **B** = standard version
- **C** = with CAN connection

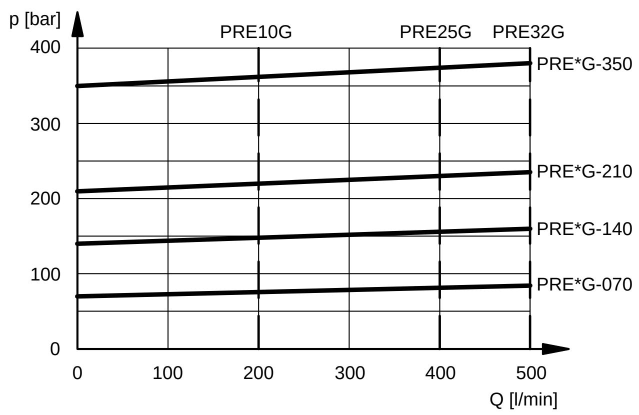
2 - CHARACTERISTIC CURVES (measured with viscosity of 36 cSt at 50°C)

PRESSURE CONTROL p=f (I)

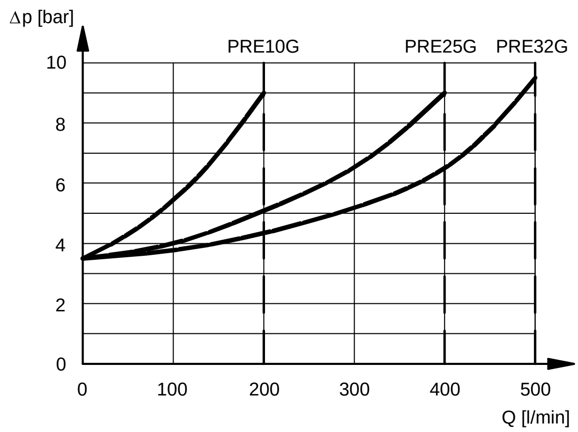




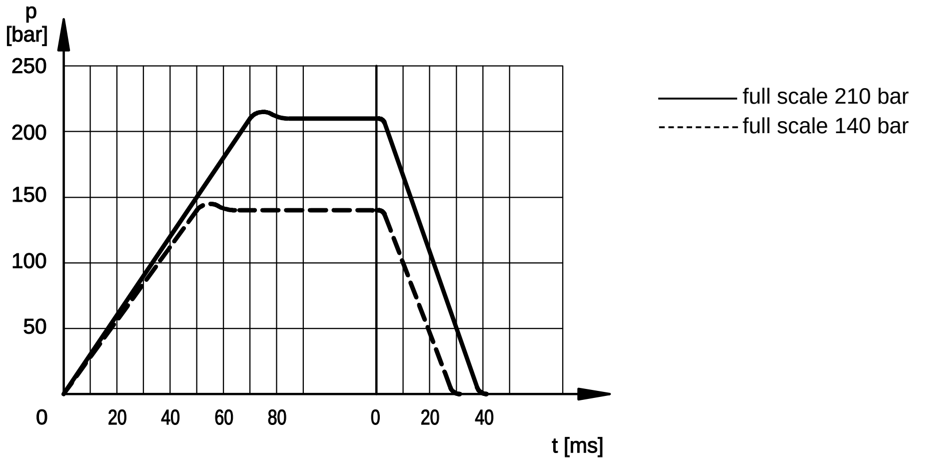
PRESSURE CONTROL p=f (Q)



PRESSURE DROPS p = f(Q)



3 - STEP RESPONSE (obtained with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronics)



NOTE: Response times are obtained by using a PRE25G valve with a full scale of 140 and 210 bar.

4 - ELECTRICAL CHARACTERISTICS

4.1 - Digital integrated electronics

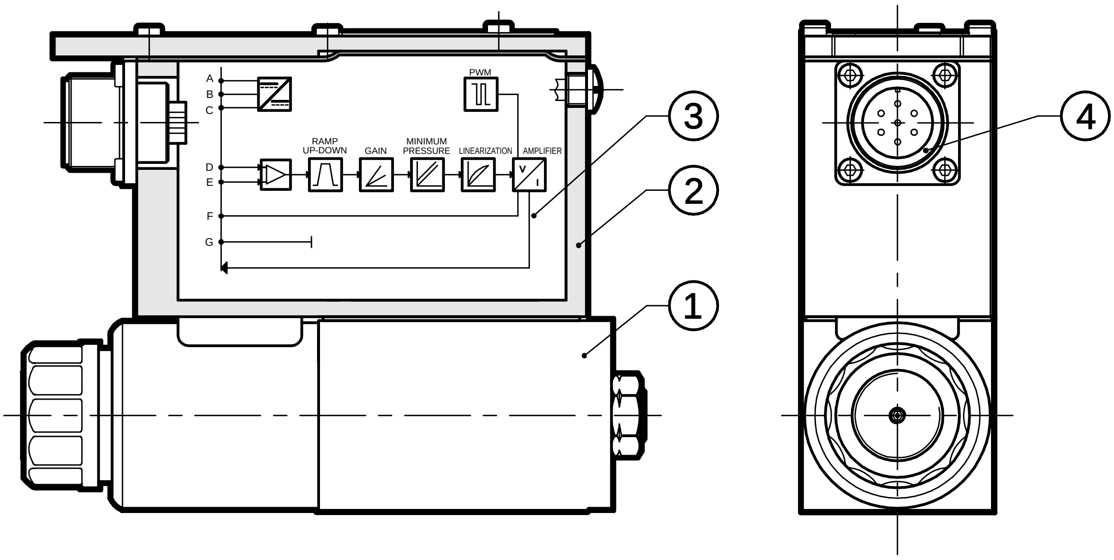
The proportional valve is controlled by a digital amplifier (driver), which incorporates a microprocessor that controls, via software, all the valve functions, such as:
- continuous converting (0,5 ms) of the voltage reference signal (E0) or of the current reference signal (E1) in a digital value
- generation of up and down ramps (see **NOTE**)
- gains limit (see **NOTE**)
- compensation of the dead band
- linearization of the characteristic curve
- regulation of the current to the solenoid
- dynamic regulation of PWM frequency
- protection of the solenoid outputs against possible short circuits

NOTE: These parameters can be set through the connection to the CAN connector, by means of a personal computer and relevant software (see paragraph 5.3)

The digital driver enables the valve to reach better performance compared to the analogic version, such as:

- reduced hysteresis and improved repeatability
- reduced response times
- linearization of the characteristic curve which is optimised in factory for each valve
- complete interchangeability in case of valve replacement
- possibility to set, via software, the functional parameters
- possibility to interface a CAN-Open network
- possibility to perform a diagnostic program by means of the CAN connection
- high immunity to electromagnetic troubles

4.2 - Functional block diagram of the pilot valve



1	Valve with proportional solenoid	3	Digital card
2	Electronics envelope	4	Main connector

4.3 - Electrical characteristics

NOMINAL VOLTAGE	V DC	24 (from 19 to 35 VDC, ripple max 3 Vpp)
ABSORBED POWER	W	50
MAXIMUM CURRENT	A	1,88
DUTY CYCLE		100%
VOLTAGE SIGNAL (E0)	V DC	0 ÷ 10 (Impedence Ri > 50K)
CURRENT SIGNAL (E1)	mA	4 ÷ 20 (Impedence Ri = 500)
ALARMS		Overload and electronics overheating
COMMUNICATION		Interface of the optoisolated industrial Field-bus type CAN-Bus ISO 11898
MAIN CONNECTOR		7 - pin MIL-C-5015-G (DIN 43563)
CAN-BUS CONNECTOR		M12-IEC 60947-5-2
ELECTROMAGNETIC COMPATIBILITY ((EMC) emissions CEI EN 61000-6-4 immunity CEI EN 61000-4-2		According to 2004/108/CE standards
PROTECTION AGAINST ATMOSPHERIC AGENTS :		IP67 (CEI EN 60529 standards)

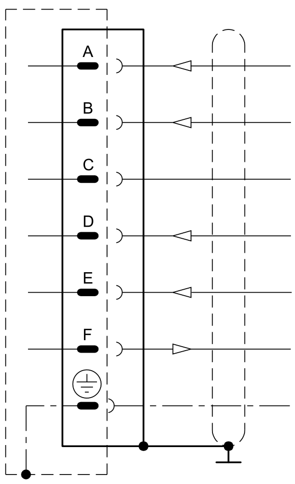
5 - OPERATING MODALITIES

The digital driver of PRE*G valve may be used with different functions and operating modalities, depending on the requested performances.

5.1 - Standard version with voltage reference signal (E0)

This is the most common version; it makes the valve completely interchangeable with the traditional proportional valves with analog type integrated electronics. The valve has only to be connected as indicated below.
This version doesn•t allow the setting of the valve parameters, for example the ramps must be performed in the PLC program, as well as the reference signal limit.

Connection scheme (Version B - E0)



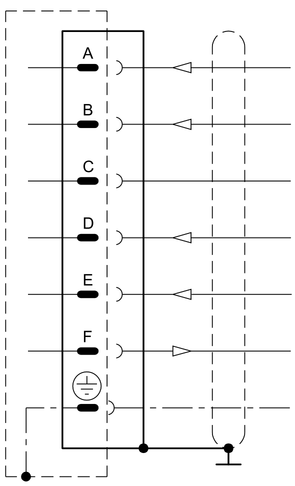
Pin	Values	Function	NOTE
A	24 VDC	Voltage	from 19 to 35 VDC (ripple max 3 Vpp)(see **NOTE 2**)
B	0 V	Power supply (zero)	0 V
C	----	Not used	----
D	0 ÷ 10 V	Input rated command	Impedence R_i > 50 k
E	0 V	Input rated command	----
F	0 ÷ 10 V	Test point coil current	0 ÷ 100% I_{MAX} (see **NOTE 1**)
PE	GND	Protective ground	----

NOTE: If only one input signal is present, the pin B (0V power supply) and the pin E (0V reference signal) must be connected through a jumper and both connected to GND, electric panel side.

5.2 - Standard version with current reference signal (E1)

This version has characteristics which are similar to the previous one, with the difference that in this case the reference signal is supplied in current 4 - 20 mA. With 4 mA signal the valve is at zero value, while with 20 mA signal the valve is at the maximum setting value.

Connection scheme (B version - E1)



Pin	Values	Function	NOTE
A	24 VDC	Voltage	from 19 to 35 VDC (ripple max 3 Vpp)(see **NOTE 2**)
B	0 V	Power supply (zero)	0 V
C	----	Not used	----
D	4 ÷ 20 mA	Input signal	Impedence R_i = 500
E	0 V	Zero reference	----
F	0 ÷ 10 V	Test point coil current	0 ÷ 100% I_{MAX} (see **NOTE1**)
PE	GND	Protective ground	----

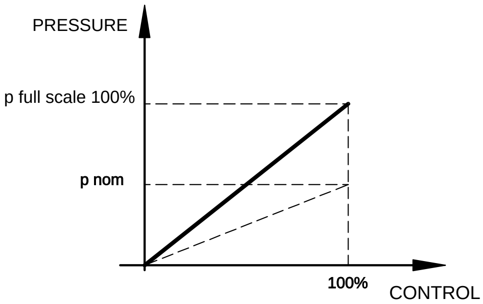
NOTE for the wiring: connections must be made via the 7-pin plug mounted on the amplifier. Recommended cable sizes are 0,75 mm^2 for cables up to 20m and 1,00 mm^2 for cables up to 40m, for power supply. The signal cables must be 0,50 mm^2 . A suitable cable would have 7 cores, a separate screen for the signal wires and an overall screen.

NOTE 1: Read the test point pin F in relation to pin B (0V)

NOTE 2: Envisage an external fuse on pin A (24V DC) to shield the card. Fuse specifications: 5A/50V fast type.

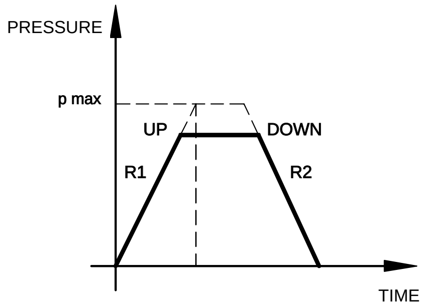
5.3 - Version with parameters set by means of CAN connector (version C)

This version allow to set some parameters of the valve connecting a PC to the CAN connector.
To do this, you have to order the interface device for USB port **CANPC-USB/20** (code 3898101002), complete of the configuration software, a communication cable (lenght 3 mt) and a hardware converter needed to connect the valve to the USB port. The software is Microsoft XP© compliant.
The parameters that can be set are described below:



Nominal pressure
The •nominal pressureŽ parameter limits the maximum current to the solenoid and therefore it sets the desired nominal pressure corresponding to the positive value of the input reference (10 V or 20 mA).
Default value = 100% of full scale
Range: from 100% to 50% of full scale

PWM Frequency
Sets the PWM frequency, which is the pulsating frequency of the control current. The PWM decrease improves the valve accuracy, decreasing the regulation stability.
The PWM increase improves the regulation stability, causing a higher hysteresis.
Default value = 300 Hz
Range 50 ÷ 500 Hz



Ramps
Increase time of Ramp R1: sets the current increase time for a variation from 0 to 100% of the input reference.
Decrease time of Ramp R2: sets the current decrease time for a variation from 0 to 100% of the input reference.
Min time = 0,001 sec.
Max time = 40,000 sec.
Default time = 0,001 sec.

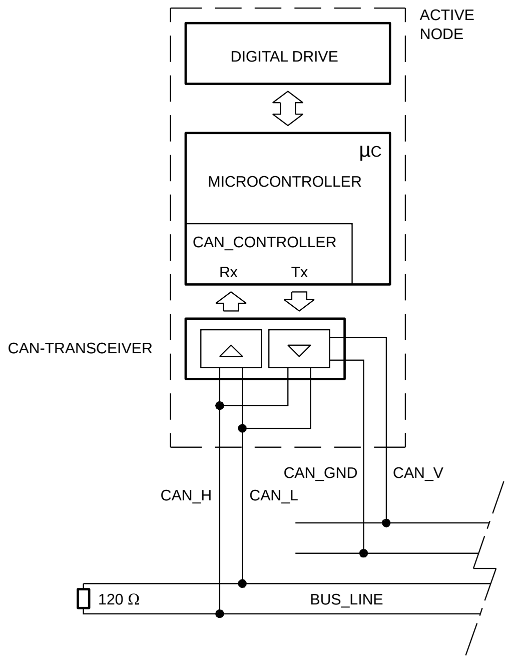
Diagnostics
Provides several information parameters, such as:
The electronic driver status (Working or Broken)
The active regulation
Input reference
Current value

5.4 - Version with CAN-Bus interface (version C)

This version allows the valve piloting through the industrial field bus CAN-Open, according to ISO 11898 standards.
The CAN connector must be connected (see scheme) as a slave node of the CAN-Open bus, while the main connector is wired only for the power supply (pin A and B + earth)

The most important characteristics of a CAN - Open connection are:
- Parameter storage also in PLC
- Parameters setting in real-time (PDO communication)
- On-line valve diagnostics
- Easy wiring with the serial connection
- Communication program according to international standards

For detailed information on the CAN-Open communication software, see cat. 89 800.



CAN connector connection scheme

Pin	Values	Function
1	CAN_SHLD	monitor
2	CAN +24VDC	BUS + 24 VDC (max 30 mA)
3	CAN 0 DC	BUS 0 VDC
4	CAN_H	BUS line (high signal)
5	CAN_L	BUS line (low signal)

N.B. : insert a 120 resistance on pin 4 and pin 5 of the CAN connector when the valve is the closure knot of the CAN network.

6 - INSTALLATION

We recommend to install the PRE*G 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 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 that the solenoid tube is always filled with oil (see paragraph 8 - 9 - 10). 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.

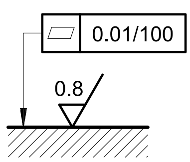
3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4.

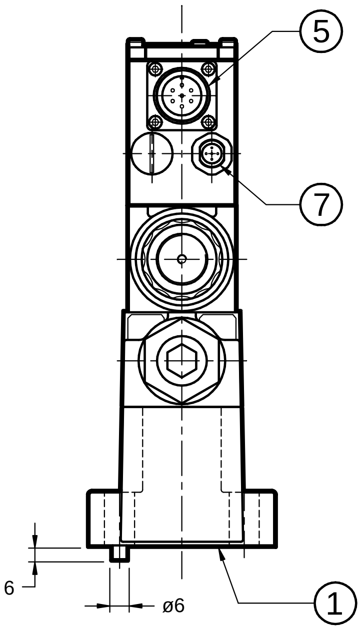
For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

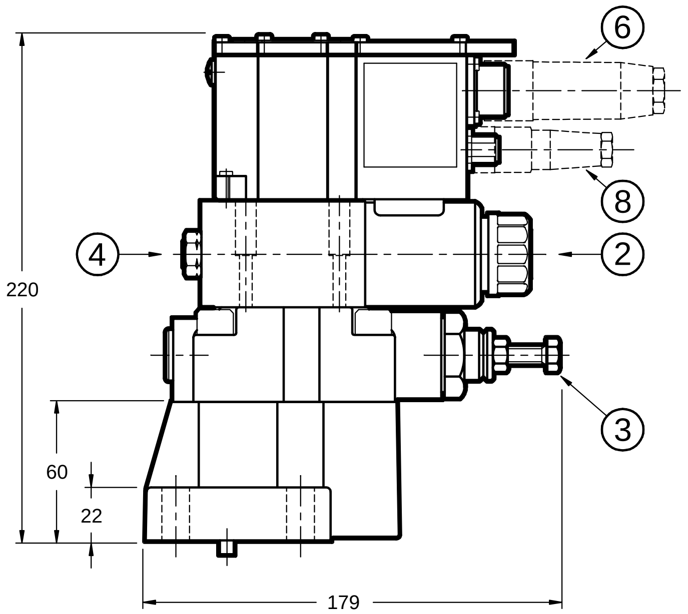
The fluid must be preserved in its physical and chemical characteristics.

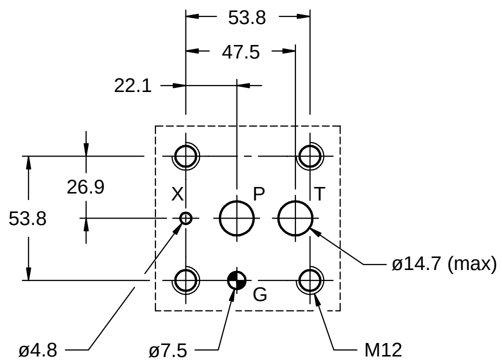
Surface finishing

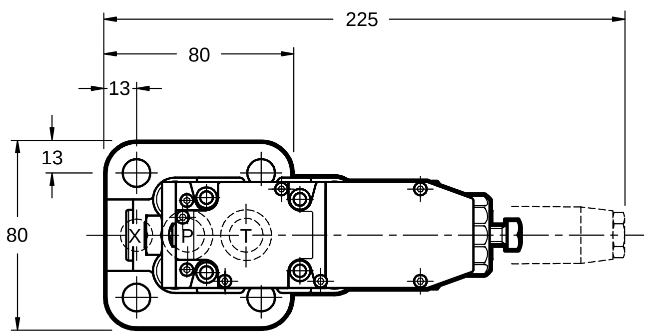


8 - OVERALL AND MOUNTING DIMENSIONS PRE10G









dimensions in mm

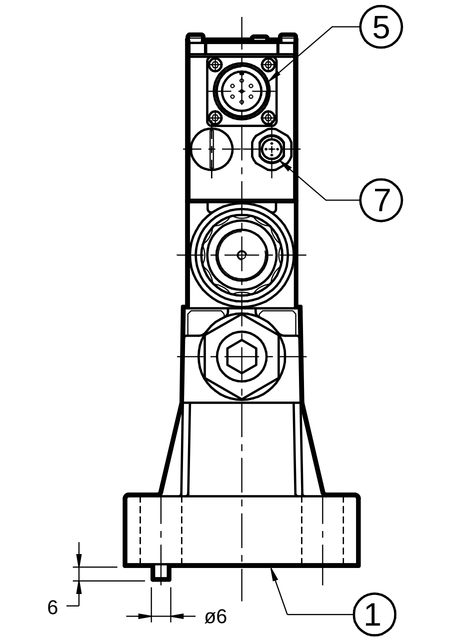
Mounting surface: ISO 6264-06-09-*-97
(CETOP 4.4.2-2-R06-350)

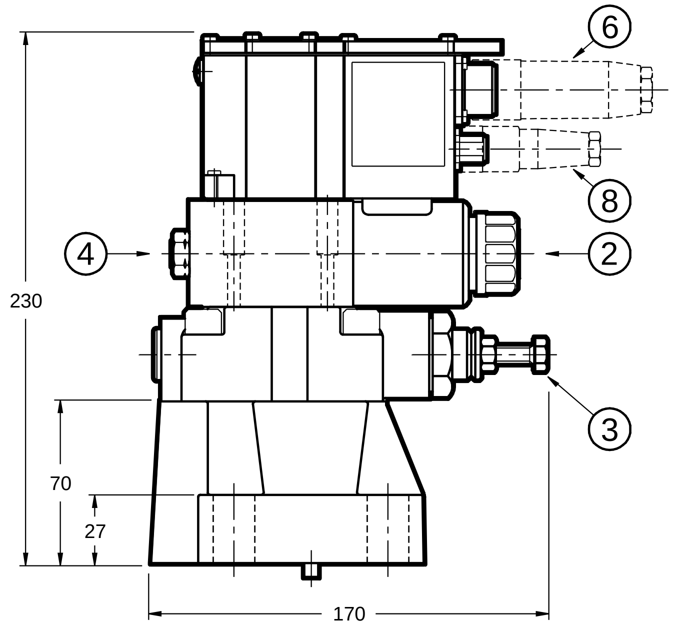
1	Mounting surface with sealing rings: 2 OR type 123 - 90 shore (17.86 x 2.62) 1 OR type 109 - 90 shore (9.13 x 2.62)
2	Breather (male hexagonal spanner 4)
3	Factory set pressure relief valve
4	Factory sealing setting (we recommend not unscrewing the nut)
5	Main connection
6	Electrical connector 7 pin DIN 43563 - IP67 PG11 EX7S/L/10 code 3890000003 (**to be ordered separately**)
7	CAN-Bus connection **(only for version C)**
8	Electrical connector 5 pin M12 - IP67 PG7 EC5S/M12L/10 code 3491001001 only for version C (**to be ordered separately**)

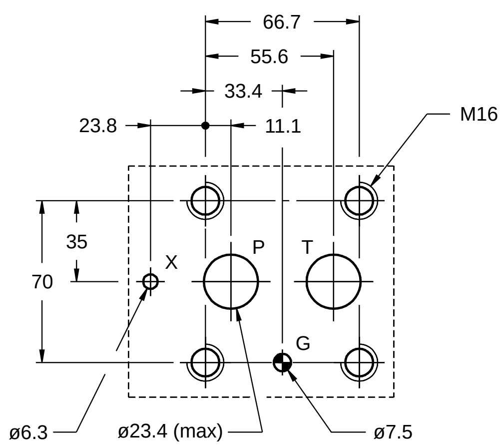
Fastening bolts: 4 bolts M12x40
Torque: 69 Nm

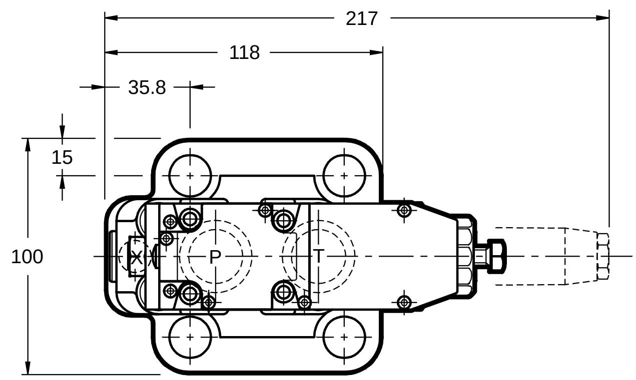
NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

9 - OVERALL AND MOUNTING DIMENSIONS PRE25G









dimensions in mm

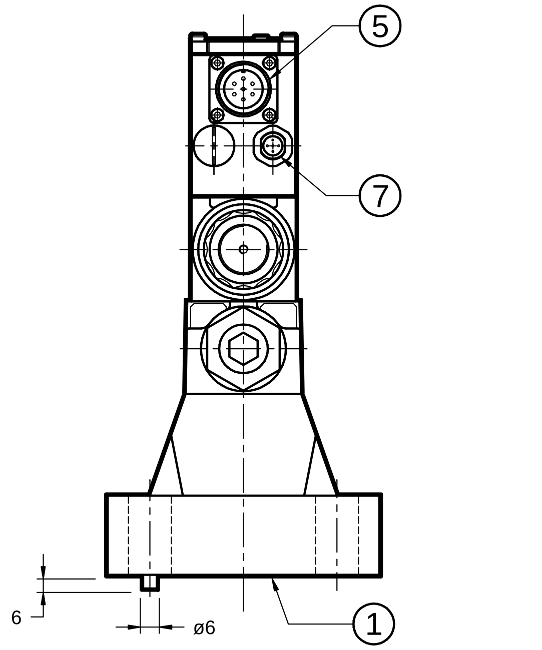
Mounting surface: ISO 6264-08-13-*-97
(CETOP 4.4.2-2-R08-350)

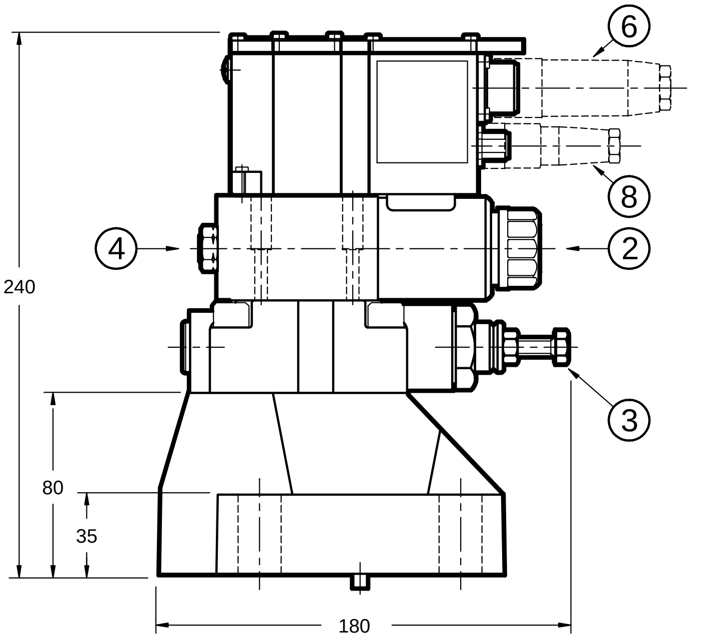
1	Mounting surface with sealing rings: 2 OR type 3118 - 90 shore (29.82 x 2.62) 1 OR type 109 - 90 shore (9.13 x 2.62)
2	Breather (male hexagonal spanner 4)
3	Factory set pressure relief valve
4	Factory sealing setting (we recommend not unscrewing the nut)
5	Main connection
6	Electrical connector 7 pin DIN 43563 - IP67 PG11 EX7S/L/10 code 3890000003 (**to be ordered separately**)
7	CAN-Bus connection **(only for version C)**
8	Electrical connector 5 pin M12 - IP67 PG7 EC5S/M12L/10 code 3491001001 only for version C (**to be ordered separately**)

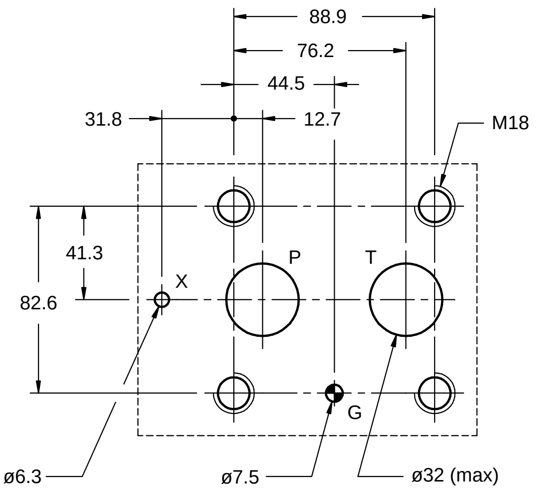
Fastening bolts: 4 bolts M16x50
Torque: 170 Nm

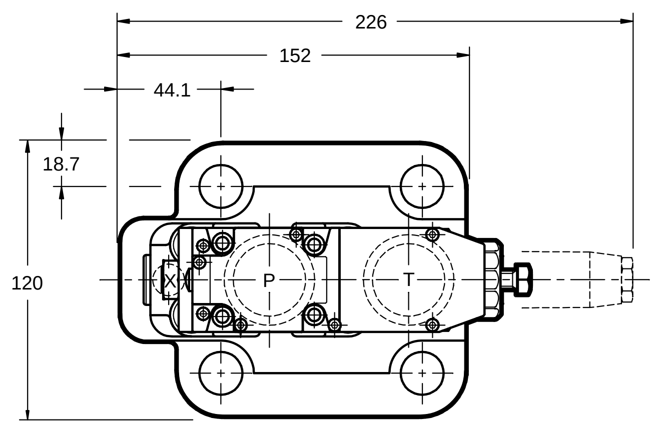
NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

10 - OVERALL AND MOUNTING DIMENSIONS PRE32G









dimensions in mm

Mounting surface: ISO 6264-10-17-*-97
(CETOP 4.4.2-2-R10-350)

Fastenign bolts: 4 bolts M18x60
Torque: 235 Nm

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.

1	Mounting surface with sealing rings: 2 OR type 4137 - 90 shore (34.52 x 3.53) 1 OR type 109 - 90 shore (9.13 x 2.62)
2	Breather (male hexagonal spanner 4)
3	Factory set pressure relief valve
4	Factory sealing setting (we recommend not unscrewing the nut)
5	Main connection
6	Electrical connector 7 pin DIN 43563 - IP67 PG11 EX7S/L/10 code 3890000003 (**to be ordered separately**)
7	CAN-Bus connection **(only for version C)**
8	Electrical connector 5 pin M12 - IP67 PG9 EC5S/M12L/10 code 3491001001 only for version C (**to be ordered separately**)

11 - SUBPLATES (see catalogue 51 000)

	PRE10G	PRE25G	PRE32G
Type	PMRQ3-AI4G rear ports	PMRQ5-AI5G rear ports	PMRQ7-AI7G rear ports
PT port dimesions	1/2Ž BSP	1Ž BSP	1Ž ¼ BSP
X port dimensions	1/4Ž BSP	1/4Ž BSP	1/4Ž BSP

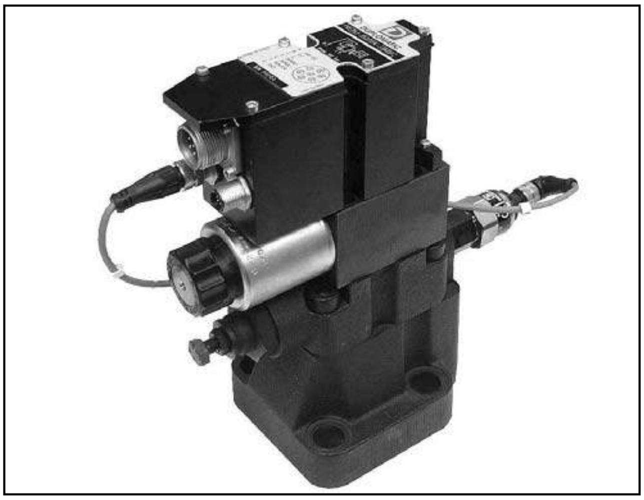
DUPLOMATIC OLEODINAMICA

DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

PRE*J

PILOT OPERATED PRESSURE VALVES IN CLOSED LOOP WITH PROPORTIONAL CONTROL AND INTEGRATED ELECTRONICS

SERIES 11

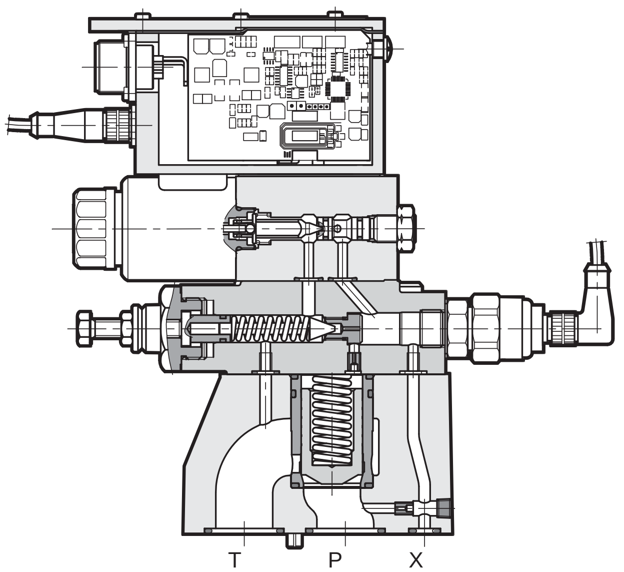


SUBPLATE MOUNTING

p max **350** bar

Q max (see table of performances)

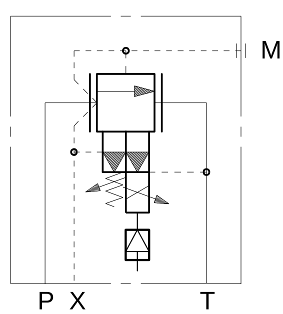
OPERATING PRINCIPLE



- PRE*J valves are pilot operated pressure relief valves with integrated electric proportional control and mounting interface in compliance with ISO 6264 standards (CETOP RP 121H).
- These valves are normally 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.
- Pressure can be modulated continuously in proportion to the reference signal
- The valve is controlled directly by an integrated digital amplifier (see par. 4).
- 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 three pressure control ranges up to 350 bar.

PERFORMANCES (obtained with mineral oil with viscosity of 36 cSt at 50°C and digital integrated electronics)		PRE10J	PRE25J	PRE32J
Maximum operating pressure:	bar	350		
Minimum controlled pressure		see p-Q diagram		
Maximum flow	l/min	200	400	500
Step response		see paragraph 3		
Hysteresis	% of p nom	< 1%		
Repeatability	% of p nom	< ± 0,5%		
Electrical characteristic		see paragraph 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 class 18/16/13			
Recommended viscosity	cSt	25		
Mass:	kg	5,5	6,3	8,5

HYDRAULIC SYMBOL



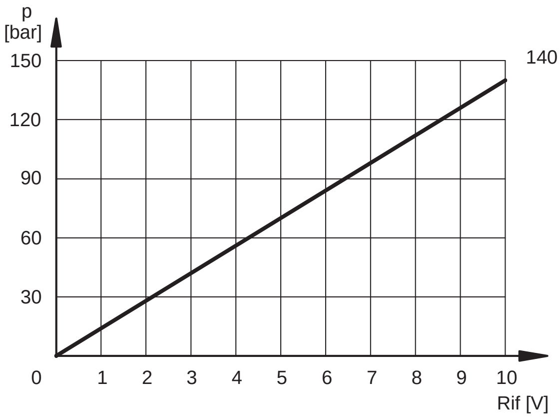
1 - IDENTIFICATION CODE

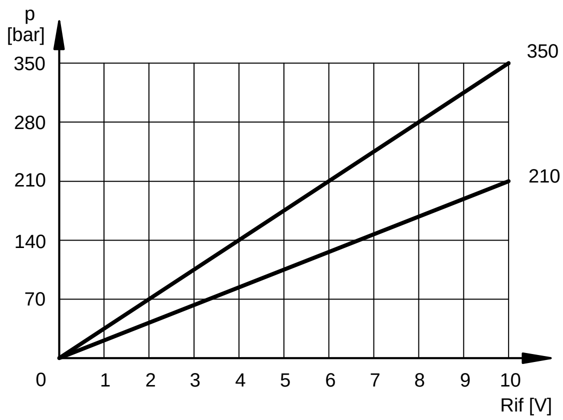
P	R	E		J	-		/	11		-		K11	/	

- Pilot operated pressure relief valve
- Electric proportional control
- Size: **10** = ISO 6264-06 (CETOP R06)
  25 = ISO 6264-08 (CETOP R08)
  32 = ISO 6264-10 (CETOP R10)
- Integrated electronics for pressure control
- 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)
- Seals:
  N = NBR seals for mineral oil (**standard**)
  V = FPM seals for special fluids
- Reference signal:
  E0 = voltage 0 / +10V
  E1 = current 4 / 20mA
- Main connector 6 pin + PE
- **B** = standard version
  C = with CAN connection

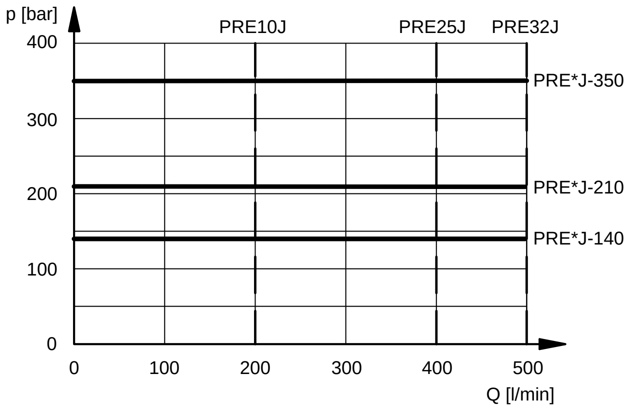
2 - CHARACTERISTIC CURVES (measured with viscosity of 36 cSt at 50°C)

PRESSURE CONTROL p=f (I)

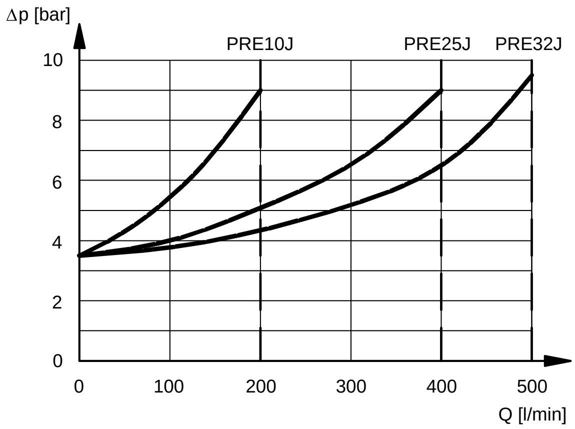




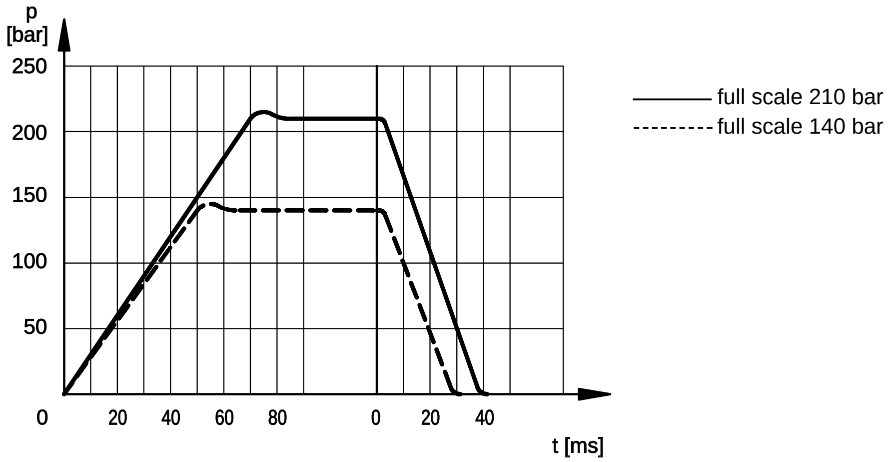
PRESSURE CONTROL p=f (Q)



PRESSURE DROPS Dp = f(Q)



3 - STEP RESPONSE (obtained with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronics)



NOTE: Response times are obtained by using PRE25J valves with a full scale of 140 and 210 bar.

4 - ELECTRICAL CHARACTERISTICS

4.1 - Digital integrated electronics

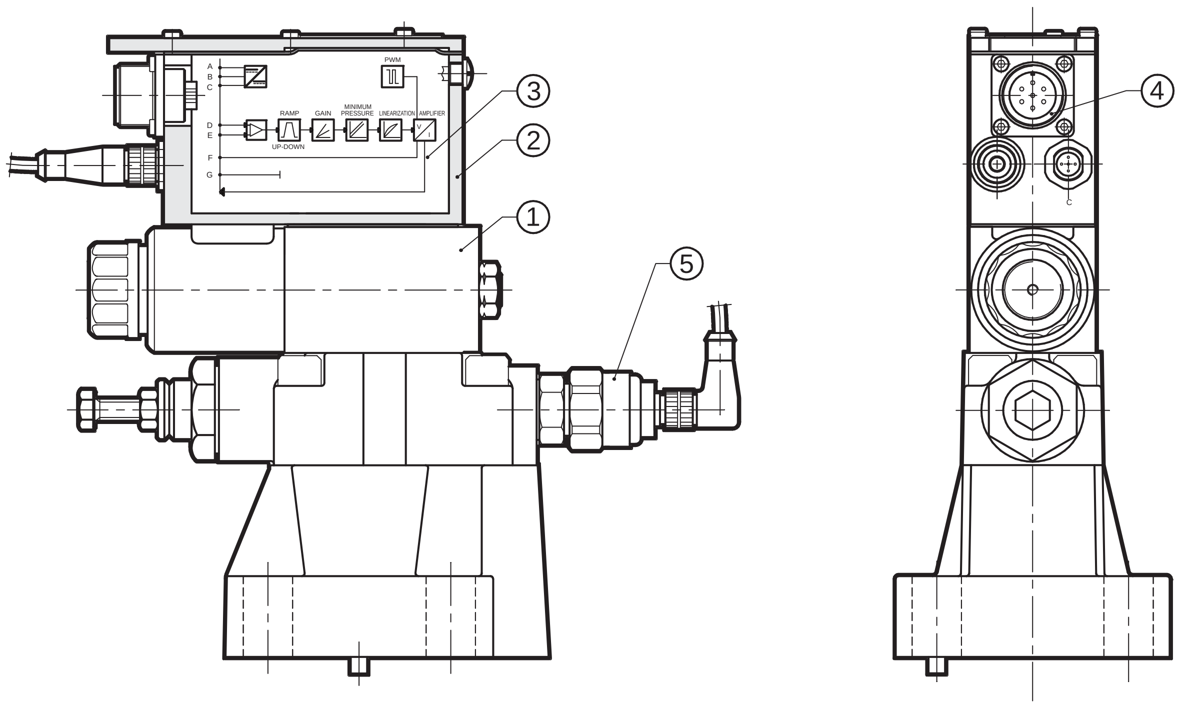
The proportional valve is controlled by a digital amplifier (driver), which incorporates a microprocessor that controls, via software, all the valve functions, such as:
- continuous converting (0,5ms) of the voltage reference signal (E0) or of the current reference signal (E1) in a digital value
- generation of up and down ramps (see **NOTE**)
- gains limit (see **NOTE**)
- compensation of the dead band
- linearization of the characteristic curve
- regulation of the current to the solenoid
- dynamic regulation of PWM frequency
- protection of the solenoid outputs against possible short circuits

NOTE: these parameters can be set through the connection to the CAN connector, by means of a personal computer and relevant software (see par. 5.3)

The digital driver enables the valve to reach better performances compared to the analogic version, such as:

- reduced hysteresis and improved repeatability
- reduced response times
- linearization of the characteristic curve which is optimised in factory for each valve
- complete interchangeability in case of valve replacement
- possibility to set, via software, the functional parameters
- possibility to interface a CAN-Open network
- possibility to perform a diagnostic program by means of the CAN connection
- high immunity to electromagnetic troubles

4.2 - Functional block diagram



1	Valve with proportional solenoid	4	Main connector
2	Electronics envelope	5	Pressure transducer
3	Digital card		

4.3 - Electrical characteristics

NOMINAL VOLTAGE	V DC	24 (from 19 to 35 VDC, ripple max 3 Vpp)
ABSORBED POWER	W	50
MAXIMUM CURRENT	A	1,88
DUTY CYCLE		100%
VOLTAGE SIGNAL (E0)	V DC	0 ÷ 10 (Impedance Ri > 50K)
CURRENT SIGNAL (E1)	mA	4 ÷ 20 (Impedance Ri = 500)
ALARMS		Overload and electronics overheating
COMMUNICATION		Interface of the optoisolated industrial Field-bus type CAN-Bus ISO 11898
MAIN CONNECTOR		7 - pin MIL-C-5015-G (DIN 43563)
CAN-BUS CONNECTOR		M12-IEC 60947-5-2
ELECTROMAGNETIC COMPATIBILITY ((EMC) emissions CEI EN 61000-6-4 immunity CEI EN 61000-4-2		According to 2004/108/CE standards
PROTECTION AGAINST ATMOSPHERIC AGENTS :		IP67 (CEI EN 60529 standards)

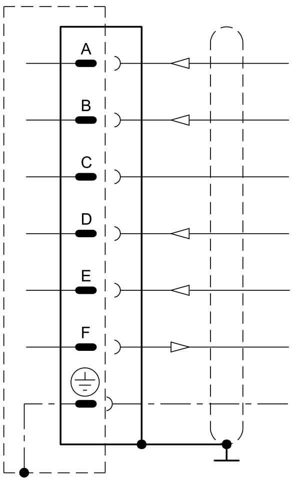
5 - OPERATING MODALITIES

The digital driver of PRE*J valve may be used with different functions and operating modalities, depending on the requested performances.

5.1 - Standard version with voltage reference signal (E0)

This is the most common version; it makes the valve completely interchangeable with the traditional proportional valves with analog type integrated electronics. The valve has only to be connected as indicated below.
This version doesn•t allow the setting of the valve parameters, for example the ramps must be performed in the PLC program, as well as the reference signal limit.

Connection scheme (B version - E0)



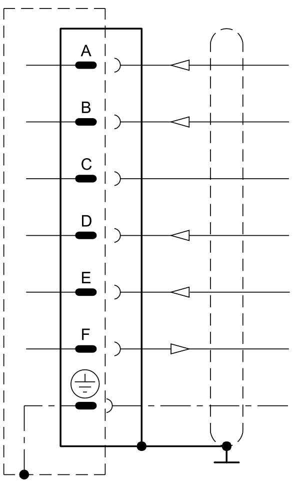
Pin	Values	Function	NOTES
A	24 VDC	Voltage	From 19 to 35 VDC (ripple max 3 Vpp)(see **NOTE 2**)
B	0 V	Power supply (zero)	0 V
C	----	Not used	----
D	0 ÷ 10 V	Input rated command	Impedance R_i > 50 K
E	0 V	Input rated command	----
F	0 ÷ 10 V	Pressure test point	0 ÷ 100% nominal pressure (see **NOTE1**)
PE	GND	Protective ground	----

NOTE: If only one input signal is present, the pin B (0V power supply) and the pin E (0V reference signal) must be connected through a jumper and both connected to GND, electric panel side.

5.2 - Standard version with current reference signal (E1)

This version has characteristics which are similar to the previous one, with the difference that in this case the reference signal is supplied in current 4 - 20 mA. With the 4 mA signal the valve is at zero value, while with 20 mA signal the valve is at the maximum setting value.

Connection scheme (B version - E1)



Pin	Values	Function	NOTE
A	24 VDC	Voltage	From 19 to 35 VDC (ripple max 3 Vpp)(see **NOTE 2**)
B	0 V	Power supply (zero)	0 V
C	----	Not used	----
D	4 ÷ 20 mA	Input signal	Impedance R_i = 500
E	0 V	Zero reference	----
F	0 ÷ 10 V	Pressure test point	0 ÷ 100% nominal pressure (see **NOTE 1**)
PE	GND	Protective ground	----

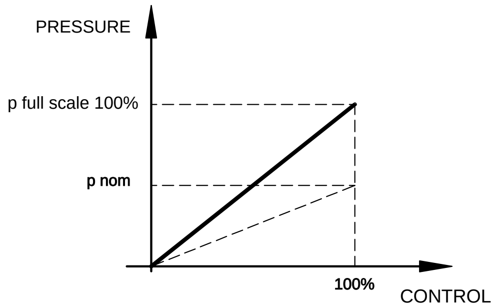
NOTE for the wiring: connections must be made via the 7-pin plug mounted on the amplifier. Recommended cable sizes are 0,75 mm^2 for cables up to 20m and 1,00 mm^2 for cables up to 40m, for power supply. The signal cables must be 0,50 mm^2 . A suitable cable would have 7 cores, a separate screen for the signal wires and an overall screen.

NOTE 1: read the test point pin F in relation to pin B (0V)

NOTE 2: Envisage an external fuse on pin A (24V DC) to shield the card. Fuse specifications: 5A/50V fast type.

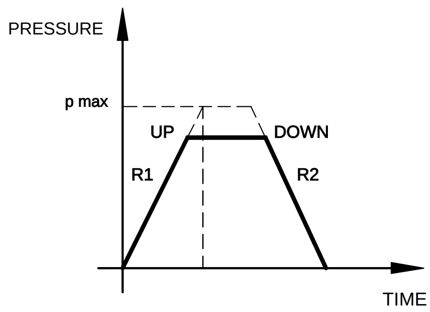
5.3 - Version with parameters set by means of CAN connector (version C)

This version allow to set some parameters of the valve connecting a PC to the CAN connector.
To do this, you have to order the interface device for USB port **CANPC-USB/20** (code 3898101002), complete of the configuration software, a communication cable (length 3 mt) and a hardware converter needed to connect the valve to the USB port. The software is Microsoft XP© compliant.
The parameters that can be set are described below:



Nominal pressure
The •nominal pressureŽ parameter sets the desired nominal pressure in bar, which the maximum reference value should be corresponding to (10 V or 20 mA).
Default value = 100% of full scale
Range: from 100% to 50% of full scale

PWM Frequency
Sets the PWM frequency, which is the pulsating frequency of the control current. The PWM decrease improves the valve accuracy, decreasing the regulation stability.
The PWM increase improves the regulation stability, causing a higher hysteresis.
Default value = 300 Hz
Range 50 ÷ 500 Hz



Ramps
Increase time of Ramp R1: Sets the current increase time for a variation from 0 to 100% of the input reference.
Decrease time of Ramp R2: Sets the current decrease time for a variation from 0 to 100% of the input reference.
Min time = 0,001 sec.
Max time = 40,000 sec.
Default time = 0,001 sec.

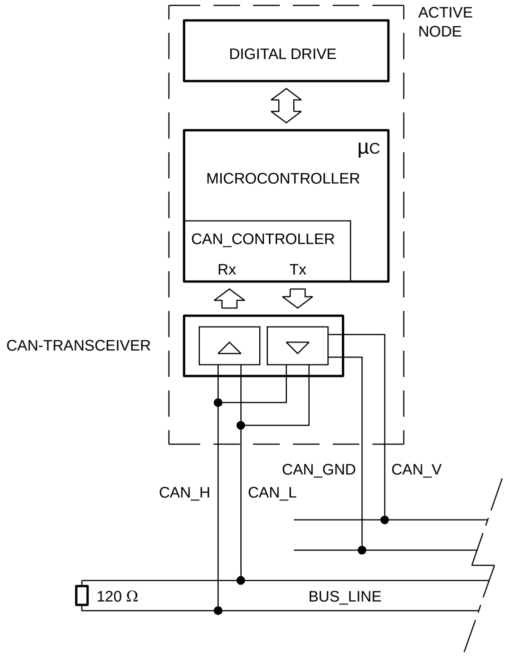
Diagnostics
Provides several information parameters, such as:
The electronic driver status (Working or Broken)
The active regulation
Input reference
Current value

5.4 - Version with CAN-Bus interface

This version allows the valve piloting through the industrial field bus CAN-Open, according to ISO 11898 standards.
The CAN connector must be connected (see scheme) as a slave node of the CAN-Open bus, while the main connector is wired only for the power supply (pin A and B + earth)

The most important characteristics of a CAN - Open connection are:
- Parameter storage also in PLC
- Parameters setting in real-time (PDO communication)
- On-line valve diagnostics
- Easy wiring with the serial connection
- Communication program according to international standards

For detailed information on the CAN-Open communication software, see cat. 89 800.



CAN connector connection scheme

Pin	Values	Functions
1	CAN_SHLD	Monitor
2	CAN +24VDC	BUS + 24 VDC (max 30 mA)
3	CAN 0 DC	BUS 0 VDC
4	CAN_H	BUS line (high signal)
5	CAN_L	BUS line (low signal)

N.B. : insert a 120 resistance on pin 4 and pin 5 of the CAN connector when the valve is the closure knot of the CAN network.

6 - INSTALLATION

We recommend to install the PRE*J 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 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 that the solenoid tube is always filled with oil (see par. 8 - 9 - 10). 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.

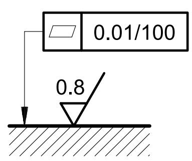
7 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4.

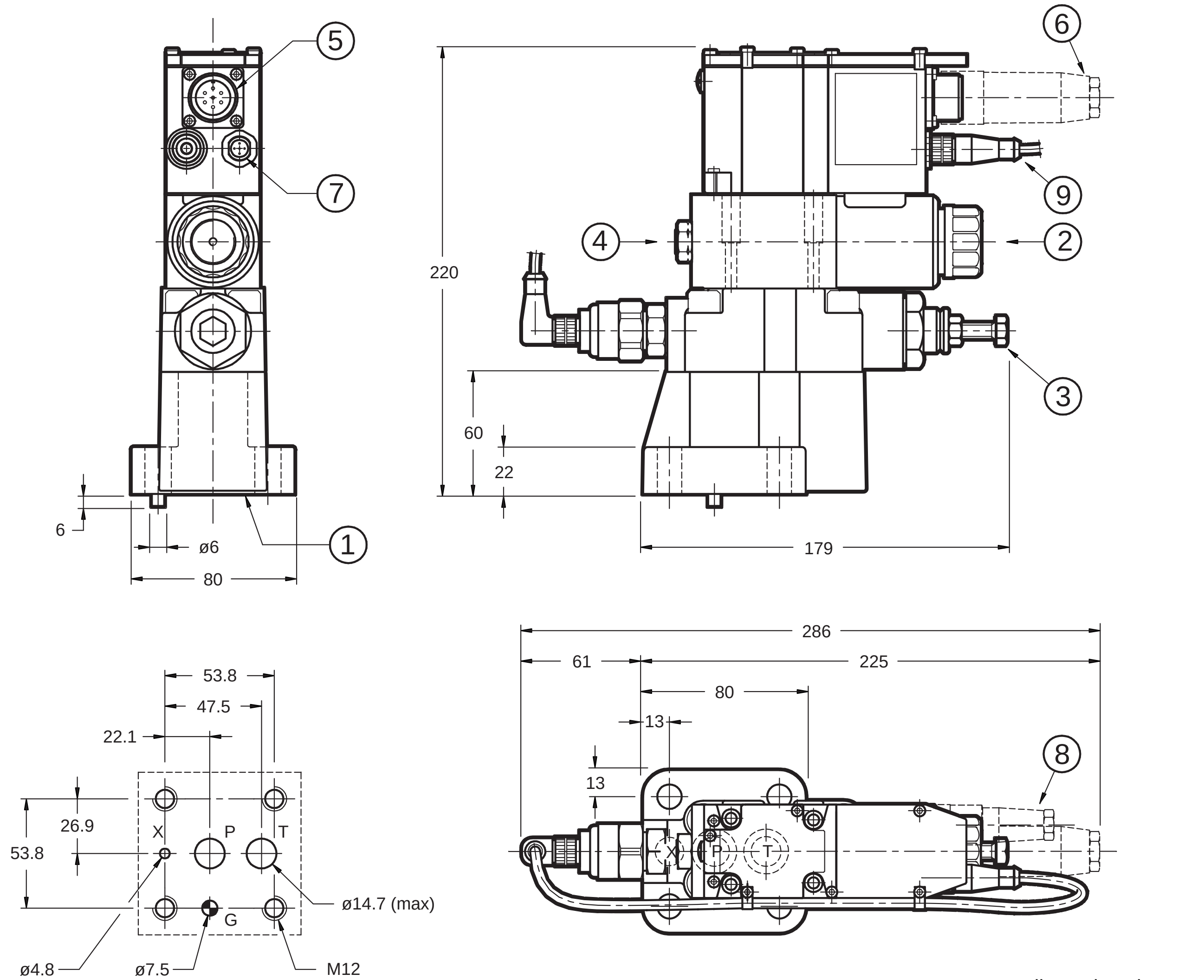
For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

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

Surface finishing



8 - OVERALL AND MOUNTING DIMENSIONS PRE10J



dimensions in mm

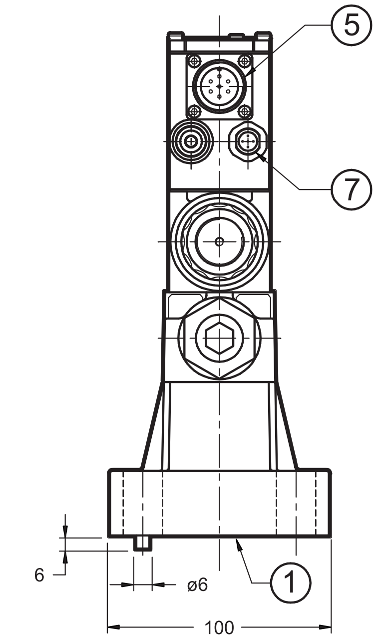
1	Mounting surface with sealing rings: 2 OR type 123 - 90 shore (17.86 x 2.62) 1 OR type 109 - 90 shore (9.13 x 2.62)
2	Breather (male hexagonal spanner 4)
3	Pressure relief valve (factory set)
4	Factory sealing setting (we recommend not unscrewing the nut)
5	Main connection
6	Electrical connector 7 pin DIN 43563 - IP67 PG11 EX7S/L/10 code 3890000003 (**to be ordered separately**)
7	CAN-Bus connection **(only for version C**)
8	Electrical connector 5 pin M12 - IP67 PG7 EC5S/M12L/10 code 3491001001 only for version C (**to be ordered separately**)
9	Cable with connectors for pressure feedback

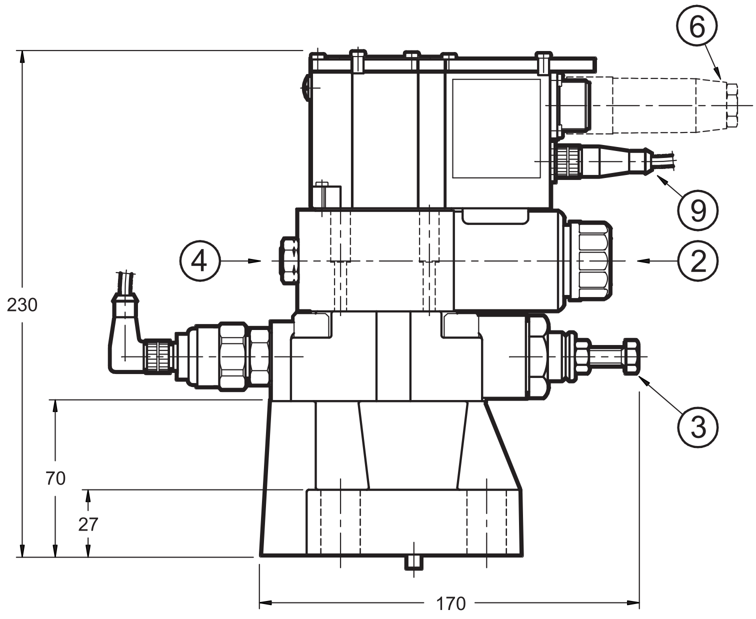
Mounting interface: ISO 6264-06-09-*-97
(CETOP 4.4.2-2-R06-350)

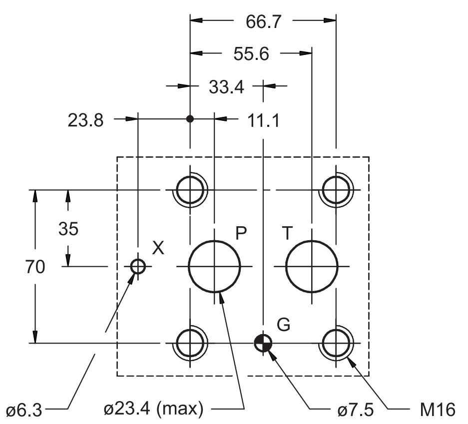
Fastening bolts: N. 4 bolts M12x40
Torque: 69 Nm

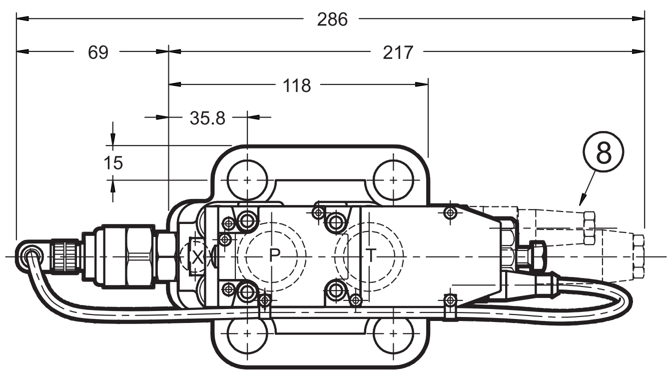
NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

9 - OVERALL AND MOUNTING DIMENSIONS PRE25J









dimensions in mm

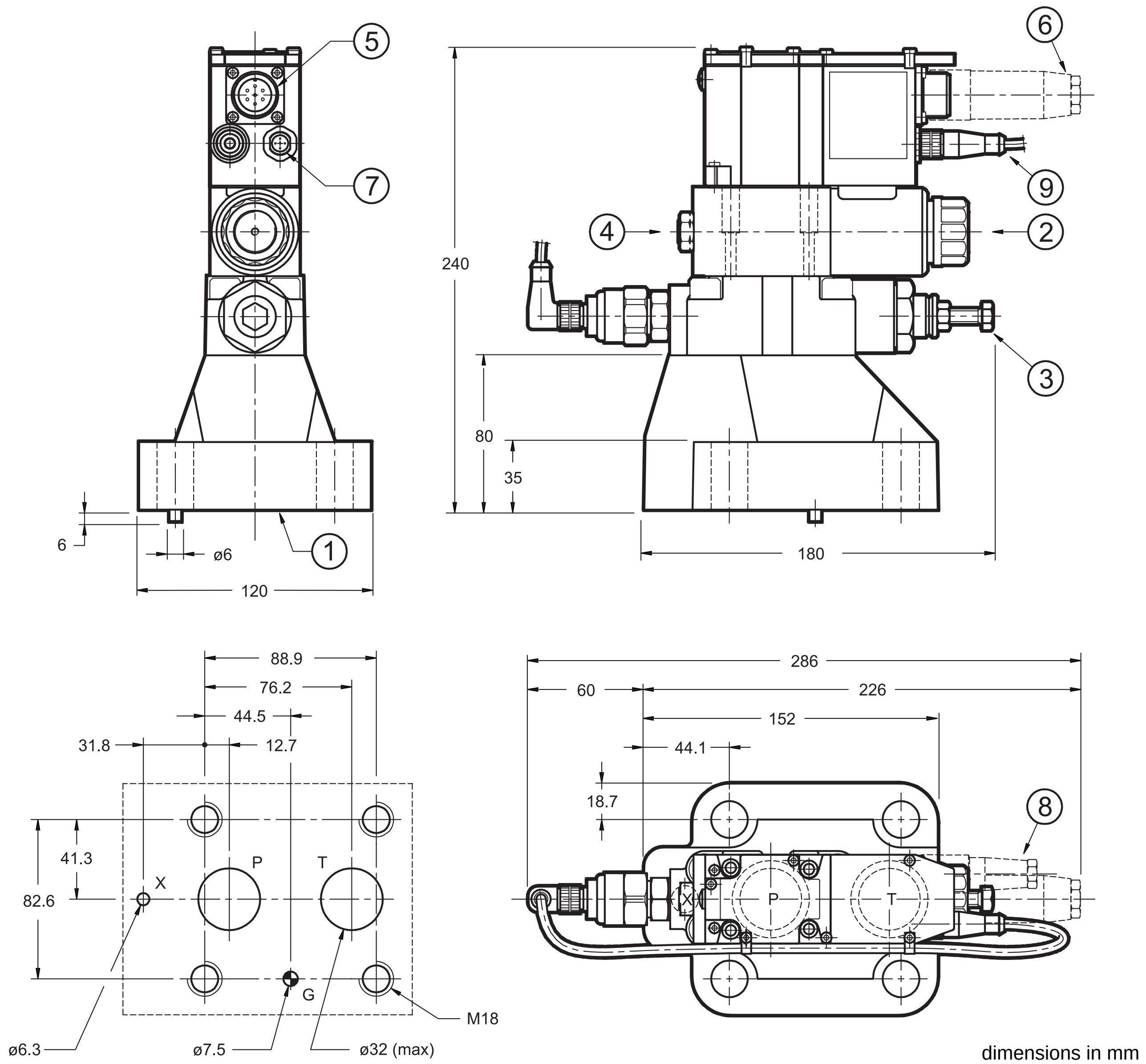
Mounting interface: ISO 6264-08-13-*-97
(CETOP 4.4.2-2-R08-350)

1	Mounting surface with sealing rings: 2 OR type 3118 - 90 shore (29.82 x 2.62) 1 OR type 109 - 90 shore (9.13x 2.62)
2	Breather (male hexagonal spanner 4)
3	Pressure relief valve (factory set)
4	Factory sealing setting (we recommend not unscrewing the nut)
5	Main connection
6	Electrical connector 7 pin DIN 43563 - IP67 PG11 EX7S/L/10 code 3890000003 (**to be ordered separately**)
7	CAN-Bus connection **(only for version C)**
8	Electrical connector 5 pin M12 - IP67 PG7 EC5S/M12L/10 code 3491001001 only for version C (**to be ordered separately**)
9	Cable with connectors for pressure feedback

Fastening bolts: N. 4 bolts M16x50
Torque: 170 Nm

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.

10- OVERALL AND MOUNTING DIMENSIONS PRE32J



dimensions in mm

1	Mounting surface with sealing rings: 2 OR type 4137 - 90 shore (34.52 x 3.53) 1 OR type 109 - 90 shore (9.13 x 2.62)
2	Breather (male hexagonal spanner 2)
3	Pressure relief valve (factory set)
4	Factory sealing setting (we recommend not unscrewing the nut)
5	Main connection
6	Electrical connector 7 pin DIN 43563 - IP67 PG11 EX7S/L/10 code 3890000003 (**to be ordered separately**)
7	CAN-Bus connection **(only for version C**)
8	Electrical connector 5 pin M12 - IP67 PG7 EC5S/M12L/10 code 3491001001 only for version C (**to be ordered separately**)
9	Cable with connectors for pressure feedback

Mounting interface: ISO 6264-10-17-*-97
(CETOP 4.4.2-2-R10-350)

Fastening bolts: N. 4 bolts M18x60
Torque: 235 Nm

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.

11 - SUBPLATES (see catalogue 51 000)

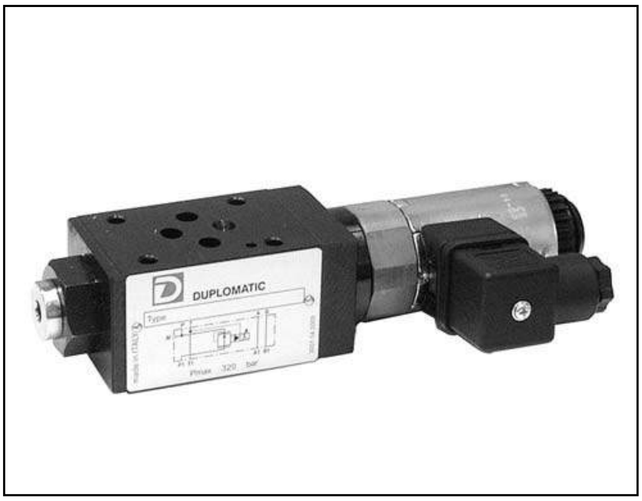
	PRE10	PRE25	PRE32
Type	PMRQ3-AI4G rear ports	PMRQ5-AI5G rear ports	PMRQ7-AI7G rear ports
PT port dimensions	1/2Ž BSP	1Ž BSP	1Ž ¼ BSP
X port dimensions	1/4Ž BSP	1/4Ž BSP	1/4Ž BSP

DUPLOMATIC OLEODINAMICA
DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

MZE

PILOT OPERATED PRESSURE REDUCING VALVE WITH ELECTRIC PROPORTIONAL CONTROL

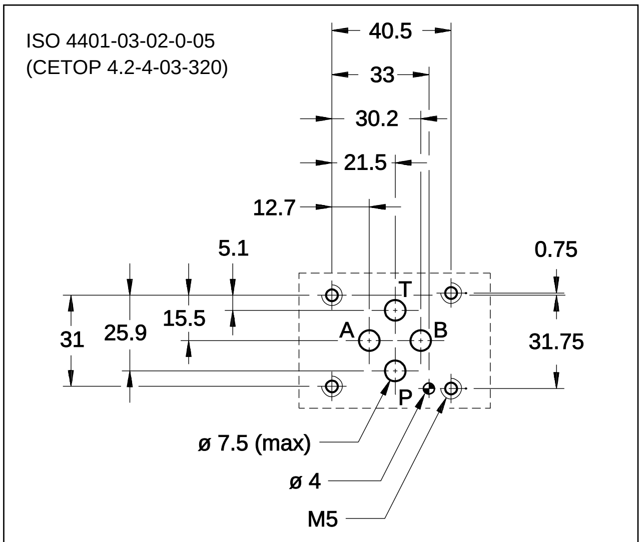
SERIES 58



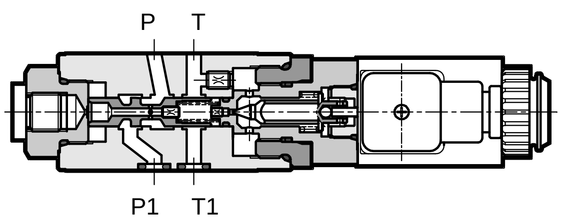
MODULAR VERSION
ISO 4401-03 (CETOP 03)

p max **320** bar
Q max (see table of performances)

MOUNTING INTERFACE



OPERATING PRINCIPLE

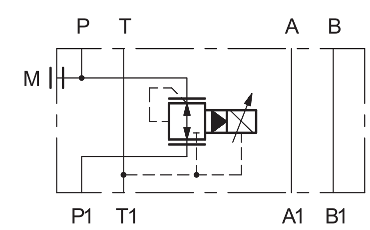


- MZE valves are 3-way pilot operated pressure reducing valves, with electric proportional control, designed as modular versions with mounting interface in compliance with ISO 4401 (CETOP RP121H) standards.
- The valves are used to reduce pressure in the secondary circuit branches thus ensuring stability of controlled pressure in the event of variations of the flow rate through the valve.
- Pressure 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 electronic control unit, to exploit valve performance to the full (see par. 8).
- The valve is available in three different pressure reduction ranges of up to 230 bar.
- The valve is available only with internal drain to the T line inside the valve.

PERFORMANCES
(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control cards)

Maximum operating pressure: - P-A-B ports - T port	bar	320 2
Minimum controlled pressure	see p-Q diagram	
Maximum flow in P line Maximum flow on passing lines Drain flow	l/min	30 50 0,4
Step response	see paragraph 5	
Hysteresis (with PWM 200 Hz)	% of p nom	< 3%
Repeatability	% of p nom	< ±1,5%
Electrical characteristic	see paragraph 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 class 18/16/13	
Recommended viscosity	cSt	25
Mass:	kg	1,8

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

M	Z	E		/	58	-		/	

Size: ISO 4401-03 (CETOP 03)

3-way pressure reducing valve: Modular version

Electric proportional control

Pressure control range:
3 = 5 ÷ 70 bar
4 = 8 ÷ 150 bar
5 = 10 ÷ 230 bar

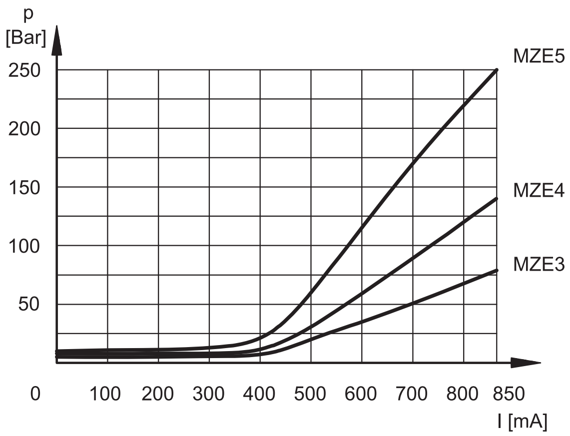
Series No. (from 50 to 59 sizes and mounting dimensions remain unchanged)

12 = Nominal solenoid voltage 12V DC
24 = Nominal solenoid voltage 24V DC

Seal:
omit for mineral oils
V = FPM seals for special fluids

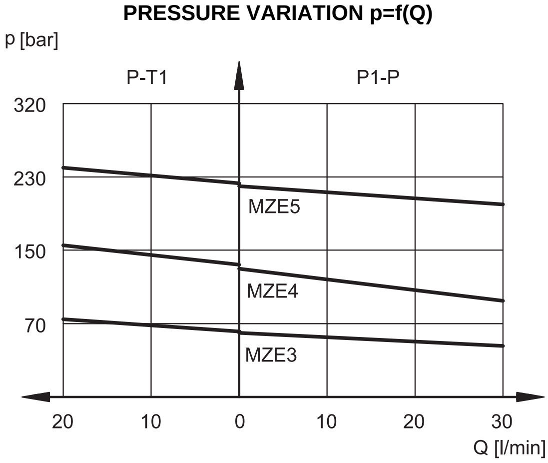
2 - CHARACTERISTIC CURVES (measured with viscosity 36 cSt at 50°C)

PRESSURE CONTROL p=f (I)



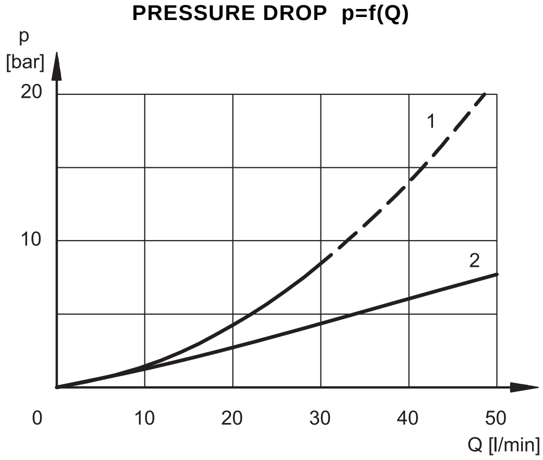
The curves have been obtained with closed users (without flow).

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 p=f(Q)



1. pressure drops P1 P
2. pressure drop in passing lines
   (ex. A A1)

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 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)		3.66	16.6
MAXIMUM CURRENT	A	1.9	0.85
DUTY CYCLE		100%	
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2004/108/CE		
CLASS OF PROTECTION: Atmospheric agents (CEI EN 60529)	IP 65		

5 - STEP RESPONSE (with mineral oil with viscosity of 36 cSt at 50°C in conjunction with the relative 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 step response times measured with input flow rate of Q = 25 l/min.

REFERENCE SIGNAL STEP	0 100%	100 0%
Step response [ms]	100	80

6 - INSTALLATION

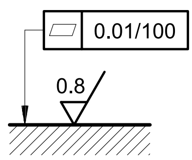
We recommend to install the MZE valve either in horizontal position, or vertical position with the solenoid downward. If the valve is installed in vertical position and with the solenoid upward, you must consider possible variations of the minimum controlled pressure, if compared to what is indicated in paragraph 2.

Ensure that there is no air in the hydraulic circuit. In 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 (see par.7). At the end of the operation, make sure of having screwed correctly the drain screw.

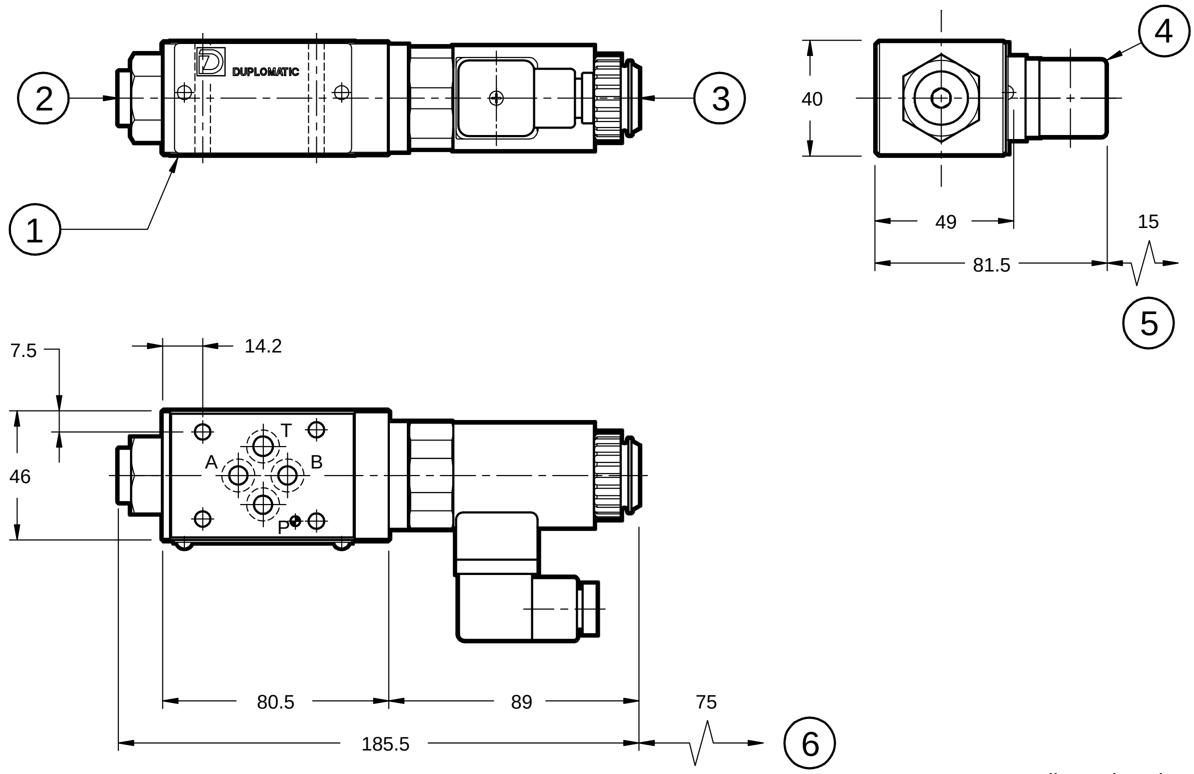
Connect the valve T port directly to the tank. Add any backpressure value detected in the T line to the reduced pressure value. Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.

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



7 - OVERALL AND MOUNTING DIMENSIONS



dimensions in mm

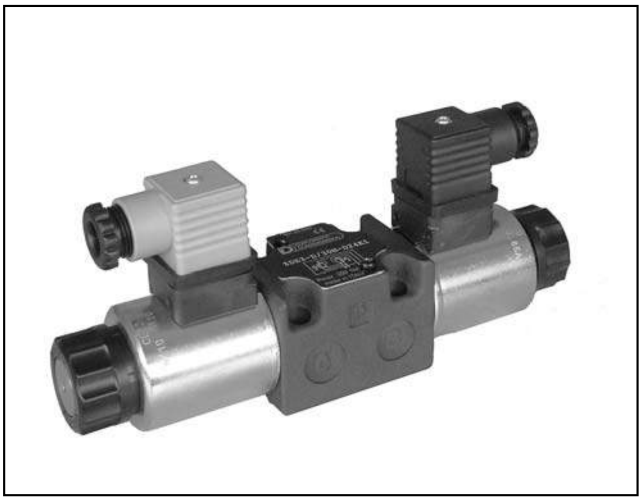
1	Mounting surface with sealing rings: 4 OR type 2037 - 90 shore (9.25x1.78)
2	Pressure gauge port 1/4Ž BSP
3	Breather (male hexagonal spanner 4)
4	DIN 43650 electric connector (included in the delivery)
5	Connector removal space
6	Coil removal space

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.

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. 89 250
EDM-M142	for solenoid 12V DC		
UEIK-11	for solenoid 24V DC	Eurocard type	see cat. 89 300

DUPLOMATIC OLEODINAMICA
DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com



ZDE3

DIRECT OPERATED PRESSURE REDUCING VALVE WITH ELECTRIC PROPORTIONAL CONTROL

SERIES 30

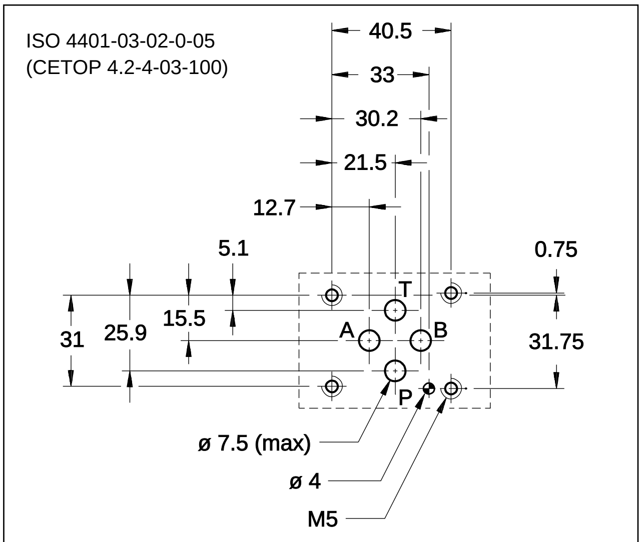
SUBPLATE MOUNTING

ISO 4401-03 (CETOP 03)

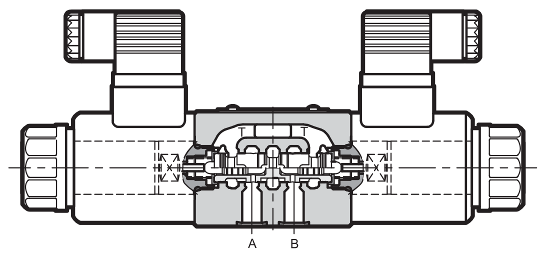
p max **100** bar

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 (CETOP RP121H) 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.

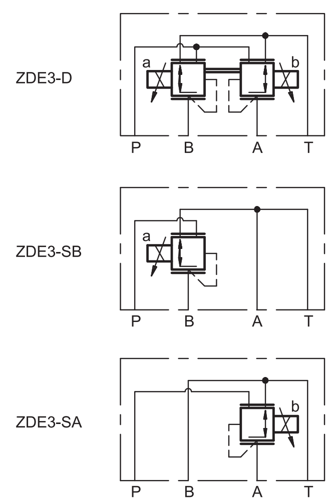
„ The valve can be controlled directly by a current control supply unit or by means of the relative electronic control units to exploit valve performance to the full (see par. 10).

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control cards)

Operating pressure range:	bar	30 ÷ 100
Pressure allowed on T port (see par. 6)	bar	0 ÷ 30
Controlled pressure	bar	23
Minimum controlled pressure	see p-Q diagram	
Maximum flow	l/min	15
Step response	see paragraph 5	
Hysteresis (with PWM 200 Hz)	% of p nom	< 4%
Repeatability	% of p nom	< ±1%
Electrical characteristic	see paragraph 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 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: (Z D)

Electric proportional control (E)

Size ISO 4401-03 (CETOP 03) (3)

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

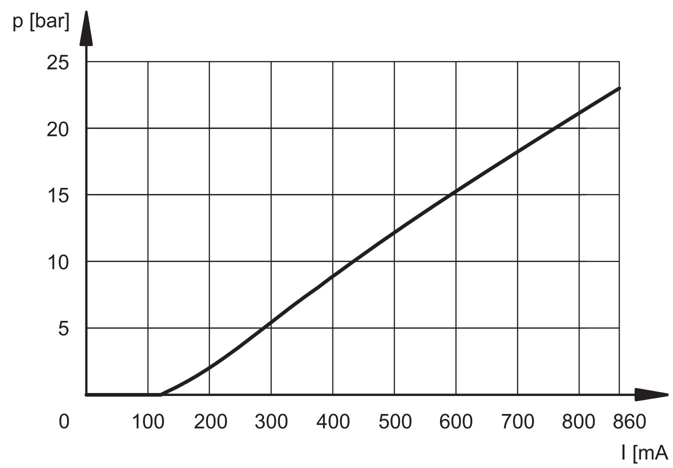
D12 = Nominal solenoid voltage 12V DC
D24 = Nominal solenoid voltage 24V DC

Coil electrical connection:
(see paragraph 7)
K1 = plug for connector type DIN 43650 (**standard**)
K7 = plug for connector type DEUTSCH DT04-2P male
K12 = plug for M12 connector K1 coils and DUAL DIN 43560

Manual override
(see par. 9)

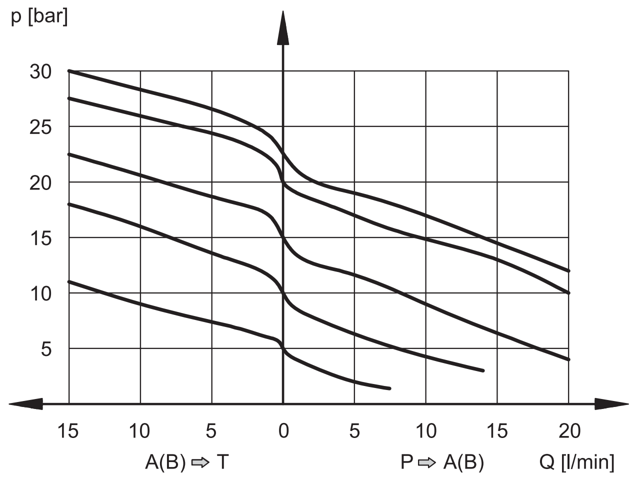
2 - CHARACTERISTIC CURVES (obtained with ZDE3-D/30N-D24K1 and oil with viscosity 36 cSt at 50°C)

PRESSURE CONTROL p=f (I)



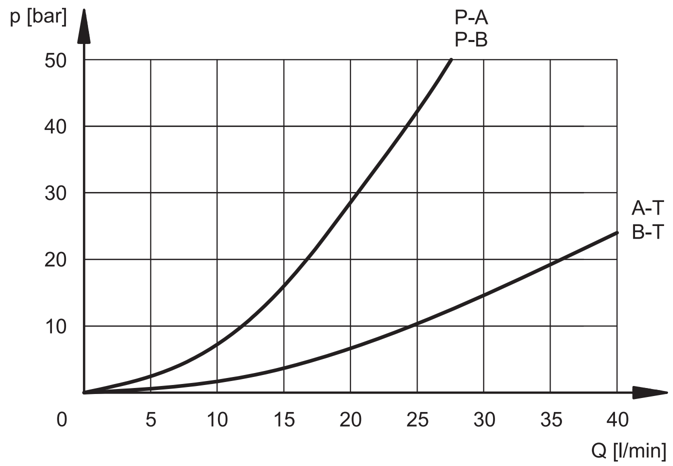
SA and SB versions pressure regulation is less than 0.5 bar.

PRESSURE VARIATION p = f(Q)



The curves have been obtained with inlet pressure 100 bar.

PRESSURE DROP p = 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. 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) K1 COIL **K7 COIL**		3.66 4	17.6 19
MAXIMUM CURRENT	A	1.88	0.86
DUTY CYCLE		100%	
PWM FREQUENCY	Hz	200	100
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2004/108/CE		
PROTECTION FROM: Atmospheric agents (CEI EN 60529)	IP 65		
CLASS OF PROTECTION : Coil insulation (VDE 0580) Impregnation:	class H class F		

5 - STEP RESPONSE

(with mineral oil with viscosity of 36 cSt at 50°C and with the relative 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 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

6 - INSTALLATION

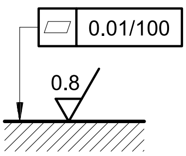
The ZDE3* valves can be installed in any position without impairing correct operation.

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.

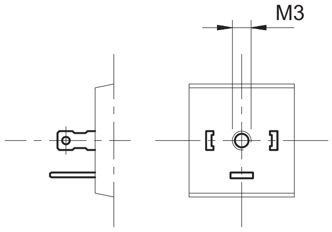
Surface finishing



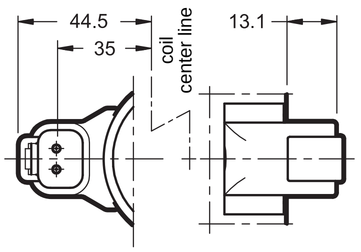
7 - ELECTRIC CONNECTIONS

The valve is supplied with connection K1. Alternatively, there are connections K7 and K12 DUAL DIN. DUAL DIN connector allows you to power two solenoids with connection K1 with a single cable with socket M12.

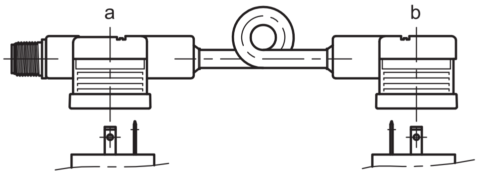
connection for DIN 43650 connector type
code **K1** (**standard**)



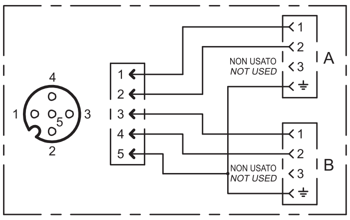
connection for DEUTSCH DT04-2P male
connector type
code **K7**



connection for DUAL DIN 43650 connector type
code **K12**

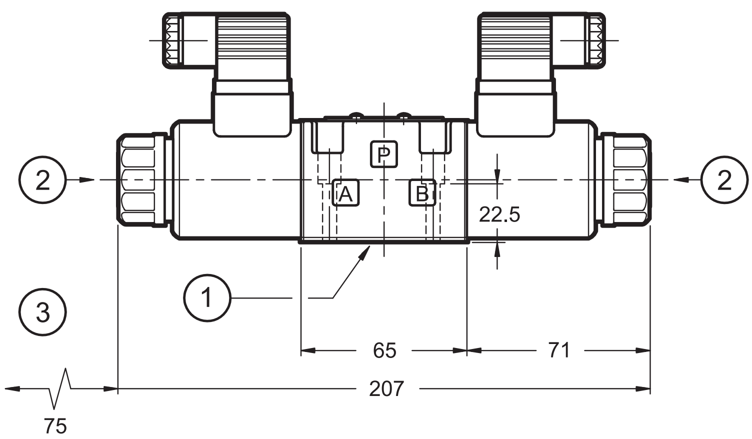


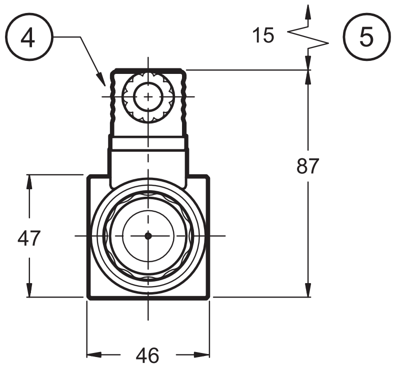
CONNECTOR M12x1 CONNECTION SCHEME

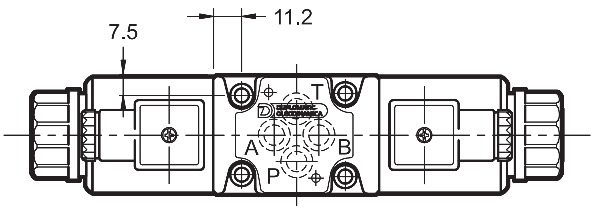


8 - OVERALL AND MOUNTING DIMENSIONS

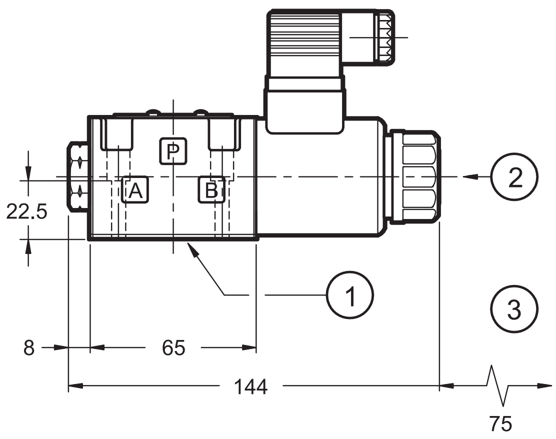
ZDE3-D



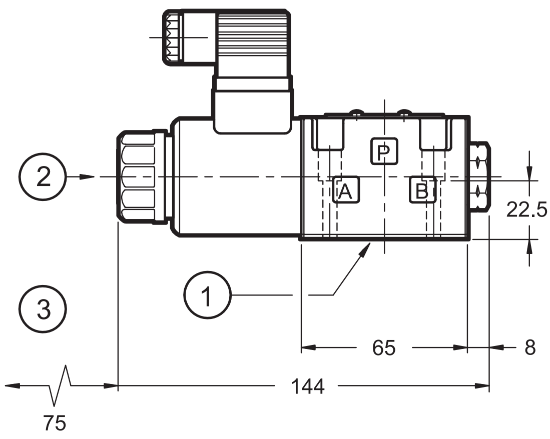




ZDE3-SA



ZDE3-SB



Fastening bolts: n° 4 bolts A8.8   M5x30

Torque: 5 Nm

dimensions in mm

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	DIN 43650 electrical connector
5	Connector removal space

9 - MANUAL OVERRIDE

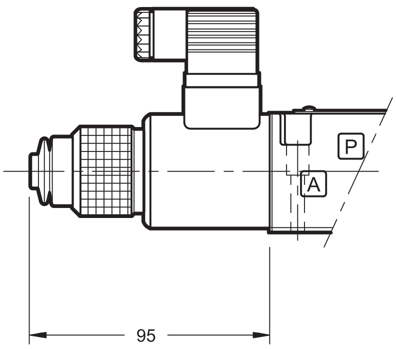
The standard valve has solenoids whose pin for the manual operation is integrated in the tube. The operation of this control must be executed with a suitable tool, minding not to damage the sliding surface.

Two different manual override version are available upon request:

- **CM** version, manual override belt protected
- **CS** version, with metal ring nut provided with a M4 screw and a blocking locknut to allow the continuous mechanical operations.

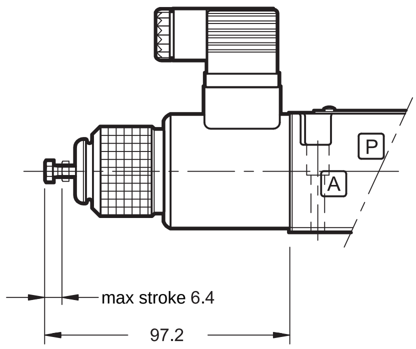
CAUTION!: The manual override use doesn't allow any proportional regulation; indeed using this kind of override, the main stage spool will open completely and the whole inlet pressure will pass through A or B line.

CM Version



Code: 3803210003

CS Version



Code: 3803210004

10 - 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. 89 250
EDM-M142	for solenoid 12V DC		

ZDE3-D*

EDM-M211	for solenoid 24V DC	rail mounting DIN EN 50022	see cat. 89 250
EDM-M242	for solenoid 12V DC		

11 - SUBPLATES (See catalogue 51 000)

Type PMMD-AI3G with rear ports
Type PMMD-AL3G with side ports
P, T, A, B port threading: 3/8Ž BSP

DUPLOMATIC OLEODINAMICA
DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

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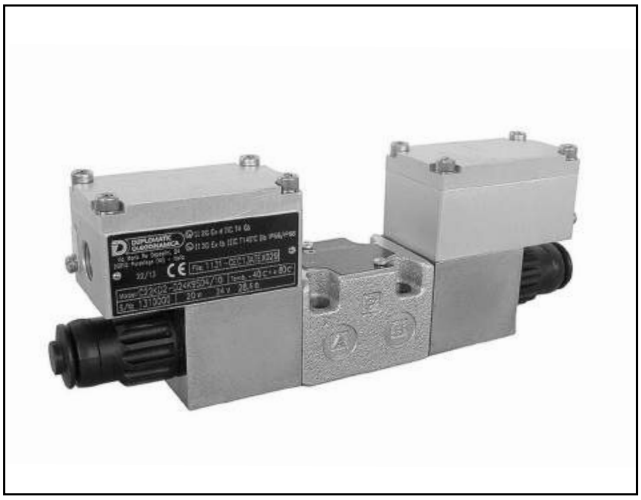

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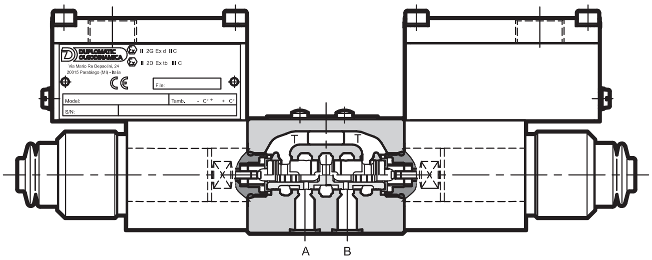

+0' / $!% +!&%) +! ! + %, $) + / _) - _

- V 1 " H4>H8E 4D8 7<D86FAB8D4F87 BD8EEGD8 D87G6<@ H4>H8E I <F; 8>86FD<6 BDABADF<A@4>6A@FDA> I <F; !* & +&') ' ? AG@F<@ EGD9468 +; 8K 4D8 <@ 6A? B>4<@68 I <F; + / EF4@74D7E 4@7 4D8 EG<F45>8 9ADF; 8 GE8 <@BAF8@F<4>>K 8JB>AE<H8 4F? AEB; 8D8E F; 4F94>> I <F; <@F; 8 + / !! 8<F; 8D9AD: 4E AD9AD7GEF 6>4EE<Z64F<A@* 88 B4D 9AD + / 6>4EE<Z64F<A@ AB8D4F<A@ F8? B8D4FGD8E 4@7 8>86FD<64>6; 4D46F8D<EF<6E
- V +; 8 H4>H8E 4D8 GE87 FA D87G68 BD8EEGD8 <@F; 8 E86A@74DK 6<D6G<F 5D4@6; 8E F; GE 8@EGD<@ EF45<><FK A9 6A@FDA>87 BD8EEGD8 <@F; 8 8H8@FA9 H4D<4F<A@E A9F; 8 [AI D4F8 F; DAG ; F; 8 H4>H8
- V . <F; F; 8 H4>H8E F; 8 EF4F8? 8@FA9 6A@@AD? <FK FA F; 8 GB ? 8@FA@87 EF4@74D7E <E 4>4 4KE EGBB>87
- V +; 8 1 " H4>H8E 4D8 EGBB>87 I <F; 4 Z@<E; <@ EGD9468 FD84F? 8@F L<@6 @6=8> EG<F45>8 FA 8@EGD8 4 E4>F EBD4K D8E<EF4@68 GB FA ; F8EF AB8D4F87 466AD7<@ FA , %! %!* & EF4@74D7E 4@7 F8EF8H4>G4F<A@AB8D4F87 466AD7<@ FA , %! %!* & EF4@74D7E

(* ' * % & +

A5F4<@87 I <F; ? <@8D4>A<> I <F; H<E6AE<FK A9 6* F4F M 4@7 8>86FDA@<6 6A@FDA>64D7E

& B8D4F<@ BD8EEGD8 D4@8	54D	Y
' D8EEGD8 4>AI 87 A@+ BADF E88 B4D	54D	Y
A@FDA>87 BD8EEGD8	54D	
$ 4J<? G? [AI	>? <@	
* F8B D8EBA@E8	E88 B4D4: D4B;	
KEF8D8E<E I <F; ' . $ L	A9B @A?	
) 8B84F45<><FK	A9B @A?	R
>86FD<64>6; 4D46F8D<EF<6E	E88 B4D4: D4B;	
? 5<8@FF8? B8D4FGD8 D4@8	M	%) 4@7 ' $ %#
>G<7 F8? B8D4FGD8 D4@8	M	%) 4@7 ' $ %#
>G<7 H<E6AE<FK D4@8	6* F	Y
>G<7 6A@F4? <@4F<A@78: D88	66AD7<@ FA !* & 6>4EE	
) 86A? ? 8@787 H<E6AE<FK	6* F	
$ 4EE E<@ >8 EA>8@A<7 H4>H8 7AG5>8 EA>8@A<7 H4>H8	=:	

! 1 * - $" +1% ' $+

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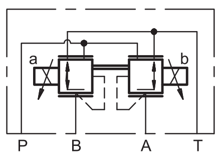

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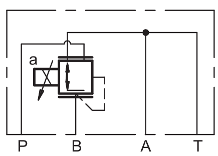

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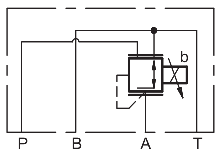


ZDE3KD2

+ * " +

" &, " " , " & '

2				#								#				

' D8EEGD8 D87G6<@
H4>B

>86FD6 BDABADF<A@4>
6A@ED>

* <L8 !* & +&'

JB>AE<A@BDAA9HBDE<A@ 466AD7<@
FA + / !! 9AD: 4E AD9AD7GEF
BDAF86F<A@FKB8 A9F; 8 6A<> W7X

* A>8@A<7E
BD8EEGD8 D87G6F<A@<@ 4@7 BADFE
+ BD8EEGD8 D87G6F<A@<@ BADF EA>8@A<7 A@E<78
+ BD8EEGD8 D87G6F<A@<@ BADF EA>8@A<7 A@E<78

* 8D<8E %A
9DA? FA E<L8E 4@7 ? AG@F<@ 7<? 8@E<A@E
D8? 4<@G@6; 4@ 87

* 84>E
ADF8? B8D4FGD8 D4@ 8 M
& %) E84>E 9AD? <@8D4>A<> EF4@74D7
. ' $ E84>E 9ADEB86<4>9>G<7E
ADF8? B8D4FGD8 D4@ 8 M
&$ E84>9AD>AI F8? B8D4FGD8E 9AD? <@8D4>A<>

& BF<A@ ,
H8DE<A@<@+ F8? B8D4FGD8
6>4EE
* 88 4FB4D
& ? <F<9@AFD8CG<D87

$ 4@G4>AH8DD<78
% 5AAFBDAF86F87
EF5A85D8 :BD6BF< & 5A8 . E95?E
@AF4H4<>45>8 9AD%# E84>E
5><@7 D@ @DF
EF5A85D8 :BD&$ E95?E
4H4<>45>8 GBA@D8CG8EF9AD5AF; %
4@7 - E84>E
E88 B4D4: D4B;

A@@86F<A@FKB8 9AD645>8 : >4@7
9ADGBB8D6A@@86F<A@
, $ J !* &
, = , %I %
, X% + %* ! 8J %* !
9ADE<78 6A@@86F<A@
+ $ J !* &
A@K 9AD 6A<>E
+ $ J !* &
4H4<>45>8 GBA@D8CG8EF A@K

A<>8>86FD<64>6A@@86F<A@
8>86FD<64>6A@@86F<A@5K FD? <@4>5>A6=

%A? <@4>EA>8@A<7 HA>F4: 8

&' , L<@6 @6=8>EF4@74D7 9<@<E; <@ EGD9468 FD84F? 8@F

! 1 * - $" $- " +

, E8 ? <@8D4>A<>54E87 ; K7D4G><6 9>G<7E # AD $ FKB8 466AD7<@ FA !* & ADF; 8 E8 9>G<7E GE8 %) E84>E AD9>G<7E) FKB8 B; AEB; 4F8 8EF8DE GE8 ' $ E84>E 6A78 - ADF; 8 GE8 A9AF; 8D9>G<7 FKB8E EG6; 4E B>84E8 6A@EG>F AGDF86; @<64>78B4DF? 8@F

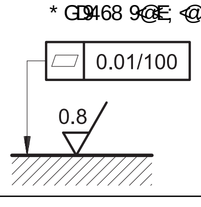
, E<@ 9>G<7 E 4FF8? B8D4FGD8E ; < ; 8DF; 4@ M 64GE8E 4 94EF8D78: D474F<A@A9 F; 8 9>G<7 4@7 A9 F; 8 E84>E 6; 4D46F8DE<EF<6E +; 8 9>G<7 ? GEF58 BD8E8DH87 <@<FE B; KE<64>4@7 6; 8? <64>6; 4D46F8D<EF<6E

"&+, $$, " &

+; 8 H4>H8E 64@58 <@EF4>87 <@4@K BAE<F<A@I <F; AGF<? B4<D<@ 6ADD86FAB8D4F<A@

@EGD8 F; 4FF; 8D8 <E @A 4<D<@F; 8 ; K7D4G><6 6<D6G<F

- 4>H8E 4D8 9<J87 5K ? 84@E A9 E6D8I E ADF<8 DA7E A@4 94F EGD9468 I <F; B>4@4D<FK 4@7 DAG ; @8EE 8CG4>FA AD58FF8DF; 4@ F; AE8 <@7<64F87 <@F; 8 D8>4F<H8 EK? 5A>E !9 ? <@<? G? H4>G8E 4D8 @AF A5E8DH87 9>G<7 64@84E<>K >84= 58F 88@F; 8 H4>H8 4@7 EGBBADFEGD9468

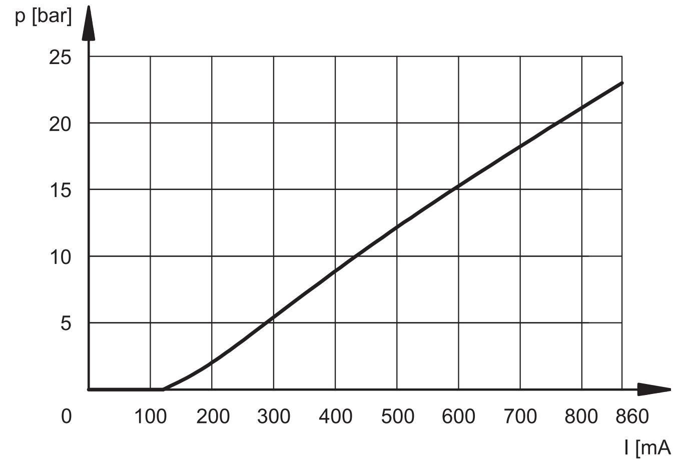


A@@86FF; 8 H4>H8 + BADF7<D86F>K FA F; 8 F4@= 77 4@K 546=BD8EEGD8 H4>G8 78F86F87 <@F; 8 + ><@8 FA F; 8 D87G687 BD8EEGD8 H4>G8 $ 4J<? G? 47? <EE<5>8 546=BD8EEGD8 <@F; 8 + ><@8 G@78DAB8D4F<A@4> 6A@7<F<A@E <E 54D

! * , * "+, " - * . +

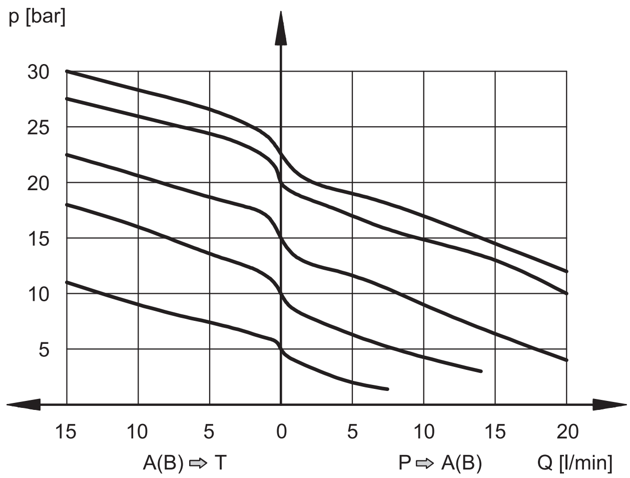
A5F4<@87 I <F; 1 % " + $ I <F; ' . $ L 4@7 A><I <F; H<E6AE<FK 6* F4F M

(* ++- * ' &, * ' $ C : "



* 4@7 * H3DE<A@E BD8EEGD8 D8: G4F<A@<E >8EE F; 4@ 54D

(* ++- * . * " , " & C :)



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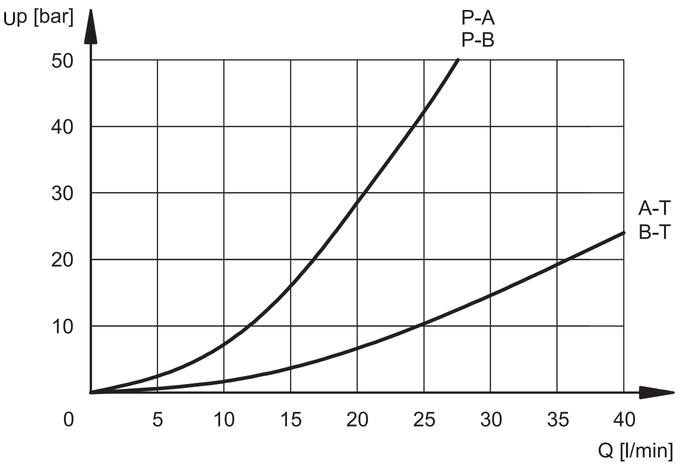

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+; 8 F45>8 <>>GEFD4F8E FKB<64> EF8B D8EBA@E8 F<? 8E ? 84EGD87 I <F; <@BGF9>AI D4F8 A9 (>? <@4@7 B 54D

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ADH4>BE EG4F5>8 9AD4BB>64F A@4@7 <@EF4>4F A@<@BAF8@F4>K 8JB>AE<+B 4F? AEB; 8D8E 466AD7<@ FA + / 7<D86F<+B BD8E6D<BF A@E GB>A? 4F6 68DF<964F8E F; 8 6A? 5<@4F A@H4>+B 6A< F<9 EGCC?K 5?! 5KE =A7?G89E F<9 897?5D5F<BA B: 7BA:BD@<FK FB F<9 8<D97F<H9 5A8 F<9 BC9D5F<A; 5A8 @5<AF9A5A79 @5AG5? F<5F7BAF5<AE 5??F<9 <A:BD@5F<BA A99898 :BD5 7BDD97FGE9 B: F<9 H5?H9 <A CBF9AF<5?K 9JC?BE<H9 9AH<DBA@9AFE

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. 5?H9 , 0 7?5EE<=<75F<BA

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!! 4E : DAGB F; 8D89AD8 4>EA 8><5>8 9AD: DAGB !! 4@7 !!

+ +8? B8D4FGD8 6>4EE ? 4J EGD9468 F8? B8D4FGD8

5 ' # BDAF86F A@8H>9AD8>86F>64>78H68E

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+KB8 A94F? AEB; 8D8 I <F; 7GEFE

!!! GEFE : DAGB F; 8D89AD8 4>EA 8><5>8 9AD: DAGB !!! 4@7 !!!

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!' !' ' DAF86F A@78: D88 9DA? 4F? AEB; 8D6 4: 8@FE 466AD7<@ FA ! %

M +4 M ? 5<8@F F8? B8D4FGD8 D4@ 8 9ADH4>+B8E I <F; 5AF; % 4@7 - E84>E

M +4 M ? 5<8@F F8? B8D4FGD8 D4@ 8 9ADH4>+B8E I <F; %# E84>E

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+; 8 6A<A9F; 8 8JB>AE<A@BDA9H4>+B8E <E <78@F<987 I <F; <E AI @F4: I ; <6; 64D8E F; 8 D8>4F<+B + / ? 4D<@ , <9 @97<5A=75?7BAEFDG7F<BA B: F<9 7B=?<BGE=A; =E @589 =A BD89DFB 9AEGD9 =E D9E=EF5A79 FB CBEE=6?9 =A9DA5?9JC?BE=BA 5A8 FB 5HB=8 5AK 9JC?BE=BA CDBC5; 5F<BA FB F<9 BGF=89 9AH<DBA@9AF @5F7<=A; 5A O J 8P FKC9 CDBF97F<BA 9JC?BE=BA CDBB: 7B=?

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$)"!% ^ &) ^ * * - ' &,) * $!*+*

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J 7 W7XBDAF86F A@FKB8 8JB>AE<A@BDA964E8

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5 ' # BDAF86F A@8H>9AD8>86F>64>78H68E

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J F5 W5XBDAF86F A@FKB8

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+ M +8? B8D4FGD8 6>4EE ? 4J EGD9468 F8? B8D4FGD8

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!' !' ' DAF86F A@78: D88 9DA? 4F? AEB; 8D6 4: 8@FE 466AD7<@ FA ! %

M +4 M ? 5<8@F F8? B8D4FGD8 D4@ 8

' C9D5F<A; F9@C9D5FGD9E

+; 8 AB8D4F<@ 4? 5<8@F F8? B8D4FGD8 ? GEF58 58F 88@ M 9ADH4>+B8E I <F; 5AF; % 4@7 - E84>E 4@7 M M 9ADH4>+B8E I <F; %# E84>E

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+; 8 H4>+B8E 4D8 6>4EE<987 <@+ F8? B8D4FGD8 6>4EE + M F; 8D89AD8 F; 8K 4D8 8><5>8 9ADAB8D4F<A@4>EA 4F; <; 8D6>4EE F8? B8D4FGD8 + + + 9AD: 4E 4@7 + M 9AD7GEF

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+; 8 ? 4D=<@ 9AD+ 6>4EE F8? B8D4FGD8 H4>H8E <E@AF 4D8

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$, * " $ ' && , " &

/ =D A;

!@AD78DFA D84>E8 F; 8 8>86FD64>6A@@86F A@A9F; 8 6A<> <F<E @868EE4DK FA 4668EE F; 8 F8D? <@4>5>A6= G@E6D8I <@ F; 8 E6D8I E F; 4F9<EF8@ F; 8 6AH8D I <F; F; 8 5AJ F; 4F6A@F4<@E F; 8 F8D? <@4>5>A6=

, <9 9?97FD=75?7BAA97F=BA =E CB5DFK =A89C9A89AF

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& @F; 8 8JF8D@4>5A7K A9F; 8 6A<> F; 8D8 <E 4 : DAG@7<@ BA<@F $ E6D8I F; 4F4>>AI FA 8@EGD8 8CG<BAF8@F4>>FK 58FI 88@F; 8 H4>H8 4@7 F; 8 : 8@8D4>: DAG@7<@ >@8 A9F; 8 EKEF8? 6A@@86F@ F; <E BA<@FF; 8 D8: G>4F<A@A9F; 8 % EF4@74D7 F; 4F<? BAE8 FA H8D<9K F; 8 8CG<BAF8@F4>>FK A9F; 8 8>8? 8@FE <@6>G787 <@4 BAF8@F4>>K 8JB>AE<H8 8@H<DA@? 8@F F; 8 ? 4J<? G? D8E<EF4@68 58FI 88@F; 8 8>8? 8@FE ? GEF58 T <E : G4D4@F887

FF; 8 8@7 A9F; 8 8>86FD64>I <D<@ <F<E @868EE4DK FA D84EE8? 5>8 F; 8 6AH8D A@F; 8 5AJ 6; 86=<@ F; 8 6AD8 6FBAE<F<A@<@ A9F; 8 E84>>A64F87 <@F; 8 6AH8D E84F4@7 9<EF8@<@ F; 8 $ E6D8I E I <F; 4 FADDG8 A9 Y %?

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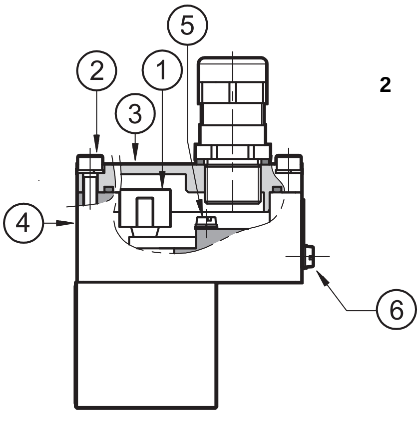

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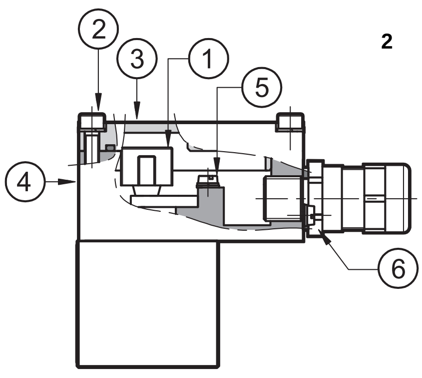

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45>8 : >4@7E I ; <6; ? GEF58 AD78D87 E8B4D4F8>K E88 B4D4: D4B; 4>AI FA GE8 645>8E I <F; 8JF8D@4>7<4? 8F8D58FI 88@ 4@7 ? ?

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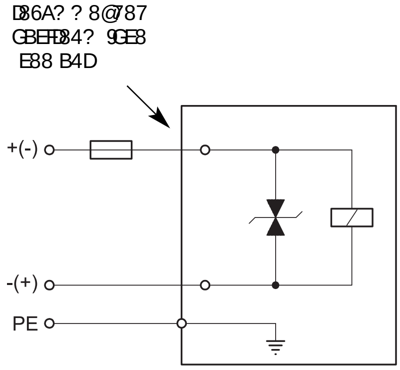

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					+D4@E<8@FHA>F4: 8 EGBBD8EEAD 5<7<D86F<A@4>

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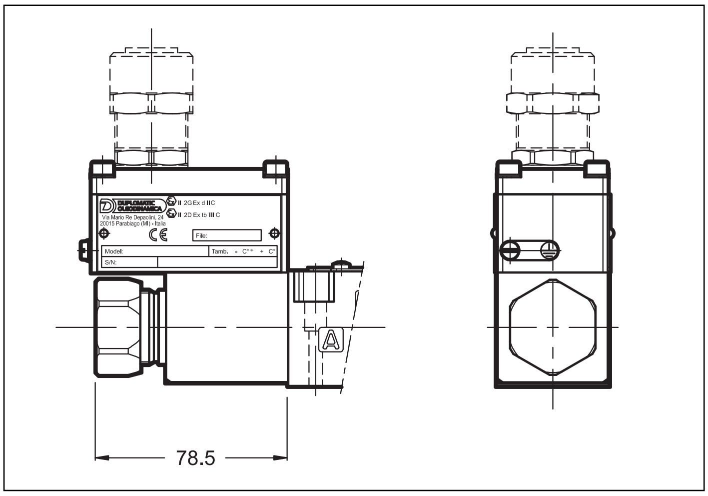
+; 8 ? 8F4>D<@ @GF BDAF86FE F; 8 EA>8@A<7 FG58 9DA? 4F? AEB; 8D<6 4: 8@FE 4@7 <EA>4F8E F; 8 ? 4@G4>AH8DD<78 9DA? 466<78@F4> AB8D4F<A@E +; 8 D<@ @GF <E F<: ; F8@87 A@4 F; D84787 94EF8@8D F; 4F=88BE F; 8 6A<>=@EE BAE<F<A@8H8@I <F; AGFF; 8 D<@ @GF

+A 4668EE F; 8 ? 4@G4>AH8DD<78 >AAE8 F; 8 D<@ @GF4@7 D8? AH8 <F F; 8@D84EE8? 5>8 ; 4@7 F<: ; F8@<@ G@F<>=FEFABE

7F=H5F9 F<9 @5AG5?BH9DD=89 51 5KE 5A8 BA?K I =F< ABA EC5D>=A; FBB?E EG=F56?9 :BDGE9 =A , 0 5D95E 7?5EE=98

$ AD8 <@9AD? 4F<A@A@E498 GE8 A9 + / 6>4EE<987 6A? BA@8@FE 4D8 BDAH<787 <@F; 8 <@EFDG6F<A@? 4@G4> 4J 4KE EGBB>87 I <F; F; 8 H4>H8

- , " & , <9 @5AG5?BH9DD=89 8B9EA F5?BI 5AK CDBCBDF=BA5?D9; G?5F=BA =A8998 GE=A; F<=E >=A8 B: BH9DD=89 F<9 @5=A EF5; 9 ECBB? I =?? BC9A 7B@C?9F9?K 5A8 F<9 I <B?9 =A?9F CD9EEGD9 I =?? C5EE F<DBG; < BD ?A9



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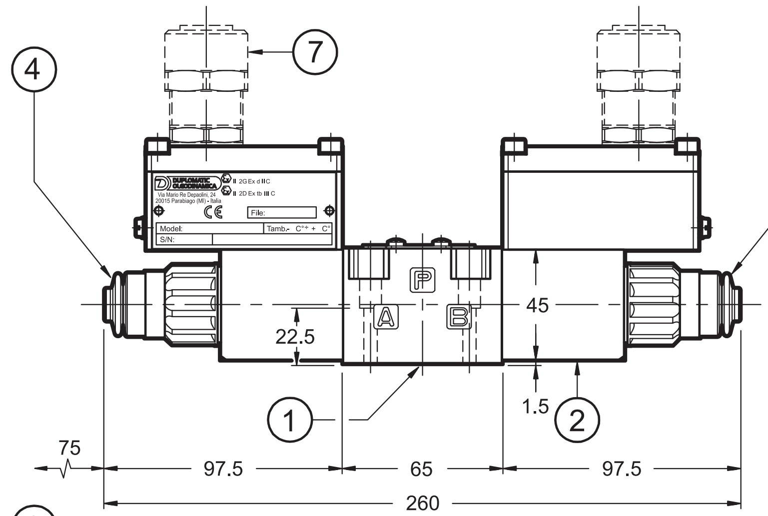

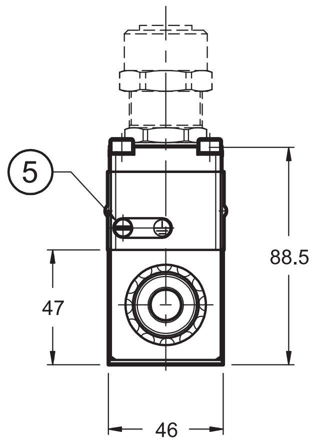

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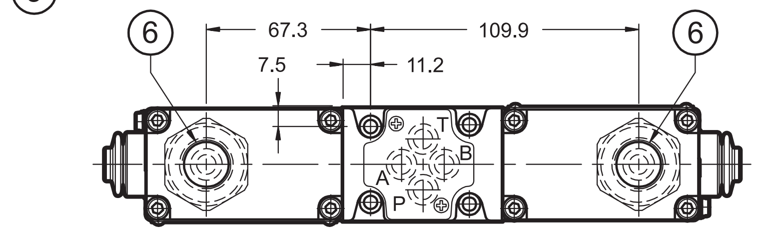

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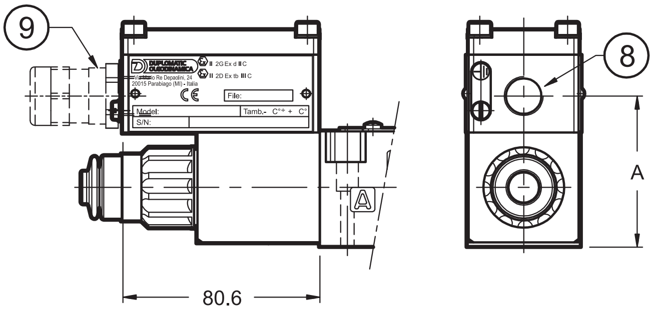

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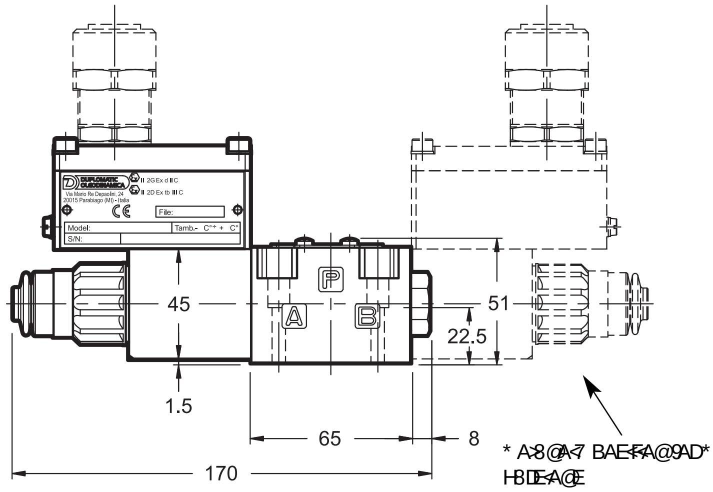

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4EF8@@ A9E<@ >8 H4>H8 *	E6D8I E !* &	$ J
+<; F8@<@ FADCG8 %?	E6D8I E	
+; D847E A9? AG@F<@ ; A>8E $ J		
* 84>@ D@ E &) FKB8	J	* ; AD8

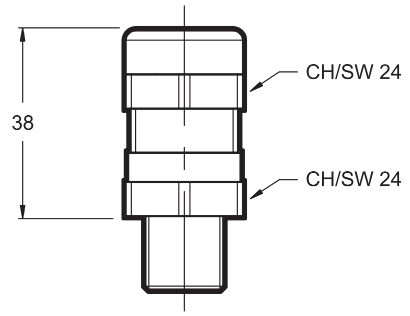
ZDE3KD2

+ * " +

$ $ & +

45>8 : >4@7E ? GEF58 AD78D87 E8B4D4F8>K GB>A? 4F6 A9B8DE EA? 8 FKB8E A9645>8 : >4@7E I <F; F; 8 9A>>AI <@ 984FGD8E

NHB8DE<A@9AD@A@4D? AG8D87 645>8 8JF8D@4>E84>A@F; 8 645>8 EG<F45>8 9ADQ Y ? ? 645>8E
N466AD7<@ FA + / !! 7<D86F<H8 68DF<9<87
N645>8 : >4@7 ? 4F8D<4> @<6=8>5D4EE
NDG558DF<B8 ? 4F8D<4> E<>6A@8
N4? 5<8@FF8? B8D4FGD8 D4@ 8 S Y S
NBDAF86F<A@78: D88 !' !'



+A AD78D >8EEF; 8 78E6D<BF<A@4@7 F; 8 6A78 A9F; 8 H8DE<A@6; AE8@9DA? 4? A@ F; AE8 >8EF87 58>AI

9E7D<CF=BA # &

B89

- 8DE<A@I <F; $ J !* & ? 4>8 F; D847 EG<F45>8 9AD6A<E I <F; + 4@7 * 6A@@86F<A@FKB8E <F<E EGBB>87 8CG<BB87 I <F; E<>6A@8 E84> F; 4F? GEF58 4EE8? 5>87 58FI 88@F; 8 645>8 : >4@7 4@7 F; 8 6A<> 6AH8D EA 4E FA 8@EGD8 !' !' BDAF86F<A@78: D88

9E7D<CF=BA # &

B89

- 8DE<A@I <F; X%' + %'* ! 8J %'* ! EG<F45>8 9AD 6A<E I <F; + 6A@@86F<A@FKB8 <@AD78DFA 8@EGD8 !' !' BDAF86F<A@78: D88 +; 8 6GEFA? 8D? GEF4BB>K #& +!+ O P F; D847>A6=8DADE<? <4D58FI 88@F; 8 645>8 : >4@7 6A@@86F<A@F; D847 4@7 F; 8 6A<>6AH8D

9E7D<CF=BA # &

B89

- 8DE<A@I <F; = , %' % ? 4>8 F; D847 EG<F45>8 9AD6A<E I <F; + 6A@@86F<A@FKB8 <@AD78DFA 8@EGD8 !' !' BDAF86F<A@78: D88 +; 8 6GEFA? 8D? GEF4BB>K #& +!+ O P F; D847>A6=8DADE<? <4D58FI 88@F; 8 645>8 : >4@7 6A@@86F<A@F; D847 4@7 F; 8 6A<> 6AH8D

9E7D<CF=BA # &

B89

- 8DE<A@I <F; $ J !* & ? 4>8 F; D847 EG<F45>8 9AD6A<E I <F; * 6A@@86F<A@FKB8 <F<E EGBB>87 8CG<BB87 I <F; E<>6A@8 E84> F; 4F? GEF58 4EE8? 5>87 58FI 88@F; 8 645>8 : >4@7 4@7 F; 8 6A<>6AH8D EA 4E FA 8@EGD8 !' !' BDAF86F<A@78: D88

$, * ' &" ' &, * ' $ - &", +

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% %	9ADEA>8@A<7 -	!% % D4<? AG@F<@	E88 64F
% %	9ADEA>8@A<7 -		

&' , 9?97F8BA=7 7BAF8B?GA=FE B::9D98 5D9 ABF79DF=:=98 577BD8=A; FB , 0 =D97F=H9 F<9D9:BD9 F<9K @GEF69 =AEF5?98 BGFE=89 F<9 7?5EE=:=98 5D95

2

% %	9ADEA>8@A<7 -	D4<? AG@F<@ !% %	E88 64F
% %	9ADEA>8@A<7 -		

+- ($, +

E88 64F4>A: G8

+KB8 ' $ $!	I <F; D84DBAD8E
+KB8 ' $ $ #	I <F; E<78 BAD8E
' +	BADFF; D847<@ X *'

&' , * G5B>4F8E FA 58 AD78D87 E8B4D4F8>K 7A @AF6A@F4<@ @8<F; 8D4>G? <@G? @AD? 4: @8E<G? 4F4 ; <; 8DD4F8 F; 4@F; 8 H4>G8 4>>AI 87 5K @AD? E 466AD7<@ FA + / 7<D86F<H8 9AD 64F8: ADK

+; 8 GE8D? GEF4=8 64D8 4@7 ? 4=8 4 6A? B>8F8 4EE8EE? 8@F A9F; 8 <@F<A@DE= F; 4F64@A66GD9DA? F; 8 D8>4F<H8 GE8 <@ BAF8@F<4>K 8JB>AE<H8 8@H<DA@? 8@FE

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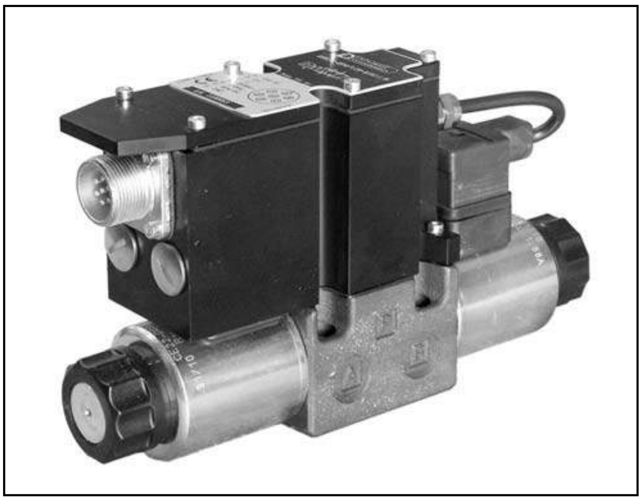
DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com



ZDE3G

DIRECT OPERATED REDUCING VALVE WITH PROPORTIONAL CONTROL AND INTEGRATED ELECTRONICS

SERIES 30

SUBPLATE MOUNTING

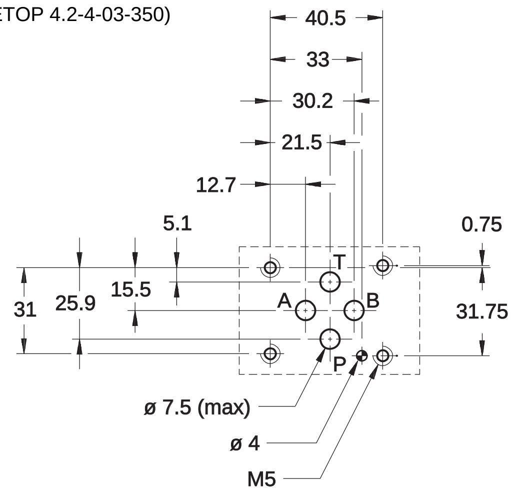
ISO 4401-03 (CETOP 03)

p max **100** bar

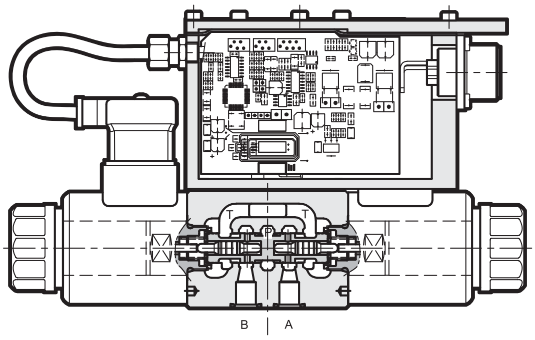
Q max **15** l/min

SUBPLATE MOUNTING

ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)



OPERATING PRINCIPLE



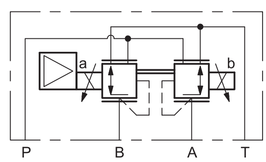
- The ZDE3G are direct operated pressure valves with electric proportional control and integrated electronics and with mounting interface in compliance with ISO 4401 (CETOP RP121H) standards.
- The valves are used to reduce pressure in the secondary circuit branches thus ensuring stability of controlled pressure in the event of variations of the flow rate through the valve..
- They are controlled directly by an integrated digital amplifier (see par. 4).

PERFORMANCES (obtained with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronics)

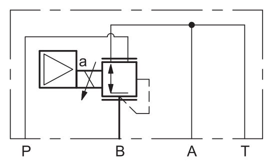
Pressure allowed on P port	bar	30 ÷ 100
Pressure allowed on T port (see par. 6)	bar	0 ÷ 30
Controlled pressure	bar	23
Maximum flow	l/min	15
Hysteresis	% Q_{max}	< 3 %
Repeatability	% Q_{max}	< 1 %
Electrical characteristics	see paragraph 4	
Ambiente temperature range	°C	-20 / +50
Fluid temperature range	°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

ZDE3G-D



ZDE3G-SB



1 - IDENTIFICATION CODE

Z	D	E	3	G	-		/	30		-		K11	/		/	

Pressure reducing valve

Electric proportional control

Dimensione ISO 4401-03 (CETOP 03)

Integrated electronics for open loop

Solenoids:
D = pressure reduction in A and B ports
SB = pressure reduction in B port (solenoid on side A)

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

Main connector 6 pin + PE

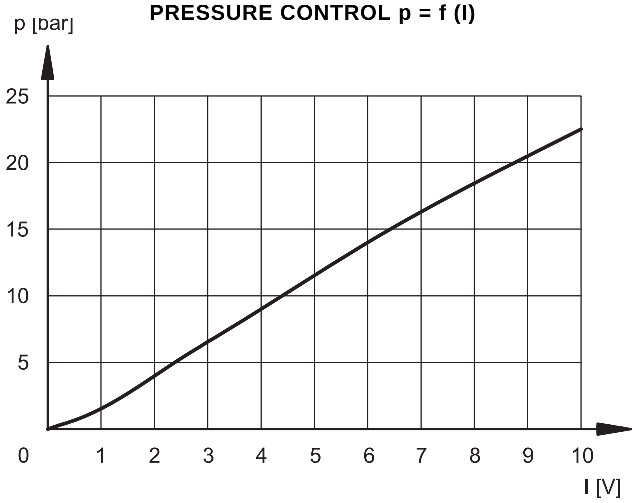
B = standard version
C = with CAN connection

Manual override (see par. 9)

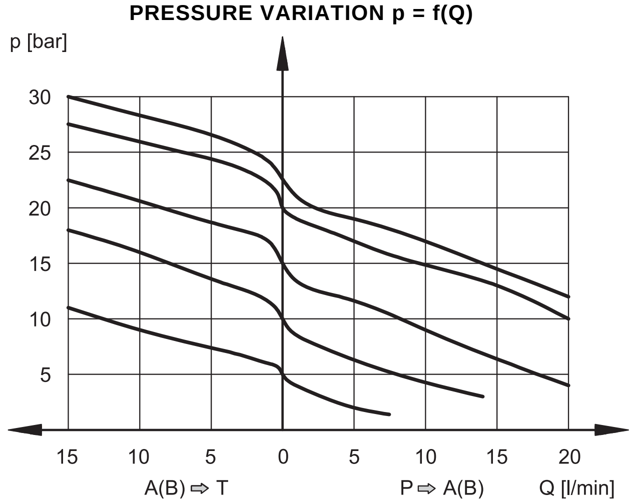
2 - CHARACTERISTIC CURVES (obtained with oil with viscosity 36 cSt at 50°C)

Adjustment characteristics depending from solenoid current supply, obtained with inlet pressure = 100 bar.

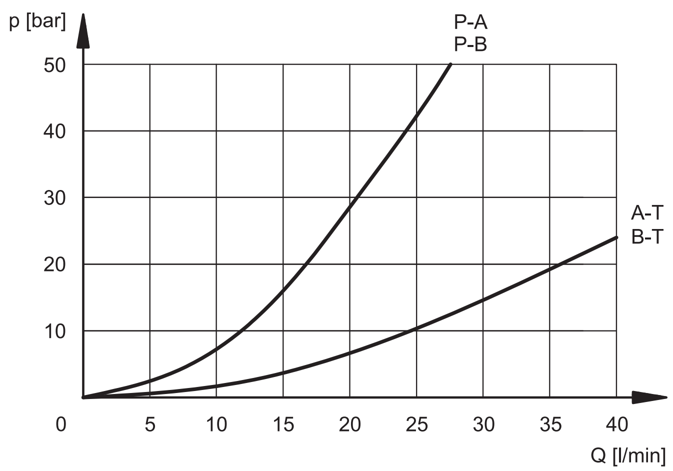
PRESSURE CONTROL p = f (I)



PRESSURE VARIATION p = f(Q)



PRESSURE DROP p = f(Q)



3 - STEP RESPONSE

Response times are obtained with an inlet pressure of 100 bar and a pressure oil volume of 0,5 lt. The response time is affected both by the flow rate and the oil volume in the pipework.

STEP RESPONSE (±10%) [ms]	
0 100%	100% 0
30	20

4 - ELECTRICAL CHARACTERISTICS

4.1 - Digital integrated electronics

The proportional valve is controlled by a digital amplifier (driver), which incorporates a microprocessor that controls, via software, all the valve functions, such as:

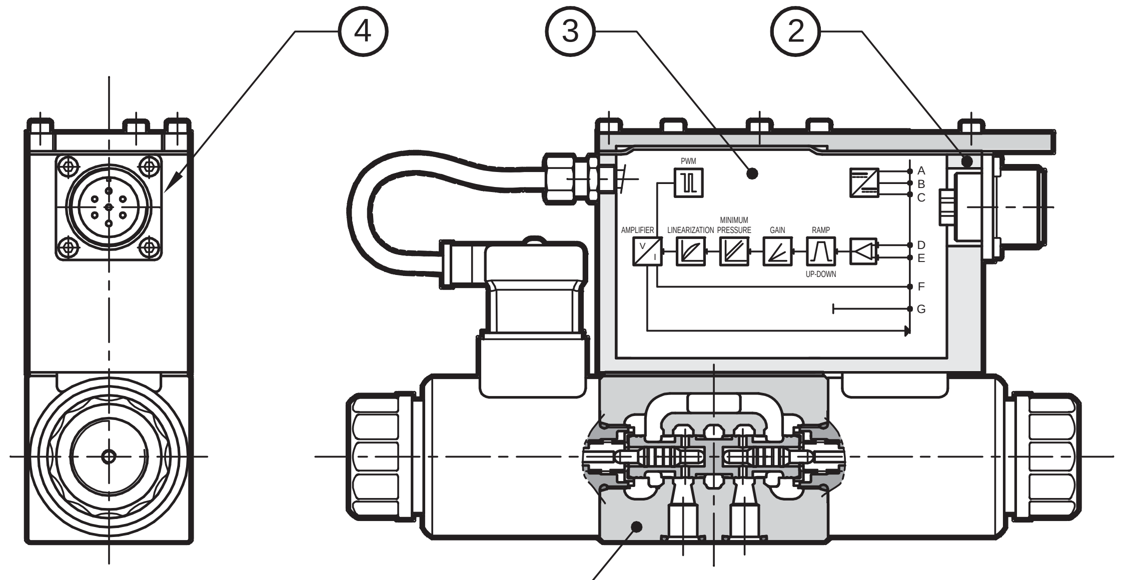
- continuous converting (0,5 ms) of the voltage reference signal (E0) or of the current reference signal (E1) in a digital value
- generation of up and down ramps (see **NOTE**)
- gains limit (see **NOTE**)
- compensation of the dead band
- linearization of the characteristic curve
- regulation of the current to the solenoid
- dynamic regulation of PWM frequency
- protection of the solenoid outputs against possible short circuits

NOTE: These parameters can be set through the connection to the CAN connector, by means of a personal computer and relevant software (see par. 5.3)

The digital driver enables the valve to reach better performance compared to the analogic version, such as:

- reduced hysteresis and better repeatability
- reduced response times
- linearization of the characteristic curve which is optimised in factory for each valve
- complete interchangeability in case of valve replacement
- possibility to set, via software, the functional parameters
- possibility to interface a CAN-Open network
- possibility to perform a diagnostic program by means of the CAN connection
- high immunity to electromagnetic troubles

4.2 - Functional block diagram



1	Valve with proportional solenoids	3	Digital card
2	Electronics case	4	Main connector

4.3 - Electrical characteristics

NOMINAL VOLTAGE	V DC	24 (from 19 to 35 VDC, ripple max 3 Vpp)
ABSORBED POWER	W	50
MAXIMUM CURRENT	A	1,88
DUTY CYCLE		100%
VOLTAGE SIGNAL (E0)	V DC	±10 (Impedence Ri > 50K)
CURRENT SIGNAL (E1)	mA	4 ÷ 20 (Impedence Ri = 500)
ALARMS		Overload and electronics overheating
COMMUNICATION		Interface of the optoisolated industrial Field-bus type CAN-Bus ISO 11898
MAIN CONNECTOR		7 - pin MIL-C-5015-G (DIN 43563)
CAN-BUS CONNECTOR		M12-IEC 60947-5-2
ELECTROMAGNETIC COMPATIBILITY ((EMC) emissions CEI EN 61000-6-4 immunity CEI EN 61000-4-2		According to 2004/108/CE standards
PROTECTION AGAINST ATMOSPHERIC AGENTS :		IP67 (CEI EN 60529 standards)

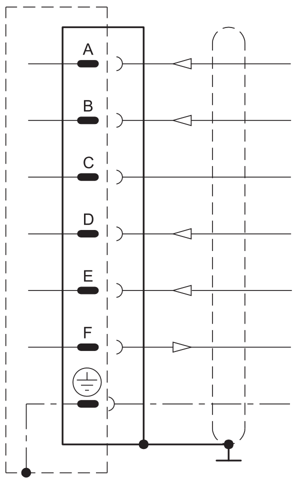
5 - OPERATING MODALITIES

The digital driver of ZDE3G valve may be used with different functions and operating modalities, depending on the requested performances.

5.1 -Standard version with voltage reference signal (E0)

This is the most common version; it makes the valve completely interchangeable with the traditional proportional valves with analogue type integrated electronics. The valve has only to be connected as indicated below. This version doesn•t allow the setting of the valve parameters, for example the ramps must be performed in the PLC program, as well as the reference signal limit.

E0 connection scheme (B version - E0)



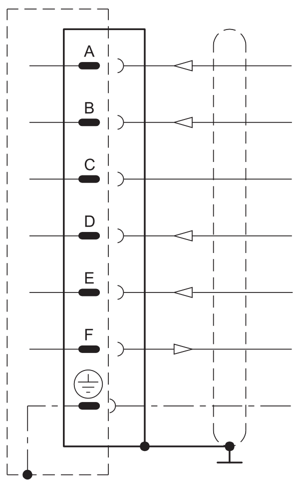
Pin	Values	Function	NOTES
A	24 VDC	Voltage	from 19 to 35 VDC (ripple max 3 Vpp) (see **NOTE 3**)
B	0 V	Power supply (zero)	0 V
C	----	Not used	----
D	± 10 V	Input rated command	Impedence R_i > 50 k (see **NOTE 1**)
E	0 V	Input rated command	----
F	± 10 V	Coil current	± 100% I_{MAX} (see **NOTE 2**)
PE	GND	Protective ground	----

5.2 - Standard version with current reference signal (E1)

This version has characteristics which are similar to the previous one, with the difference that in this case the reference signal is supplied in current 4 - 20 mA. With the 12 mA signal the valve is in central position, with the 20 mA signal the valve performs the configuration P-A and B-T, while with 4 mA the configuration is P-B and A-T. For •SAŽ single solenoid valves, with reference 20 mA to pin D, the valve full opening is P-B and A-T, while with 4 mA the valve is at rest. This configuration may be modified via software.

If the current to solenoid is lower, than the card shows a BREAKDOWN CABLE error. To reset the error switch-off the supply.

E1 connection scheme (B version - E1)



Pin	Values	Function	NOTES
A	24 VDC	Voltage	from 19 to 35 VDC (ripple max 3 Vpp) (see **NOTE 3**)
B	0 V	Power supply (zero)	0 V
C	----	Not used	----
D	4 ÷ 20 mA	Input signal	Impedence R_i = 500
E	0 V	Zero reference	----
F	± 10 V	Coil current	± 100% I_{MAX} (see **NOTE 2**)
PE	GND	Protective ground	----

NOTE 1: The input signal is differential type. For double solenoid valves, with positive reference signal connected to pin D, the valve opening is P - A and B - T. With zero reference signal the valve is in central position. For •SAŽ single solenoid valves, with positive reference to pin D, the valve opening is P-B and A-T. The spool stroke is proportional to U_D - U_E. If only one input signal (single-end) is available, the pin B (0V power supply) and the pin E (0V reference signal) must be connected through a jumper and both connected to GND, electric panel side.

NOTE 2: read the test point pin F in relation to pin B (0V).

NOTE 3: preview on the Pin A (24 VDC) an external fuse for protecting electronics. Fuse characteristics: 5A/50V type fast.

NOTE for the wiring: connections must be made via the 7-pin plug mounted on the amplifier. Recommended cable sizes are 0,75 mm^2 for cables up to 20m and 1,00 mm^2 for cables up to 40m, for power supply. The signal cables must be 0,50 mm^2 . A suitable cable would have 7 cores, a separate screen for the signal wires and an overall screen.

5.3 - Version with parameters set by means of CAN connector (version C)

This version enables the setting of some parameters of the valve, by connecting the CAN connector to a traditional computer.

To do this, it is necessary to order the interface device for USB port CANPC-USB/20, cod. 3898101002, with the relevant configuration software, the communication cable (L=3 meters) and an hardware converter for connecting the valve to the PC USB port. The software is Microsoft Windows XP© compliant.

The parameters that can be set are described below:

Maximun current (Gain regulation)

Imax A and Imax B set the maximun current to the solenoid A corresponding to the positive value of the input reference. This parameter allows the reduction of the valve flow rate with the maximum reference.

Default value = 100% of full scale

Range: from 100% to 50% of full scale

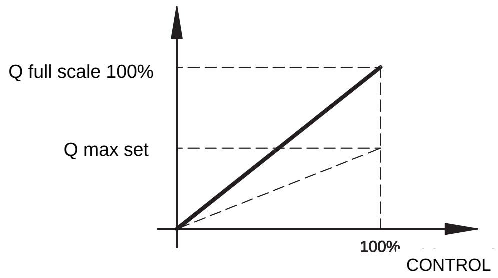
PWM Frequency

Sets the PWM frequency, which is the pulsating frequency of the control current. The PWM decrease improves the valve accuracy, decreasing the regulation stability.

The PWM increase improves the regulation stability, causing a higher hysteresis.

Default value = 300 Hz

Range 50 ÷ 500 Hz



Ramps

Increase time of Ramp R1 - solenoid A: sets the current increase time for a variation from 0 to 100% of the input reference from zero to -10V.

Decrease time of Ramp R2 - solenoid A: sets the current decrease time for a variation from 100 to 0% of the input reference from -10V to zero.

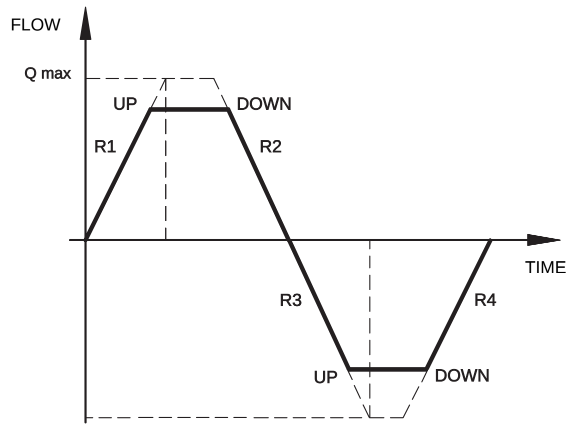
Increase time of Ramp R3 - solenoid B: sets the current increase time for a variation from 0 to 100% of the input reference from zero to -10V.

Decrease time of Ramp R4 - solenoid B: sets the current decrease time for a variation from 100 to 0% of the input reference from -10V to zero.

Min time = 0,001 sec

Max time = 40,000 sec

Default time = 0,001 sec.



Diagnostics

Provides several information parameters, such as:

The electronic driver status (Working or Broken)

The active regulation

Input reference

Current value

5.4 - Version with CAN-Bus interface (version C)

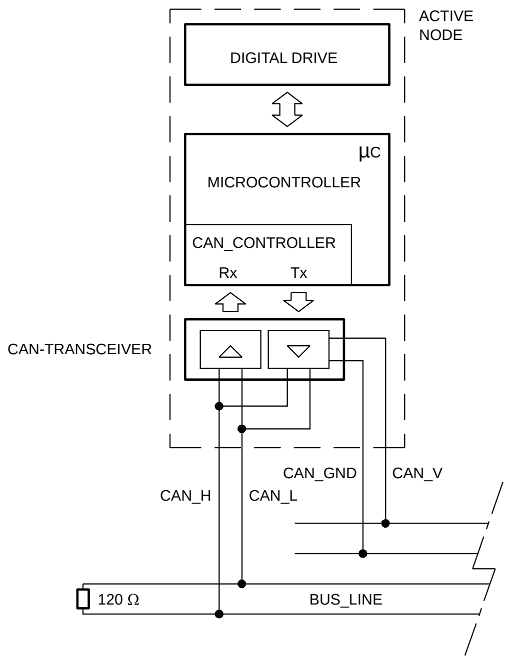
This version allows the valve piloting through the industrial field bus CAN-Open, according to ISO 11898 standards.

The CAN connector must be connected (see scheme) as a slave node of the CAN-Open bus, while the main connector is wired only for the power supply (pin A and B + earth).

The most important characteristics of a CAN - Open connection are:

- Parameter storage also in PLC
- Parameters setting in real-time (PDO communication)
- On-line valve diagnostics
- Easy wiring with the serial connection
- Communication program according to international standards

For detailed information on the CAN-Open communication software, see cat. 89 800.



CAN connector connection scheme

Pin	Values	Function
1	CAN_SHLD	Monitor
2	CAN +24VDC	BUS + 24 VDC (max 30 mA)
3	CAN 0 DC	BUS 0 VDC
4	CAN_H	BUS line (high signal)
5	CAN_L	BUS line (low signal)

N.B. Insert a 120 resistance on pin 4 and 5 of the CAN connector when the valve is the closure knot of the CAN network.

6 - INSTALLATION

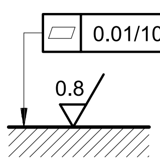
The ZDE3G valves can be installed in any position without impairing correct operation.

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



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).

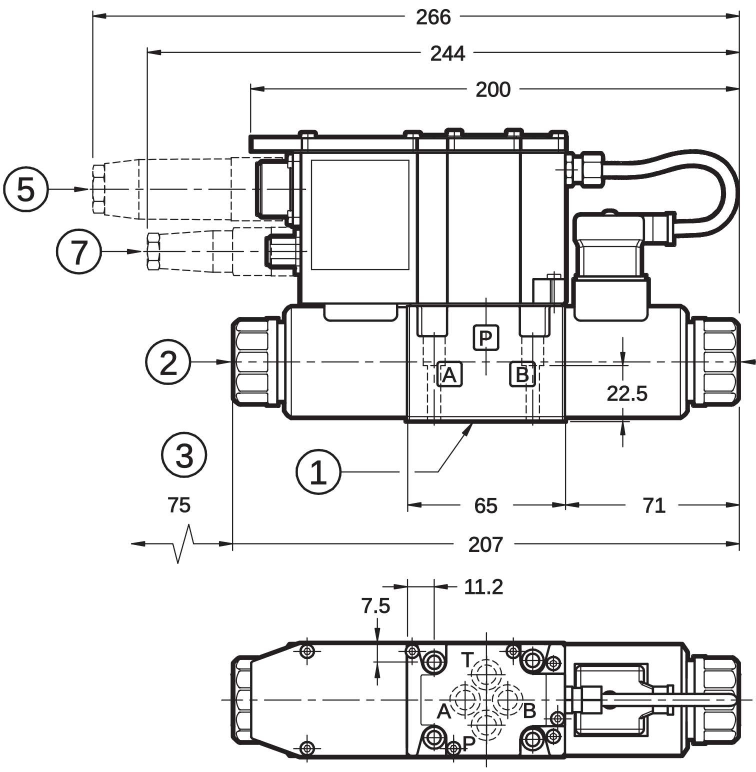
For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

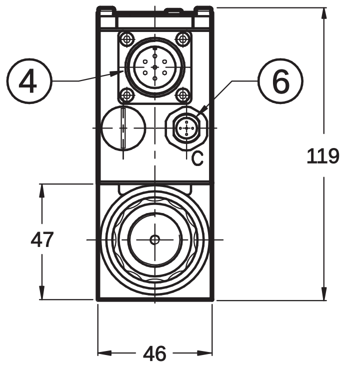
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

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

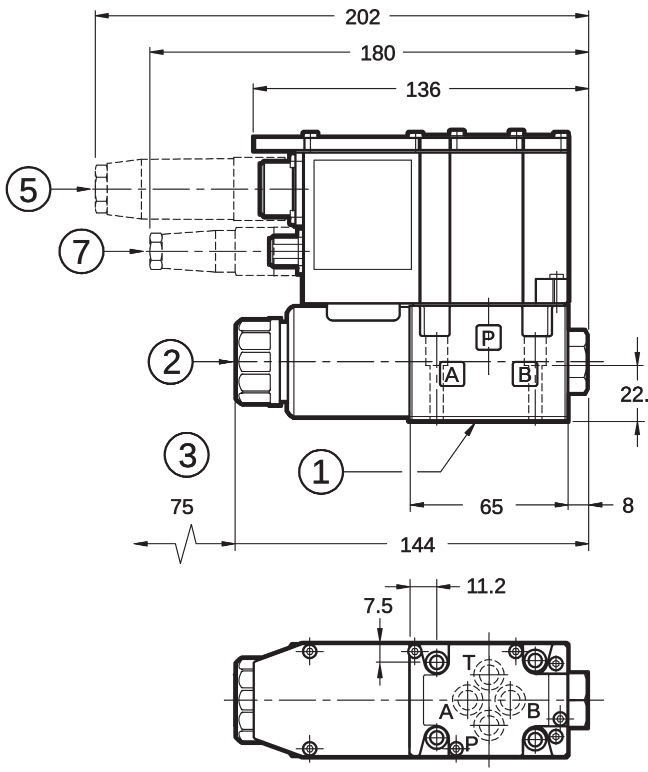
8 - OVERALL AND MOUNTING DIMENSIONS

ZDE3G-D





ZDE3G-SB



dimensions in mm

1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) - 90 Shore
2	Locking ring with integrated manual override
3	Coil removal space
4	Main connection
5	Electrical connector 7 pin DIN 43563 - IP67 PG11 EX7S/L/10 code 3890000003 (**to be ordered separately**)
6	CAN-Bus connection (**only for version C**)
7	Electrical connector 5 pin M12 - IP67 PG7 EC5S/M12L/10 code 3491001001 only for version C (**to be ordered separately**)

Fastening bolts: n° 4 bolts A8.8 M5x30

Torque: 5 Nm

9 - MANUAL OVERRIDE

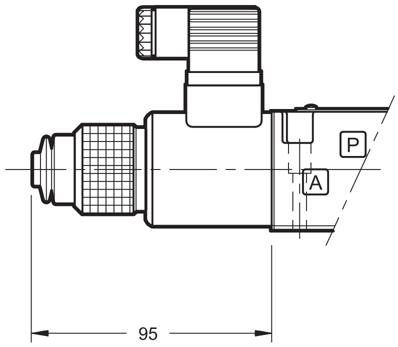
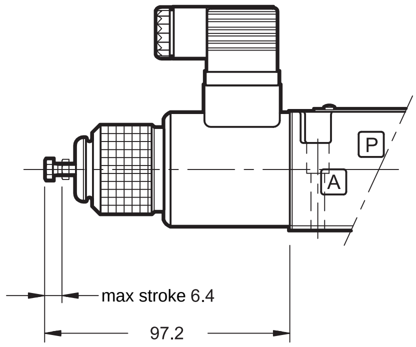
The standard valve has solenoids whose pin for the manual operation is integrated in the tube. The operation of this control must be executed with a suitable tool, minding not to damage the sliding surface.

Two different manual override version are available upon request:

- **CM** version, manual override belt protected

- **CS** version, 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	CS Version
	
Code: 3803210003	Code: 3803210004

10 - SUBPLATES (See catalogue 51 000)

Type PMMD-AI3G with rear ports
Type PMMD-AL3G with side ports
P, T, A, B port threading: 3/8Ž BSP

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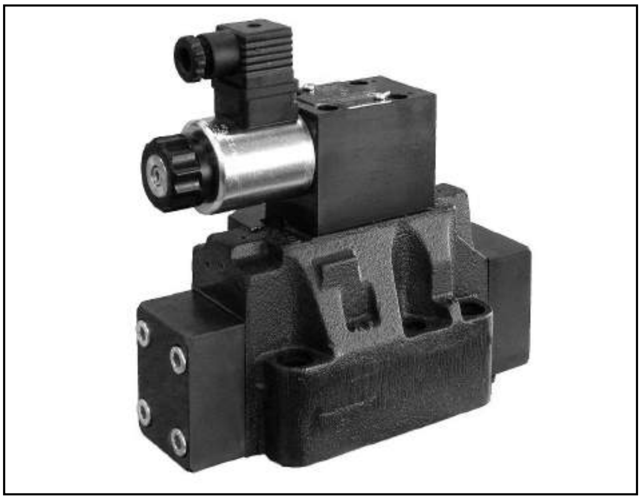
DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com



DZCE*

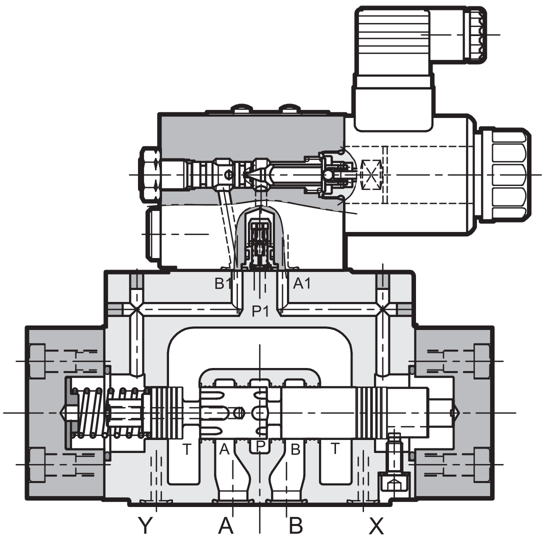
#% &&(% % (!))
*** ' #%"#"%' "! "!'%"**

& % &

- '"# #
- % &" (CETOP R05)
- &" (CETOP 07)
- &" (CETOP 08)

9 max bar
$ max (see table of performances)

"# % ' ! #% ! #



— 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.

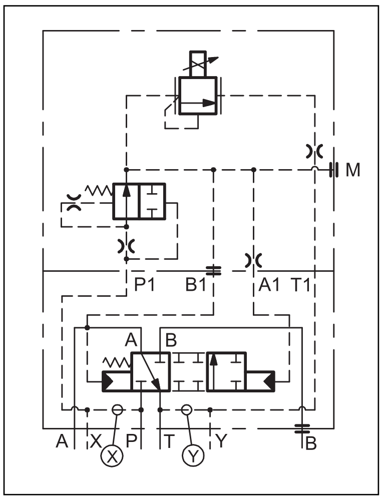
— They can be controlled directly by a current control supply unit or by means of the electronic control units (par. 12) to exploit valve performance to the full .

— 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.

# % "% ! & (obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control cards)		**- - %**	**-**	**-**
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

, % (@&, "



! ' ' " ! "

	-													

Pressure reducing valve

Electric proportional control

$ominal size:
CETOP P05 (! " ')
% ISO 4401-05 (CETOP R05)
ISO 4401-07 (CETOP 07)
ISO 4401-08 (CETOP 08)

Pressure control range
1 ÷ 70 bar
1 ÷ 140 bar
1 ÷ 210 bar
1 ÷ 300 bar

Series $. (the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
! $ R seals for mineral oil (; < 70. :0)
) FPM seals for special fluids

Piloting: internal
external

Drainage: internal
external

Supply voltage:
voltage 12+ DC
voltage 24+ DC

Coil electrical connection:
for connector type
DI$ 43650 (; < 70. :0)

! " ' : This version is interchangeable with the model ZCE4 Duplomatic.

% ' %&' (%) & (obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control cards)

3. :. / <1:4; <4 / =:>1; - . 70 - %

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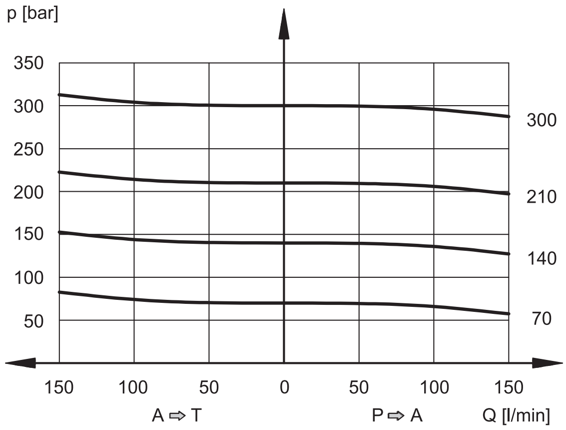

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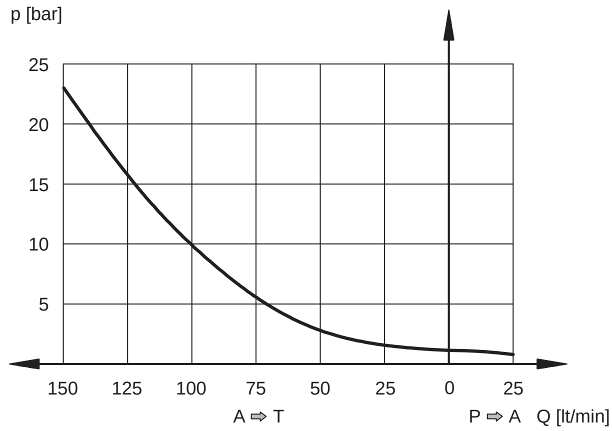

3. :. / <1:4; <4 / =:>1; -

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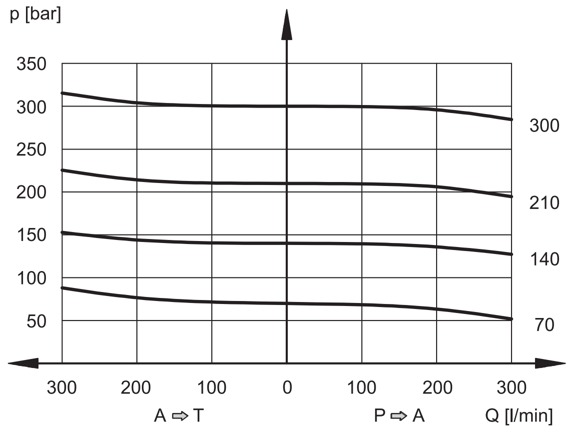
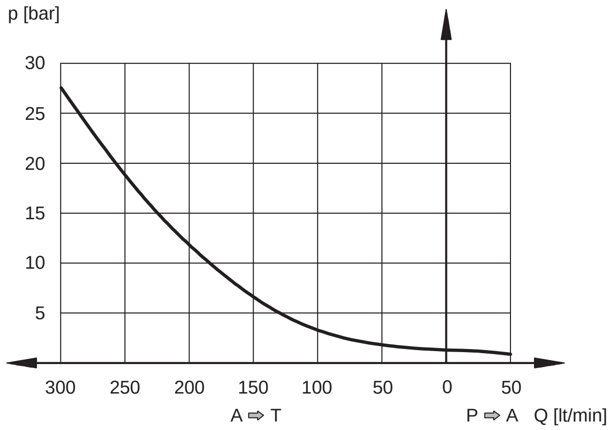


! " ! ' %" #% &&(% 9 6 4 7 2 $



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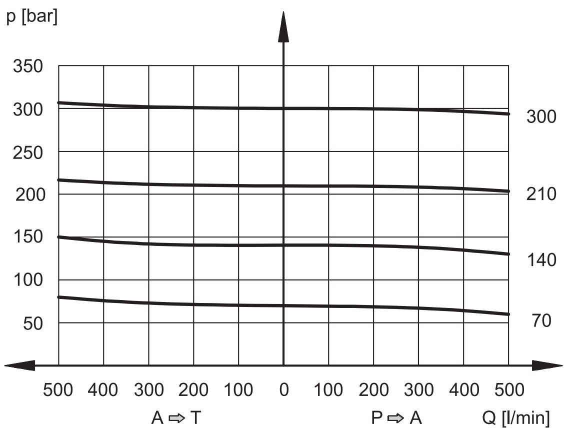

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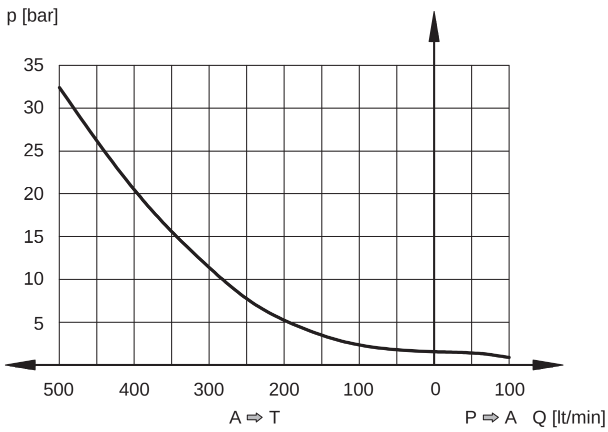

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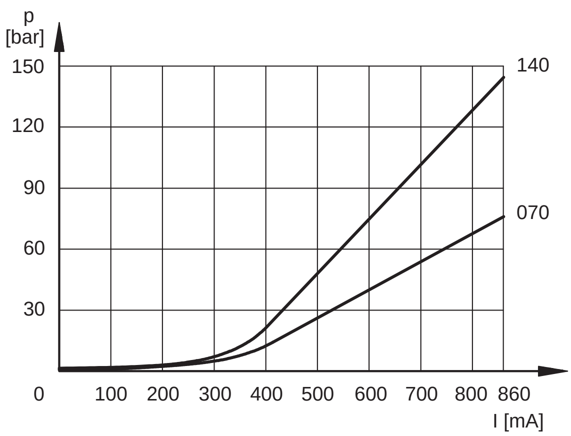
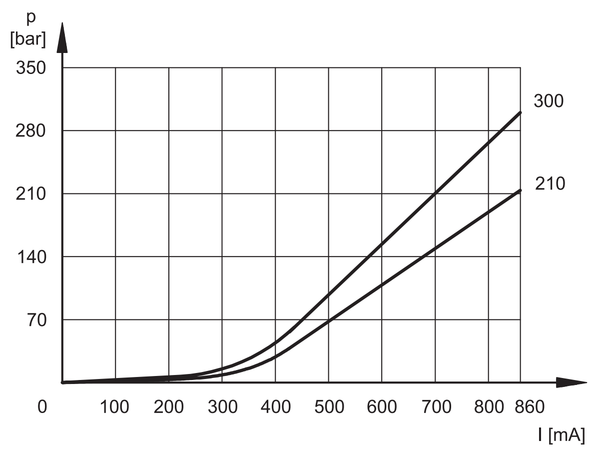




, % ((&

* se mineral oil-based hydraulic fluids H" or HM type, according to ISO 6743-4. For these fluids, use $ R seals (code $). For fluids HFDR type (phosphate esters) use FPM seals (code +). For the use of other kinds of fluid such as HFA, HF , HFC, please consult our technical department. * sing 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.

" ' ! @! @% !

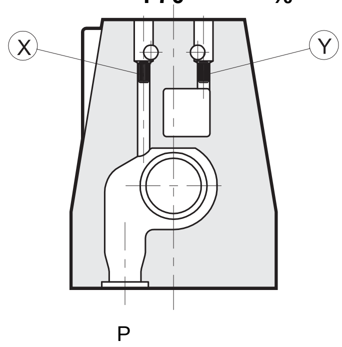
The DZCE* valves are available with piloting and drainage, both internal and external.
We suggest to use the version with external drainage that allows a higher backpressure on the unloading.

+A" +EVT. PE	Plug assembly	
	+	,
ITERA" PI"OT A$D E- TER$A" DRAI$	$O	. ES
ITERA" PI"OT A$D I$TER$A" DRAI$	$O	$O
E- TER$A" PI"OT A$D E- TER$A" DRAI$	. ES	. ES
E- TER$A" PI"OT A$D ITERA" DRAI$	. ES	$O

#% &&(% & (bar)

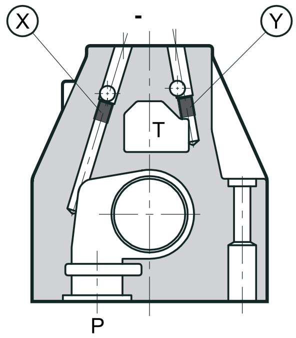
Pressure	MI$	MA-
Piloting pressure on - port	30	350
Pressure on T port with interal drain	O	2
Pressure on T port with external drain	O	250

- . 70 - %



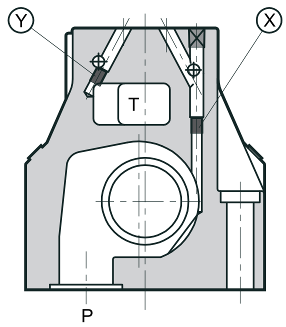
+: M5x6 plug for external pilot
, : M5x6 plug for external drain

-



+ M6x8 plug for external pilot
, M6x8 plug for external drain

-



+: M6x8 plug for external pilot
, : M6x8 plug for external drain

' % @ % ' %&' &

#:898:<87. 5; 851784 0

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.

! " !) " '	+ DC		
% &&' ! . < ?	N	3.66	17.6
! " ! (%% ! '	A	1.88	0.86
(' , ,	100%		
' %" ! ' " # ' ' ,	According to 2004/108/CE		
&&@ @%" ' ' " ! atmospheric agents (CEI E$ 60529) coil insulation (+DE 0580) Impregnation	IP 65 class H class F		

&' # % &#" ! & (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.

% %! & ! &' #	0 U 100%	100U 0%
response times 0ms1		
- . 70 - %	100	70
-	100	50
-	100	50

! &' ' " !

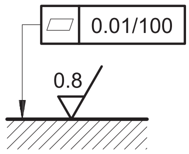
We recommend to install the DZCE* valve either in horizontal position, or vertical position with the solenoid downward. If the valve is installed in vertical position and with the solenoid upward, you must consider possible variations of the minimum controlled pressure, if compared to what is indicated 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.

+alves are fixed by means of screws or tie rods on a flat surface with planarity and roughness eBual 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



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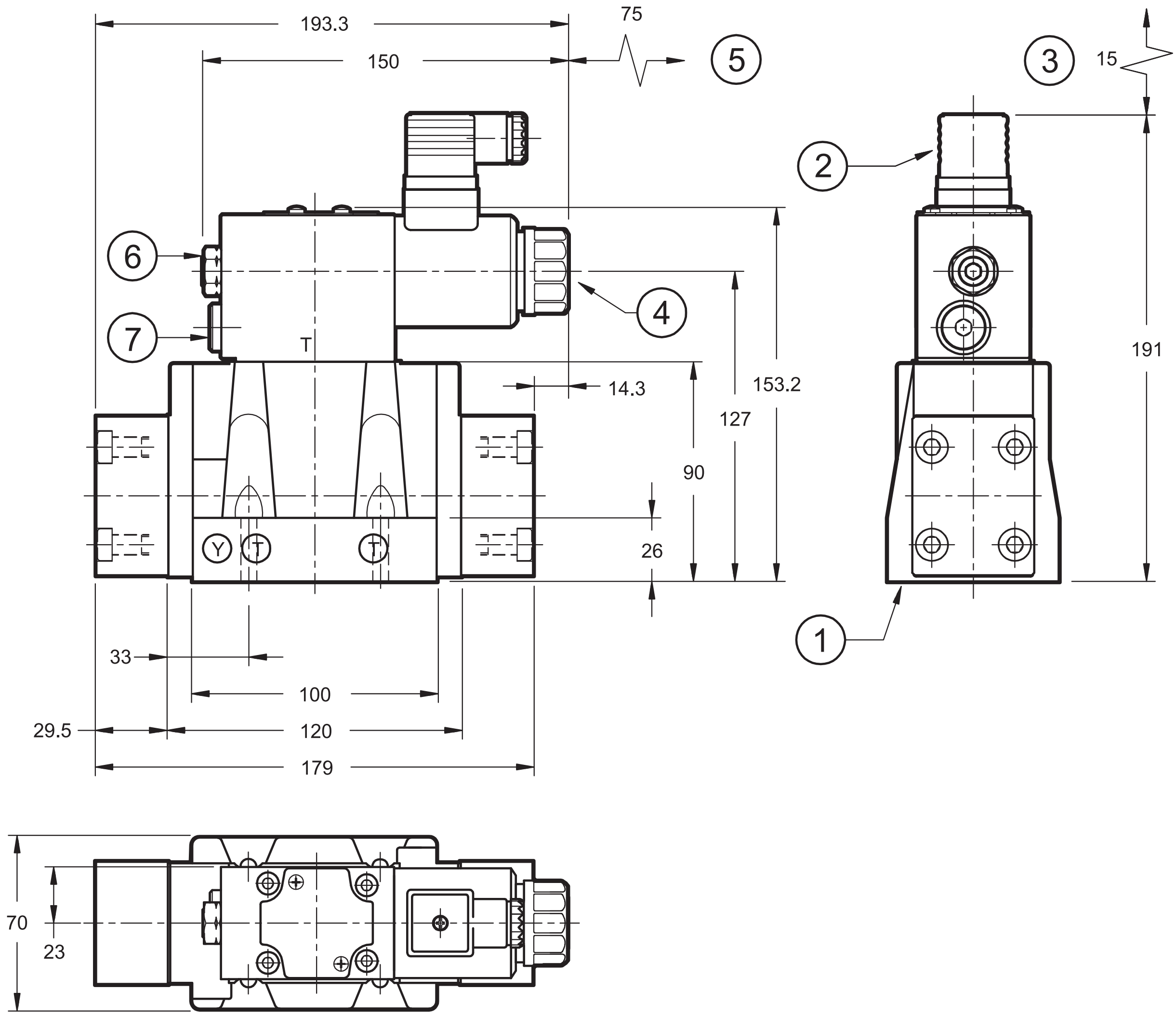
dimensions in mm



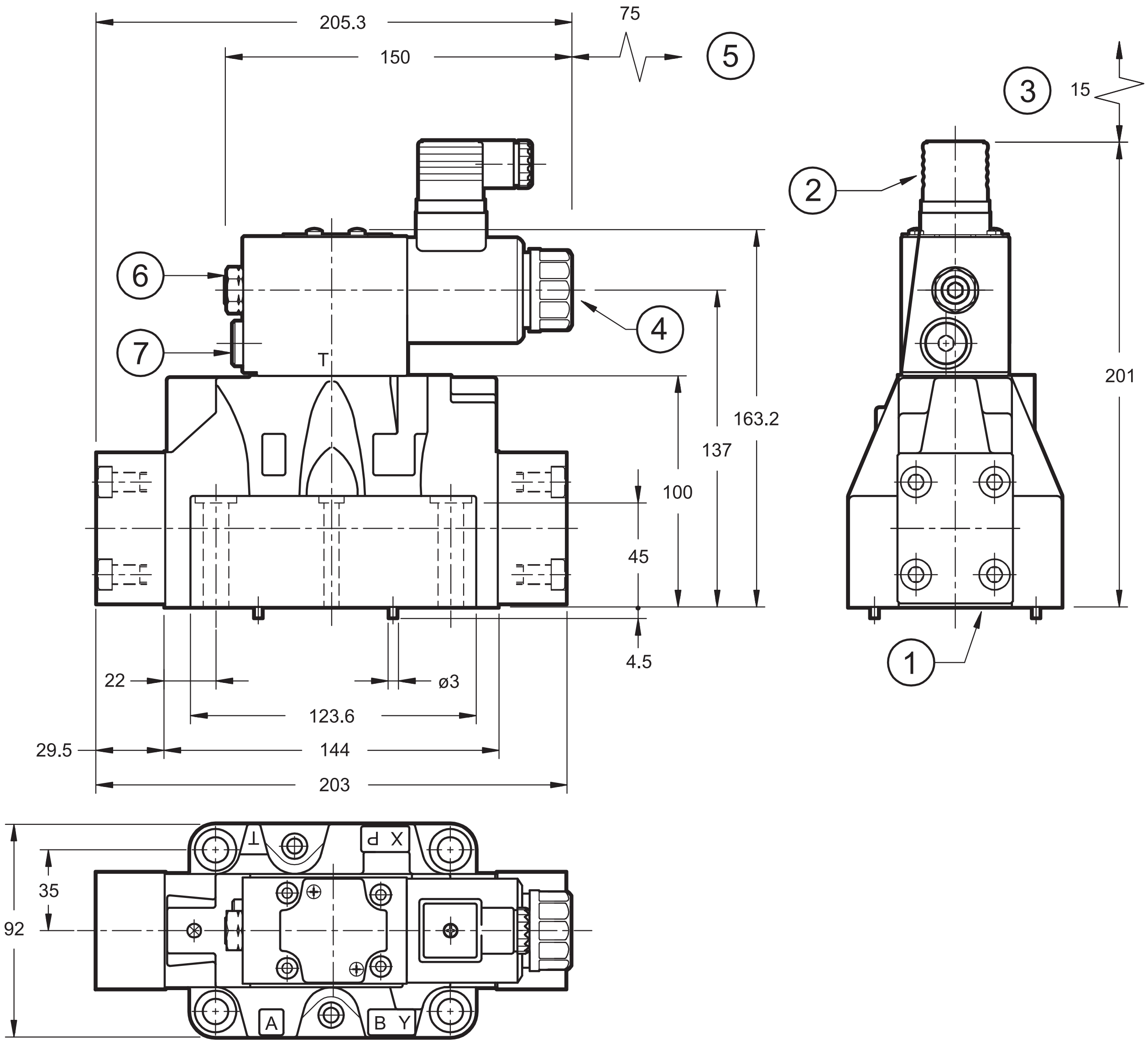
!"' at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (4) placed at the end of the solenoid tube.

+alve fastening: $. 4 bolts SHC M6x35 - ISO 4762
Tightening torBue: 8 $m (A 8.8 bolts)
Thread of mounting holes: M6x10
Sealing rings: $. 5 OR type 2050 (12.42x1.78) - 90 Shore $. 2 OR type 2037 (9.25x1.78) - 90 Shore

1	Mounting surface with sealing rings
2	DI$ 43650 electrical connector (included in the supply)
3	Connector removal space
4	reather (Allen key 4)
5	Coil removal space
6	Ad;ustment sealing made in factory. Do not unscrew the nut.
7	Pressure gauge port 1/4R SP

- ") % ! "(!'! !&"!&

dimensions in mm



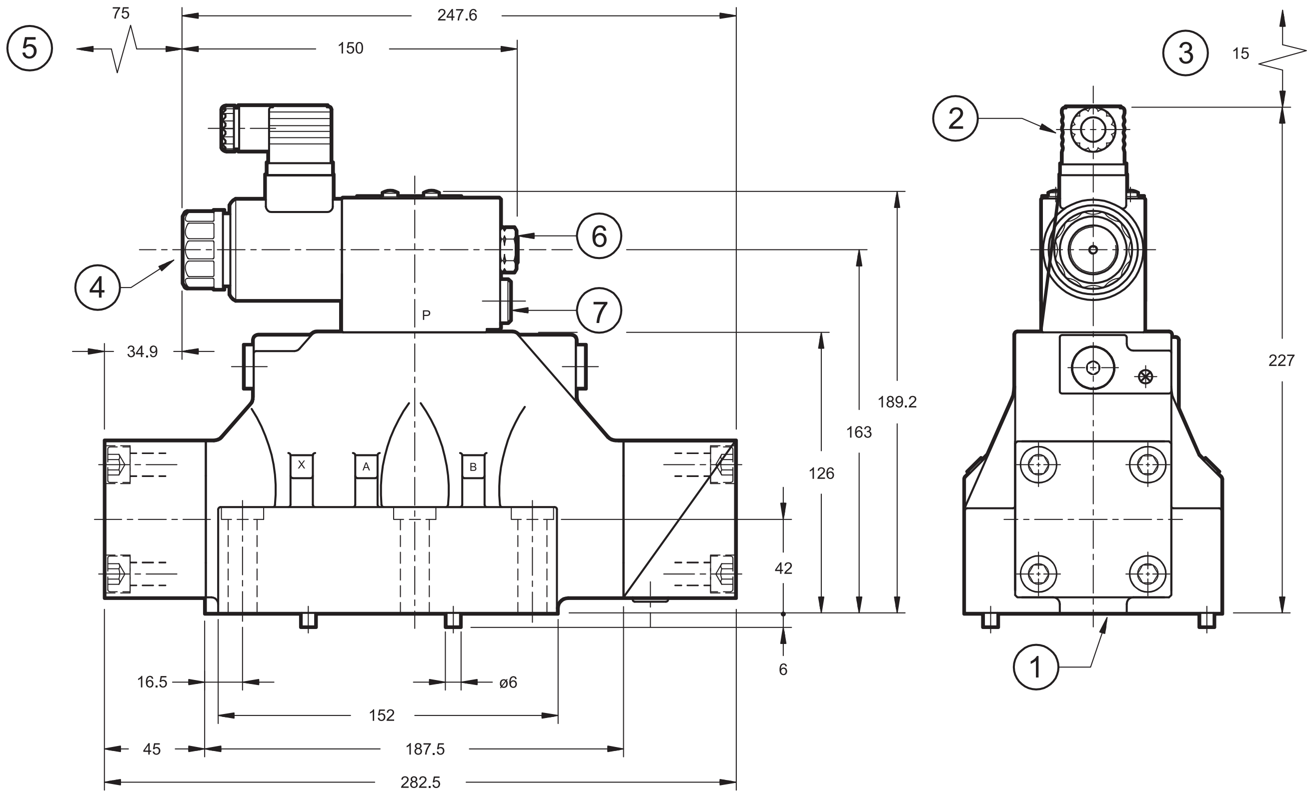
! " ' at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (4) placed at the end of the solenoid tube.

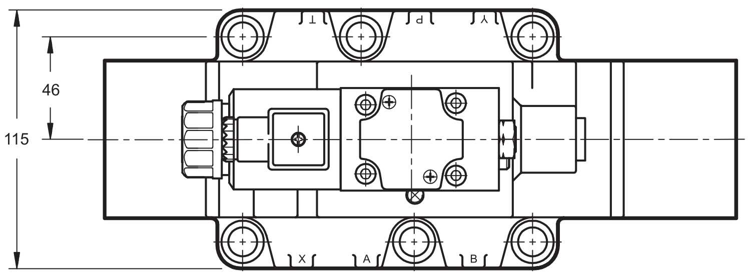
Single valve fastening:	$. 4 SHC M10x60 bolts - ISO 4762 $. 2 SHC M6x60 bolts - ISO 4762
Tightening torBue M10x60: 40 $m (A 8.8 bolts) M6x60: 8 $m (A 8.8 bolts)	
Thread of mounting holes: M6x18 M10x18	
Sealing rings:	$. 4 OR type 130 (22.22x2.62) - 90 Shore $. 2 OR type 2043 (10.82x1.78) - 90 Shore

1	Mounting surface with sealing rings
2	DI$ 43650 electrical connector (included in the supply)
3	Connector removal space
4	reather (Allen key 4)
5	Coil removal space
6	Ad;ustment sealing made in factory. Do not unscrew the nut.
7	Pressure gauge port 1/4R SP

- ") % ! " (! ' ! ! & " ! &

dimensions in mm



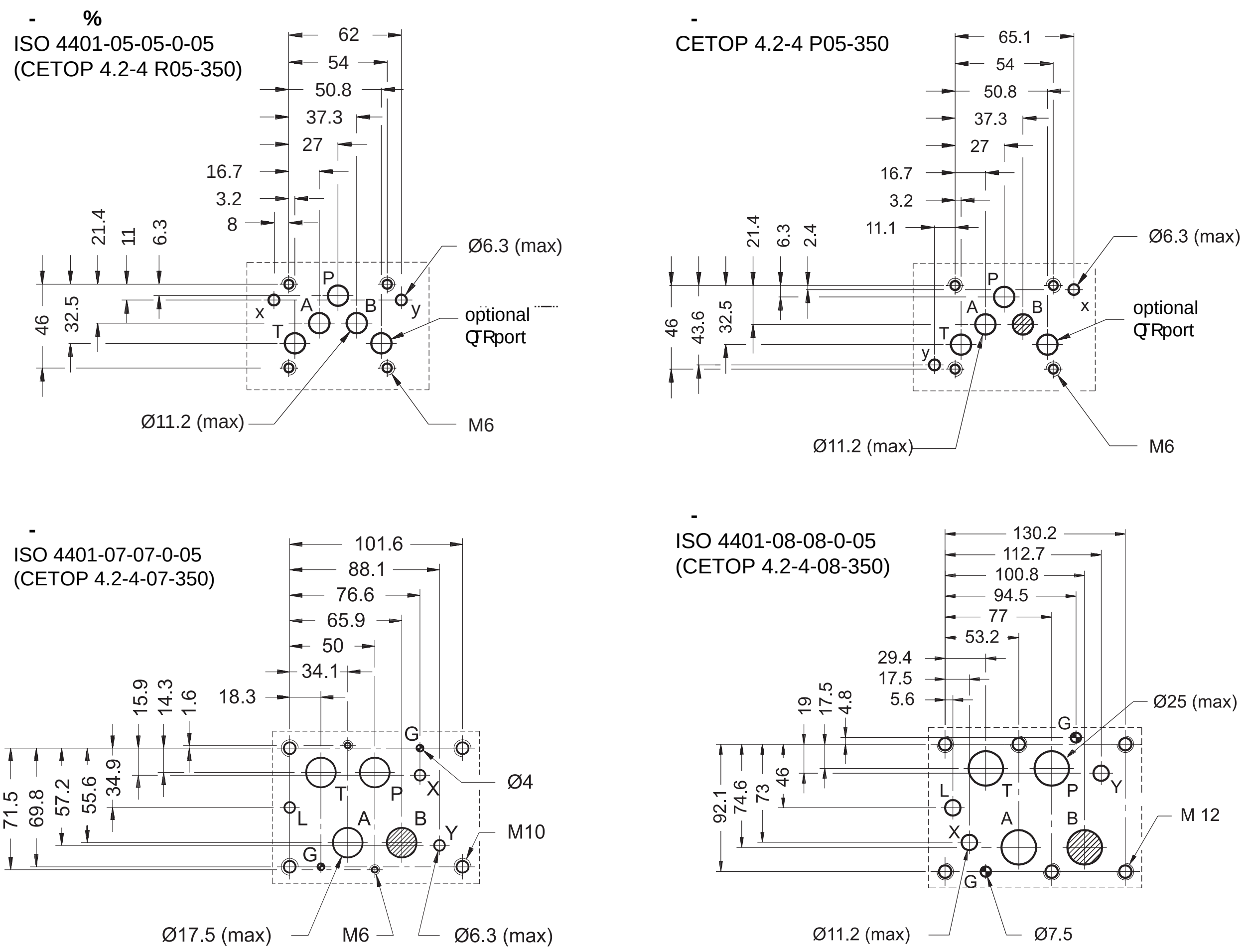


! " ' at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (4) placed at the end of the solenoid tube.

+alve fastening: $. 6 SHC M12x60 screws - ISO 4762
Tightening torBue: 69 $m (A 8.8 bolts)
Thread of mounting holes: M12x20
Sealing rings: $. 4 OR type 3118 (29.82x2.62) - 90 Shore $. 2 OR type 3081 (20.24x2.62) - 90 Shore

1	Mounting surface with sealing rings
2	DI$ 43650 electrical connector (included in the supply)
3	Connector removal space
4	reather (Allen key 4)
5	Coil removal space
6	Ad;ustment sealing made in factory. Do not unscrew the nut.
7	Pressure gauge port 1/4R SP

" (! ' !   &(%   &



' %" !   " ! ' %"   (! ' &

	for solenoid 24+ DC	plug version	see cat.89 120
	for solenoid 12+ DC		
	for solenoid 24+ DC	DI$ E$ 50022 rail mounting	see cat. 89 250
	for solenoid 12+ DC		
(	for solenoid 24+ DC	Eurocard type	see cat. 89 300

&(#   ' & (see catalogue 51 000)

	-	-	-
Model with rear ports	PME4-AI5	PME07-AI6	-
Model with side ports	PME4-A" 5	PME07-A" 6	PME5-A" 8
Thread of ports: P - T - A - - - .	3/4R SP 1/4R SP	1T R SP 1/4R SP	1R SP 1/4R SP

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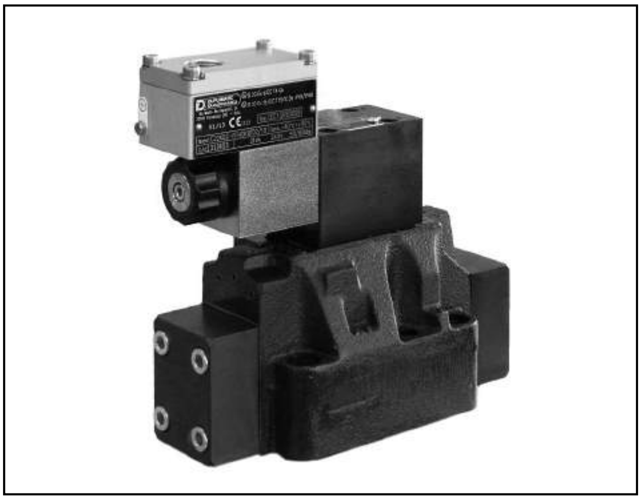
DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

DUPLOMATIC OLEODINAMICA



DZCE*KD2

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<@6A? B>4@68 H<E; + /
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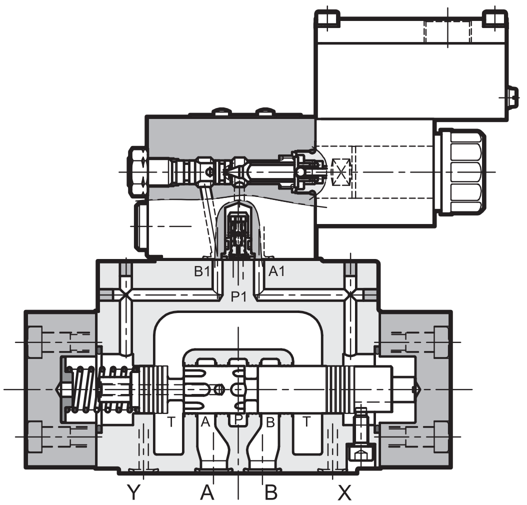


*/ ' . $!% *!&% (*! ! * %A * . (,

U *: 7 0 " 3D7 7JB>AE;A@BDA8BD7EEGD7 D76G5;@9 H3>H7E B;>AF AB7D3F76 I ;F: BDABADF;A@3> 5A@FDA>;@5A? B>;3@57 I ;F: * . EF3@63D6E *: 7K 3D7 EG;F34>7 8AD GE7 ;@ BAF7@F;3>>K 7JB>AE;H7 3F? AEB: 7D7E F: 3F 83>> I ;F: ;@ F: 7 * . !! 7;F: 7D8AD93E AD8AD6GEF5>3EE;853F;A@) 77 3F B3D 8AD * . 5>3EE;853F;A@ AB7D3F;@9 F7? B7D3FGD7E 3@6 7>75FD;53>5: 3D35F7D;EF;5E

U *: 7 BD7EEGD7 53@47 ? A6G>3F76 5A@F;@GAGE>K ;@BDABADF;A@FA F: 7 5GDD7@F EGBB>;76 FA F: 7 EA>7@A;6

U *: 7K 53@47 5A@FDA>>76 6;D75F>K 4K 3 5GDD7@F 5A@FDA> EGBB>K GF AD4K ? 73@E A83@7>75FDA@5 53D6 FA 7JB>A;F H3>H7 B7D8AD? 3@57 FA F: 7 8G>> E77 B3D

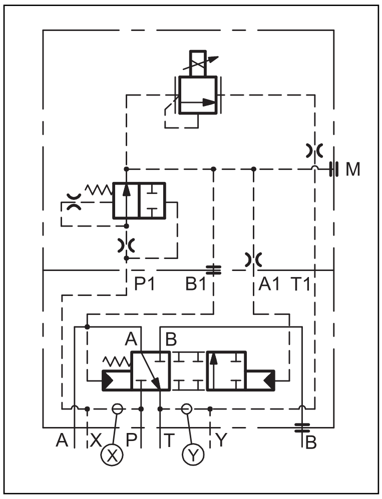
U *: 7K 3D7 3H3;>34>7 I ;F: * &' ' !) & * &' (!) & * &' 3@6 !) & * &' ? AG@F;@9 EGD8357E

U *: 7 EF3F7? 7@F A85A@8AD? ;FK FA F: 7 GB ? 7@F;A@76 EF3@63D6E ;E 3> 3KE EGBB>;76 I ;F: F: 7 H3>H7

U + BA@D7CG7EF 0 " H3>H7E 53@47 EGBB>;76 I ;F: 3 8@E ;@9 EGD8357 FD73F? 7@F L;@5 @5=7> EG;F34>7 FA 7@EGD7 3 E3>F EBD3K D7E;EF3@57 GB FA : F7EF AB7D3F76 355AD6;@9 FA +%(%!) & EF3@63D6E 3@6 F7EF 7H3>G3F;A@AB7D3F76 355AD6;@9 FA +%(%!) & EF3@63D6E

') &) $ % * A4F3;@76 I ;F: ? ;@7D3>A;> ;F: H;E5AE;FK A8 5) F3F M 3@6 7>75FDA@5 5A@FDA>53D6E		1 " 1) "	1 "	1 "
$ 3J;? G? AB7D3F;@9 BD7EEGD7	43D			
$ 3J;? G? 8AI	>? ;@			
) F7B D7EBA@E7		E77 B3D39D3B:		
KEF7D7E;E I ;F: ' - $ L	A8B ? 3J			
(7B73F34;>;FK	A8B ? 3J	R		
>75FD;53>5: 3D35F7D;EF;5		E77 B3D39D3B:		
? 4;7@F F7? B7D3FGD7 D3@97	M	% (3@6 ' $ %#		
>G;6 F7? B7D3FGD7 D3@97	M	% (3@6 ' $ %#		
>G;6 H;E5AE;FK D3@97	5) F	Z		
>G;6 5A@F3? ;@3F;A@679D77	55AD6;@9 FA !) & 5>3EE			
(75A? ? 7@676 H;E5AE;FK	5) F			
$ 3EE	=9			

0) , # 0$ &#



DZCE*KD2

*) *

%+ + &% &

	1				"										"			

' D7EEGD7 D76G5;@9 H3>H7

>75FD;5
BDABADF;A@3>5A@FDA>

%A? ;@3>E;L7
* &' '
) !) & * &' (
!) &^ * &'
!) & * &'

JB3AE;A@BDA8H7DE;A@
355AD6;@9 FA * . !! 8AD93E AD
8AD6GEF BDAF75F;A@FKB7 A8F: 7 5A;> \6W

' D7EEGD7 5A@FDA>D3@97
Z 43D
Z 43D
Z 43D
Z 43D

) 7D7E % F: 7 AH7D3>>3@6 ? AG@F;@9
6;? 7@E;A@E D7? 3;@G@5: 3@976 8DA? FA

) 73>E
ADF7? B7D3FGD7 D3@97 M
% % (E73>E 8AD? ;@7D3>A;> DE4@74C7
- ' $ E73>E 8ADEB75;3>8G;6E
ADF7? B7D3FGD7 D3@97 M
%# E73>8AD>AI F7? B7D3FGD7E 8AD? ;@7D3>A;>

%& + F: 7 H3>H7 ;E EGBB>;76 I ;F: EF3@63D6 EGD8357 FD73F? 7@F A8
B: AEB: 3F;@9 4>35= + BA@D7CG7EFI 7 53@EGBB>K F: 7E7 H3>H7E I ;F: L;@5
@5=7>EGD8357 FD73F? 7@F

ADF: ;E ABF;A@366 F: 7 EG8;J . 3FF: 7 7@6 A8F: 7 ;67@F;853F;A@5A67

& BF;A@ EGD8357
FD73F? 7@F;@AF
EF3@63D6
& ? ;F;8@AF
D7CG;D76
E77 %& +

& BF;A@ +
H7DE;A@;@*
F7? B7D3FGD7 5>3EE
) 77 3FB3D
& ? ;F;8@AFD7CG;D76

A@@75F;A@FKB7 8AD534>7 9>3@6
8ADGBB7D5A@@75F;A@
+ $ J !) &
+ = + %! %
+ W%' * %) !
7J %) !
8ADE;67 5A@@75F;A@
* $ J !) &
A@K 8AD 5A;>E
* $ J !) &
3H3;>34>7 GBA@D7CG7EFA@K

A;>7>75FD;53>5A@@75F;A@
7>75FD;53>5A@@75F;A@4K
F7D? ;@3>4>A5=

%A? ;@3>EA>7@A;6 HA>F397
,
,

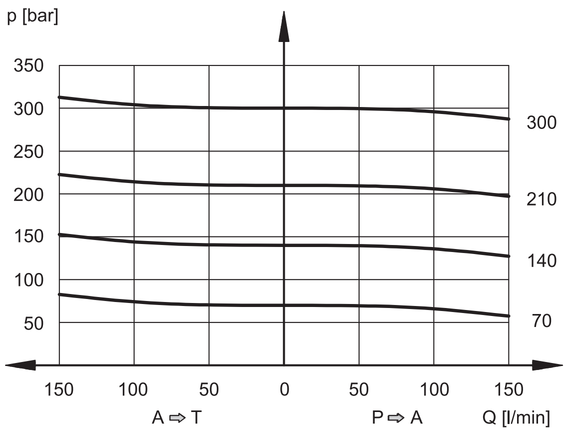
D3;@397 ;@F7D@3>
7JF7D@3>

' ;>AF;@9 ;@F7D@3>
7JF7D@3>

) +) * + ,) - *
A4F3;@76 I ;F: ? ;@7D3>A;> I ;F: H;E5AE;FK A8 5) F3F M 3@6 7>75FDA@5 5A@FDA>53D6E

; 4C46EBG>DE6 6FCG8D 1 " 4@7 1) "

! , * +$ %+



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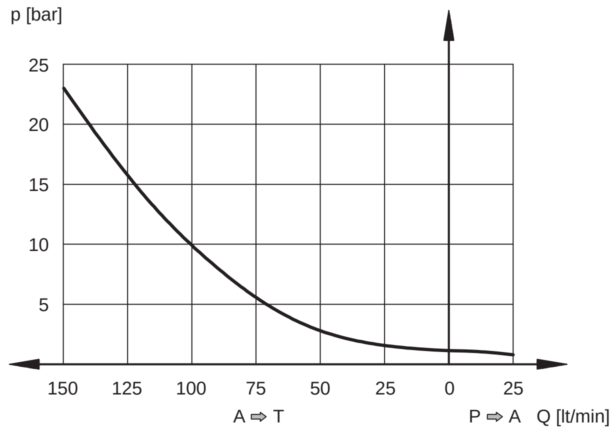
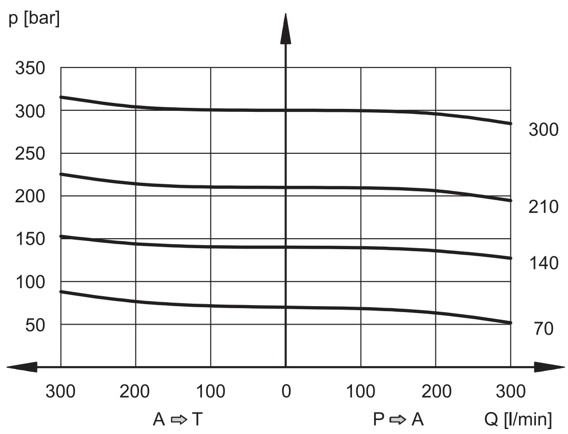
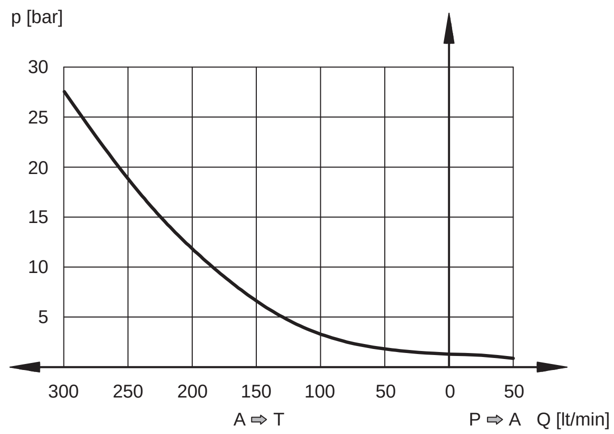


; 4C46EBGDE6 6FCG8D 1 "

! , * +$ %+

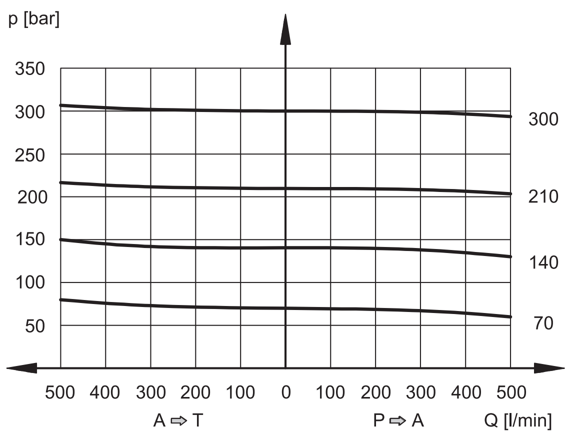


$ % &%+) &## ') * * ,) B ? <@ 9(

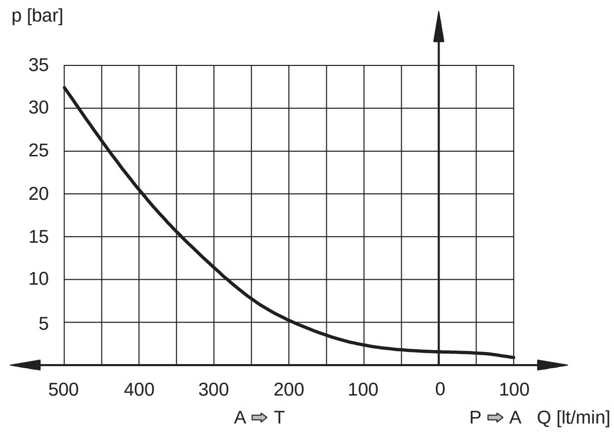


; 4C46EBGDE6 6FCG8D 1 "

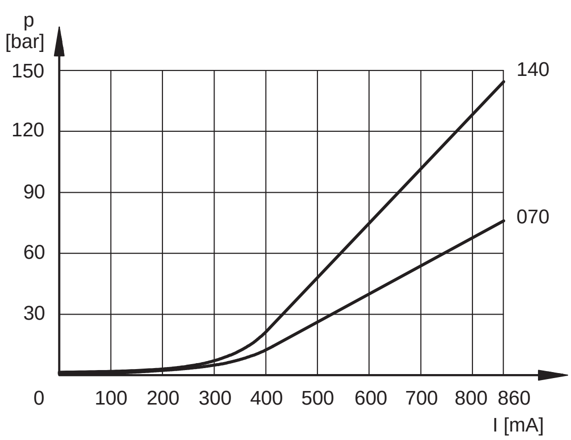
! , * +$ %+

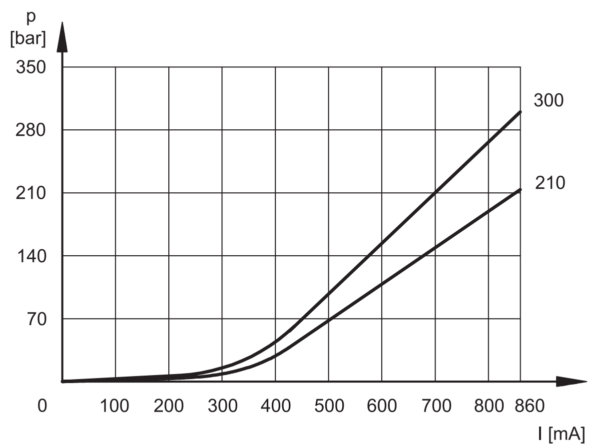


$ % &%+) &## ') * * ,) B ? <@ 9(



' G8DDFG8 6A@EA>B 9 1 " 1) " 1 " 4@7 1 "





' #&+ % O% O) %

* : 7 0 " H3>H7E 3D7 3H3;>34>7 I ;F: B;>AF;@9 3@6 6D3;@397 4AF: ;@F7D@3> 3@6 7JF7D@3>
- 7 EG997EFFA GE7 F: 7 H7DE;A@ I ;F: 7JF7D@3> 6D3;@397 F: 3F3>AI E 3 : ;9: 7D435=BD7EEGD7 A@F: 7 G@A36;@9

*/ ' & , #,	' >@9 3EE7? 4>K	
	.	/
!%* (% # ' !#&* % . * (% # (!%	%&	/)
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') **,) * 254C3	$!%	$.
' ;>AF;@9 BD7EEGD7 A@. BAD F		
' D7EEGD7 ;@* BADF I ;F: ;@F7D@3> 6D3;@		
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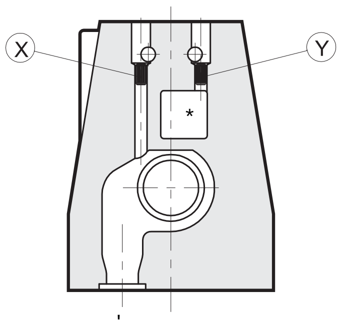
1 " 4@7 1) "



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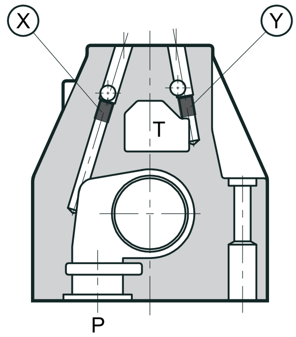
7JF7D@3> B;>AF
0 $ J B>G9 8AD
7JF7D@3> 6D3;@

1 "



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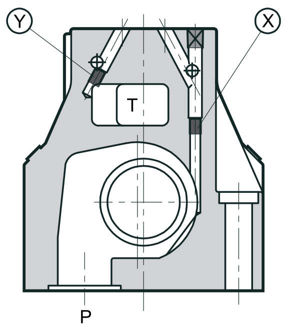

/ $ J B>G9 8AD
7JF7D@3> B;>AF
0 $ J B>G9 8AD
7JF7D@3> 6D3;@

DZCE*KD2

*) *

*+ ') *' &%*

? 73EGD76 I ;F: ? ;@7D3>A;>I ;F: H;E5AE;FK A8 5) F3F M I ;F: F: 7 D7>3F;H7 7>75FDA@5 5A@FDA>G@FE

) F7B D7EBA@E7 ;E F: 7 F;? 7 F3=7@8ADF: 7 H3>H7 FA D735: A8 F: 7 E7FBD7EEGD7 H3>G7 8A>>AI ;@9 3 EF7B 5: 3@97 A8 D78D7@57 E;9@3>

)) % * % # *+ '	]	]
(7EBA@E7 F;? 7E 1? E2		
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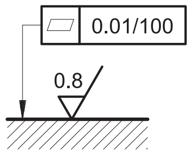
- 7 D75A? ? 7@6 FA ;@EF3>> F: 7 0 " H3>H7 7;F: 7D ;@: AD;LA@F3> BAE;F;A@ ADH7DF;53> BAE;F;A@I ;F: F: 7 EA>7@A;6 6AI @ 3D6 !8 F: 7 H3>H7 ;E ;@EF3>>76 ;@H7DF;53> BAE;F;A@3@6 I ;F: F: 7 EA>7@A;6 GBI 3D6 KAG ? GEF 5A@E;67D BAEE;4>7 H3D;3F;A@E A8 F: 7 ? ;@;? G? 5A@FDA>>76 BD7EEGD7 ;@85A? B3D76 FA I : 3F ;E ;@6;53F76 ;@B3D39D3B:

@EGD7 F: 3F F: 7D7 ;E @A 3;D ;@F: 7 : K6D3G>;5 5;D5G;F !@B3DF;5G>3D E 3BB>;53F;A@E ;F 53@47 @7577EE3DK FA H7@F F: 7 3;D 7@FD3BB76 ;@F: 7 EA>7@A;6 FG47 GE;@9 F: 7 EB75;3>6D3;@E5D7I 3@6 F: 7@7@EGD7 FA E5D7I 76 ;F 5ADD75F>K

A@@75F F: 7 H3>H7 * BADF6;D75F>K FA F: 7 F3@= 66 3@K 435=BD7EEGD7 H3>G7 67F75F76 ;@F: 7 * >;@7 FA F: 7 5A@FDA>>76 BD7EEGD7 H3>G7 $ 3J;? G? 36? ;EE;4>7 435=BD7EEGD7 ;@F: 7 * >;@7 G@67DAB7D3F;A@3> 5A@6;F;A@E ;E 43D

, 3>H7E 3D7 8;J76 4K ? 73@E A8 E5D7I E ADF;7 DA6E A@3 83F EGD853 57 I ;F: B>3@3D;FK 3@6 DAG9: @7EE 7CG3>FA AD 47FF7D F: 3@F: AE7 ;@6;53F76 ;@F: 7 D7>3F;H7 EK? 4A>E !8 ? ;@? G? H3>G7E 3D7 @AF A4E7DH76 8G;6 53@73E;>K >73= 47FI 77@F: 7 H3>H7 3@6 EG4BB>ADF EGD853 57

) GD857 8@E ;@9



0) , # #, *

+ E7 ? ;@7D3>A;>43E76 : K6D3G>;5 8G;6E # AD $ FKB7 355AD6;@9 FA !) & ADF: 7E7 8G;6E GE7 % (E73>E 5A67 % AD 8G;6E (FKB7 B: AEB: 3F7 7EF7DE GE7 ' $ E73>E 5A67 , ADF: 7 GE7 A8 AF: 7D =;@6E A8 8G;6 EG5: 3E B>73E7 5A@EG>F AGD F75: @;53> 67B3DF? 7@F + E;@9 8G;6E 3FF7? B7D3FGD7E : ;9: 7DF: 3@ M 53GE7E 3 83EF7D 67F7D;AD3F;A@A8 F: 7 8G;6 3@6 A8 F: 7 E73>E 5: 3D35F7D;EF;5E

* : 7 8G;6 ? GEF 47 BD7E7DH76 ;@;FE B: KE;53>3@6 5: 7? ;53>5: 3D35F7D;EF;5E

DZCE*KD2

*) *

+ / # ** + &% &') + % + $') +,) * % # +) #) +) *+ *

ADH3>H7E EG;F34>7 8AD3BB>;53F;A@3@6 ;@EF3>>8F;A@;@BAF7@F;3>*K 7JB>AE;H7 3F? AEB: 7D7E 355AD6;@9 FA * . 6;D75F;H7 BD7E5D;BF;A@E GB>A? 3F;5 57DF;853F7E F: 7 5A? 4;@3F;A@H3>H7 5A;> **E; 8 DFBB>J 4>H4JD <@6>F78DE; 8 786>4C4E4A@A96A@9AC? <EJ EA E; 8 7<C86EG8 4@7 E; 8 AB8C4E@ 4@7 ? 4<@EB@4@68 ? 4@F4> E; 4E6A@E4<@D 4>E; 8 <@9AC? 4E4A@@88787 9AC4 6AC38EFD8 A9E; 8 G4>G8 <@BAEE@E4>J 8I B>AD<G8 8@G<CA@? 8@ED**

A;>E 3EE7? 4>76 A@F: 7E7 H3>H7E : 3H7 477@E7B3D3F7>K 57DF;876 355AD6;@9 FA * . 6;D75F;H7 3@6 EA F: 7K 3D7 EG;F34>7 8ADGE7 ;@BAF7@F;3>K 7JB>AE;H7 3F? AEB: 7D7E

- 4>G8 + / 6>4DD<964E4A@

*: 7 H3>H7E 53@47 GE76 8AD3BB>;53F;A@E 3@6 ;@EF3>>8F;A@E ;@BAF7@F;3>K 7JB>AE;H7 3F? AEB: 7D7E F: 3F 8>I ;F: ;@7;F: 7DF: 7 * . !! ADF: 7 * . !! 5>8EE;853F;A@ I ;F: F: 7 8A>AI ? 3D<;@9

$ (" !% ^ &(^)) , ' &+( ) $!) *)

8AD% 3@6 , E73>E

+ 5 K +4 K

8AD %# E73>E

+ 5 K +4 K

.) B75;85 ? 3D<;@9 A87JB>AE;A@BDA F75F;A@3E * .
6;D75F;H7 3@6 D7>3F76 F75: @53>EB75;853F;A@D7CG7EFE

!! DAGB !! 8ADEGD8857 B>8@E

3F79ADK : ;9: BDAF75F;A@ 7>9;4>7 8ADLA@7
F: 7D78AD7 3>EA 7>9;4>7 8AD53F79ADK LA@7

* KB7 A83F? AEB: 7D7 I ;F: 93E7E H3BAGDE ? ;EFE

!! 3E 9DAGB
F: 7D78AD7 3>EA 7>9;4>7 8AD9DAGB !! 3@6 !!

* * 7? B7D3FGD7 5>8EE ? 3J EGD8857 F7? B7D3FGD7

4 ' # BDAF75F;A@ 7H7>8AD7>75FD;53>67H;57E

M * 3 M ? 4;7@FF7? B7D3FGD7 D3@97 8ADH3>H7E I ;F: 4AF: %
3@6 , E73>E

M * 3 M ? 4;7@FF7? B7D3FGD7 D3@97 8ADH3>H7E I ;F: %#
E73>E

$ (" !% ^ &(+) *)

8AD% 3@6 , E73>E

+ K 5 ' ' K +4 K

8AD%# E73>E

+ K 5 ' ' Q K +4 K

.) B75;85 ? 3D<;@9 A87JB>AE;A@BDA F75F;A@3E * .
6;D75F;H7 3@6 D7>3F76 F75: @53>EB75;853F;A@D7CG7EFE

!! DAGB !! 8ADEGD8857 B>8@E

3F79ADK : ;9: BDAF75F;A@ 7>9;4>7 8ADLA@7
F: 7D78AD7 3>EA 7>9;4>7 8AD53F79ADK LA@7

* KB7 A83F? AEB: 7D7 I ;F: 6GEFE

!!! GEFE 9DAGB
F: 7D78AD7 3>EA 7>9;4>7 8AD9DAGB !!! 3@6 !!!

* M * 7? B7D3FGD7 5>8EE ? 3J EGD8857 F7? B7D3FGD7

4 ' # BDAF75F;A@ 7H7>8AD7>75FD;53>67H;57E

!' !' ' DAF75F;A@679D77 8DA? 3F? AEB: 7D;5 397@FE 355AD6;@9 FA
! %

M * 3 M ? 4;7@FF7? B7D3FGD7 D3@97 8ADH3>H7E I ;F: 4AF: %
3@6 , E73>E

M * 3 M ? 4;7@FF7? B7D3FGD7 D3@97 8ADH3>H7E I ;F: %# E73>E

A<D + / 6>4DD<964E4A@

*: 7 5A;>A8F: 7 7JB>AE;A@BDAA8H3>H7E ;E ;67@F;876 I ;F: ;FE AI @F39 I : ;5: 53DD;7E F: 7 D7>3F;H7 * . ? 3D<;@9 **+; 8 ? 86; 4@6>4>6A@DE<F6E4A@A9 E; 8 6A<; AFD<@ <D ? 478 <@AC78CEA 8@DFC8 <ED C8D<DE4@68 EA BADD<5>8 <@E8C@4>8I B>AD<A@4@7 EA 4GA<7 4@J 8I B>AD<A@BCA84: 4E4A@EA E; 8 AFED<78 8@G<CA@? 8@E ? 4E6; <@ 4@M I 7NEJB8 BCAEB6E4A@ 8I B>AD<A@BCAA96A<**

$ AD7AH7D F: 7 EA>7@A;6 ;E 67E;9@76 FA ? 3;@F3;@;FE EGD8857 F7? B7D3FGD7 47>AI F: 7 >;? ;FE EB75;876 FA F: 7 D7>7H3@F5>8EE

7D7 47>AI KAG 8@6 F: 7 5A;>E ? 3D<;@9

$ (" !% ^ &(^)) , ' &+( ) $!) *)

I 7 + 5 P K +4 K

.) B75;85 ? 3D<;@9 A87JB>AE;A@BDA F75F;A@3E * .
6;D75F;H7 3@6 D7>3F76 F75: @53>EB75;853F;A@D7CG7EFE

!! DAGB !! 8ADEGD8857 B>8@E

3F79ADK : ;9: BDAF75F;A@ 7>9;4>7 8ADLA@7
F: 7D78AD7 3>EA 7>9;4>7 8AD53F79ADK LA@7

* KB7 A83F? AEB: 7D7 I ;F: 93E7E H3BAGDE ? ;EFE

J 6 \6\BDAF75F;A@FKB7 7JB>AE;A@BDAA853E7

!! 3E 9DAGB
F: 7D78AD7 3>EA 7>9;4>7 8AD9DAGB !! 3@6 !!

* * 7? B7D3FGD7 5>8EE ? 3J EGD8857 F7? B7D3FGD7

4 ' # BDAF75F;A@ 7H7>8AD7>75FD;53>67H;57E

M * 3 M ? 4;7@FF7? B7D3FGD7 D3@97

$ (" !% ^ &(+) *)

I E5 + K 5 ' ' P K +4 K

.) B75;85 ? 3D<;@9 A87JB>AE;A@BDA F75F;A@3E * .
6;D75F;H7 3@6 D7>3F76 F75: @53>EB75;853F;A@D7CG7EFE

!! DAGB !! 8ADEGD8857 B>8@E

3F79ADK : ;9: BDAF75F;A@ 7>9;4>7 8ADLA@7
F: 7D78AD7 3>EA 7>9;4>7 8AD53F79ADK LA@7

* KB7 A83F? AEB: 7D7 I ;F: 6GEFE

J F4 X4 YBDAF75F;A@FKB7

!!! GEFE 9DAGB
F: 7D78AD7 3>EA 7>9;4>7 8AD9DAGB !!! 3@6 !!!

* M * 7? B7D3FGD7 5>8EE ? 3J EGD8857 F7? B7D3FGD7

4 ' # BDAF75F;A@ 7H7>8AD7>75FD;53>67H;57E

!' !' ' DAF75F;A@679D77 8DA? 3F? AEB: 7D;5 397@FE 355AD6;@9 FA
! %

M * 3 M ? 4;7@FF7? B7D3FGD7 D3@97

&B8C4E<@ B? B8C4EFC8D

*: 7 AB7D3F;@9 3? 4;7@FF7? B7D3FGD7 ? GEF47 47FI 77@ M 8ADH3>H7E I ;F: 4AF: % 3@6 , E73>E 3@6 _ __ M 8ADH3>H7E I ;F: %# E73>E

*: 7 8G;6 F7? B7D3FGD7 ? GEF47 47FI 77@ _ M 8ADH3>H7E I ;F: 4AF: % 3@6 , E73>E 3@6 _ __ M 8ADH3>H7E I ;F: %# E73>E

: 7 H3>H7E 3D7 5>8EE;876 ;@ F7? B7D3FGD7 5>8EE * M F: 7D78AD7 F: 7K 3D7 7>9;4>7 8ADAB7D3F;A@3>EA 3F: ;9: 7D5>8EE F7? B7D3FGD7 * * * 8AD93E 3@6 * M 8AD6GEF

DZCE*KD2

*) *

+ &BE<A@ - 8OD<A@9AC+ EB? B8C4EFG8 6>4DD

* : 7 H3>H7E 5>8EE;876 8AD* F7? B7D3FGD7 5>8EE 3D7 EG;F34>7 8ADAB7D3F;A@;@BAF7@F;3>>K 7JB>AE;H7 3F? AEB: 7D7E I ;F: 3? 4;7@F F7? B7D3FGD7E 47FI 77@ M 8AD4AF: H3>H7E I ;F: %3@6 , E73>E 3@6 M 8ADH3>H7E I ;F: %# E73>E

* : 7 8G;6 F7? B7D3FGD7 ? GEF47 47FI 77@ M 8AD4AF: H3>H7E I ;F: %3@6 , E73>E 3@6 M 8ADH3>H7E I ;F: %# E73>E

* : 7 H3>H7E 3D7 5>8EE;876 ;@* F7? B7D3FGD7 5>8EE * M F: 7D78AD7 F: 7K 3D7 7>;9;4>7 8ADAB7D3F;A@3>EA 3F: ;9: 7D5>8EE F7? B7D3FGD7 * * * * 8AD93E 3@6 * M 8AD6GEFE

* : 7 ? 3D=;@9 8AD* 5>8EE F7? B7D3FGD7 H7DE;A@E 3D7

, #,) $ (" !% ^ &(^)) , ' &+( ) $!) *)

8AD%3@6 , E73>E

+ 5 K +4 K

8AD%# E73>E

+ 5 K +4 K

, #,) $ (" !% ^ &(+) *)

8AD%3@6 , E73>E

+ K 5 ' ' K +4 K

8AD%# E73>E

+ K 5 ' ' K +4 K

&!# $ (" !% ^ &(^)) , ' &+( ) $!) *)

I 7 + 5 K +4 K

&!# $ (" !% ^ &(+) *)

I E5 + K 5 ' ' K +4 K

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# * * & ') &+ + &% F? AEB: 7D;5 397@FE A;>;@EG>8F;A@ ,	!' !' 5>8EE

 # +) # &%% + &%

. <G@

!@AD67DFA D73>;E7 F: 7 7>75FD;53>5A@@75F;A@A8F: 7 5A;> ;F;E @757EE3DK FA 3557EE F: 7 F7D? ;@3>4>A5= G@E5D7I ;@9 F: 7 E5D7I E F: 3F83EF7@ F: 7 5AH7D I ;F: F: 7 4AJ F: 3F5A@F3;@E F: 7 F7D? ;@3>4>A5=

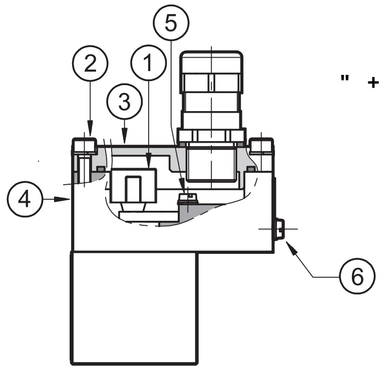
+; 8 8>86EG64>6A@@86EA@<D BA>4GEJ <@78B8@78@E

K 6A;@9 7>75FD;53>5A@@75F;A@;F;E ;? BADF3@FFA 5A@@75F3>EA F: 7 9DAG@6;@9 BA;@F ;@F: 7 F7D? ;@3>4>A5= 4AJ $ E5D7I E F: DAG9: EG;F34>7 5A@6G5FADE I ;F: F: 7 97@7D3>9DAG@6;@9 >;@7 A8F: 7 EKEF7?

& @F: 7 7JF7D@3>4A6K A8F: 7 5A;> F: 7D7 ;E 3 9DAG@6;@9 BA;@F $ E5D7I F: 3F3>>AI FA 7@EGD7 7CG;BAF7@F;3>;FK 47FI 77@F: 7 H3>H7 3@6 F: 7 97@7D3>9DAG@6;@9 >;@7 A8F: 7 EKEF7? 5A@@75F;@9 F: ;E BA;@FF: 7 D7E9G>8F;A@A8F: 7 % EF3@63D6 F: 3F;? BAE7 FA H7D;8K F: 7 7CG;BAF7@F;3>;FK A8F: 7 7>7? 7@FE ;@5>G676 ;@3 BAF7@F;3>>K 7JB>AE;H7 7@H;DA@? 7@F F: 7 ? 3J;? G? D7E;EF3@57 47FI 77@F: 7 7>7? 7@FE ? GEF47 T ;E 9G3D3@F776

FF: 7 7@6 A8F: 7 7>75FD;53>I ;D;@9 ;F;E @757EE3DK FA D73EE7? 4>7 F: 7 5AH7D A@F: 7 4AJ 5: 75=;@9 F: 7 5ADD75FBAE;F;A@@9 A8F: 7 E73>>A53F76 ;@F: 7 5AH7DE73F3@6 8EE7@;@9 F: 7 $ E5D7I E I ;F: 3 FADCG7 A8 Z %?

>75FD;53>I ;D;@9 ? GEF47 6A@7 8A>>AI ;@9 F: 7 ;@EFDG5F;A@E A8F: 7 DG>7E ;@5A? B>3@57 I ;F: * . ^EF3@63D6E



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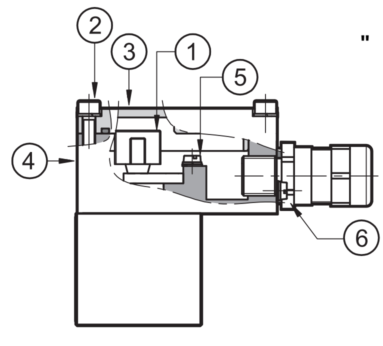

" * 6A@@86EA@

: 3D35F7DEEF;5E A8F: 7 534>7E 5A@@75F34>7 8ADI ;D;@9 3D7 ;@6;53F76 ;@F: 7 F34>7 47>AI

F@6EA@	45>8 D86EA@
& B7D3F;@9 HA>F397 534>7E 5A@@75F;A@	? 3J ? ? [
A@@75F;A@8AD;@F7D@3>9DAG@6;@9 BA;@F	? 3J ? ? [
A@@75F;A@8AD7JF7D@3>7CG;BAF7@F;3>9DAG@6;@9 BA;@F	? 3J ? ? [

34>7E 8ADI ;D;@9 ? GEF47 @A@3D? AGD76 534>7E I ;F: 7JF7D@3>5AH7D;@9 E: 73F: 3@6 ? GEF47 EG;F34>7 8ADGE7 ;@7@H;DA@? 7@FE I ;F: F7? B7D3FGD7E 8DA? M FA M 8ADH3>H7E 7;F: 7DI ;F: %A D, E73>E AD8DA? M FA M 8ADH3>H7E I ;F: %# E73>E

34>7 9>3@6E I : ;5: ? GEF47 AD67D76 E7B3D3F7>K E77 B3D39D3B: 3>AI FA GE7 534>7E I ;F: 7JF7D@3>6;3? 7F7D47FI 77@ 3@6 ? ?

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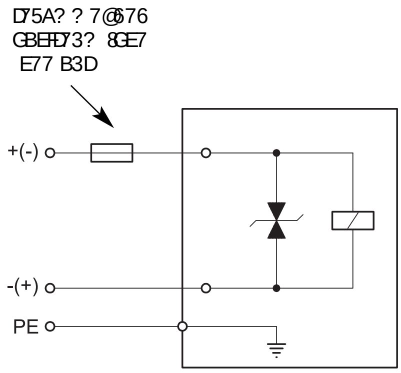

&G3G6FG3@E9FD8 4@7 DH<E6; A99GA>E4: 8 B84=

+ BEFD73? A8735: H3>H7 3@3BBDABD;3F7 8GE7 ? 3J J !@355AD6;@9 FA ! AD3 BDAF75F;H7 ? AFADEI ;F5: I ;F: E: ADF5;D5G;F3@6 F: 7D? 3> ;@EF3@F3@7AGE FD;BB;@9 3E E: ADF5;D5G;FBDAF75F;A@? GEF47 5A@@75F76 * : 7 5GFA88BAI 7DA8F: 7 8GE7 ? GEF5ADD7EBA@6 AD7J5776 F: 7 E: ADF5;D5G;F 5GDD7@FA8F: 7 EGBB>K EAGD57 * : 7 8GE7 ADF: 7 BDAF75F;H7 ? AFAD? GEF47 B>8576 AGFE;67 F: 7 63@97DAGE 3D73 ADF: 7K ? GEF47 BDAF75F76 I ;F: 3@ 7JB>AE;A@BDAA85AH7D;@9

!@AD67DFA E387G3D6 F: 7 7>75FDA@5 67H;57 FA I : ;5: F: 7 H3>H7 ;E 5A@@75F76 F: 7D7 ;E 3 BDAF75F;A@5;D5G;F;@F: 7 5A;> F: 3FD76G57E HA>F397 B73=E I : ;5: 53@A55GDI : 7@;@6G5F3@57E 3D7 EI ;F5: 76 A88

* : 7 F34>7 E: AI E F: 7 FKB7 A88GE7 D'5A? ? 7@676 355AD6;@9 FA F: 7 @A? ;@3>HA>F397 A8F: 7 H3>H7 3@6 FA F: 7 H3>G7 A8F: 7 HA>F397 B73=E D76G5F;A@

A;> FKB7	%A? ;@3> HA>F397 1, 2	(3F76 5GDD7@F 1 2	) 86A? ? 8@787 BG3 9FD8 6; 4C46BBGDE6D ? 87<F? E? 8 >4: 466AC7<@ EA % 2 3	$ 3J;? G? HA>F397 H3>G7 GBA@EI ;F5: A88 1, 2	) GBBD7EEAD5;D5G;F
					* D3@E;7@FHA>F397 EGBBD7EEAD 4;6;D75F;A@3>

DZCE*KD2

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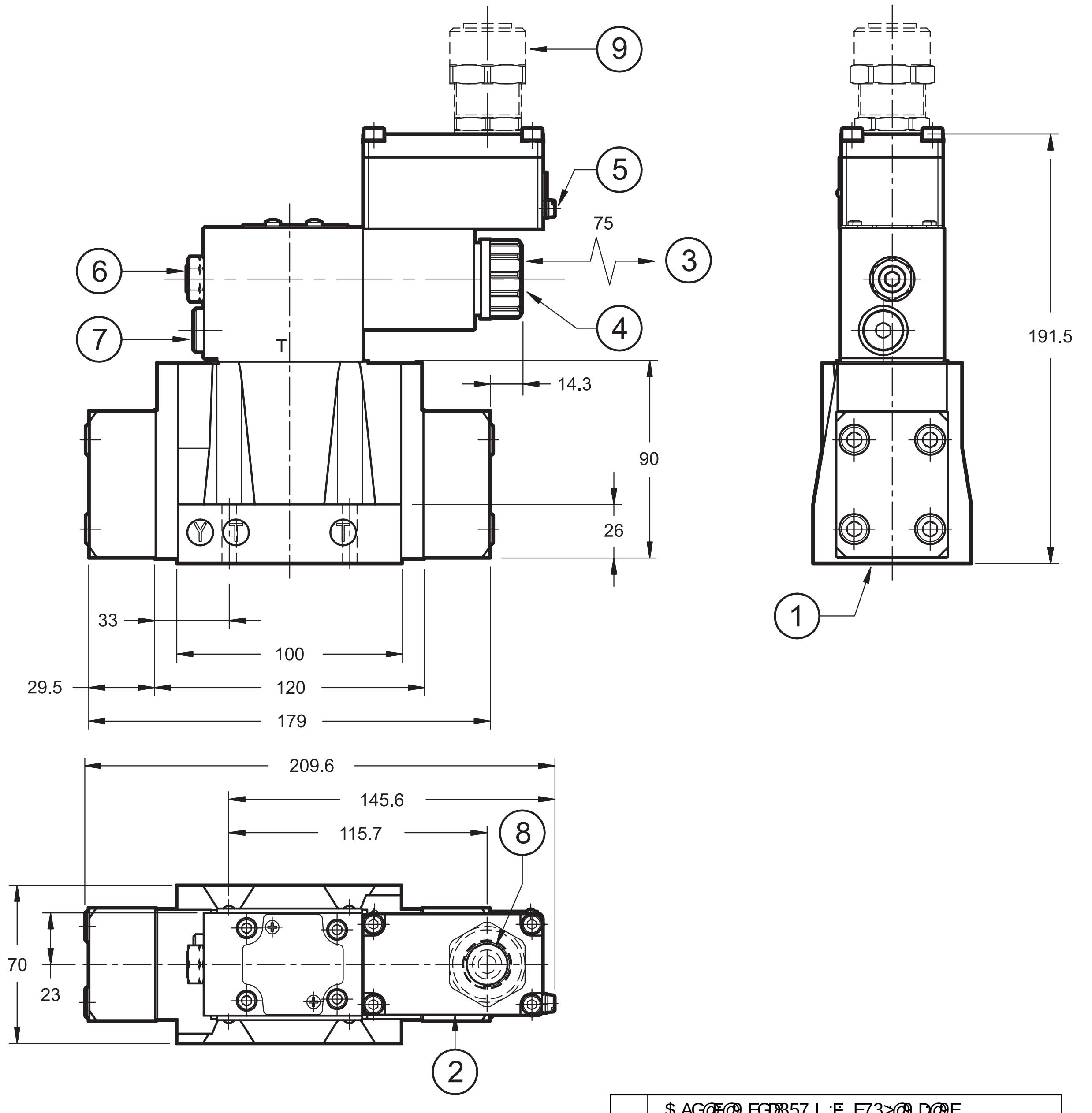

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%&+ 8ADE;67 BADF534>7 9>3@6 E77 B3D39D3B:

, 3>H7 83EF7@@9 %) E5D7I E $ J !) &
* ;9: F7@@9 FADDG7 %? E5D7I E
* : D736 A8? AG@F;@9 : A>7E $ J
) 73>;@9 D;@9E % &(FKB7 J) : AD7 % &(FKB7 J) : AD7

	$ AG@F;@9 EGD8357 I ;F: E73>;@9 D;@9E
	JB>AE;A@BDAA85A;>
	A;>D7? AH3>EB357
	D73F: 7D >7@=7K
	* 7D? ;@3>8ADEGBB>7? 7@F3DK 73DF: % 5A@@75F;A@
	6<GEF? 7@FE73>;@9 ? 367 ;@835FADK A @AFG@E5D7I F: 7 @GF
	' D7EEGD7 93G97 BADF W) '
	+ BB7DBADF8AD534>7 9>3@6
	34>7 9>3@6 GBB7DBADFE: AI @ * A 47 AD67D76 E7B3D3F7>K E77 B3D39D3B:

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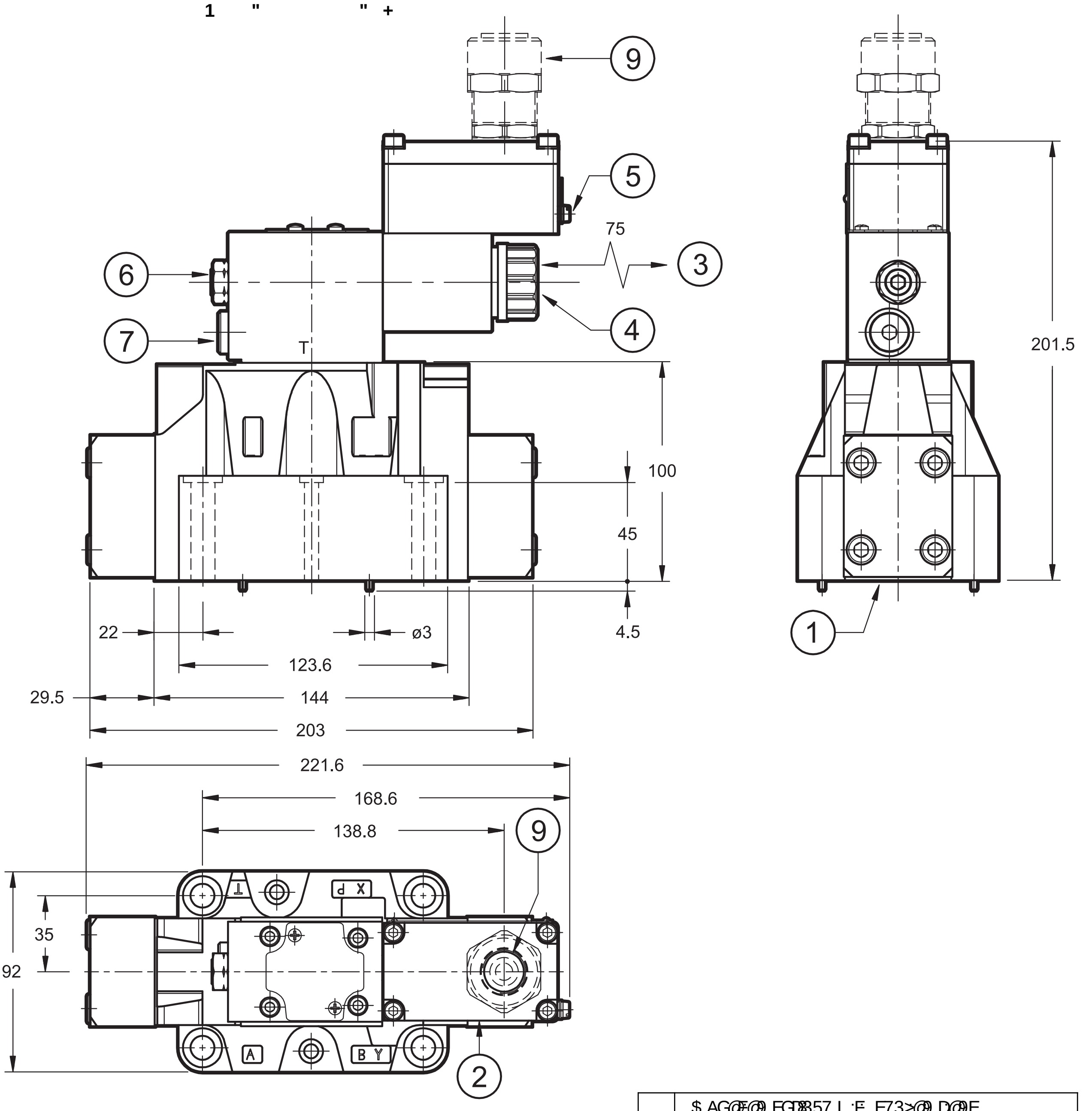

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%&+ 8ADE;67 BAD34>7 9>3@6 E77 B3D39D3B:

) ;@9>7 H3>H7 83EF7@@9 %) E5D7I E $ J !) & %) E5D7I E $ J !) &	
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) 73>;@9 D;@9E % &(FKB7 J) : AD7 % &(FKB7 J) : AD7	

	$ AG@F;@9 EGD8357 I ;F: E73>;@9 D;@9E
	JB>AE;A@BDAA85A;>
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	D73F: 7D >7@=7K
	* 7D? ;@3>8ADEGBB>7? 7@F3DK 73DF: % 5A@@75F;A@
	6<GEF? 7@FE73>;@9 ? 367 ;@835FADK A @AFG@E5D7I F: 7 @GF
	' D7EEGD7 93G97 BADF W) '
	+ BB7DBADF8AD534>7 9>3@6
	34>7 9>3@6 GBB7DBADFE: AI @ * A 47 AD67D76 E7B3D3F7>K E77 B3D39D3B:

DZCE*KD2

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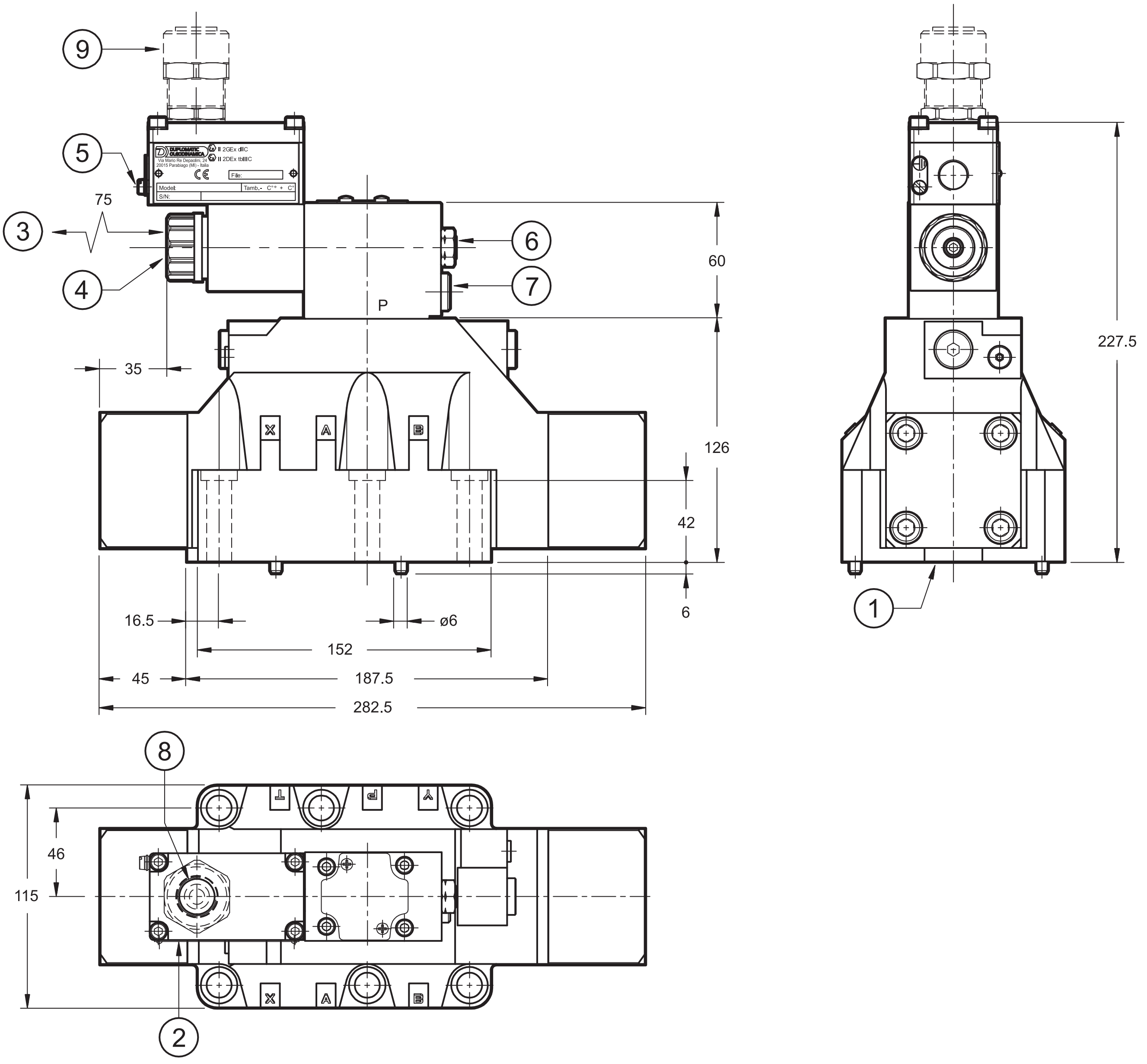

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%&+ 8ADE;67 BADF534>7 9:3@6 E77 B3D39D3B:

, 3>H7 83EF7@@9 %) E5D7I E$ J !) &	
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) 73>;@9 D;@9E % &(FKB7 J) : AD7 % &(FKB7 J) : AD7	

	$ AG@F;@9 EGD8357 I ;F: E73>;@9 D;@9E
	JB>AE;A@BDAA85A;>
	A;>D7? AH3>EB357
	D73F: 7D >7@=7K
	* 7D? ;@3>8ADEGBB>7? 7@F3DK 73DF: % 5A@@75F;A@
	6<GEF? 7@FE73>;@9 ? 367 ;@835FADK A @AFG@E5D7I F: 7 @GF
	' D7EEGD7 93G97 BADF W) '
	+ BB7DBADF8AD534>7 9:3@6
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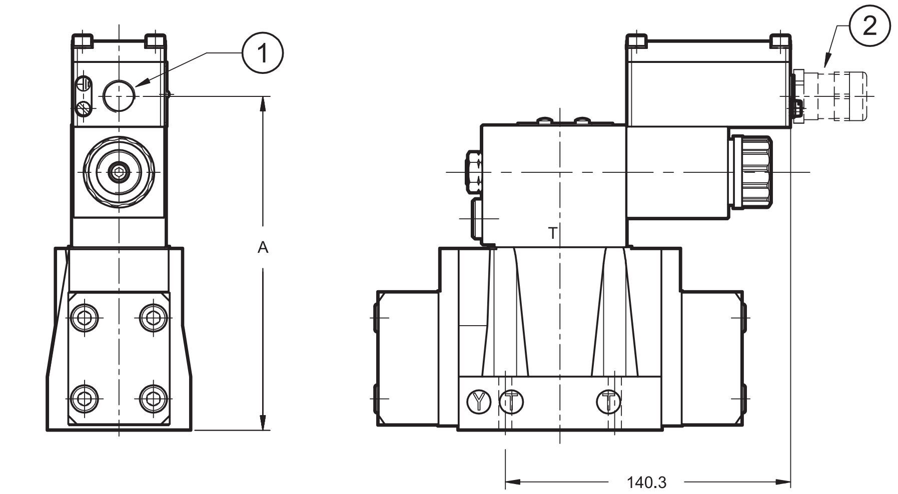

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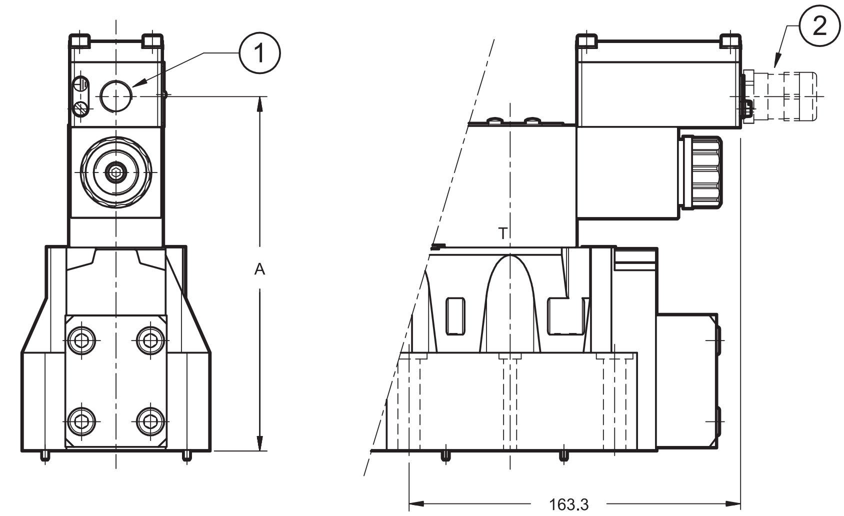

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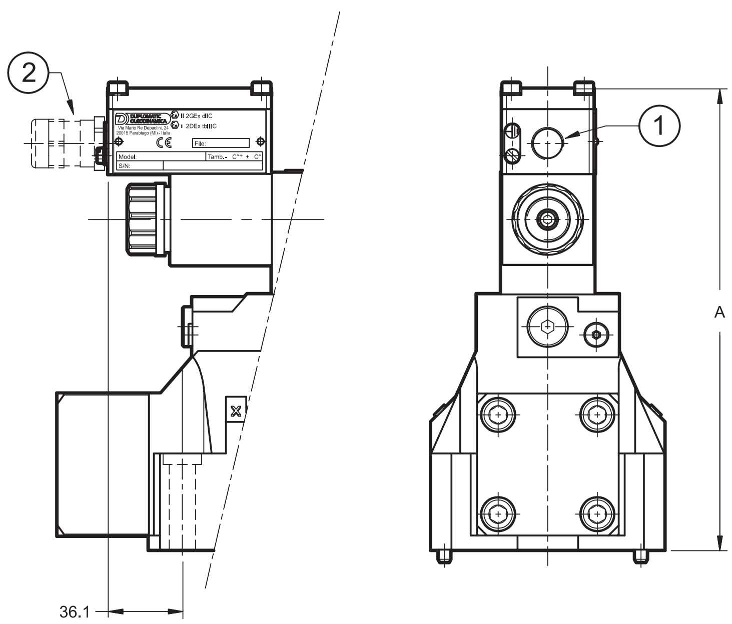

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6;? 7@E;A@E ;@? ?

	) ;67 BADF8AD534>7 9>3@6
	34>7 9>3@6 E;67 BADF E AI @ * A 47 AD67D76 E7B3D3F7>K E77 B3D

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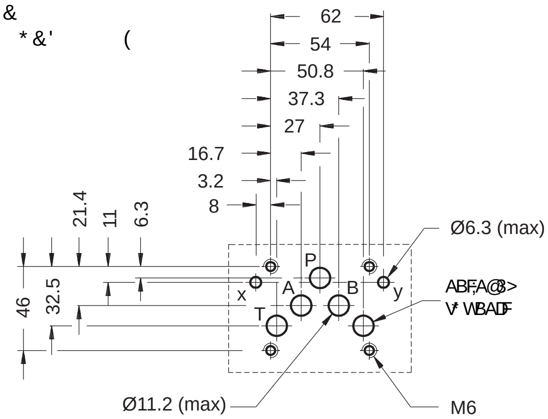

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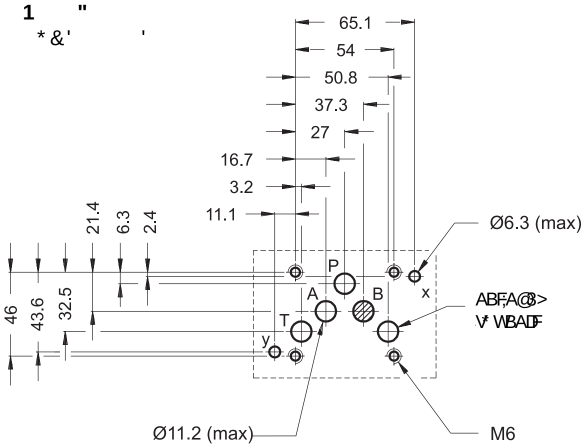

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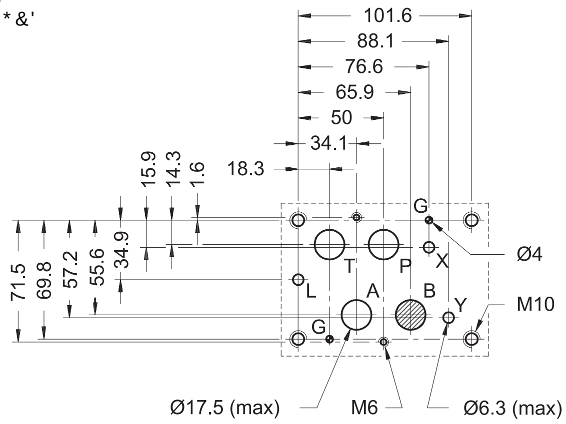

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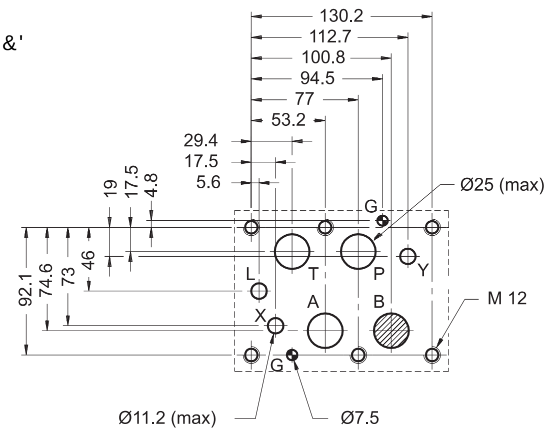

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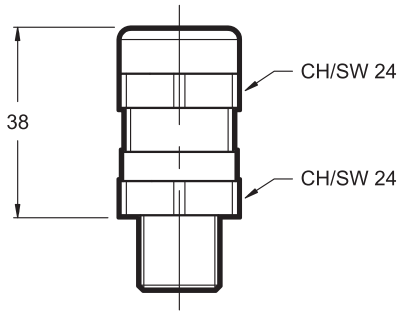
34>7 9:3@6E ? GEF47 AD67D76 E7B3D3F7>K GB>A? 3F;5 A887DE EA? 7 FKB7E A8534>7 9>3@6E I ;F: F: 7 8A>>AI ;@9 873FGD7E

N H7DE;A@8AD@A@3D? AGD76 534>7 7JF7D@3>E73>A@F: 7 534>7 EG;F34>7 8ADQ Z ? ? 534>7E
N 355AD6;@9 FA * . !! 6;D75F;H7 57DF;876
N 534>7 9:3@6 ? 3F7D;3> @5=7>4D3EE
N DG447DF;B ? 3F7D;3> E;>;5A@7
N 3? 4;7@F F7? B7D3FGD7 D3@97 S Z S
N BDAF75F;A@679D77 !' !'



* A AD67D >;EF F: 7 67E5D;BF;A@3@6 F: 7 5A67 A8 F: 7 H7DE;A@5: AE7 @8DA? 3? A@9 F: AE7 >;EF76 47>AI

8D6GBE;A@ " %

A78

, 7DE;A@I ;F: $ J !) & ? 3>7 F: D736 EG;F34>7 8AD5A;>E I ;F: * 3@6) 5A@@75F;A@FKB7E ;F;E EGBB>;76 7CG;BB76 I ;F: E;>;5A@7 E73> F: 3F? GEF47 3EE7? 4>76 47F I 77@F: 7 534>7 9>3@6 3@6 F: 7 5A;> 5AH7D EA 3E FA 7@EGD7 !' !' BDAF75F;A@679D77

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A78

, 7DE;A@I ;F: WA% * %) ! 7J %) ! EG;F34>7 8AD 5A;>E I ;F: * 5A@@75F;A@FKB7 ;@AD67DFA 7@EGD7 !' !' BDAF75F;A@679D77 * : 7 5GEFA? 7D? GEF3BB>K #& * !* O P F: D736>A5=7DADE;? ;>3D47F I 77@F: 7 534>7 9>3@6 5A@@75F;A@F: D736 3@6 F: 7 5A;>5AH7D

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A78

, 7DE;A@I ;F: = +%I % ? 3>7 F: D736 EG;F34>7 8AD5A;>E I ;F: * 5A@@75F;A@FKB7 ;@AD67DFA 7@EGD7 !' !' BDAF75F;A@679D77 * : 7 5GEFA? 7D? GEF3BB>K #& * !* O P F: D736>A5=7DADE;? ;>3D47F I 77@F: 7 534>7 9>3@6 5A@@75F;A@F: D736 3@6 F: 7 5A;> 5AH7D

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, 7DE;A@I ;F: $ J !) & ? 3>7 F: D736 EG;F34>7 8AD5A;>E I ;F:) 5A@@75F;A@FKB7 ;F;E EGBB>;76 7CG;BB76 I ;F: E;>;5A@7 E73> F: 3F ? GEF47 3EE7? 4>76 47F I 77@F: 7 534>7 9>3@6 3@6 F: 7 5A;>5AH7D EA 3E FA 7@EGD7 !' !' BDAF75F;A@679D77

+) &% &%+) &# , %+*

$ $	8ADEA>7@A;6 ,	!% % D3;>? AG@F;@9	E77 53F
$ $	8ADEA>7@A;6 ,		

%&+ 8>86EEA@6 6A@EA>F@EED A998C87 4C8 @AE68CE98 87 466AC7<@ EA + / <C86EG8 E; 8C89AC8 E; 8J ? FDE 58 <@DE4>>87 AFED<78 E; 8 6>4DD<98 87 4C84

* , ' # + *

E77 53F3>A9G7

	1 "	1 "	1 "
* KB7 I ;F: D73DBADE	' $!	' $!	
* KB7 I ;F: E;67 BADE	' $ #	' $ #	' $ #
* : D736 A8BADE ' * . /	W) ' W) '	\ W) ' W) '	W) ' W) '

%&+) G4B3F7E FA 47 AD67D76 E7B3D3F7>K 6A @AF5A@3;@@7;F: 7D3>G? ;@G? @AD? 39@7E;G? 3F3 : ;9: 7DD3F7 F: 3@F: 7 H3>G7 3>AI 76 4K @AD? E 355AD6;@9 FA * . 6;D75F;H7 8AD53F79ADK

* : 7 GE7D? GEF F3=7 53D7 3@6 ? 3=7 3 5A? B>7F7 3EE7EE? 7@FA8 F: 7 ;9@;F;A@D;E= F: 3F53@A55GD8DA? F: 7 D7>3F;H7 GE7 ;@BAF7@F;3>K 7JB>AE;H7 7@H;DA@? 7@FE

DUPLOMATIC OLEODINAMICA
DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

DZCE*G

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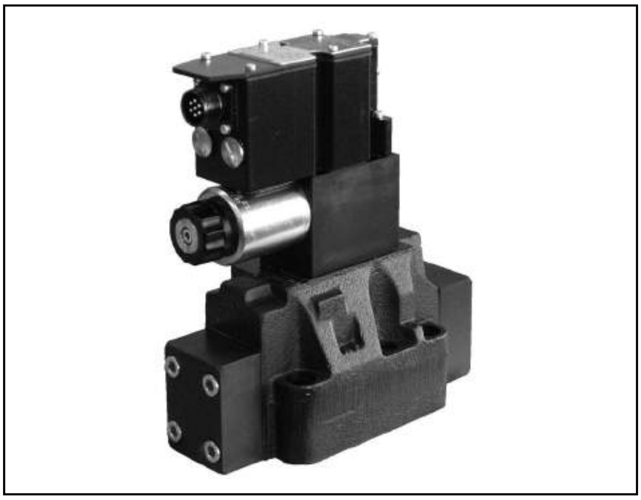
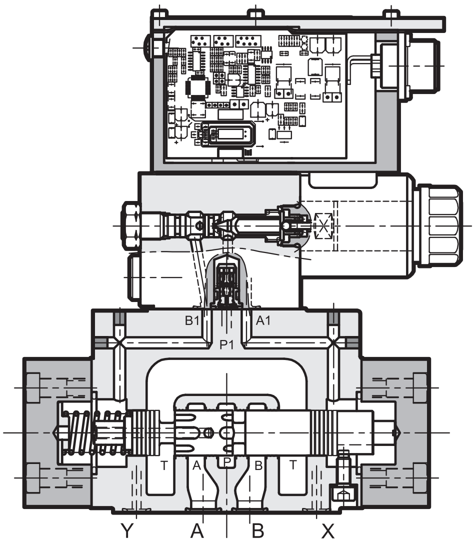


"
" (CETOP R05)
" (CETOP 07)
" (CETOP 08)

max bar
max (see performance table)



— The DZCE*G are pressure reducing valves with electric proportional control with integrated electronics, with 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.

— They are controlled directly by an integrated digital amplifier (see paragraph 5).

— 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 different controlled flow rates, up to 500 l/min.

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

		" "	"	"
Max operating pressure	bar	350		
Maximum flow	l/min	150	300	500
Step response		see paragraph 4		
Hysteresis	% of p_{max}	< 2%		
Repeatability	% of p_{max}	< ±2%		
Electrical characteristics		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	7,3	9,5	15,6

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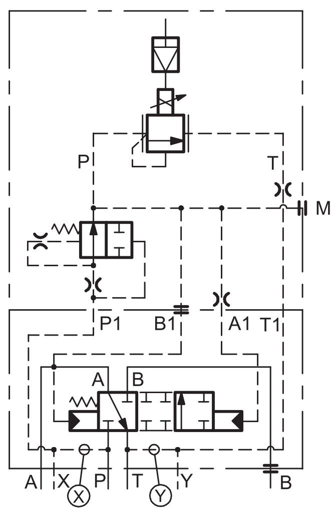

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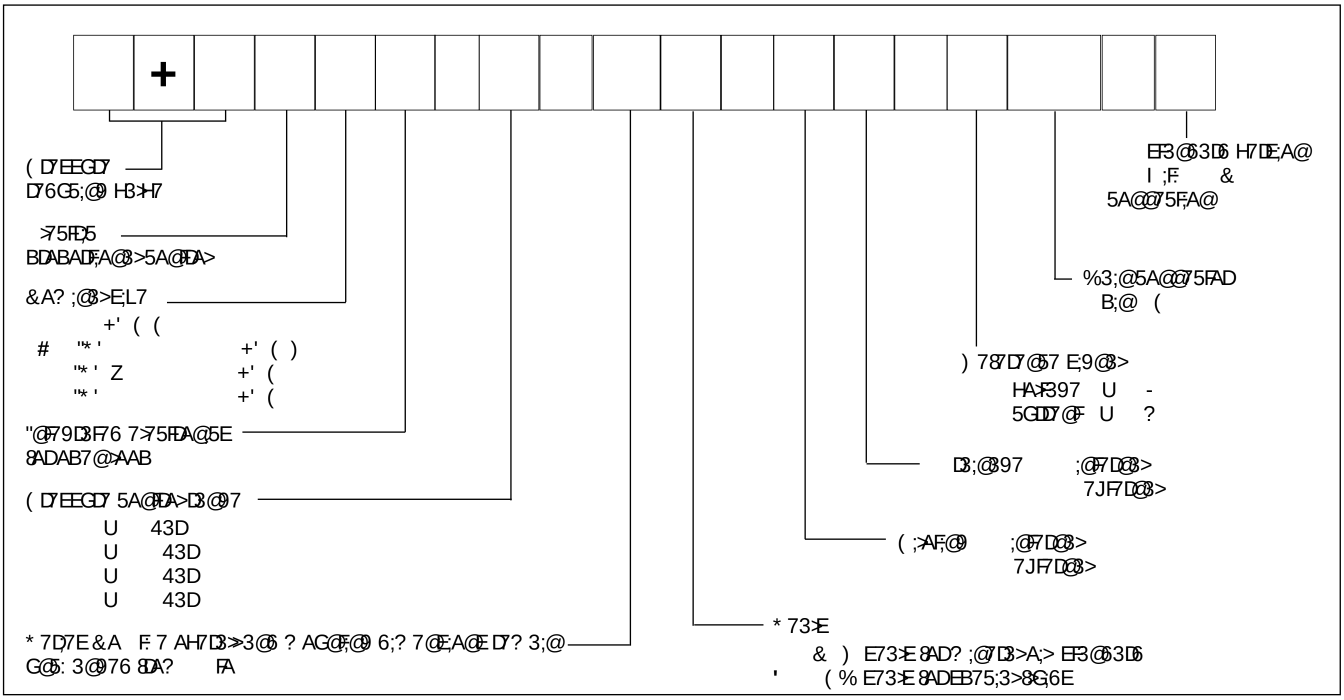

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I ;F: ? ;@7D3>A;> I ;F: H;E5AE;FK A8 5* F3F M

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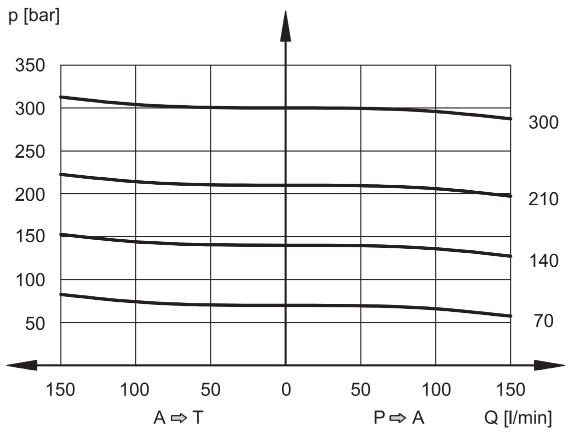

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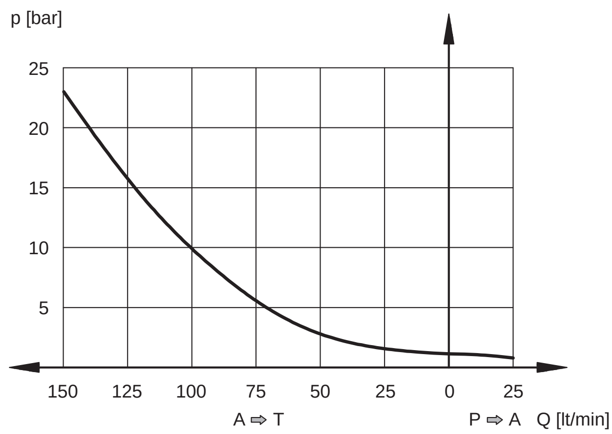

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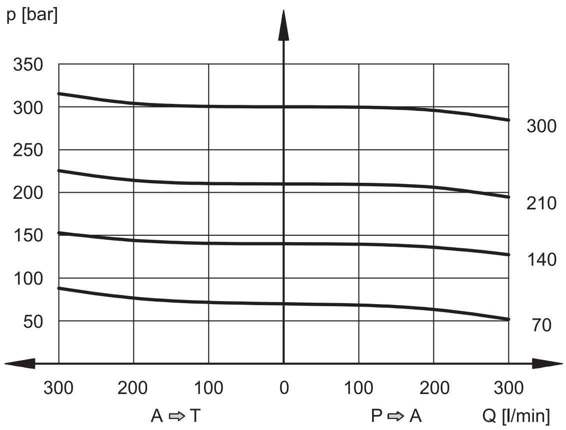

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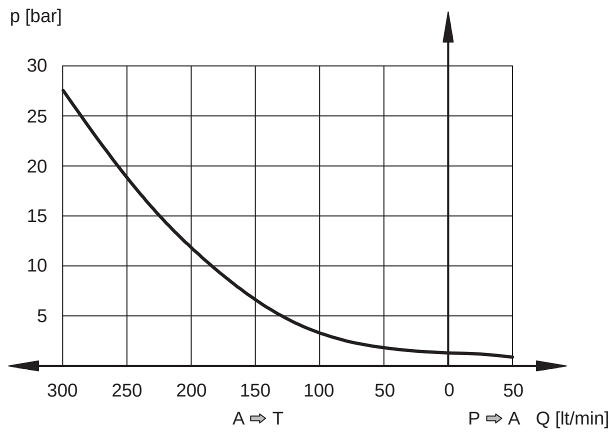

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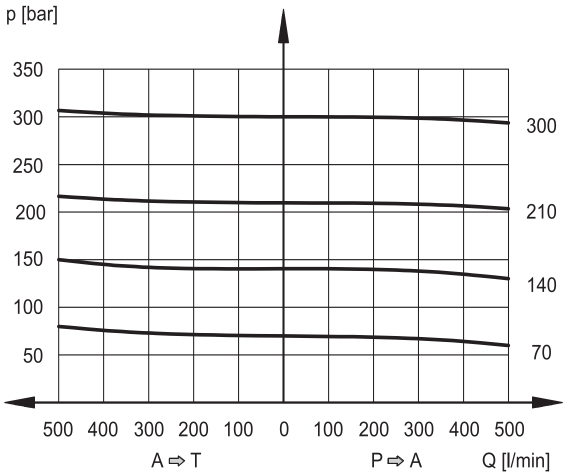

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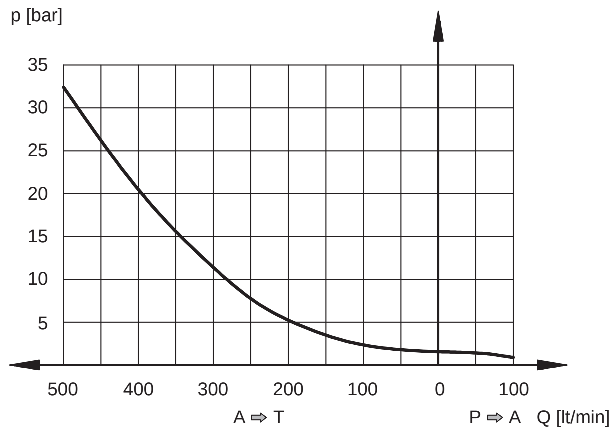

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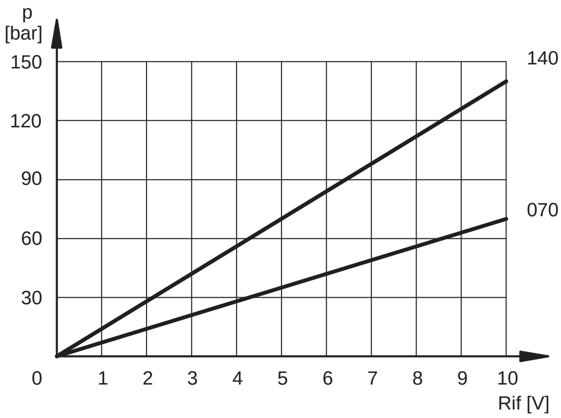

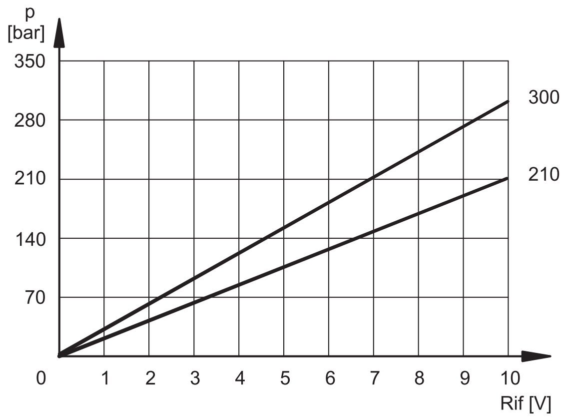

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, E7 ? ;@7D3>A;>43E76 : K6D3G>5 8G;6E ! $ AD! % FKB7 355AD6;@9 FA "* ' ADF: 7E7 8G;6E GE7 &) E73>E AD8G;6E !) FKB7 B: AEB: 3F7 7EF7DE GE7 (% E73>E 5A67 - ADF: 7 GE7 A8 AF: 7D=;@6E A8 8G;6 EG5: 3E ! ! ! B>73E7 5A@EG>F AGD F75: @53> 67B3DF: 7@F , E;@9 8G;6E 3FF7? B7D3FGD7E : ;9: 7DF: 3@ M 53GE7E 3 8EF7D 679D363F;A@ A8 F: 7 8G;6 3@6 A8 F: 7 E73>E 5: 3D35F7D;EF;5E

+: 7 8G;6 ? GEF 47 BD7E7DH76 ;@ ;FE B: KE;53> 3@6 5: 7? ;53> 5: 3D35F7D;EF;5E

$% ! # $! $

A4F3;@76 I ;F: ? ;@7D3>A;> I ;F: HE5AE;FK A8 5* F3F M 3@6 I ;F: 6;9;F3> ;@F79D3F76 7>75FDA@;5E

+: 7 9D3B: E E: AI F: 7 FKB;53> DEF7B D7EBA@E7 F7EF76 I ;F: EF3F;5 BD7EEGD7 43D

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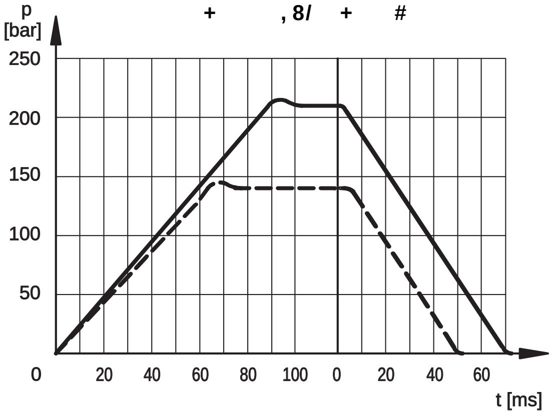

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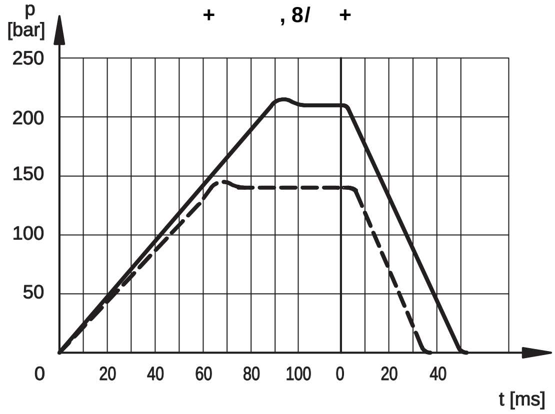

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424;64>02<,>0/ 00.>984 =

+: 7 BDABADF;A@3>H3>H7 ;E 5A@FDA>>76 4K 3 6;9;F3>3? B>;87D 6D;H7D I : ;5: ;@5ADBAD3F7E 3 ? ;5DABDA57EEADF: 3F5A@FDA>E H;3 EA8FI 3D7 3>> F: 7 H3>H7 8G@5F;A@E EG5: 3E

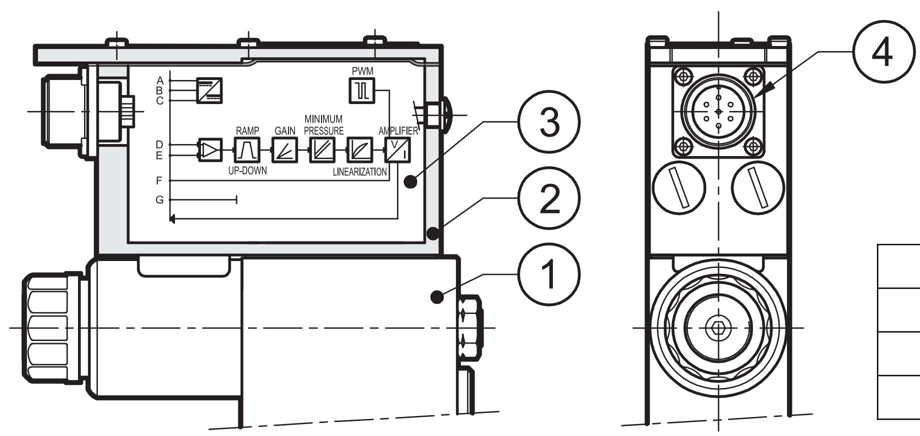
- 5A@F;@GAGE 5A@H7DF;@9 ? E A8F: 7 HA>F397 D787D7@57 E;9@3> ADA8F: 7 5GDD7@F D787D7@57 E;9@3> ;@3 6;9;F3>H3>G7
- 97@7D3F;A@A8GB 3@6 6AI @D3? BE E77 %
- 93;@E ;? ;F E77 %
- 5A? B7@E3F;A@A8F: 7 6736 43@6
- >;@73D;L3F;A@A8F: 7 5: 3D35F7D;EF;5 5GDH7
- D79G>3F;A@A8F: 7 5GDD7@FFA F: 7 EA>7@A;6
- 6K@3? ;5 D79G>3F;A@A8(. % 8D7CG7@5K
- BDAF75F;A@A8F: 7 EA>7@A;6 AGFBGFE 393;@EFBAEE;4>7 E: ADF5;D5G;FE

+: 7 6;9;F3>6D;H7D D7@34>7E F: 7 H3>H7 FA D735: 47FF7D BD7D8AD? 3@57 5A? B3D76 FA F: 7 3@3>A9;5 H7DE;A@ EG5: 3E

- D76G576 : KEF7D7E;E 3@6 47FF7D D7B73F34;>;FK
- D76G576 D7EBA@E7 F;? 7E
- >;@73D;L3F;A@A8F: 7 5: 3D35F7D;EF;5 5GDH7 I : ;5: ;E ABF;? ;E76 ;@ 835FADK 8AD735: H3>H7
- 5A? B>7F7 ;@F7D5: 3@9734;>;FK ;@53E7 A8H3>H7 D7B>357? 7@F
- BAEE;4;>;FK FA E7F H;3 EA8FI 3D7 F: 7 8G@5F;A@3>B3D3? 7F7DE
- BAEE;4;>;FK FA ;@F7D8357 3 & ' B7@7>FF AD=
- BAEE;4;>;FK FA B7D8AD? 3 6;39@AEF;5 BDA9D3? 4K ? 73@E A8F: 7 & 5A@@75F;A@
- : ;9: ;? ? G@;FK FA 7>75FDA? 39@7F;5 FDAG4>7E

% F: 7E7 B3D3? 7F7DE 53@47 E7FF: DAG9: F: 7 5A@@75F;A@FA F: 7 & 5A@@75FAD 4K ? 73@E A83 B7DEA@3>5A? BGF7D3@6 D7>7H3@F EA8FI 3D7 E77 B3D

?8.>498,6- 69.5/4,2<,7



	- 3>H7 I ;F: BDABADF;A@3>EA>7@A;6
	AJ A8F: 7 7>75FDA@5E
	;9;F3>53D6
	%3;@5A@@75FAD

60.>4 ,6.3,<. >0<4=>4 =

' %	-	8DA? FA - D;BB>7 ? 3J - BB
$ # ! (#	.	
) & &## %		
&%# *		
' % $	-	U "? B763@57) ; # P
&## %$	?	U "? B763@57) ; P
# $		' H7DA36 3@6 7>75FDA@5E AH7D 73F;@9
& %		"@F7D8357 A8F: 7 ABFA;EA>3F76 ;@6GEFD;3> ;7>6 4GE FKB7 & GE "* '
% #		B;@%"$ "&
&$ % #		% "
%# % ! % %# 7? ;EE;A@E " & ;? ? G@;FK " &		55AD6;@9 FA EF3@63D6E
! # % % $% % $! # %$		"("(" & EF3@63D6E

"

! # % % $

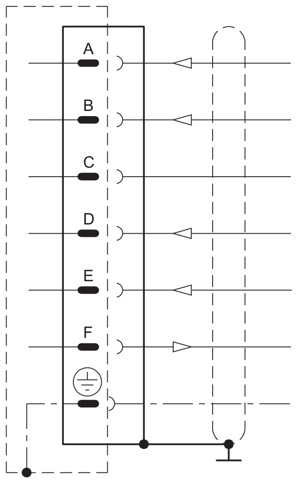
+: 7 6;9;F3>6D;H7DA8 1 H3>H7 ? 3K 47 GE76 I ;F: 6;887D7@F8G@5F;A@E 3@6 AB7D3F;@9 ? A63>;F;7E 67B7@6;@9 A@F: 7 D7CG7EF76 B7D8AD? 3@57E

' 0<=498 A4:3 @96;20 <010<08. 0 =428, 6

+: ;E ;E F: 7 ? AEF5A? ? A@H7DE;A@ ;F? 3=7E F: 7 H3>H7 5A? B>7F7>K ;@F7D5: 3@9734>7 I ;F: F: 7 FD36;F;A@3>BDABADF;A@3>H3>H7E I ;F: 3@3>A9G7 F7KB7 ;@F79D3F76 7>75FDA@;5E +: 7 H3>H7 : 3E A@>K FA 47 5A@@75F76 3E ;@6;53F76 47>AI

+: ;E H7DE;A@6A7E@AF3>>AI F: 7 E7FF;@9 A8F: 7 H3>H7 B3D3? 7F7DE 8AD7J3? B>7 F: 7 D3? BE ? GEF47 B7D8AD? 76 ;@F: 7 ($ BDA9D3? 3E I 7>>3E F: 7 D78D7@57 E;9@3>>;? ;F

9880. >498 =. 307 0



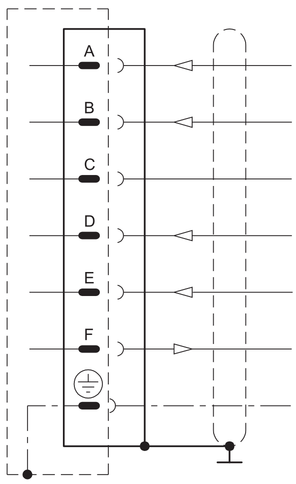
! 4:3	' , 6?0=	?8. >498	%
	-	- A>F397	8DA? FA - D;BB>7 ? 3J - BB E77 %
	-	(AI 7DEGBB>K L7DA	-
		&AFGE76	
	U -	"@BGF D3F76 5A? ? 3@6	"? B763@57) ; =P
	-	"@BGF D3F76 5A? ? 3@6	
	U -	+7EF BA;@F5A;>5GDD7@F	U "% / E77 %
!	&	(DAF75F;H7 9DAG@6	

% ;8A@>K A@7 ;@BGF E;9@3>;E 3H3;>34>7 E;@9>7 7@6 F: 7@F: 7 B;@ - BAI 7DEGBB>K 3@6 F: 7 B;@ - D78D7@57 E;9@3> ? GEF47 5A@@75F76 F: DAG9: 3 <G? B7D3@6 4AF: 5A@@75F76 FA & 7>75FD;5 B3@7>E;67

' 0<=498 A4:3 . ?<<08><010<08. 0 =428, 6

+: ;E H7DE;A@: 3E 5: 3D35F7D;EF;5E I : ;5: 3D7 E;? ;>3D FA F: 7 BD7H;AGE A@7 I ;F: F: 7 6;887D7@57 F: 3F;@F: ;E 53E7 F: 7 D78D7@57 E;9@3>;E EGBB>;76 ;@ 5GDD7@F ? . ;F: F: 7 ? E;9@3>F: 7 H3>H7 ;E 3FL7DA H3>G7 I : ;>7 I ;F: ? E;9@3>F: 7 H3>H7 ;E 3FF: 7 ? 3J;? G? E7FF;@9 H3>G7

9880. >498 =. 307 0



! 4:3	' , 6?0=	?8. >498	%
	-	- A>F397	8DA? FA - D;BB>7 ? 3J - BB E77 %
	-	(AI 7DEGBB>K L7DA	-
		&AFGE76	
	U ?	"@BGF E;9@3>	"? B763@57) ; P
	-	17DA D78D7@57	
	U -	+7EF BA;@F5A;>5GDD7@F	U "% / E77 %
!	&	(DAF75F;H7 9DAG@6	

% 19<>30 A4<432 5A@@75F;A@E ? GEF47 ? 367 H;3 F: 7 B;@B>G9 ? AG@F76 A@F: 7 3? B>;87D) 75A? ? 7@676 534>7 E;L7E 3D7 ? ? 8AD 534>7E GB FA ? 3@6 ? ? 8AD534>7E GB FA ? 8ADBAI 7DEGBB>K +: 7 E;9@3>534>7E ? GEF47 ? ? EG;F34>7 534>7 I AG@6 : 3H7 5AD7E 3 E7B3D3F7 E5D77@8AD F: 7 E;9@3>I ;D7E 3@6 3@AH7D3>>E5D77@

% D736 F: 7 F7EF BA;@FB;@ ;@D7>3F;A@FA B;@ -

% 7@H;E397 3@7JF7D@3>8GE7 A@B;@ - FA E: ;7>6 F: 7 53D6 GE7 EB75;8;53F;A@E - 8;EFFKB7

' 0<=4)98 : , <, 7 0>0<= =0>>4B2= @4, . 9880. >9<

+: ;E H7DE;A@3>AI FA E7FEA? 7 B3D3? 7F7DE A8 F: 7 H3>H7 5A@@75F;@9 3 (FA F: 7 &
5A@@75FAD

+A 6A F: ;E KAG : 3H7 FA AD67DF: 7 ;@F7D835 7 67H;57 8AD, * BADF **! &$**
5A67 F: 3F ;@5>G67E F: 7 5A@8;9GD3F;A@EA8FI 3D7 &(*') 3
5A? ? G@53F;A@534>7 >7@9F: ? F 3@6 3 : 3D6I 3D7 5A@H7DF7D @77676 FA 5A@@75F F: 7
H3>H7 FA F: 7 , * BADF +: 7 EA8FI 3D7 ;E ? ;5DAEA8F/ (N 5A? B>;3@F

+: 7 B3D3? 7F7DE F: 3F53@47 E7F3D7 67E5D;476 47>AI

97 4B, 6: <0==?<0

+: 7 F@A? ;@3>BD7EEGD7SB3D3? 7F7D>;? ;FE F: 7 ? 3J;? G? 5GDD7@FFA F: 7 EA>7@A;6 F: 7D78AD7
;FE7FE F: 7 67E;D76 @A? ;@3>BD7EEGD7 5ADD7EBA@6;@9 FA F: 7 BAE;F;H7 H3>G7 A8 F: 7 ;@BGF
D787D7@57 - AD ?

78G>FH3>G7 A8G>E53>7

) 3@97 8DA? FA A8G>E53>7

! (<0; ?08. B

* 7FE F: 7 (. % 8D7CG7@5K I : ;5: ;E F: 7 BG>E3F;@9 8D7CG7@5K A8 F: 7 5A@FDA>5GDD7@F +: 7
(. % 675D73E7 ;? BDAH7E F: 7 H3>H7 355GD35K 675D73E;@9 F: 7 D7E;EF3@57 DD;9G3F;A@EF34;>;FK

+: 7 (. % ;@5D73E7 ;? BDAH7E F: 7 D79G>3F;A@EF34;>;FK 53GE;@9 3 : ;9: 7D: KEF7D7E;E

78G>FH3>G7 ! L

) 3@97 U ! L

 # , 7 : =

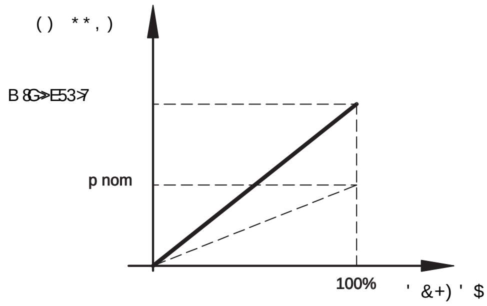
"@5D73E7 F;? 7 A8) 3? B) E7FE F: 7 5GDD7@F;@5D73E7 F;? 7 8AD3 H3D;3F;A@8DA? FA
A8F: 7 ;@BGFD787D7@57

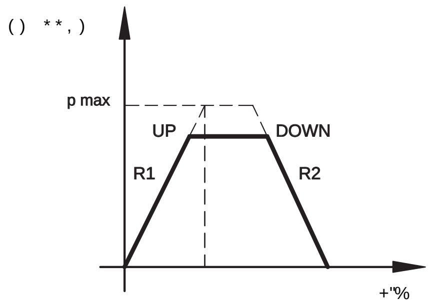
75D73E7 F;? 7 A8) 3? B) E7FE F: 7 5GDD7@F675D73E7 F;? 7 8AD3 H3D;3F;A@8DA? FA
A8F: 7 ;@BGFD787D7@57

%;@F;? 7 E75

%3J F;? 7 E75

78G>FF;? 7 E75





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(DAH;67E E7H7D3>;@8AD? 3F;A@B3D3? 7F7DE EG5: 3E

W+: 7 7>75FDA@;5 6D;H7 DEF3FGE . AD=;@9 AD DA=7@
W+: 7 35F;H7 D79G>3F;A@
W'@BGFD787D7@57
W GDD7@FH3>G7

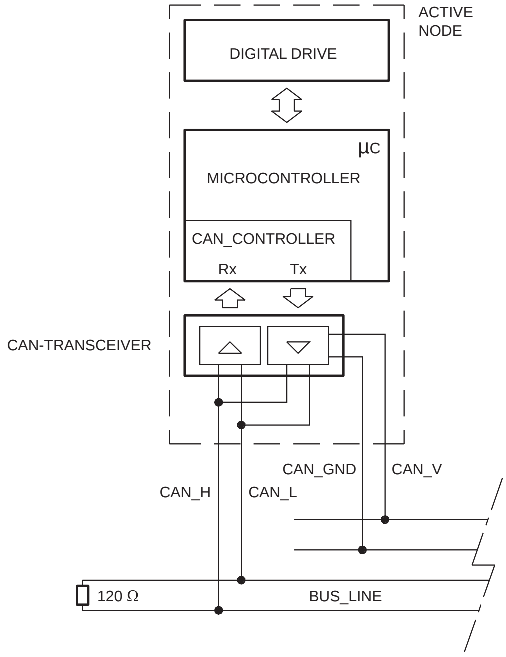
' 0<=49 8 A4 3 ?= 4 3>0<1, . 0 @0<=4 9 8

+: ;E H7DE;A@3>AI E F: 7 H3>H7 B;>AF;@9 F: DAG9: F: 7 ;@6GEFD;3>87>6 4GE
& ' B7@355AD6;@9 FA "* ' EF3@63D6E

+: 7 & 5A@@75FAD? GEF 47 5A@@75F76 E77 E5: 7? 7 3E 3 E3>H7 @A67 A8 F: 7 & ' B7@4GE I : ;>7 F: 7 ? 3;@5A@@75FAD;E I ;D76 A@K 8ADF: 7 BAI 7DEGBB>K B;@ 3@6 73DF:

+: 7 ? AEF;? BADF3@F5: 3D35F7D;EF;5E A8 3 & ' B7@5A@@75F;A@ 3D7

(3D3? 7F7DE FAD397 3>EA ;@($
(3D3? 7F7DE E7FF;@9 ;@D73>F;? 7 (' 5A? ? G@53F;A@
' @>;@7 H3>H7 6;39@AEF;5E
3EK I ;D;@9 I ;F: F: 7 E7D;3>5A@@75F;A@
A? ? G@53F;A@BDA9D3? 355AD6;@9 FA ;@F7D@3F;A@3>EF3@63D6E
AD67F3;>76 ;@8AD? 3F;A@A@F: 7 & ' B7@5A? ? G@53F;A@ EA8FI 3D7 E77 53F



. 9880. >9<. 9880. >49 8 =. 307 0

! 4 3	' , 6?0=	?8. >49 8
	&2* ! $	? A@FAD
	& -	, * - ? 3J ?
	&	, * -
	&2!	, * >;@7 : ;9: E;9@3>
	&2$	, * >;@7 >AI E;9@3>

% ;@E7DF3 P D7E;EF3@57 A@B;@ 3@6 B;@ A8 F: 7 & 5A@@75FADI : 7@F: 7 H3>H7 ;E F: 7 7@6 =@AF A8 F: 7 & @7FI AD=

$% %

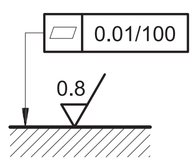
. 7 D75A? ? 7@6 FA ;@EF3>>F: 7 1 H3>H7 7;F: 7D;@: AD;LA@F3> BAE;F;A@ ADH7DF;53>BAE;F;A@I ;F: F: 7 EA>7@A;6 6AI @ 3D6 "8F: 7 H3>H7 ;E ;@EF3>>76 ;@H7DF;53>BAE;F;A@3@6 I ;F: F: 7 EA>7@A;6 GBI 3D6 KAG ? GEF 5A@E;67D BAEE;4>7 H3D;3F;A@E A8 F: 7 ? ;@? G? 5A@FDA>>76 BD7EEGD7 ;85A? B3D76 FA I : 3F;E ;@6;53F76 ;@B3D39D3B:

@EGD7 F: 3F F: 7D7 ;E @A 3;D;@F: 7 : K6D3G>;5 5;D5G;F "@B3DF;5G>3D 3BB>;53F;A@E ;F53@47 @757EE3DK FA H7@FF: 7 3;D7@FD3BB76 ;@F: 7 EA>7@A;6 FG47 4K GE;@9 F: 7 3BBDABD;3F7 6D3;@E5D7I ;@F: 7 EA>7@A;6 FG47 @EGD7 F: 3F F: 7 EA>7@A;6 FG47 ;E 3> 3KE 8;>>76 I ;F: A;> E77 B3D39D3B: FF: 7 7@6 A8 F: 7 AB7D3F;A@ ? 3=7 EGD7 A8: 3H;@9 5AD7 5FK D7B>3576 F: 7 6D3;@E5D7I

A@@75FF: 7 H3>H7 + BADF6;D75FK FA F: 7 F3@= 66 3@K 435=BD7EEGD7 H3>G7 67F75F76 ;@F: 7 + >;@7 FA F: 7 5A@FDA>>76 BD7EEGD7 H3>G7 %3J;? G? 36? ;EE;4>7 435=BD7EEGD7 ;@F: 7 + >;@7 G@67DAB7D3F;A@3> 5A@6;F;A@E ;E 43D

- 3>H7E 3D7 8;J76 4K ? 73@E A8 E5D7I E ADF;7 DA6E A@3 83F EGD8357 I ;F: B3D3>>7>;EF;5 3@6 DAG9: @7EE 7CG3>FA AD47FF7DF: 3@F: AE7 ;@6;53F76 ;@F: 7 D7>3F;H7 EK? 4A>E "8? ;@? G? H3>G7E 3D7 @AF A4E7DH76 8>G;6 53@73E;>K >73= 47FI 77@F: 7 H3>H7 3@6 EGBBADF EGD8357

* GD8357 8@E: ;@9



! % D D #

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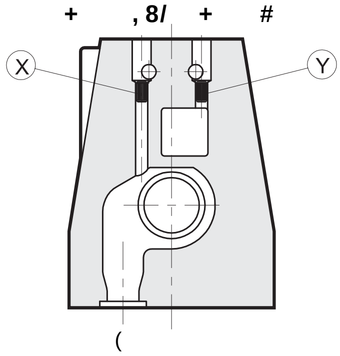
+0(' - $-	(>G9 3EE7? 4>K	
	/	0
"&+) & $ ("$' + & / +) & $) "&	&'	0 *
"&+) & $ ("$' + & "&+) & $) "&	&'	&'
/ +) & $ ("$' + & / +) & $) "&	0 *	0 *
/ +) & $ ("$' + & "&+) & $) "&	0 *	&'



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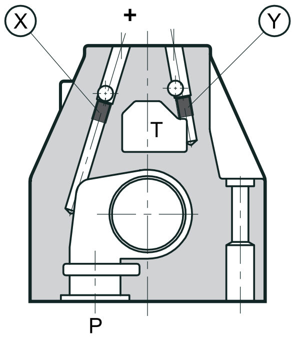
***** % J B>G9 8AD 7JF7D@3> 6D3;@



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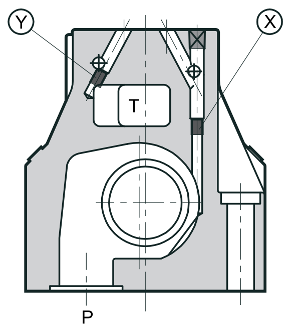
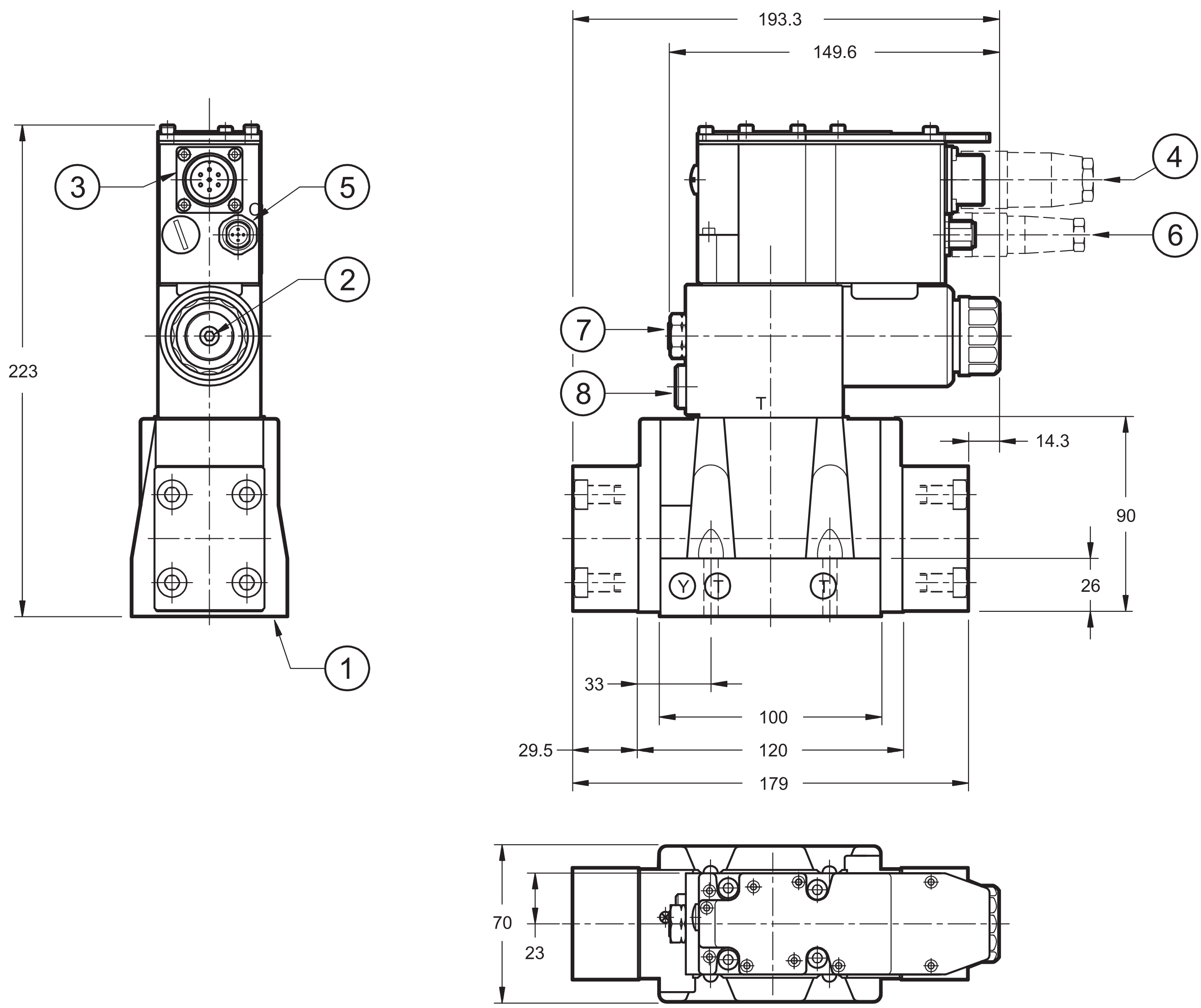
***** % J B>G9 8AD 7JF7D@3> 6D3;@



) % J B>G9 8AD 7JF7D@3> B;>AF
***** % J B>G9 8AD 7JF7D@3> 6D3;@

' # & % $ $ + + #

6;? 7@E;A@E ;@? ?



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;E @757EE3DK FA H7@F: 7 3;DF: DAG9: F: 7 4D73F: 7D B:8576
3FF: 7 7@6 A8F: 7 EA>7@A;6 FG47

%AG@F;@9 EGD8357 E: AI @3FB3D39D3B:

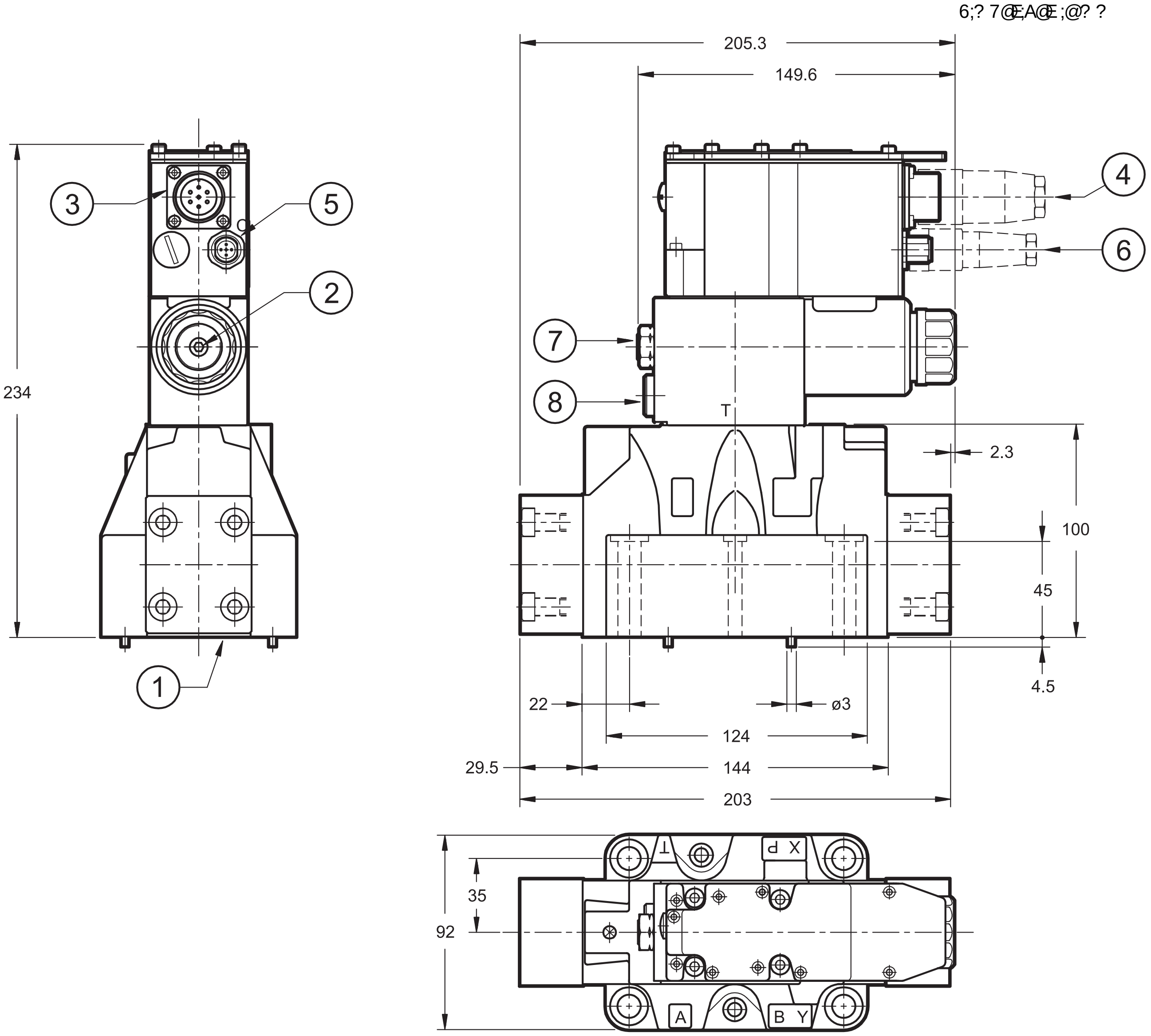
- 3>H7 83EF7@@9 & 4A>FE * ! % J "* '
+;9: F7@@9 FADCG7 & ? 4A>FE
+: D736 A8? AG@F;@9 : A>7E % J
* 73>;@9 D;@9E & ') FKB7 J * : AD7 & ') FKB7 J * : AD7

	%AG@F;@9 EGD8357 I ;F: E73>;@9 D;@9E
	D73F: 7D >7@=7K
	%3;@5A@@75F;A@
	>75FD;53>5A@@75FAD B;@ "((/ * $ 5A67 >9 - 0 9< 0<0/ =0: , <, >06B
	86B 19< @0<=49 8 & GE 5A@@75F;A@
	86B 19< @0<=49 8 >75FD;53>5A@@75FAD B;@% "((* % $ 5A67 >9 - 0 9< 0<0/ =0: , <, >06B
	6<GEF? 7@FE73> E7F;@9 5FADK "F;E D75A? ? 7@676 @AFFA G@E5D7I F: 7 @GF
	(D7EEGD7 93G97 BADF * (S

DZCE*G

$ # $

' # & % $ $ +



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%AG@F;@9 EGD8357 E: AI @3FB3D39D3B:

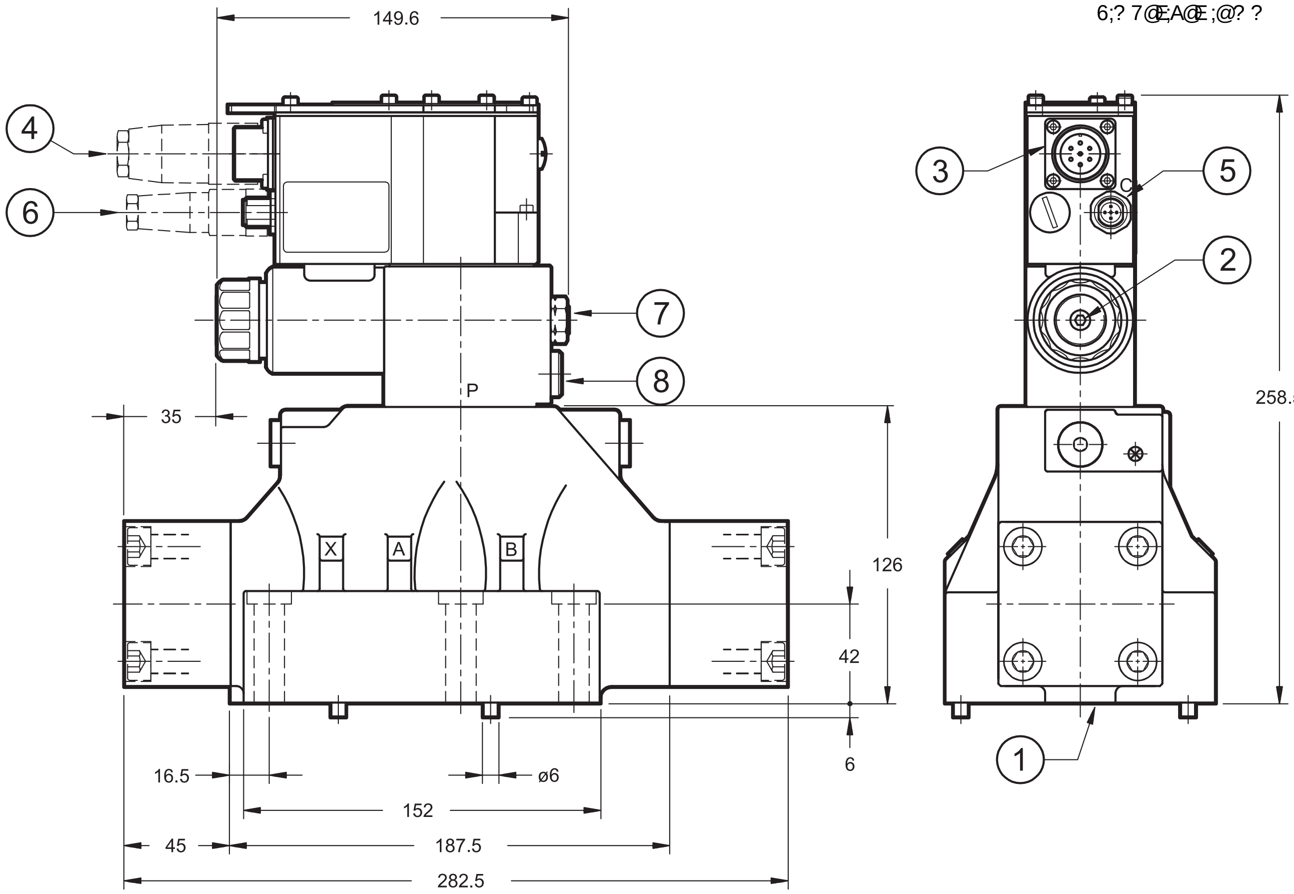
- 3H7 8EF7@@9	& 4A>FE * ! % J "* ' & 4A>FE * ! % J "* '
+;9: F7@@9 FADDG7 % J	&? 4A>FE % J &? 4A>FE
+: D736 A8? AG@F;@9 : A>7E	% J % J
* 73>;@9 D;@9E	& ') FKB7 J * : AD7 & ') FKB7 J * : AD7

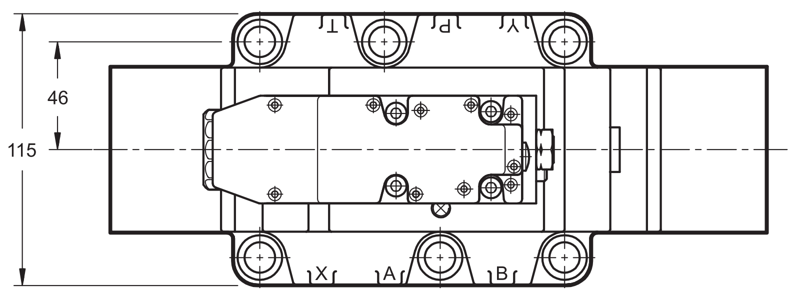
	%AG@F;@9 EGD8357 I ;F: E73>;@9 D;@9E
	D73F: 7D >7@=7K
	%3;@5A@@75FA@
	>75FD;53>5A@@75FAD B;@ "((/ * $ 5A67 **>9 - 0 9< 0<0/ =0: , <, >06B**
	86B 19< @0<=49 8 & GE 5A@@75FA@
	86B 19< @0<=49 8 >75FD;53>5A@@75FAD B;@% "((* % $ 5A67 **>9 - 0 9< 0<0/ =0: , <, >06B**
	6<GEF? 7@F E73> E7F;@8 5FADK "F;E D75A? ? 7@676 @AFFA G@E5D7I F: 7 @GF
	(D7EEGD7 93G97 BADF * (S

"

' # & % $ $ +

6;? 7@E,A@E ;@? ?





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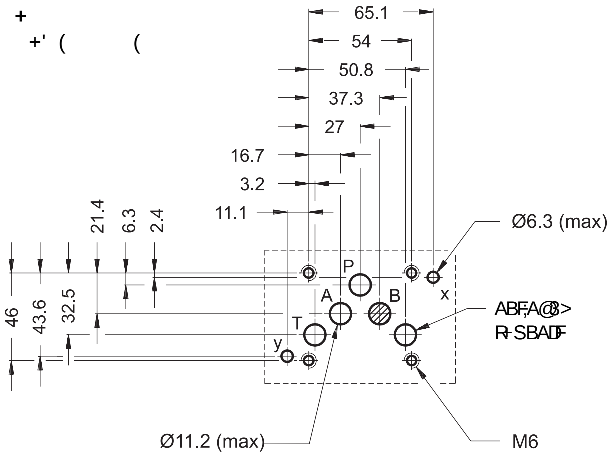

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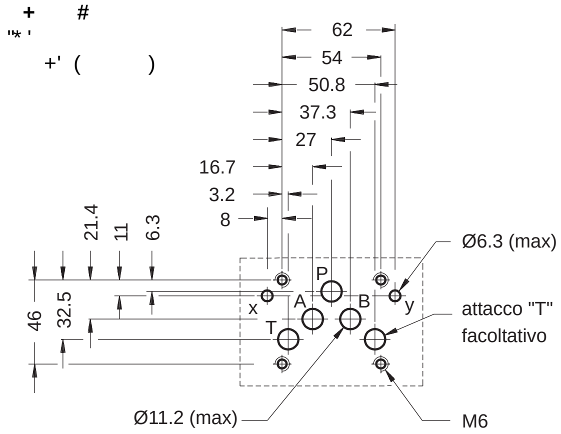

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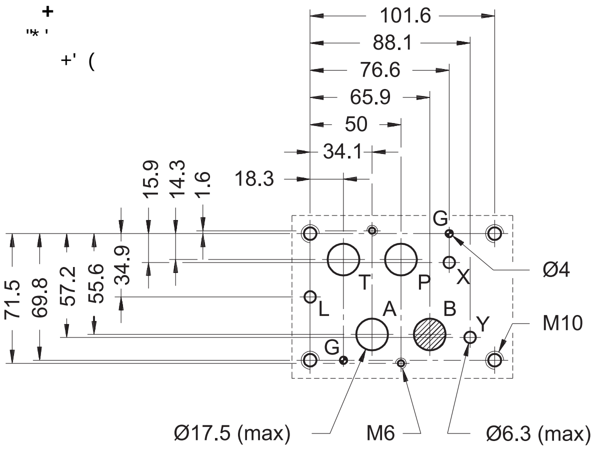

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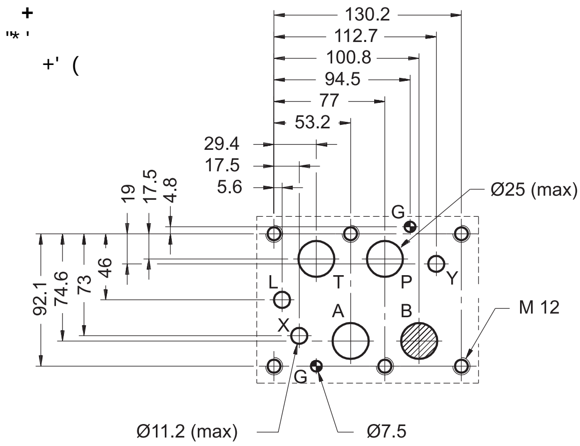

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DUPLOMATIC OLEODINAMICA

DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

RPCED1

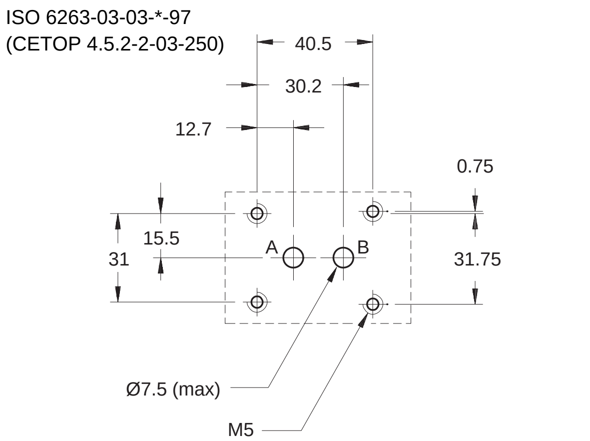
DIRECT OPERATED FLOW CONTROL VALVE WITH ELECTRIC PROPORTIONAL CONTROL

SERIES 52

SUBPLATE MOUNTING
ISO 6263-03 (CETOP 03)

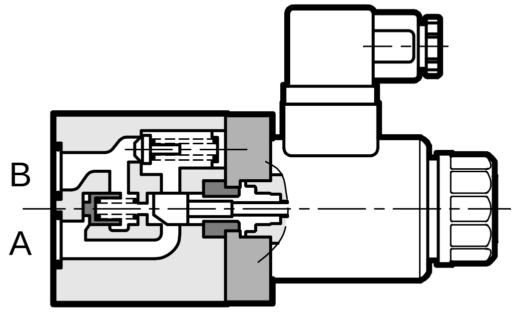
p max **250** bar
Q max (see table of performances)

MOUNTING INTERFACE



NOTE: The RPCED1 mounting interface, with ISO 6263 (CETOP 03) holes, must not have P and T ports or must have the 0113388 subplate (to be ordered separately)

OPERATING PRINCIPLE

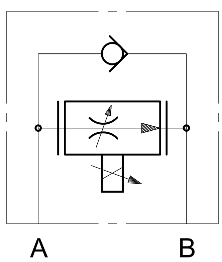


- The RPCED1 valve is a two-way flow control valve with pressure and thermal compensation, electric proportional control, and mounting interface in compliance with ISO 6263 (CETOP RP 121H) standards.
- It is normally used for flow rate control in hydraulic circuit branches or for speed control of hydraulic 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 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.

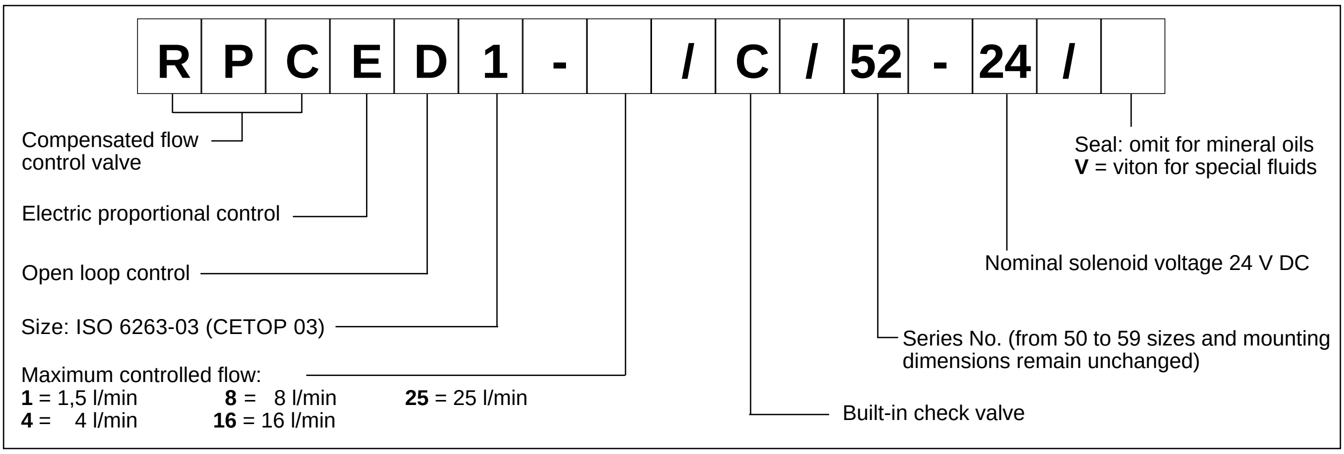
PERFORMANCES
(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control cards)

Maximum operating pressure Minimum p 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 paragraph 7	
Hysteresis (with PWM 100 Hz)	% of p nom	< 6%
Repeatability	% of p nom	< ±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



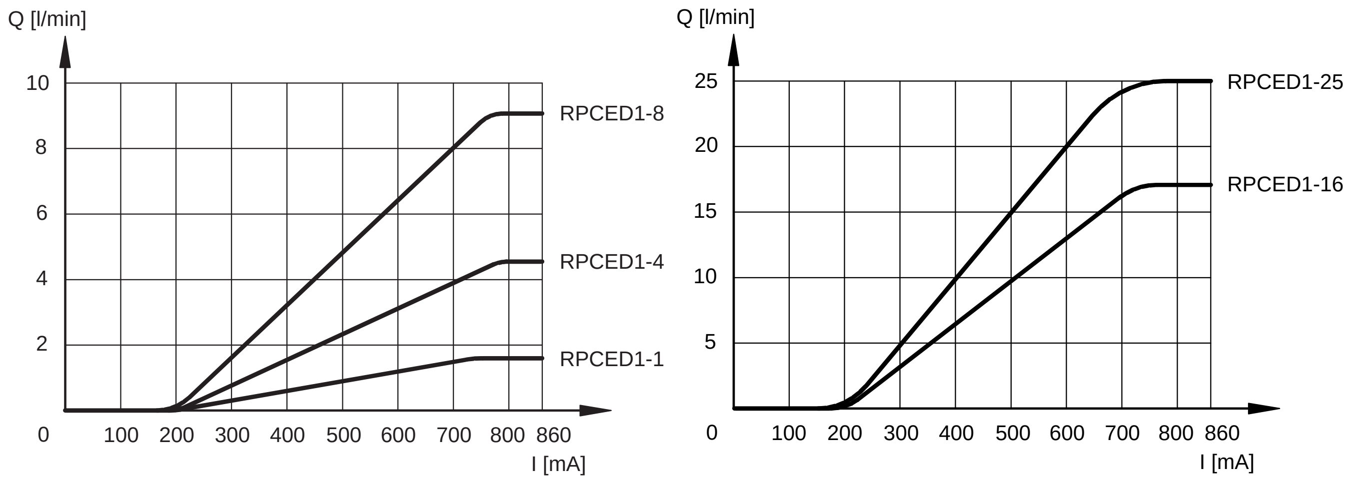
1 - IDENTIFICATION CODE



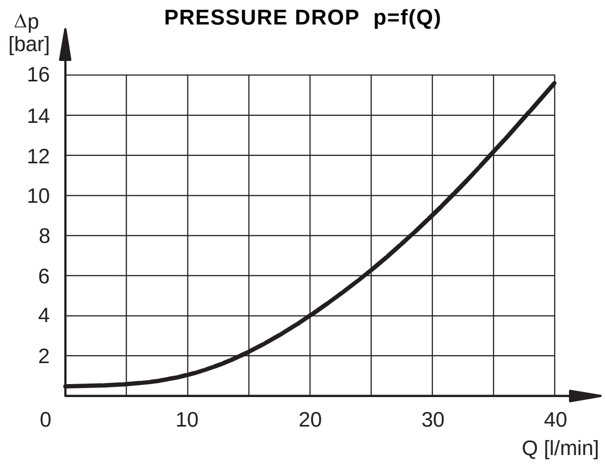
2 - CHARACTERISTIC CURVES (measured with viscosity of 36 cSt at 50°C)

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 p=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 one 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 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)		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)

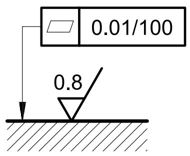
Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.
The table illustrates typical response times with valve flow rate of 16 l/min and with input pressure of 100 bar.

REFERENCE SIGNAL STEP	0 100%	100 0%	25 75%	75 25%
Step response [ms]	60	80	50	70

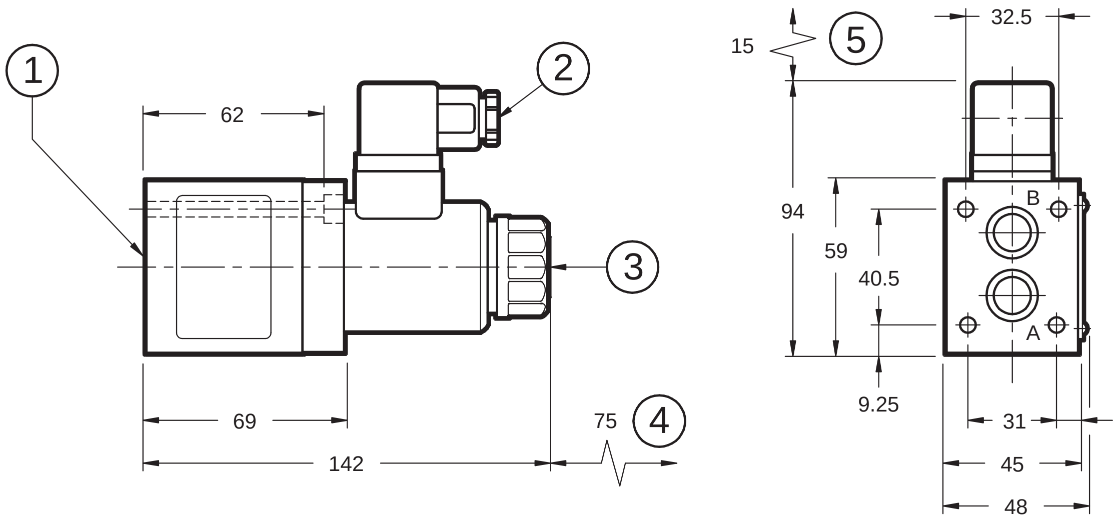
8 - INSTALLATION

RPCED1 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



9 - OVERALL AND MOUNTING DIMENSIONS



dimensions in mm

1	Mounting surface with sealing rings: 2 ORM-0140-20 (14x2)
2	Coil electrical connector DIN 43650
3	Manual emergency control
4	Coil removal space
5	Connector removal space

Fastening bolts: 4 bolts M5x70
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	PMRPC1-AI3G ports on rear PMRPC1-AL3G side ports
Port dimensions	3/8Ž BSP

DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

DUPLOMATIC OLEODINAMICA

RPCED1-*/T3

THREE-WAY DIRECT OPERATED FLOW CONTROL VALVE WITH ELECTRIC PROPORTIONAL CONTROL

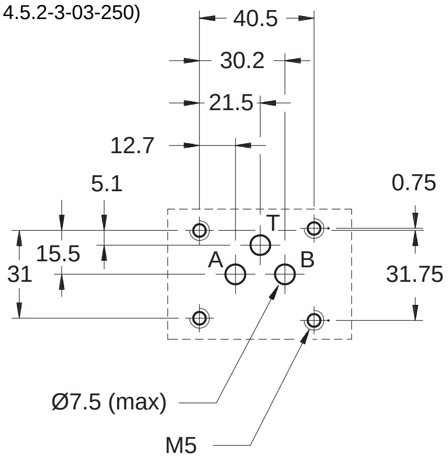
SERIES 52

SUBPLATE MOUNTING
ISO 6263-03 (CETOP 03)

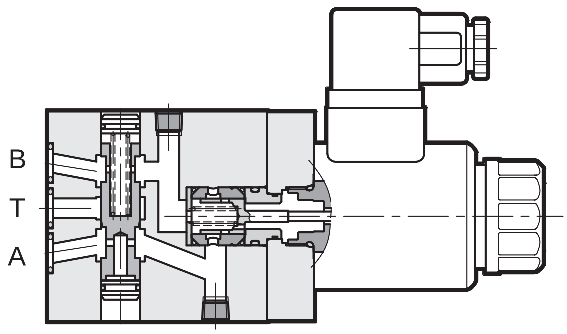
p max **250** bar
Q max (see table of performances)

MOUNTING INTERFACE

ISO 6263-03-03-*-97
(CETOP 4.5.2-3-03-250)



OPERATING PRINCIPLE



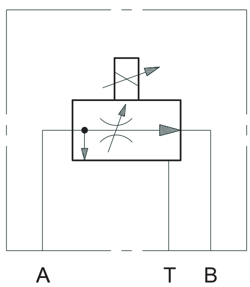
- RPCED1-*/T3 is a three-way flow control valve, pressure and temperature compensated with electric proportional control and mounting interface in compliance with ISO 6263 (CETOP RP121H) standards.
- This valve controls the flow to the circuit, by dumping the exceeding oil flow to the tank.
- Flow rate 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 p 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



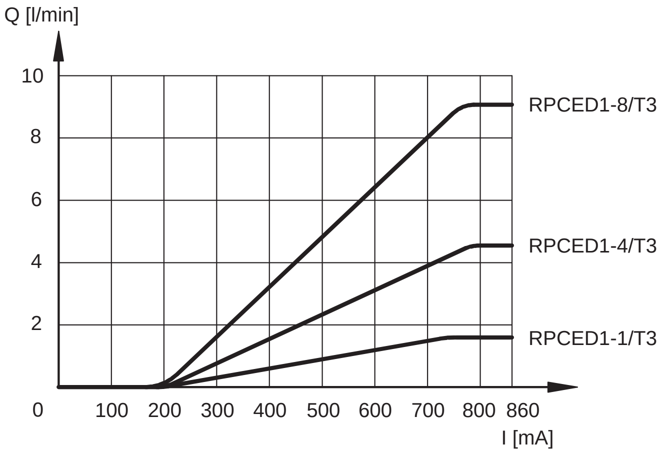
1 - IDENTIFICATION CODE

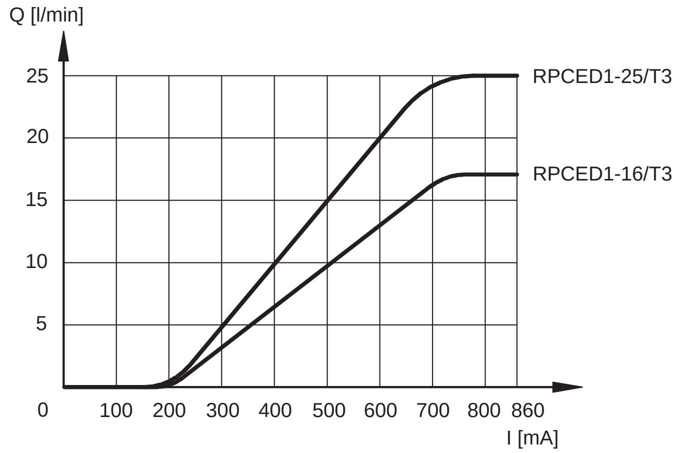
R	P	C	E	D	1	-		/	T3	/	52	-	24	/	

- R P C: Compensated flow control valve
- E: Electric proportional control
- D: Open loop control
- 1: Size ISO 6263 (CETOP 03)
- Maximum controlled flow:
  - **1** = 1,5 l/min
  - **4** = 4 l/min
  - **8** = 8 l/min
  - **16** = 16 l/min
  - **25** = 25 l/min
- T3: Three-way version
- 52: Series No. (from 50 to 59 sizes and mounting dimensions remain unchanged)
- 24: 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)

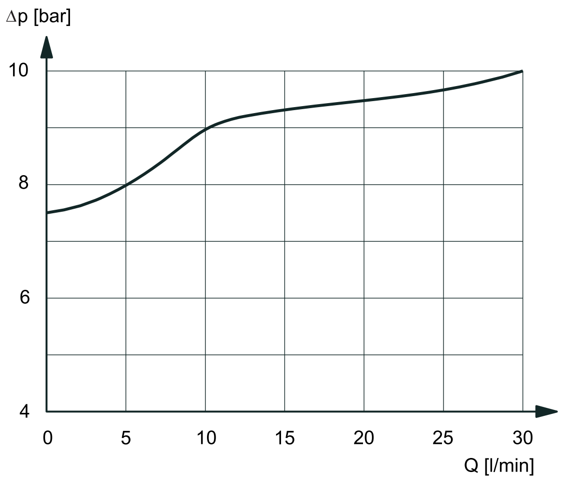
FLOW CONTROL Q=f(I)





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 p=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)		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)

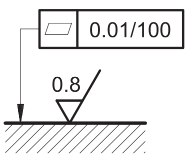
Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.
The table illustrates typical response times with valve flow rate of 16 l/min and with input pressure of 100 bar.

REFERENCE SIGNAL STEP	0 100%	100 0%	25 75%	75 25%
Step response [ms]	60	80	50	70

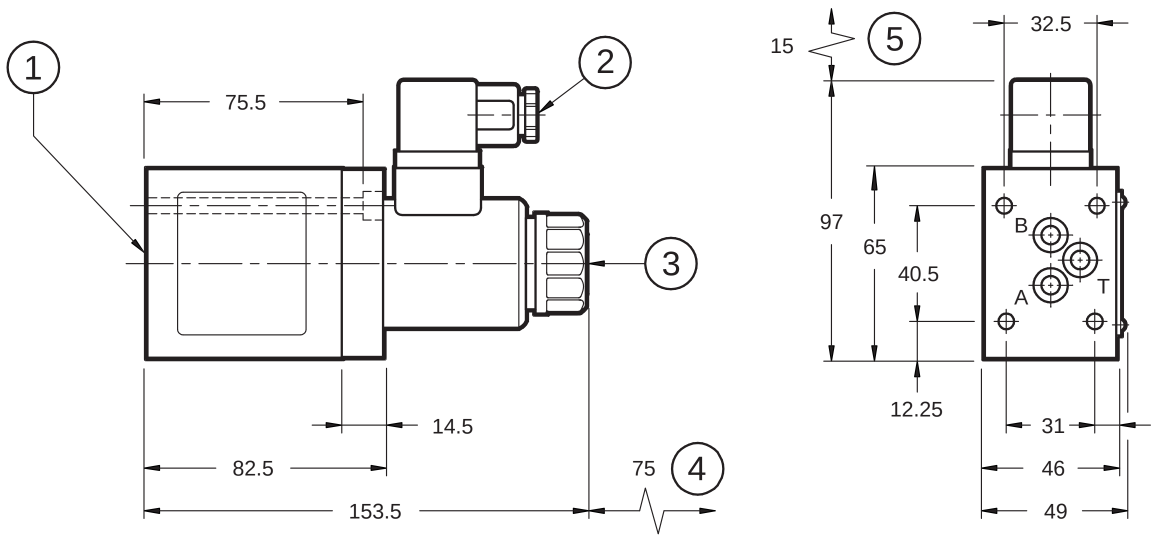
8 - INSTALLATION

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.

Surface finishing



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	3/8Ž BSP

DUPLOMATIC OLEODINAMICA
DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

QDE*

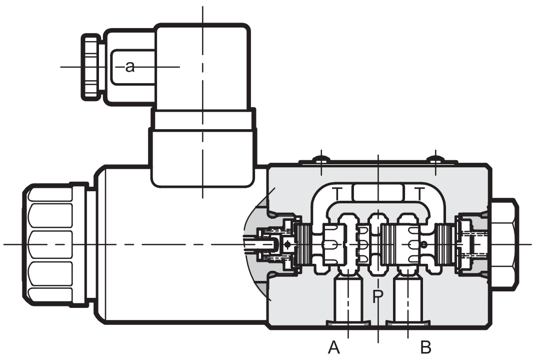
DIRECT OPERATED FLOW CONTROL VALVE WITH PROPORTIONAL CONTROL AND COMPENSATION

SERIES 10

SUBPLATE MOUNTING
ISO 6263-03 (CETOP 03)
ISO 4401-05 (CETOP 05)

p max **250** bar
Q max **80** l/min

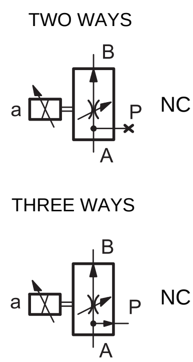
OPERATING PRINCIPLE



- The QDE* are a compensated flow control valves with pressure compensation and proportional electric control, with mounting surface according to ISO 6263-03 and ISO 4401-05 (CETOP RP121H), supplied with 2 or 3 way design, depending on the use of port P.
- This valve is used for the regulation of the flow in branches of a hydraulic circuit or for the speed control of hydraulic cylinders.
- The flow can modulated continuously in proportion to the current supplied by the solenoid
- The valve can be controlled directly from a current controlled power supply or with an integrated electronic, which allow to fully exploit the performance of the valve.
- QDE* valves are available in two sizes, for 5 flow adjustment ranges of up to 80 l/min.

PERFORMANCES (Obtained with mineral oil of viscosity 36 cSt at 50°C and electronic control card)		QDE3				QDE5
Maximum operating pressure	bar	250				250
Controlled flow (Q_B)	l/min	14	20	30	40	80
Minimum suggested input flow (Q_A)	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 %				< ±2 %
Repeatability	% of Q_{max}	< ± 1,5 %				
Electrical characteristics	see paragraph 6					
Fluid 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				4,6

HYDRAULIC SYMBOLS



1 - IDENTIFICATION CODE

Q	D	E	3	-		/	10		-		K1	

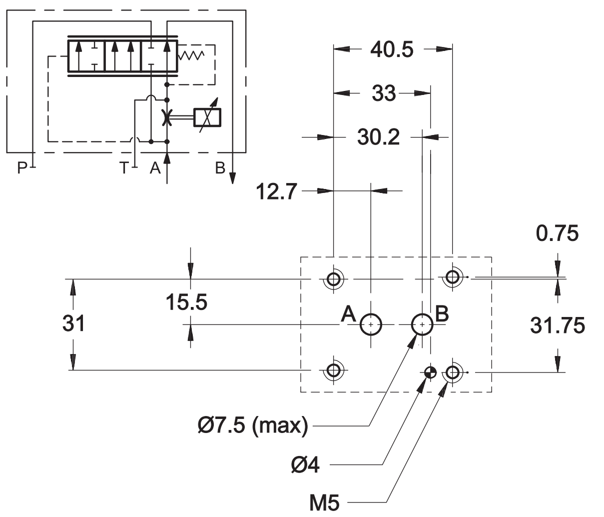
- **Q D** — Direct flow control valve pressure compensated
- **E** — Electric proportional control
- **3** = Size NG06 - ISO 6263-03 (CETOP 03)
  5 = Size NG10 - ISO 4401-05 (CETOP 05)
- Controlled flow:
  QDE3: **14** = 14 l/min; **20** = 20 l/min; **30** = 30 l/min; **40** = 40 l/min
  QDE5: **80** = 80 l/min
- **10** — 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
- **K1** — Coil electrical connection: plug for connector type DIN 43650 (**standard**)
- Manual override (see par. 12)

2 - CONFIGURATIONS AND MOUNTING INTERFACE

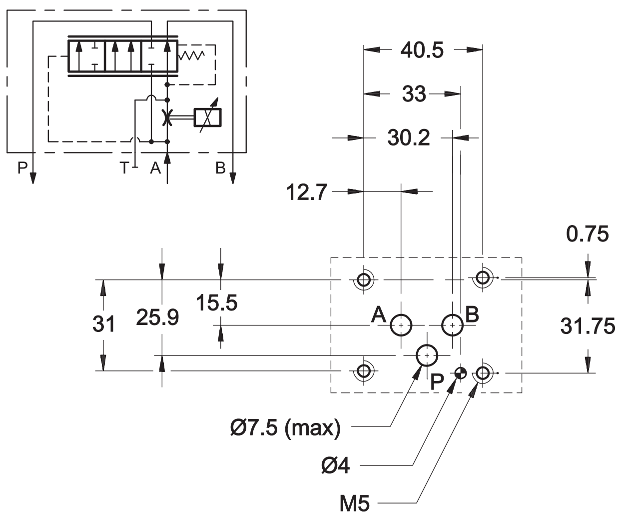
The function of two or three ways is obtained realizing the mounting interface according to ISO 6263-03 (CETOP 03) for QDE3 and ISO 4401-05 (CETOP 05) for QDE5, using the port P for three way configuration only. The port T will never be used.

To use the valve in two ways for QDE3 is also possible to interpose a subplate with plug (code 0113388 and 0530384) be ordered separately.

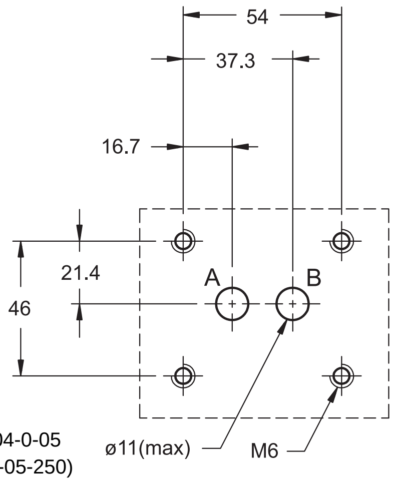
2-WAYS

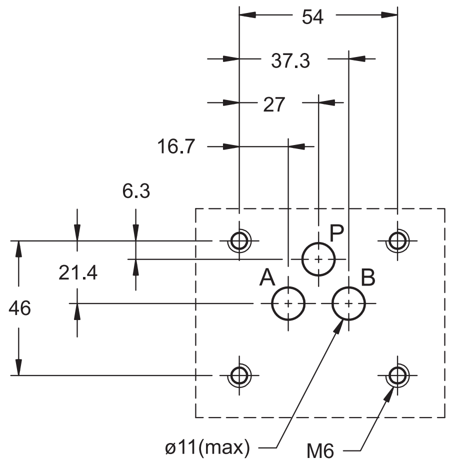


3-WAYS



ISO 6263-03-03-*-97
(CETOP 4.5.2-2-03-250)

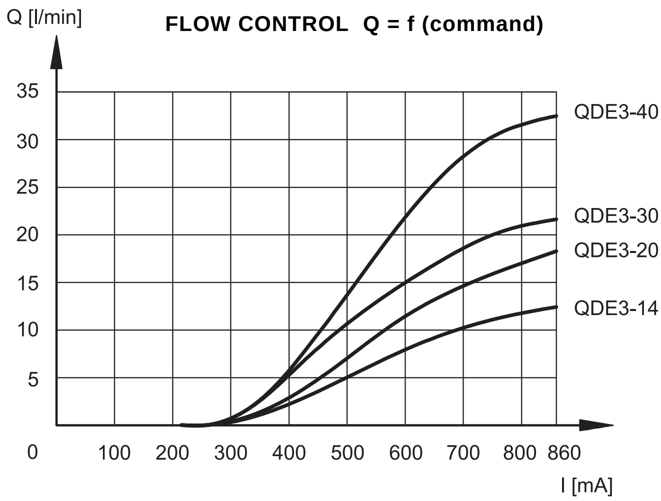


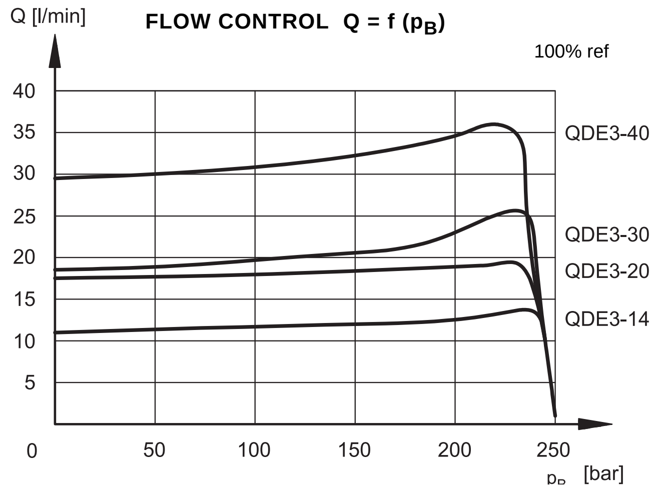


ISO 4401-05-04-0-05
(CETOP 4.5.4-05-250)

4 - CHARACTERISTIC CURVES QDE3 (obtained with viscosity of 36 cSt a 50°C)

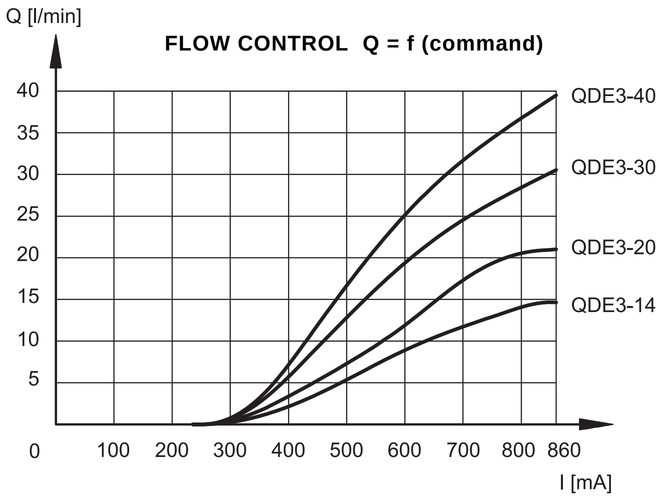
4.1 - Two ways

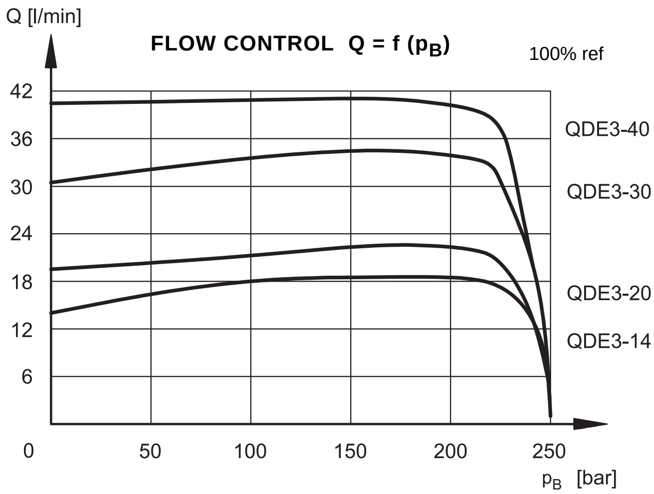




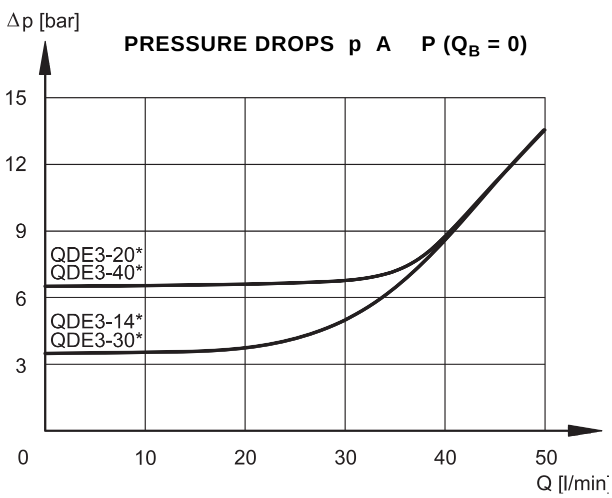
Typical flow rate characteristics A B for controlled flow rate: 14 - 20 - 30 - 40 l/min in function of the current supplied to the solenoid (D24 version, maximum current 860 mA, PWM 100 Hz)

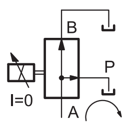
4.2 - Three ways





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)

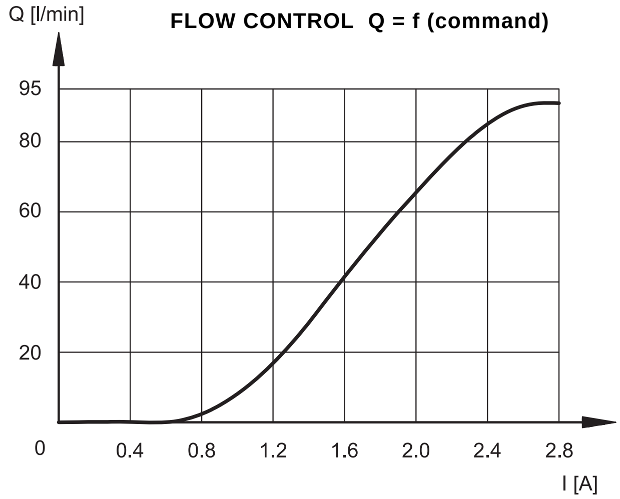


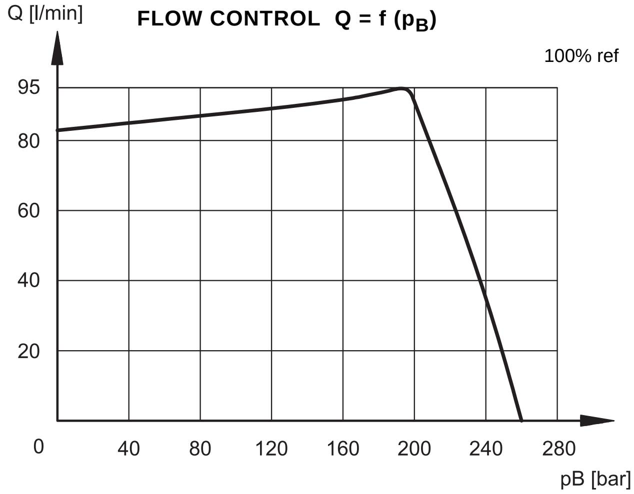


Pressure drops with flow A P.
Obtained with Q_B = 0 (no current)

4 - CHARACTERISTIC CURVES QDE5 (obtained with viscosity of 36 cSt a 50°C)

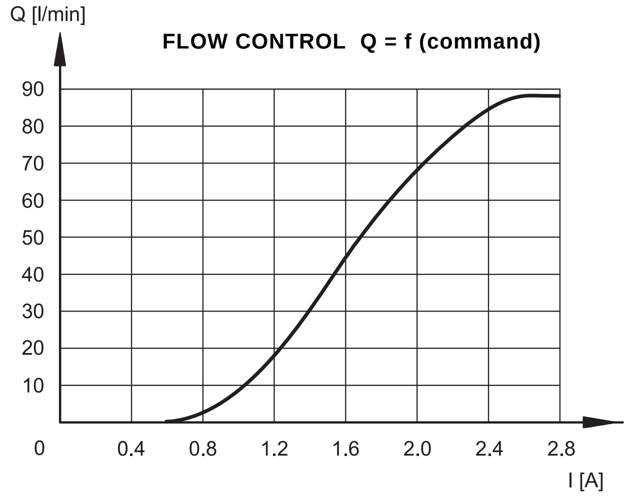
4.1 - Two ways

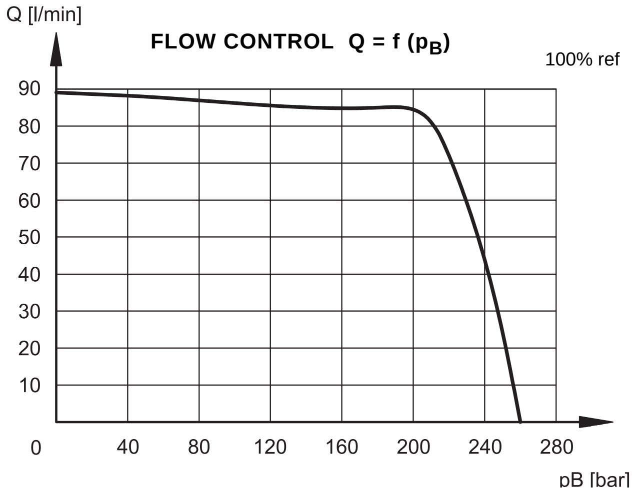




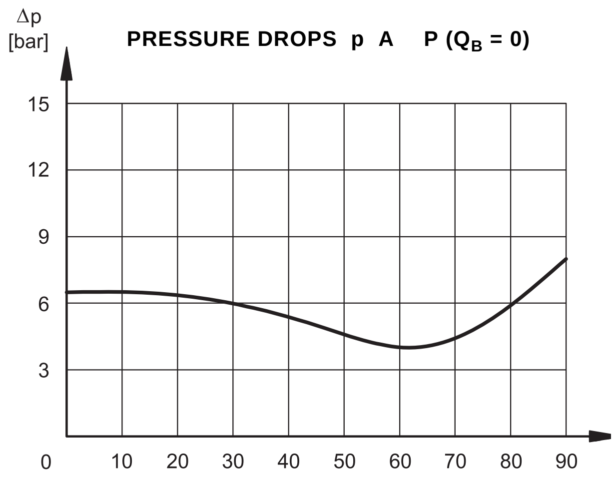
Typical flow rate characteristics A B in function of the current supplied to the solenoid (D12 version, max current 2.8 A, PWM 100 Hz).

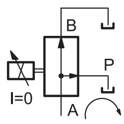
4.2 - Three ways





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 - 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 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.

NOMINAL VOLTAGE	V DC	12	24
RESISTANCE (at 20°C) QDE3 QDE5		3,66 3,2	17,6 8,65
NOMINAL CURRENT QDE3 QDE5	A	1,88 2,8	0,86 1,6
PWM FREQUENCY QDE3 QDE5	Hz	200 100	100 100
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		

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 flow value following a step change of reference signal.

The table illustrates typical response times with p = 8 bar.

REFERENCE SIGNAL STEP	0 100%
Step response [ms]	< 70

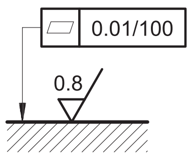
8 - INSTALLATION

QDE* valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

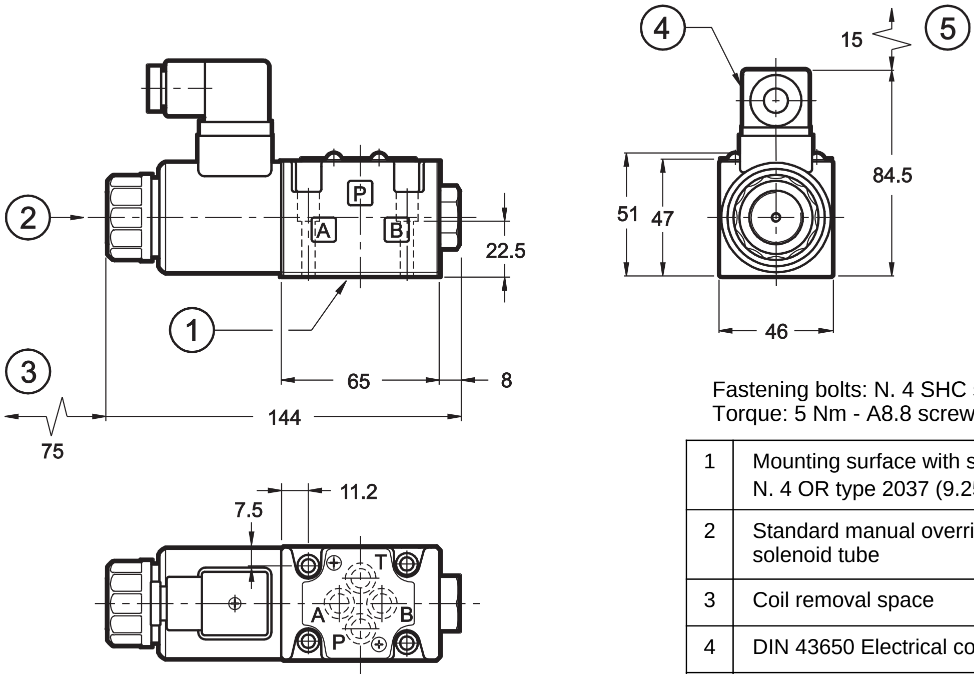
Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed fluid can easily leak between the valve and support surface.

Surface quality



9 - QDE3 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

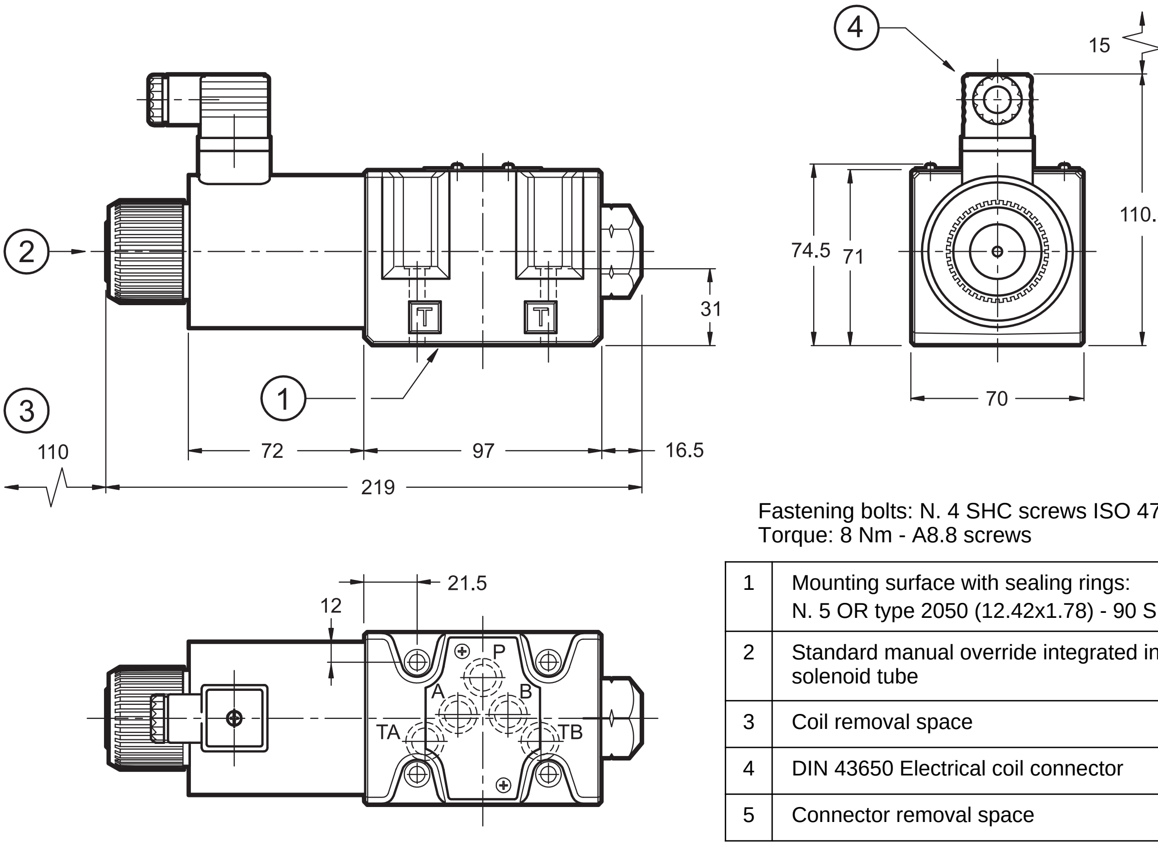


Fastening bolts: N. 4 SHC screws ISO 4762 M5x30
Torque: 5 Nm - A8.8 screws

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	Coil removal space
4	DIN 43650 Electrical coil connector
5	Connector removal space

10 - QDE5 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



Fastening bolts: N. 4 SHC screws ISO 4762 M6x40
Torque: 8 Nm - A8.8 screws

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	DIN 43650 Electrical coil connector
5	Connector removal space

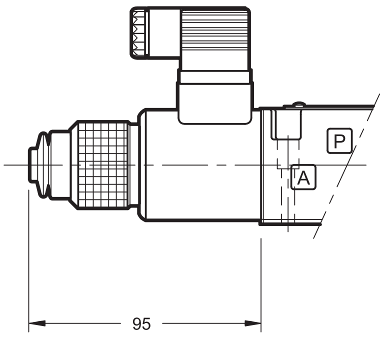
11 - MANUAL OVERRIDE

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.

On demand, there are three types of manual override:

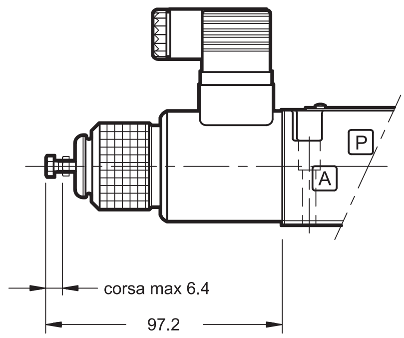
- **CM** version, manual override belt protected (available only for QDE3).
- **CS** version, with metal ring nut provided with a M4 screw and a blocking locknut to allow the continuous mechanical operations (available only for QDE3).
- **CK** version, knob. When the set screw is screwed and its point 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



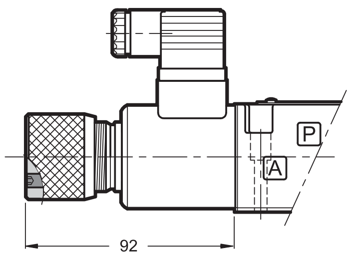
Code: 3803210003

CS Version



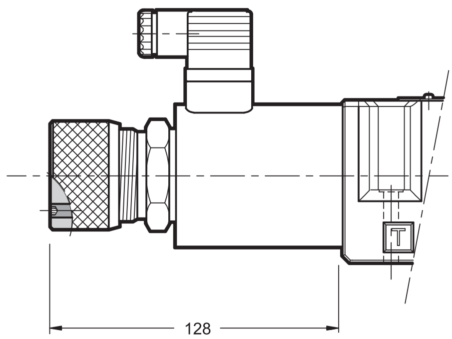
Code: 3803210004

CK Version for QDE3



Spanner for set screw: 3 mm.
Code: 3803210005

CK Version for QDE5



Spanner for set screw : 3 mm.
Code: 3803260003

12 - ELECTRONIC CONTROL UNITS

QDE3

EDC-111	24V DC solenoids	plug version	see cat. 89 120
EDC-142	12V DC solenoids		
EDM-M111	24V DC solenoids	rail mounting DIN EN 50022	see cat. 89 250
EDM-M142	12V DC solenoids		

QDE5

EDC-131	24V DC solenoids	plug version	see cat. 89 120
EDC-151	12V DC solenoids		
EDM-M131	24V DC solenoids	rail mounting DIN EN 50022	see cat. 89 250
EDM-M151	12V DC solenoids		

DUPLOMATIC OLEODINAMICA
DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

DUPLOMATIC OLEODINAMICA

RPCER1

DIRECT OPERATED FLOW CONTROL VALVE WITH ELECTRIC PROPORTIONAL CONTROL AND POSITION FEEDBACK

SERIES 52

SUBPLATE MOUNTING

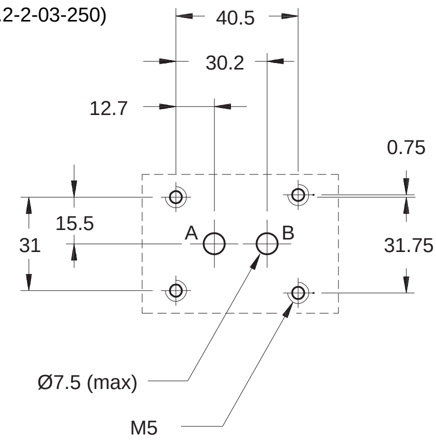
ISO 6263-03 (CETOP 03)

p max **250** bar

Q max (see performances table)

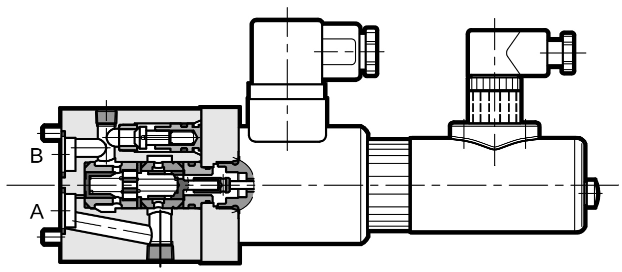
MOUNTING INTERFACE

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 (CETOP 03), must not have P and T ports

OPERATING PRINCIPLE

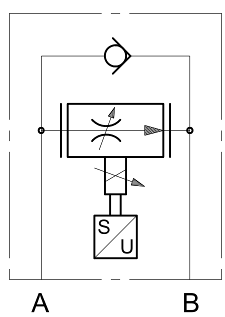


- RPCER1 is a pressure and temperature compensated two-way flow control valve, with electric proportional control and mounting interface in accordance with the ISO 6263 (CETOP RP121H) standards.
- The position feedback of the flow rate controlling throttle gives regulation conditions featuring highly reduced hysteresis and high repeatability.
- It is normally used to control the flow rate into an arm of the hydraulic circuit or the speed of the hydraulic actuators.
- The flow rate can be modulated continuously in proportion to the reference signal sent to 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 UEIK-11RSQ/52-24 electronic card)

Maximum operating pressure Minimum p 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 paragraph 7	
Hysteresis	% of Q max	< 2,5%
Repeatability	% of Q max	< ±1%
Electrical characteristic	see paragraph 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



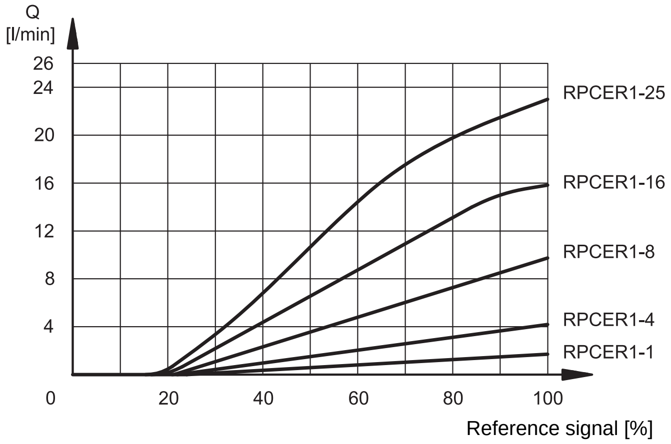
1 - IDENTIFICATION CODE

R	P	C	E	R	1	-		/	C	/	52	-	24	/	

- RPC: Compensated flow control valve
- E: Electric proportional control
- R: Position feedback
- 1: ISO 6263 (CETOP 03) size
- Maximum controlled flow:
  1 = 1.5 l/min, **4** = 4 l/min, **8** = 8 l/min, **16** = 16 l/min, **25** = 25 l/min
- C: Built-in check valve
- 52: Series No. (from 50 to 59 sizes and mounting dimensions remain unchanged)
- 24: Nominal solenoid voltage 24 V DC
- Seal: omit for mineral oils
  V = FPM seals for special fluids

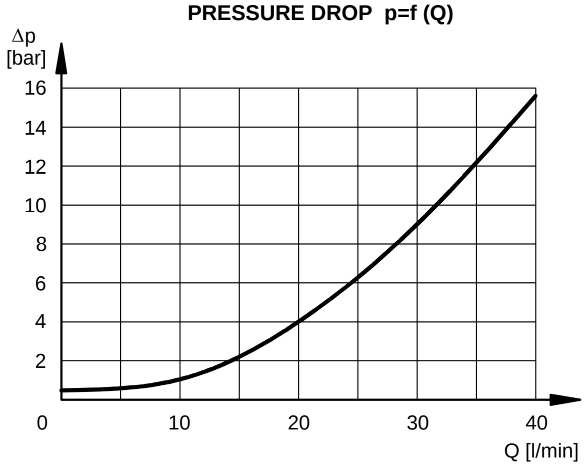
2 - CHARACTERISTIC CURVES (measured with viscosity of 36 cSt at 50°C and UEIK-11RSQ/52-24 card)

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 p=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 control unit.

NOMINAL VOLTAGE	V DC	**24**
RESISTANCE (at 20°C)		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	

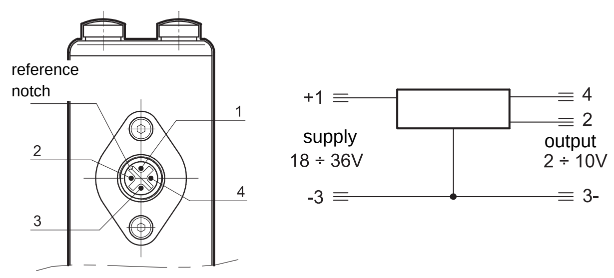
6.2 - Positional transducer
The feedback control version RPCER1 uses an LVDT type positional transducer with amplified signal to enable precise control of the restrictor and the set flow rate, thus improving repeatability and hysterisis characteristics.

The transducer is fitted coaxially on the proportional solenoid and the connector features 360° positioning.

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. 10)
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



7 - STEP RESPONSE (measured with mineral oil with viscosity of 36 cSt at 50°C with UEIK-11RSQ/52-24 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 valve flow rate of 16 l/min and with input pressure of 100 bar.

REFERENCE SIGNAL STEP	0 100%	100 0%	25 100%	100 25%
Step response [ms]	180	150	150	120

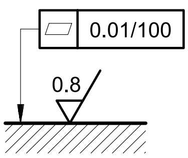
8 - INSTALLATION

RPCER1 valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

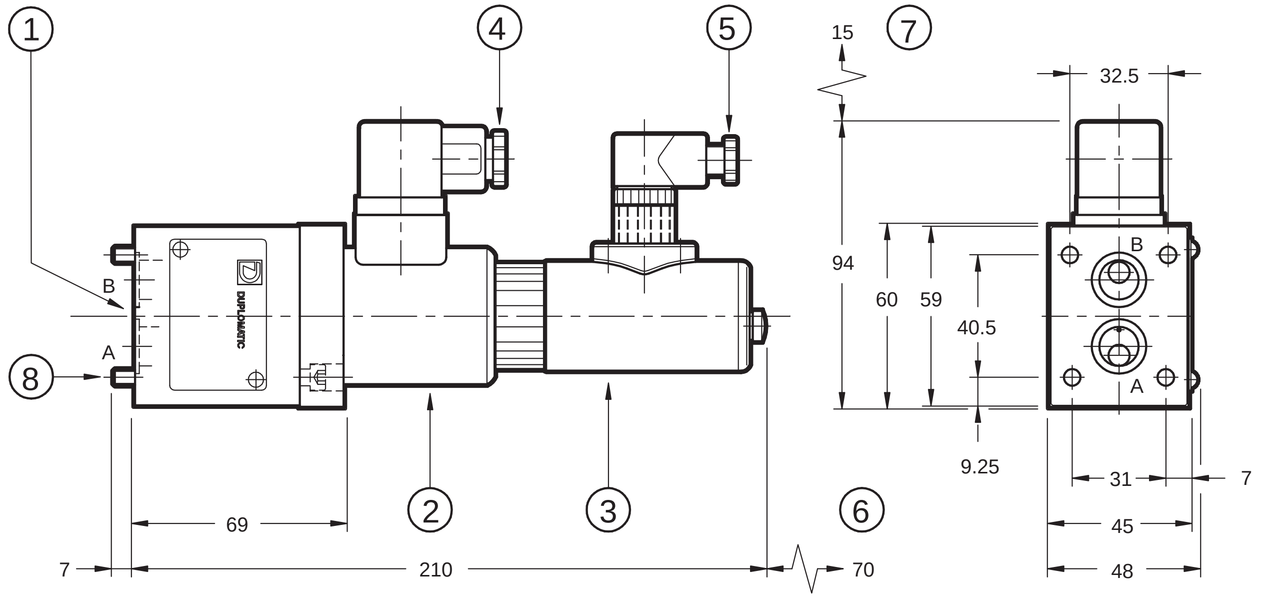
Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed fluid can easily leak between the valve and mounting surface.

Surface finishing



9 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	Mounting surface with sealing rings: 2 ORM-0140-20 (14 x 2)
2	Proportional solenoid
3	Position transducer
4	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 bolts M5 x 65 included in the supply Torque: 5 Nm

Torque: 5 Nm

10 - ELECTRONIC CONTROL UNIT

UEIK-11RSQ/52-24	Eurocard format	see cat. 89 315

11 - SUBPLATES (see cat. 51 000)

Type	PMRPC1-AI3G rear ports PMRPC1-AL3G side ports
Port dimensions	3/8Ž BSP

DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

RPCE2-*

PILOT OPERATED FLOW CONTROL VALVE WITH ELECTRIC PROPORTIONAL CONTROL

SERIES 52

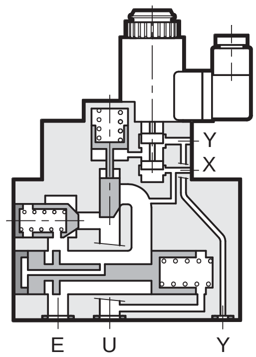
RPCE2-* **two-way**
RPCE2-*-T3 **three-way**

SUBPLATE MOUNTING
ISO 6263-06 (CETOP 06)

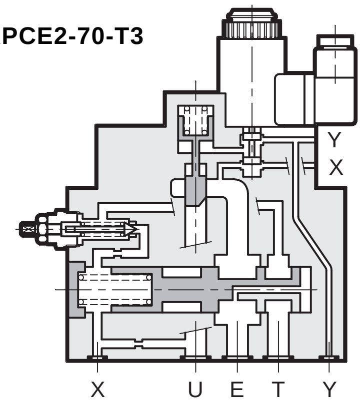
p max **250** bar
Q max (see performaces table)

OPERATING PRINCIPLE

RPCE2-*



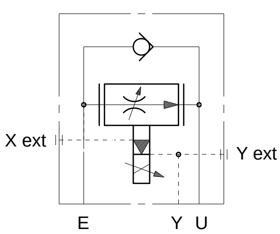
RPCE2-70-T3



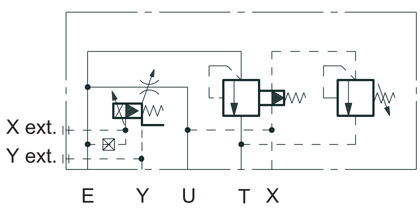
- RPCE2- * valves are two-way or three-way flow control valves with pressure and thermal compensation and electric proportional control with mounting interface in compliance with ISO 6263 (CETOP RP 121H) standards.
- These valves are normally used for flow rate control in hydraulic circuit branches and 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 by means of the relative electronic control units which enable optimal valve performance (see par. 12).
- The valves are available in four flow control ranges: three with progressive gain up to 60 l/min and the fourth with differential gain of 35 l/min.
- To ensure correct valve operation, maintain a minimum pilot control flow rate of 2 l/min and minimum pressure of 20 bar.
- Pilot control can be internal, with intake of oil from line E, or external from a line with 1/4Ž BSP connection on the pilot body.
- Drainage is always external and must be connected directly to the tank without backpressure by means of subplate connection Y (OR ø 35) or by means of a line (1/4Ž BSP coupling) on the pilot body.
- The three-way version RPCE2-70-T3 allows flow control to the circuit by dumping the exceeding flow to the tank. Maximum pressure in the circuit is limited by means of a manual adjustment relief valve which operates on the compensator pilot.
- RPCE2-70-T3 valve is also available in M version, which allows, by means of an electric control, to unload the total flow with a minimum pressure drop.

HYDRAULIC SYMBOLS

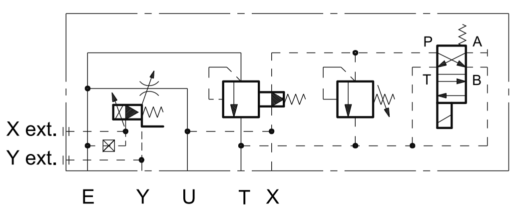
RPCE2-*



RPCE2-70-T3



RPCE2-70-T3M



1 - IDENTIFICATION CODES

1.1 - Identification code for two-way valve: RPCE2-*

R	P	C	E	2	-		/	C	/		/	52	-	24	/	

Compensated flow control valve

Electric proportional control

ISO 6263-06 (CETOP 06) size

Controlled flow rate:
35 = 37 l/min **70** = 72 l/min
30G = 35 l/min (with differential gain)

Built-in check valve

Seals:
omit for NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Nominal solenoid voltage 24 VDC

Series No. (from 50 to 59 sizes and mounting dimensions remain unchanged)

Pilot: omit for internal pilot
E = external pilot

1.2 - Identification code for three-way valve: RPCE2-70-T3

R	P	C	E	2	-	70	-	T3		/		/	52	-	24	/	

Compensated flow control valve

Electric proportional control

ISO 6263-06 (CETOP 06) size

Controlled flow rate:
70 = 80 l/min

Three-way version

Seals:
omit for NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Nominal solenoid voltage 24 V DC

Series No. (from 50 to 59 sizes and mounting dimensions remain unchanged)

Pilot: omit for internal pilot
E = external pilot

Unloading device:
omit for version without device (**standard**)
M = version with unloading valve

PERFORMANCES (obtained with mineral oil with viscosity of 36 cSt at 50°C and relevants electronic control units)

Maximum working pressure Minimum p across E and U ports Piloting pressures: min max	bar	250 10 20 160 (**NOTE 1**)
Maximum controlled flow E U (RPCE2- *) 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	22 - 35 - 40 - 60 50 - 60 - 90 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 / +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: RPCE2-* RPCE2-70-T3 RPCE2-70-T3M	kg	7,2 9

NOTE 1: Pilot must be external if the valve is used with line pressure over 160 bar.

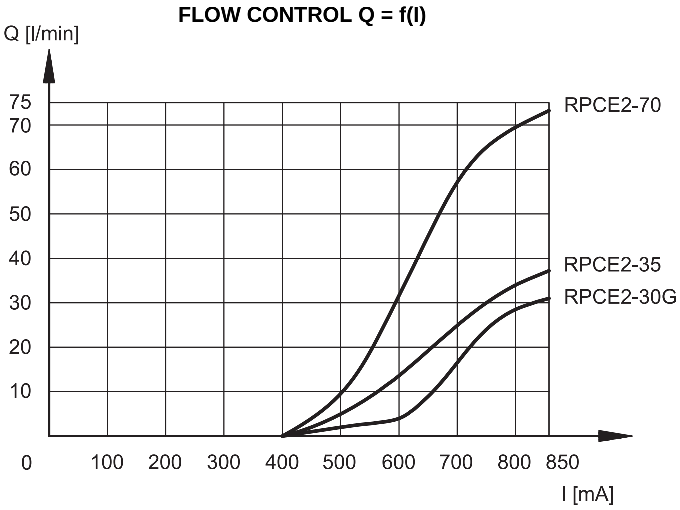
NOTE 2: Maximum recommended flow U E through the check valve (only for two-way version).

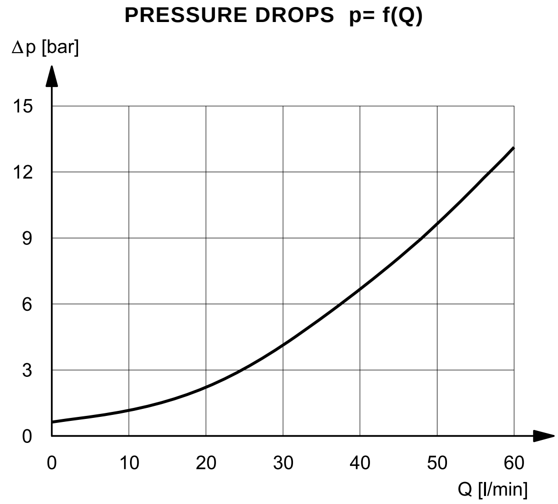
3 - HYDRAULIC FLUIDS

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

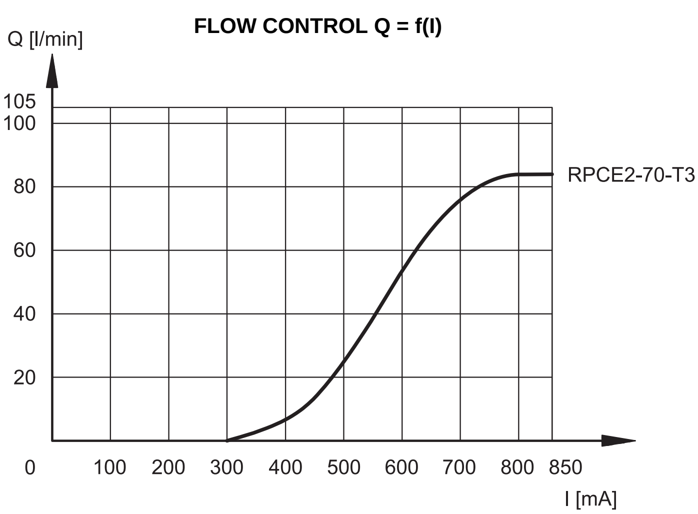


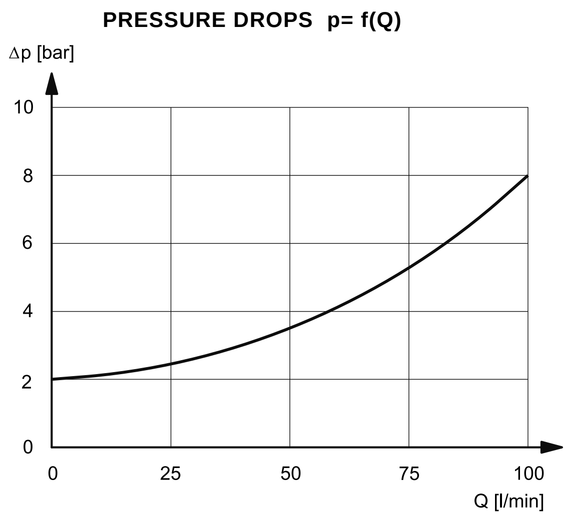


Typical flow control curves for flow rate E → U according to the current supplied to the solenoid.
The RPCE2-G version, featuring differential gain control, is particularly suitable for •FAST-SLOWŽ flow rate control as it ensures high sensitivity at low flow rates while enabling high flow rates for rapid actuator movement.

Pressure drops with free flow U → E through check valve.

4.2 - 3-way valve





Typical flow control curves for flow rate E → T , according to the current supplied to the solenoid.

Pressure drops E → T
Curve obtained with unloading electrical control (RPCE2-70-T3M)

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)		16.6
MAXIMUM CURRENT	A	0.85
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	

8 - STEP RESPONSE (with mineral oil with viscosity of 36 cSt at 50°C and relevants 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.
The table shows typical response times measured with valves •SŽ (40 l/min) and with an input pressure of 100 bar.

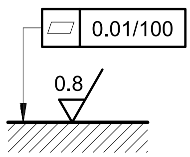
REFERENCE SIGNAL STEP	0 100%	100 0%
Step response [ms]	250	120

9 - INSTALLATION

The RPCE2-* valve, both two-way or three-way 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.

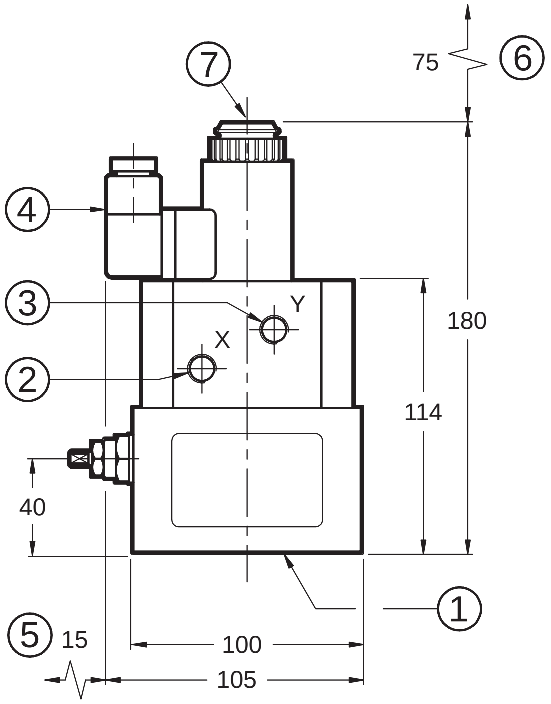
Surface finishing



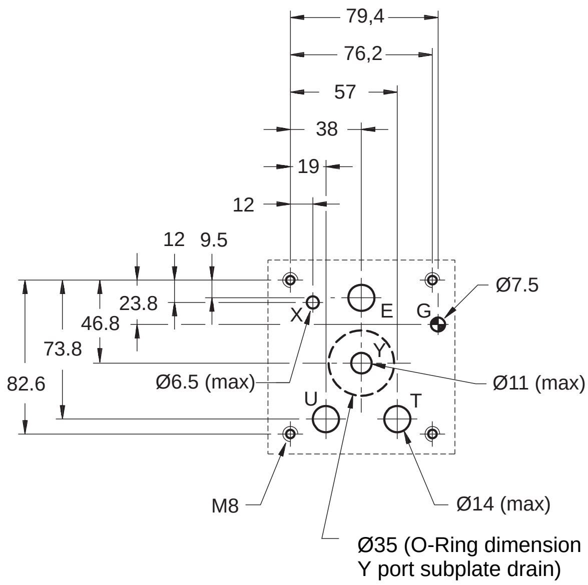
10 - ELECTRONIC CONTROL UNITS

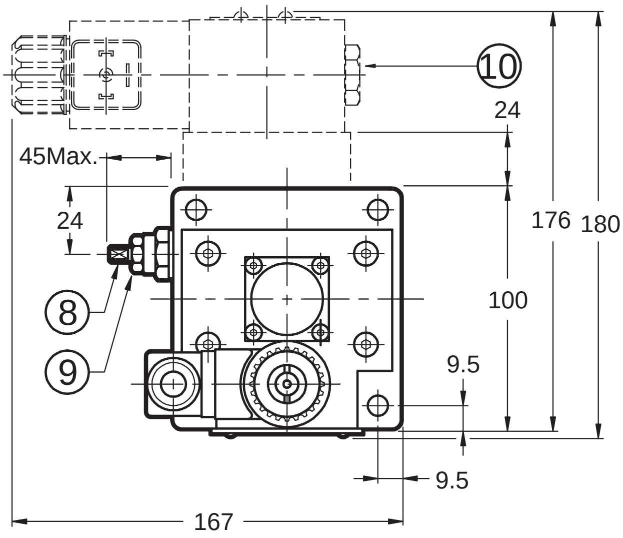
EDC-111	for solenoid 24V DC	plug version	see cat.89 120
EDM-M111	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250

11 - OVERALL AND MOUNTING DIMENSIONS THREE-WAY VALVES RPCE2-70-T3 and RPCE2-70-T3M



MOUNTING SURFACE:
ISO 6263-06-07-*-97 (CETOP 4.5.2-3-06-250)



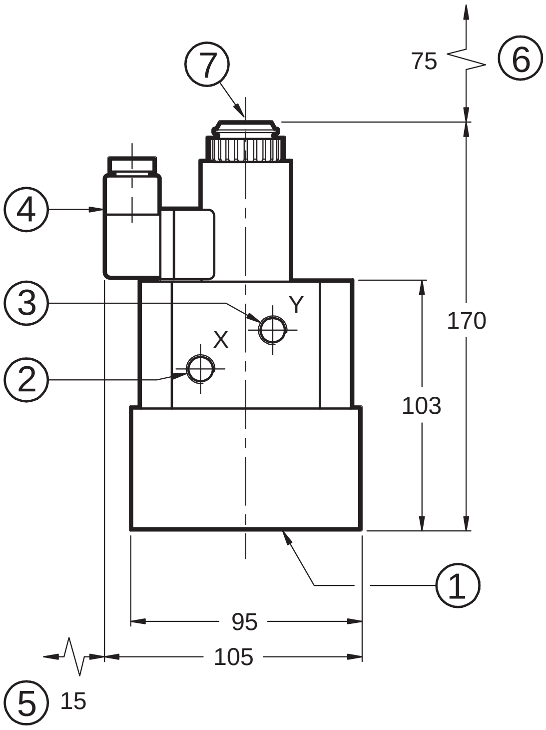


dimensions in mm

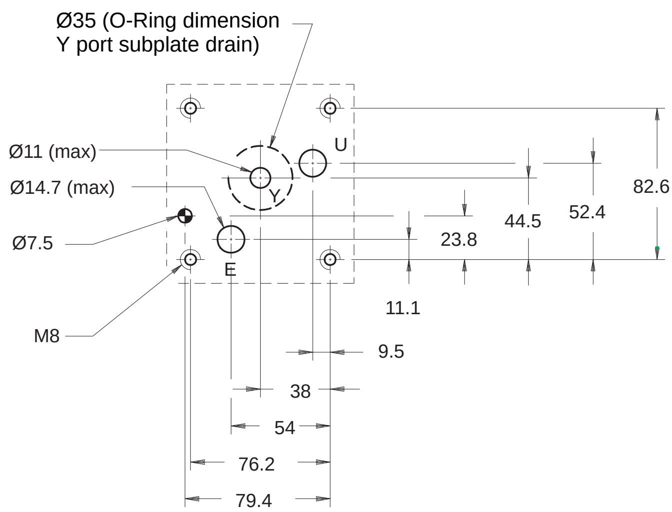
1	Mounting surface with sealing rings: 3 OR type 119 (15.08x2.62) 1 OR type 2125 (31.47x1.78) 1 OR type 109 (19.13x2.62)
2	External pilot port X: 1/4Ž BSP
3	Drain port Y: 1/4Ž BSP if mounting interface port is not used
4	DIN 43650 electric connector
5	Connector removal space
6	Coil removal space
7	Breather (male hexagonal spanner 4)
8	Pressure relief valve - adjustment screw: square spanner 6 - pressure adjustment range up to 210 bar - default setting: minimum
9	Locking nut: spanner 13
10	Unloading solenoid valve type DS3-TB (only for version RPCE2 -*-T3M) - solenoid valve OFF = flow unloading at minimum pressure - solenoid valve ON = unloading pressure controlled by pressure relief valve 8

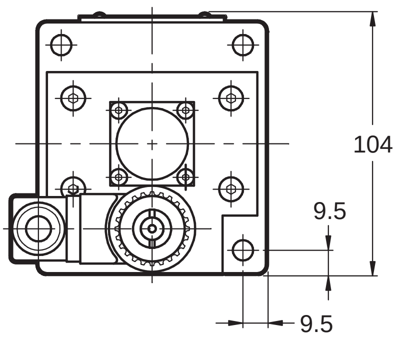
Fastening bolts: 4 bolts M8x75
Torque: 20 Nm

12 - OVERALL AND MOUNTING DIMENSION TWO-WAY VALVE RPCE2-*



MOUNTING SURFACE:
ISO 6263-06-05-*-97 (CETOP 4.5.2-2-06-250)





dimensions in mm

1	Mounting surface with sealing rings: 2 OR type 119 (15.08x2.62) 1 OR type 2125 (31.47x1.78)
2	External pilot port X: 1/4Ž BSP
3	Drain port Y: 1/4Ž BSP if mounting interface port is not used
4	DIN 43650 electric connector
5	Connector removal space
6	Coil removal space
7	Breather (male hexagonal spanner 4)

Fastening bolts: 4 bolts M8x60
Torque: 20 Nm

13 - SUBPLATES (see catalogue 51 000)

The valve must have the Y drain with external pipe when using the subplates listed below.

	RPCE2-* two way version	**RPCE2-*-T3** three way version
Type	PMRPC2-AI4G rear ports	PMRPCQ2-AI4G rear ports
E, U, T ports threading	1/2Ž BSP	1/2Ž BSP
X port threading	-	1/4Ž BSP

DUPLOMATIC OLEODINAMICA
DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

RPCE3-*

PILOT OPERATED FLOW CONTROL VALVE WITH ELECTRIC PROPORTIONAL CONTROL

SERIES 52

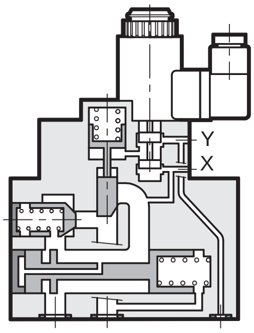
RPCE3-*	**two-way**
RPCE3-100-T3	**three-way**

SUBPLATE MOUNTING
ISO 6263-07 (CETOP 07)

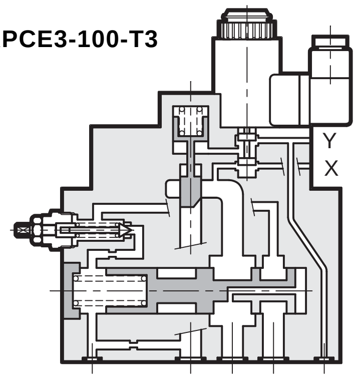
p max **250** bar
Q max (see performances table)

OPERATING PRINCIPLE

RPCE3-*



RPCE3-100-T3



„ RPCE3- * valves are two-way or three-way ”ow control valves with pressure and thermal compensation and electric proportional control with mounting interface in compliance with ISO 6263 (CETOP RP 121H) standards.

„ These valves are normally used for ”ow 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 by means of the relative electronic control units which enable optimal valve performance (see paragraph 12).

„ The valves are available in two ”ow control ranges of 100 l/min, with progressive gain or with differential gain.

„ To ensure correct valve operation, maintain a minimum pilot control ”ow rate of 2 l/min and minimum pressure of 20 bar.

„ Pilot control can be internal, with intake of oil from line E, or external from a line with 1/4Ž BSP connection on the pilot body.

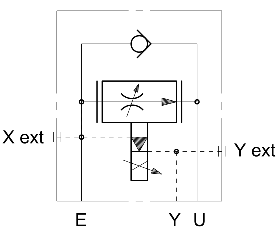
„ Drainage is always external and must be connected directly to the tank without backpressure by means of subplate connection Y (OR Ø32) or by means of a line (1/4Ž BSP coupling) on the pilot body.

„ The three-way version RPCE3-100-T3 allows ”ow control to the circuit by dumping the exceeding ”ow to the tank. Maximum pressure in the circuit is limited by means of a manual adjustment relief valve which operates on the compensator pilot.

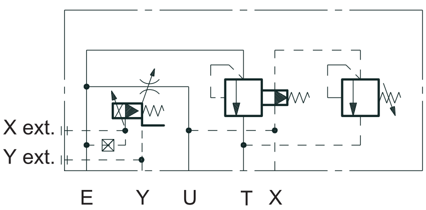
„ RPCE3-100-T3 valve is also available in /M version, which allows, by means of an electric control, to unload the total ”ow with a minimum pressure drop.

HYDRAULIC SYMBOLS

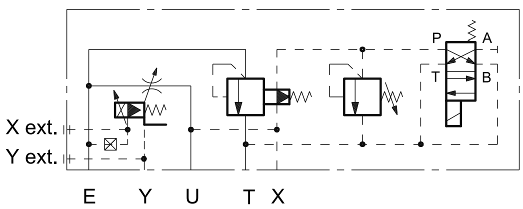
RPCE3-*



RPCE3-100-T3



RPCE3-100-T3M



1 - IDENTIFICATION CODES

1.1 - Identification code for two-way valve: RPCE3-*

R	P	C	E	3	-		/	C	/		/	52	-	24	/	

Compensated ”ow control valve

Electric proportional control

ISO 6263-07 (CETOP 07) size

Controlled ”ow rate:
100 = 100 l/min
100G = 100 l/min (with differential gain)

Built-in check valve

Pilot: omit for internal pilot
E = external pilot

Series No. (from 50 to 59 sizes and mounting dimensions remain unchanged)

Nominal solenoid voltage 24 V DC

Seals:
omit for NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

1.2 - Identification code for three-way valve: RPCE3-100-T3

R	P	C	E	3	-	100	-	T3		/		/	52	-	24	/	

Compensated ”ow control valve

Electric proportional control

ISO 6263-07 (CETOP 07) size

Controlled ”ow rate:
100 = 100 l/min

Three-way version

Unloading device:
Omit for version without device (**standard**)
M = version with unloading valve

Pilot: omit for internal pilot
E = external pilot

Series No. (from 50 to 59 sizes and mounting dimensions remain unchanged)

Nominal solenoid voltage 24 V DC

Seals:
omit for NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

PERFORMANCES (obtained with mineral oil with viscosity of 36 cSt at 50°C and the related electronic control units)

Maximum working pressure Minimum p 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 / +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: RPCE3-* RPCE3-100-T3 RPCE3-100-T3M	kg	10,8 12,6

NOTE 1: Pilot must be external if the valve id used with line pressure over 160 bar.

NOTE 2: Maximum recommended ”ow U E through the check valve (only for two-way version)

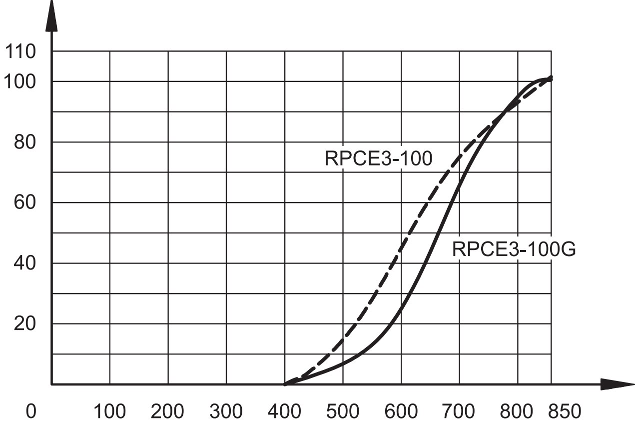
3 - HYDRAULIC FLUIDS

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.

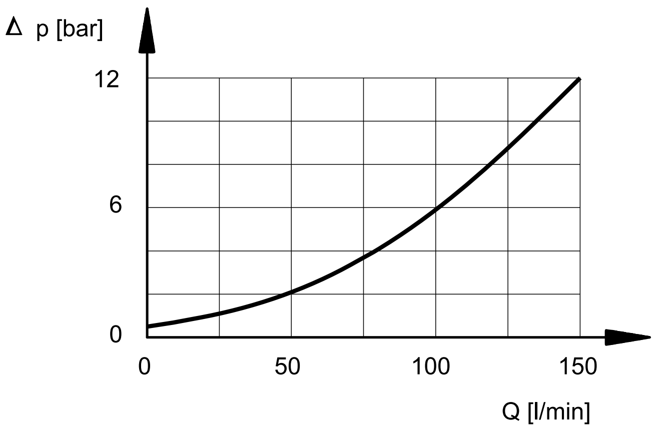
4 - CHARACTERISTIC CURVES (measured with viscosity of 36 cSt at 50°C)

4.1 2-way valve

FLOW CONTROL Q = f(I)



PRESSURE DROPS p= f(Q)

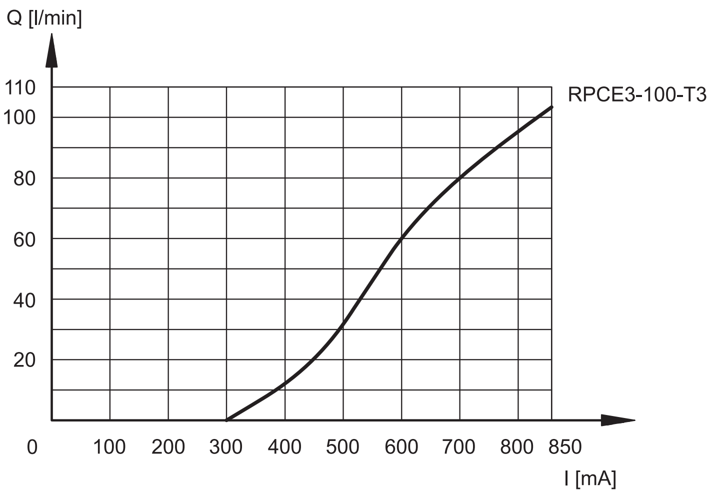


Typical ”ow control curves for ”ow rate E U , according to the current supplied to the solenoid.
The RPCE3-100G version, featuring differential gain control, is particularly suitable for •FAST-SLOWŽ ”ow rate control as it ensures high sensitivity at low ”ow rates while enabling high ”ow rates for rapid actuator movement.

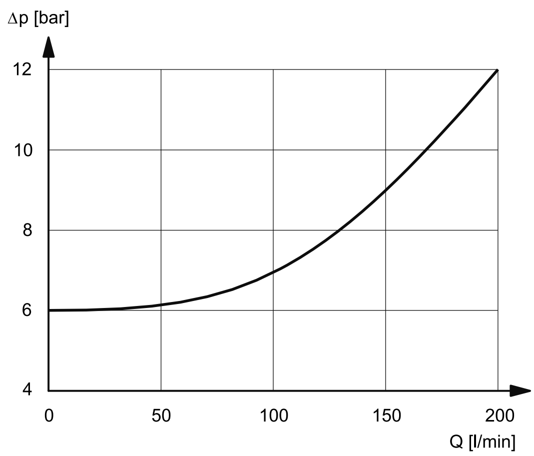
Pressure drops with free ”ow U E through the check valve

4.1 3-way valve

FLOW CONTROL Q = f(I)



PRESSURE DROPS p= f(Q)



Typical ”ow control curves for ”ow rate E U , according to the current supplied to the solenoid.

Pressure drops E T (only for three-way versions)
Curve obtained with unloading electrical control (RPCE3-100-T3M)

5 - PRESSURE COMPENSATION

The valves are equipped with two restrictors. The “rst is an opening which can be adjusted by the proportional solenoid; the se cond, controlled by the pressure upstream and downstream of the “rst restrictor ensures constant pressure drop across the adjustable restrictor. In these conditions, the set ”ow rate value is maintained constant within a tolerance range of ±3% of the set ”ow rate for maximum pres sure variation between the valve inlet and outlet chambers.

6 - THERMAL COMPENSATION

A temperature-sensitive device installed on the ”ow control element corrects the position and maintains the set ”ow rate virtua lly unchanged, also in the case of ”uid viscosity variation.
Flow rate variation remains within 2,5% of the set ”ow rate, for a ”uid 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)		16.6
MAXIMUM CURRENT	A	0.85
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2004/108/CE	
CLASS OF PROTECTION: Atmospheric agents (CEI EN 60529)	IP 65	

8 - STEP RESPONSE (with mineral oil with viscosity of 36 cSt at 50°C with the related 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.
The table shows typical response times measured with valves •SŽ (150 l/min) and with an input pressure of 100 bar.

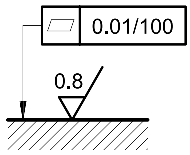
REFERENCE SIGNAL STEP	0 100%	100% 0
Step response [ms]	250	120

9 - INSTALLATION

The RPCE3 valve, both two-way or three-way versions, can be installed in any position without impairing correct operation.
Ensure that there is no air in the hydraulic circuit.

Valves are “xed by means of screws or tie rods on a ”at surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed ”uid can easily leak between the valve and support surface.

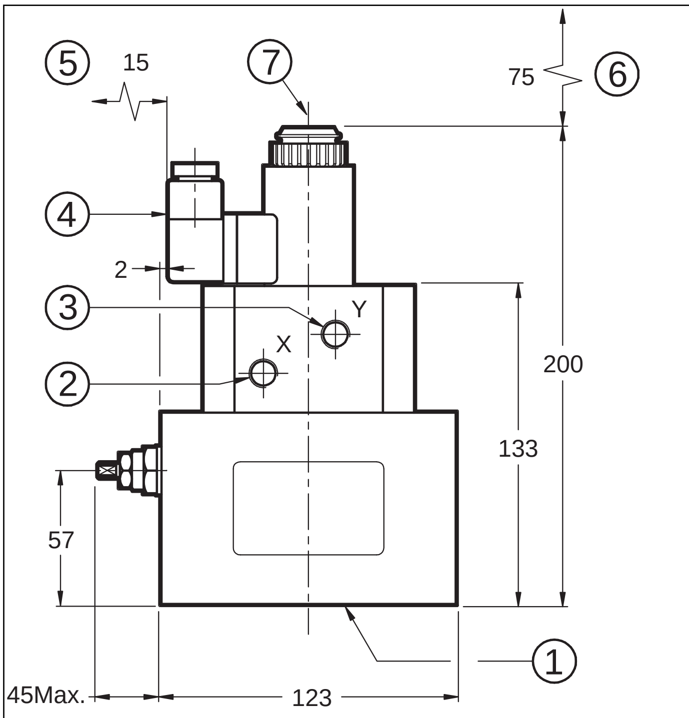
Surface “nishing



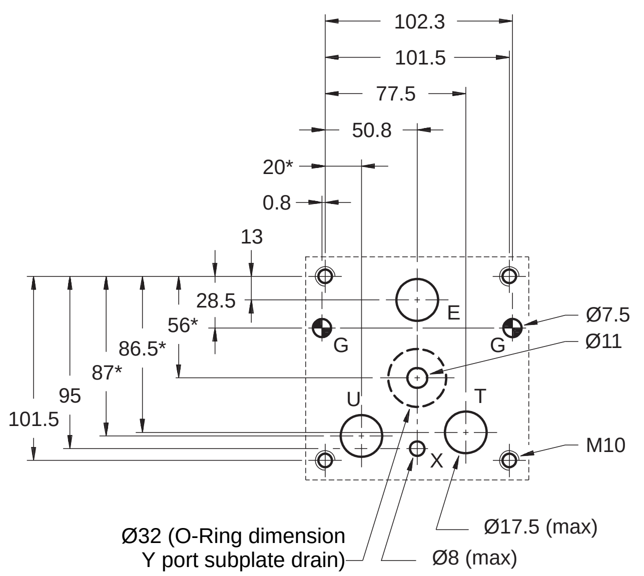
10 - ELECTRONIC CONTROL UNITS

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. 89 250

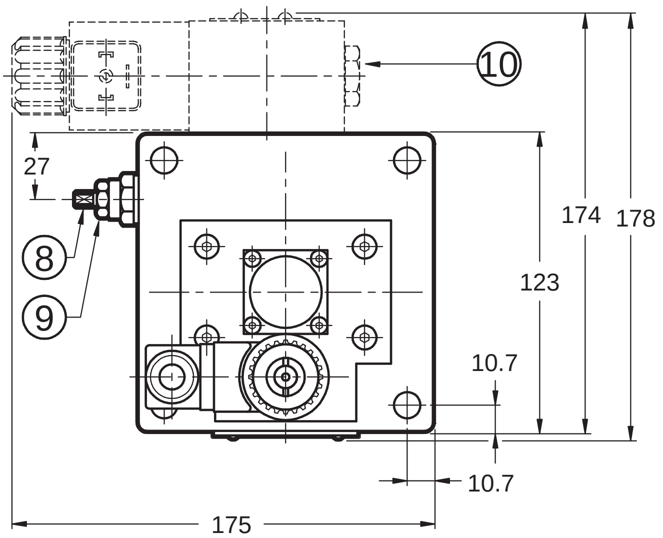
11 - OVERALL AND MOUNTING DIMENSIONS THREE-WAY VALVES RPCE3-100-T3 and RPCE3-100-T3M



MOUNTING SURFACE: ISO 6263-07-11-*-97
(CETOP 4.5.2-3-07-250)



NOTE = The dimension with the asterisk * are slightly different from ISO (CETOP) standards.

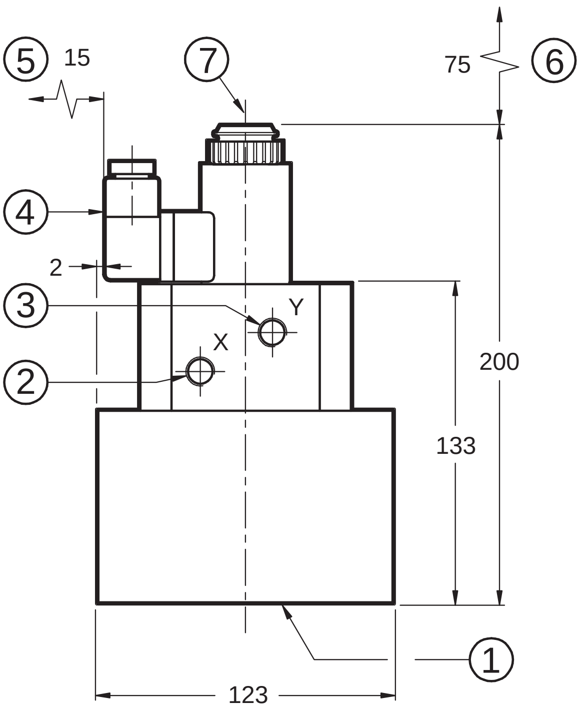


dimensions in mm

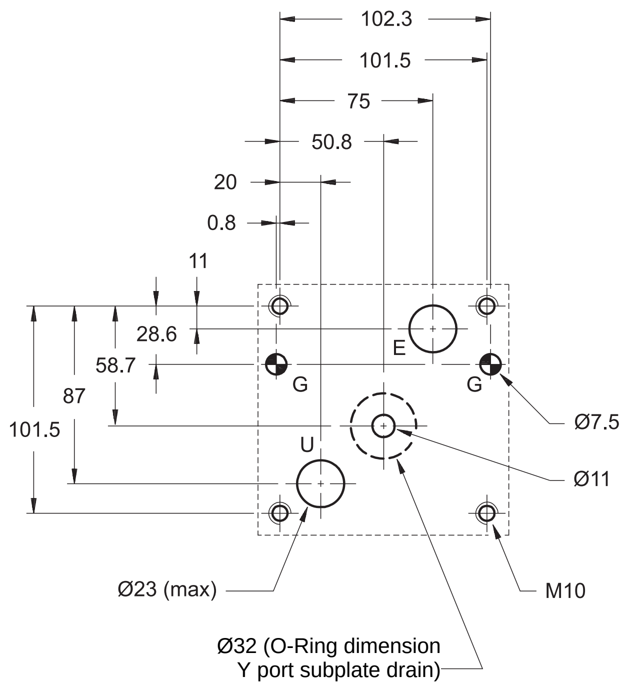
1	Mounting surface with sealing rings: N. 3 OR type 3106 (26.65x2.62) N. 1 OR type 2112 (28.30x1.78) N. 1 OR type 3050 (12.37x2.62)
2	External pilot port X: 1/4Ž BSP
3	Drain port Y: 1/4Ž BSP if mounting interface port is not used
4	DIN 43650 electric connector
5	Connector removal space
6	Coil removal space
7	Breather (hexagonal male spanner 4)
8	Pressure relief valve - adjustment screw: square spanner 6 - pressure adjustment range up to 210 bar - default setting: minimum
9	Locking nut: spanner 13
10	Unloading solenoid valve type DS3-TB (only for version RPCE3 -*-T3M) - solenoid valve OFF = flow unloading at minimum pressure - solenoid valve ON = unloading pressure controlled by pressure relief valve 8

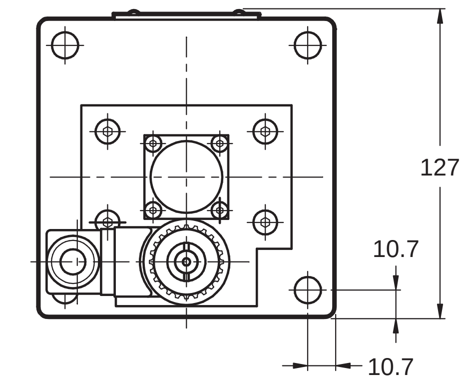
Fastening bolts: 4 bolts M10x90
Torque: 40 Nm

10 - OVERALL AND MOUNTING DIMENSIONS TWO-WAY VALVE RPCE3



MOUNTING SURFACE: ISO 6263-07-09-*-97
(CETOP 4.5.2-2-07-250)





Fastening bolts: 4 bolts M10x90
Torque: 40 Nm

dimensions in mm

1	Mounting surface with sealing rings: N. 2 OR type 3106 (26.65x2.62) N. 1 OR type 2112 (28.30x1.78)
2	External pilot port X: 1/4Ž BSP
3	Drain port Y: 1/4Ž BSP if mounting interface port is not used
4	DIN 43650 electric connector
5	Connector removal space
6	Coil removal space
7	Breather (hexagonal male spanner 4)

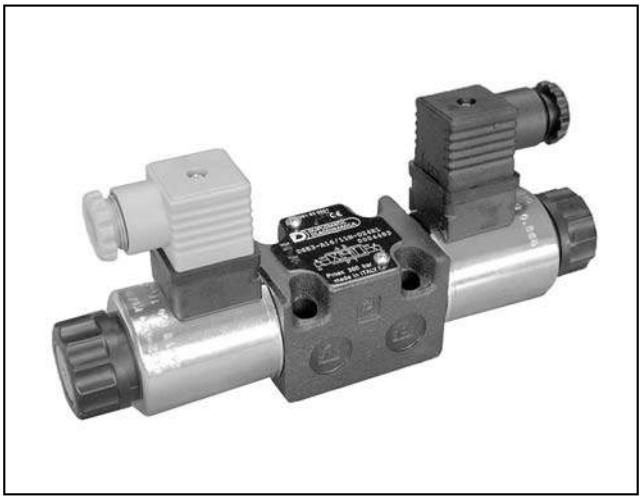
13 - SUBPLATES (see catalogue 51 000)

The valve must have the Y drain with external pipe when using the subplates listed below.

	RPCE3-* two way version	**RPCE3-*-T3** three way version
Type	PMRPC3-AI6G rear ports	PMRPCQ3-AI6G rear ports
E, U, T ports threading	1Ž BSP	1Ž BSP
X port threading	-	1/4Ž BSP

DUPLOMATIC OLEODINAMICA

DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com



DSE3

DIRECTIONAL VALVE WITH PROPORTIONAL CONTROL

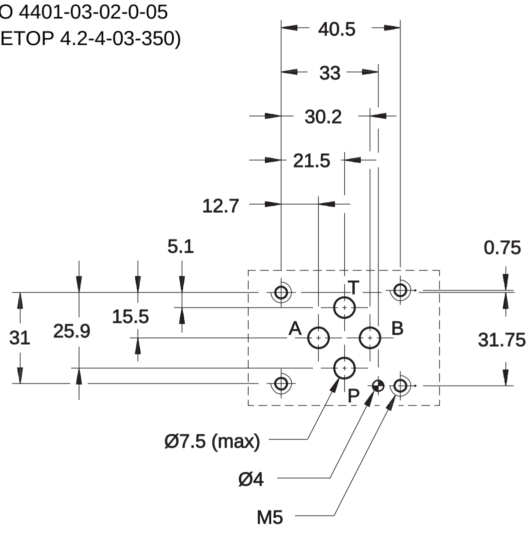
SERIES 11

SUBPLATE MOUNTING
ISO 4401-03 (CETOP 03)

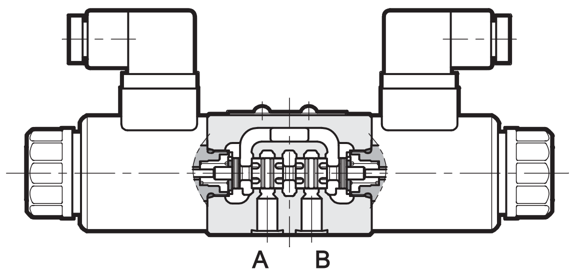
p max **350** bar
Q max **40** l/min

MOUNTING INTERFACE

ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)



OPERATING PRINCIPLE



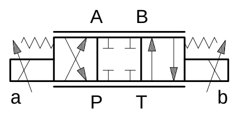
- The DSE3 valve is a directly operated directional control valve with electric proportional control and with ports, in compliance with ISO 4401 standards (CETOP RP 121H).
- It is used for directional and speed control of hydraulic actuators.
- Valve opening and hence flow rate can be modulated continuously in proportion to the current supplied to the solenoid.
- The valve can be controlled directly by a current control supply unit or by means of the relative electronic control units to exploit valve performance to the full (see paragraph 10).
- Also available with manual lever override.

PERFORMANCES (obtained with mineral oil with viscosity of 36 cSt at 50°C and with the relative electronic control units)

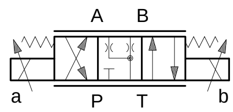
Max operating pressure: P - A - B ports T port	bar	350 210
Maximum flow with p 10 bar P-T	l/min	1,3 - 4 - 8 - 16 - 26
Step response		see chapter 6
Hysteresis (with PWM 200 Hz)	% Q_{max}	< 6%
Repeatability	% Q_{max}	< ± 1,5%
Electrical characteristics		see chapter 5
Ambient temperature range	°C	-20 / +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	1,6 2,0

HYDRAULIC SYMBOLS (typical)

DSE3-C*



DSE3-A*



1 - IDENTIFICATION CODE

D	S	E	3	-				/	11		-			/	

Directly operated directional control valve

Electric proportional control

Size ISO 4401-03 (CETOP 03)

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

NOTE:The valve is supplied with standard surface treatment of phosphatising black. On request we can supply these valves with other surface finishes.
Add suffix **/ W *** at the end of the code.

W4 = gas nitriding and oxidation process black colour

Manual override
(see par. 9)

Coil electrical connection:
K1 = plug for connector type DIN 43650 (**standard**)
K7 = plug for connector type DEUTSCH DT04-2P male

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)

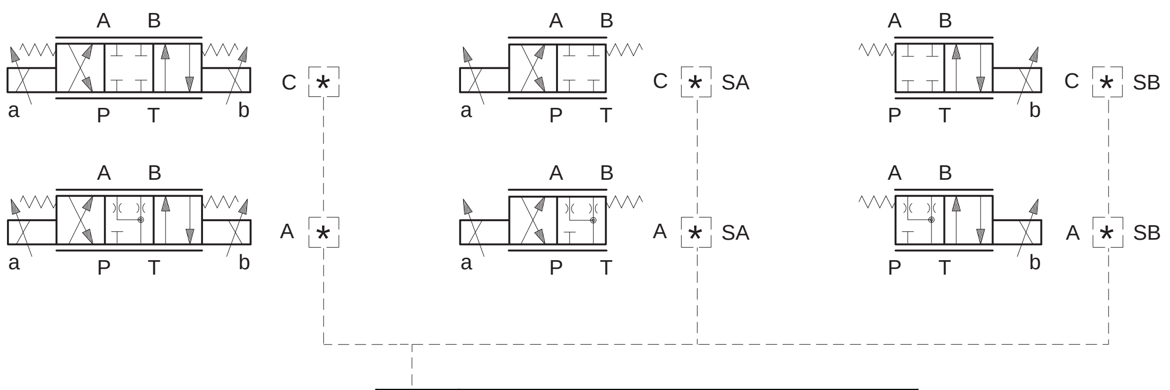
2 - CONFIGURATIONS

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**Ž configuration: 1 solenoid on side A.
2 positions (central + external) with spring centering

•**SB**Ž configuration: 1 solenoid on side B.
2 positions (central + external) with spring centering

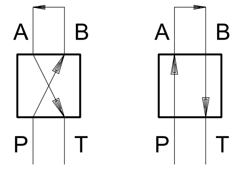


*	Controlled flow with p10 bar P-T
01	1,3 l/min (**NOTE**)
04	4 l/min
08	8 l/min
16	16 l/min
16/08	16 (P-A) / 08 (B-T) l/min
26	26 l/min
26/13	26 (P-A) / 13 (B-T) l/min

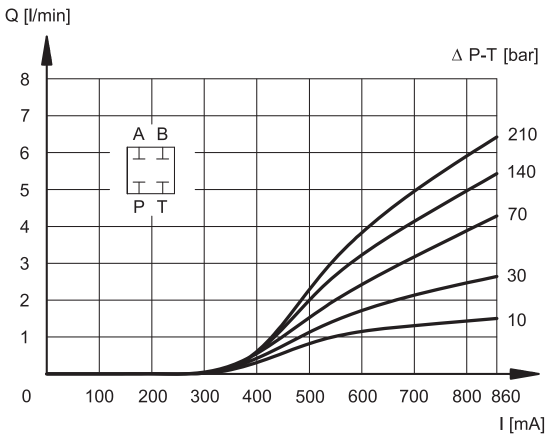
NOTE: the 01 spool is available in version **C** (closed center) only.

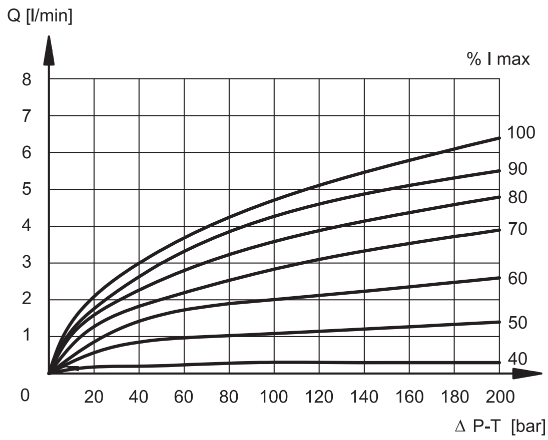
3 - CHARACTERISTIC CURVES (values measured with viscosity of 36 cSt at 50°C with valves connected to the relative electronic control units)

Typical constant flow rate control curves at p according to current supply to solenoid (D24 version, maximum current 860 mA), measured for the various spool types available.
The reference p values are measured between ports P and T on the valve.

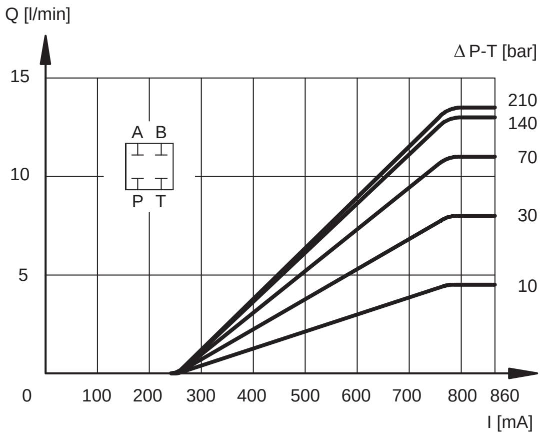


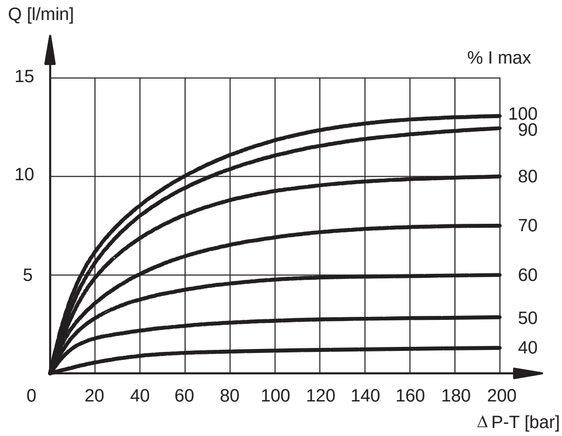
SPOOL TYPE C01



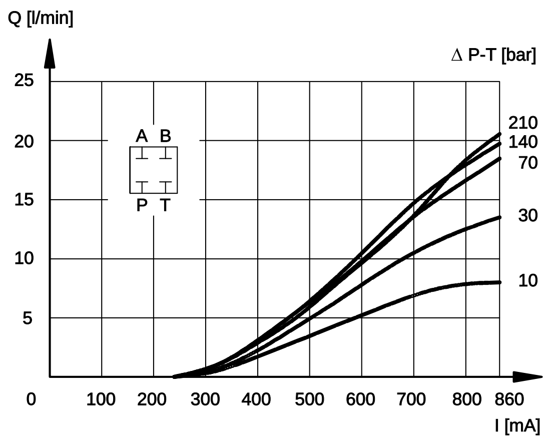


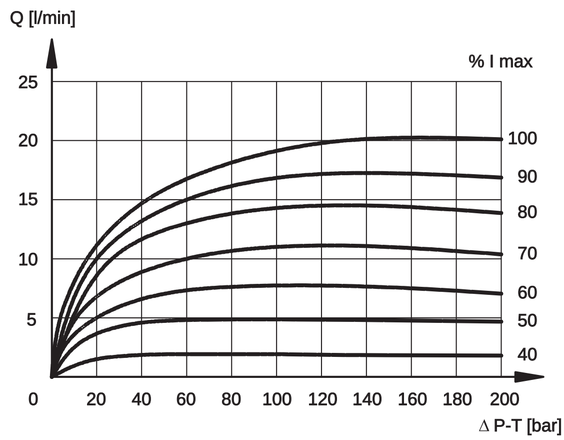
SPOOL TYPE C04



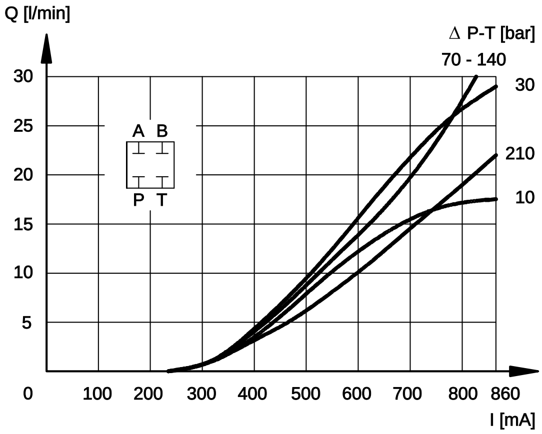


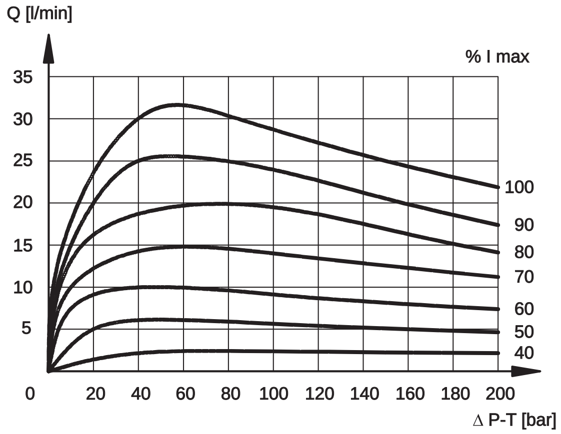
SPOOL TYPE C08



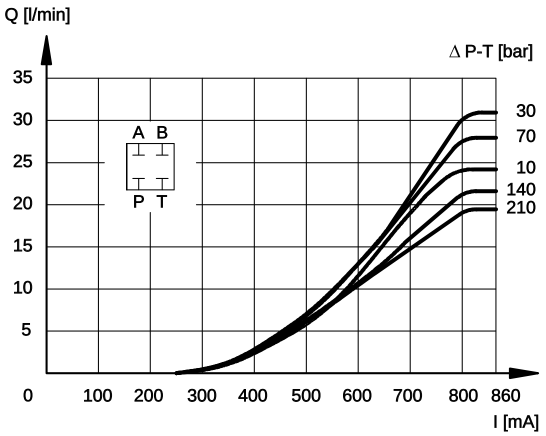


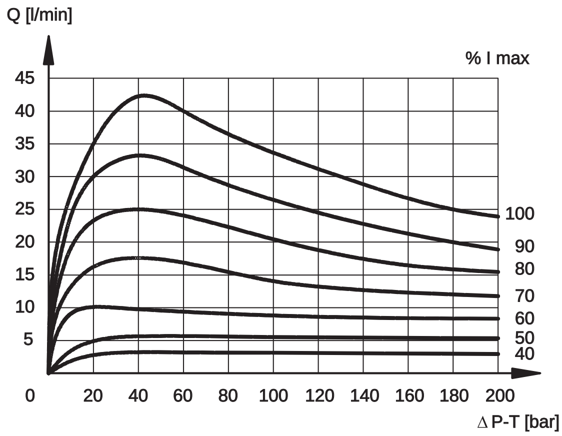
SPOOL TYPE C16



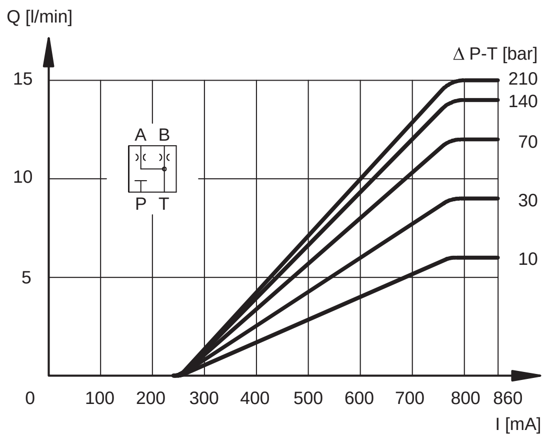


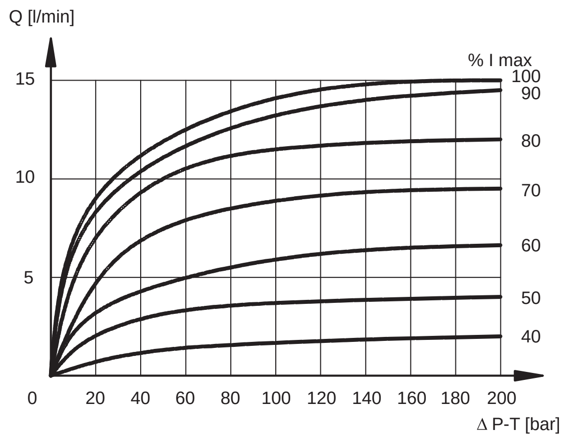
SPOOL TYPE C26



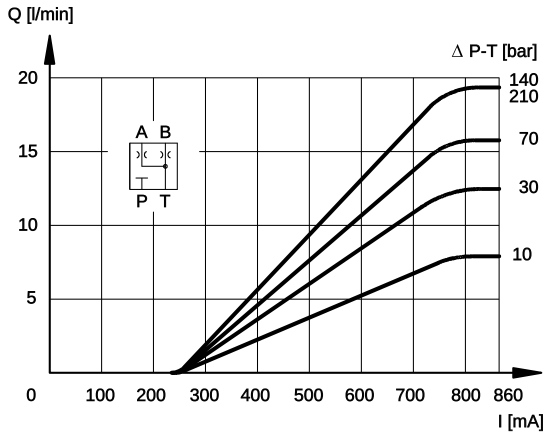


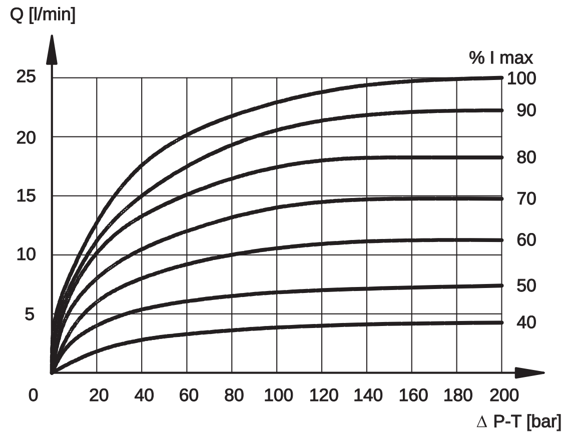
SPOOL TYPE A04



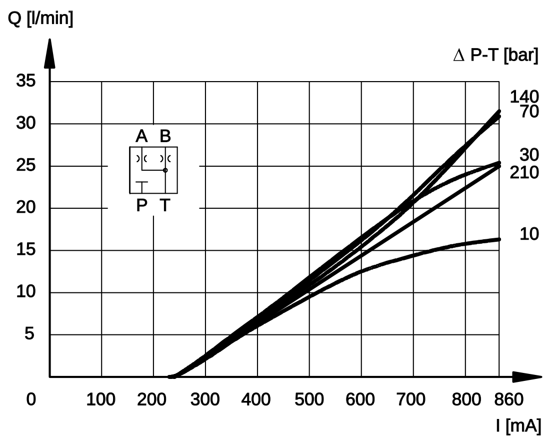


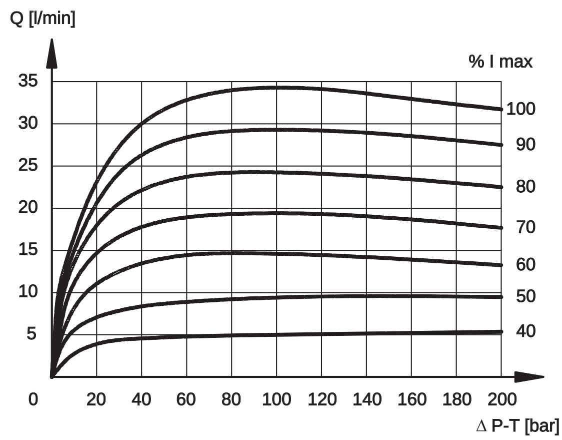
SPOOL TYPE A08



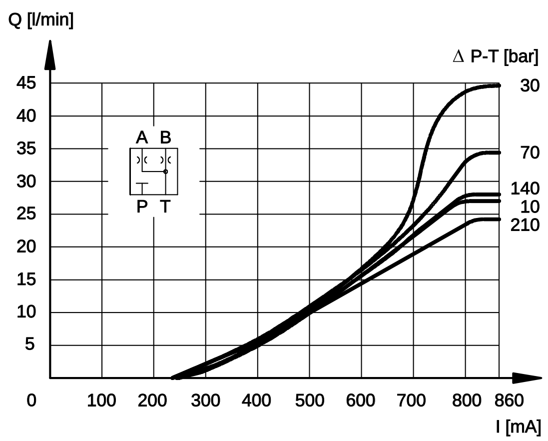


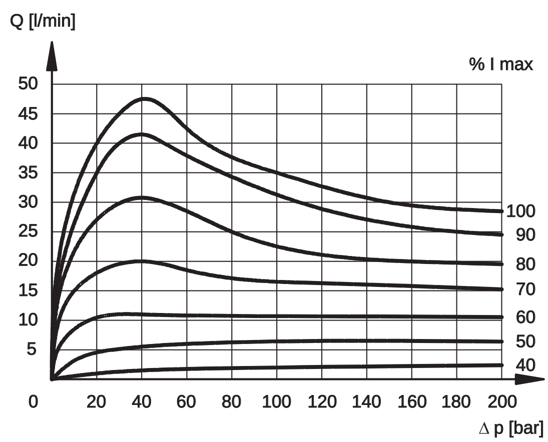
SPOOL TYPE A16





SPOOL TYPE A26





4 - 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.

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 COIL**		3.66 4	17.6 19
NOMINAL CURRENT	A	1.88	0.86
DUTY CYCLE		100%	
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2004/108/CE		
CLASS OF PROTECTION : Coil insulation (VDE 0580) Impregnation:	 class H class F		

Protection from atmospheric agents CEI EN 60529

Plug-in type	IP 65	IP 69 K
K1 DIN 43650	x (*****)	
K7 DEUTSCH DT04 male	x	x (*****)

(*****) The protection degree is guaranteed only with the connector correctly connected and installed

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 setted positioning value, following a step change of reference signal. The table shows typical response times tested with spool type C16 and p = 30 bar P-T.

REFERENCE SIGNAL STEP	0 100%	100% 0
Step response [ms]		
DSE3-A* **DSE3-C***	50	40

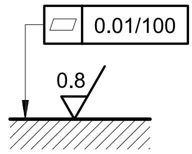
7 - INSTALLATION

DSE3 valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

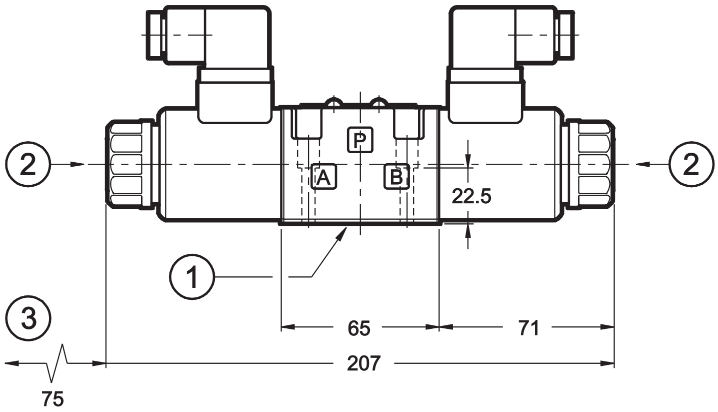
Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed fluid can easily leak between the valve and support surface.

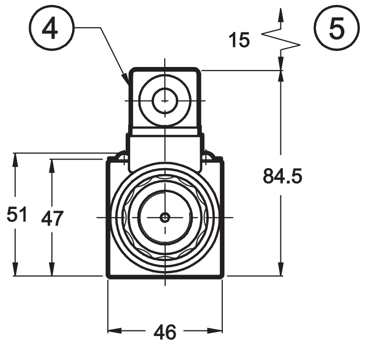
Surface finishing

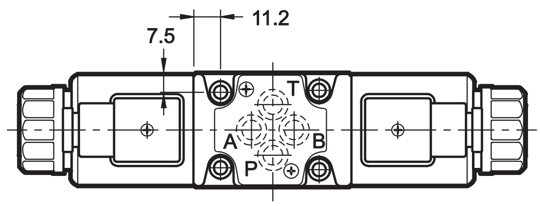


8 - OVERALL AND MOUNTING DIMENSIONS

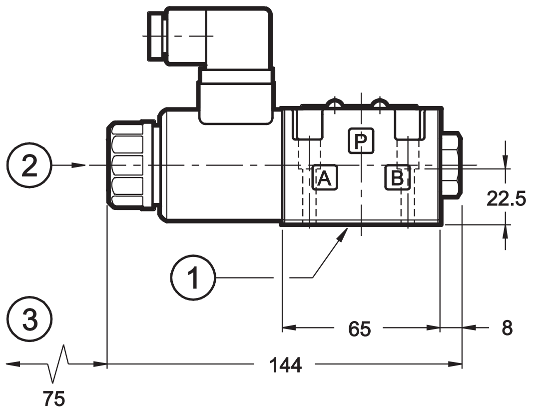
DSE3-A*
DSE3-C*

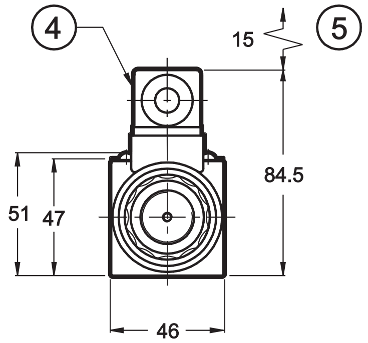


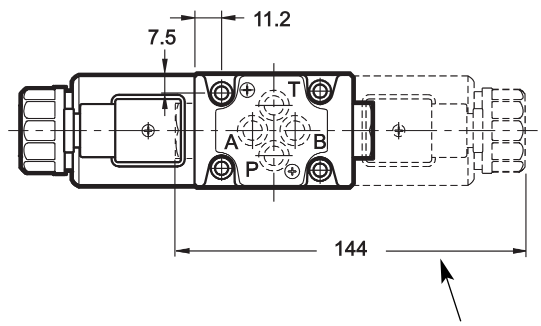




DSE3-A*SA
DSE3-C*SA







A*SB and C*SB versions solenoid position

dimensions in mm

1	Mounting surface with sealing rings: 4 OR type 2037 - 90 shore (9.25 x 1.78)
2	Standard manual override integrated in the solenoid tube see par. 9
3	Coil removal space
4	DIN 43650 electric coil connector
5	Connector removal space

Fastening bolts: 4 bolts M5x30 - ISO 4762
Torque: 5 Nm

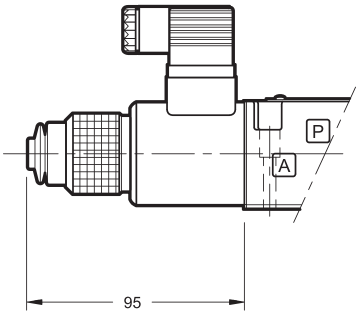
9 - MANUAL OVERRIDE

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.

Four different manual override versions are available upon request:

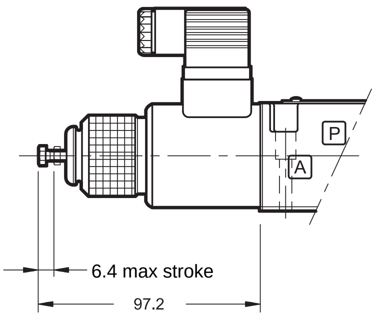
- **CM** version, manual override belt protected.
- **CS** version, with metal ring nut provided with a M4 screw and a blocking locknut to allow the continuous mechanical operations.
- **CH** version, lever manual override.
- **CK** version, knob. When the set screw is screwed and its point is aligned 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



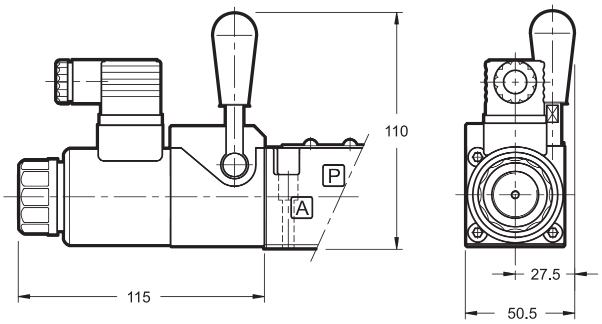
Code: 3803210003

CS Version

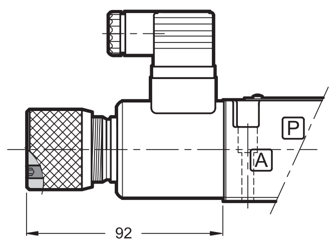


Code: 3803210004

CH Version



CK Version



Spanner for set screw: 3 mm.
Code: 3803210005

10 - 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. 89 250
EDM-M142	for solenoid 12V DC		
UEIK-11	for solenoid 24V DC	Eurocard type	see cat. 89 300

DSE3 - A*   DSE3 - C*

EDM-M212	24V DC solenoids	rail mounting DIN EN 50022	see cat. 89 250
EDM-M242	12V DC solenoids		
UEIK-21	24V DC solenoids	Eurocard format	see cat. 89 320

11 - SUBPLATES (see catalogue 51 000)

Type PMMD-AI3G ports on rear
Type PMMD-AL3G side ports
P, T, A, B port threading: 3/8Ž BSP

DUPLOMATIC OLEODINAMICA

DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

DSE3B

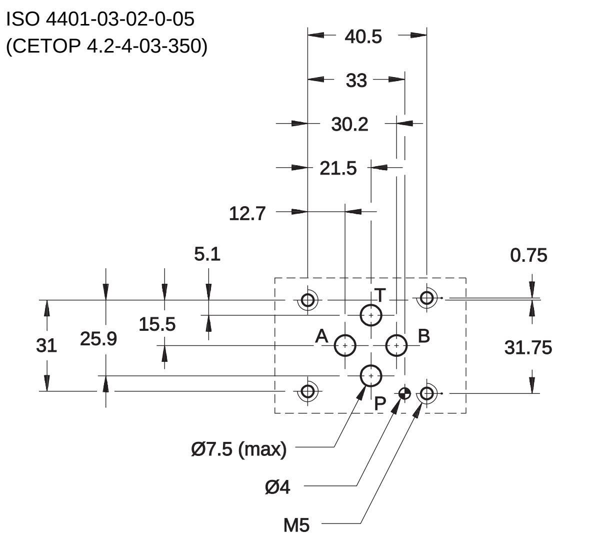
DIRECTIONAL VALVE WITH PROPORTIONAL CONTROL

SERIES 10

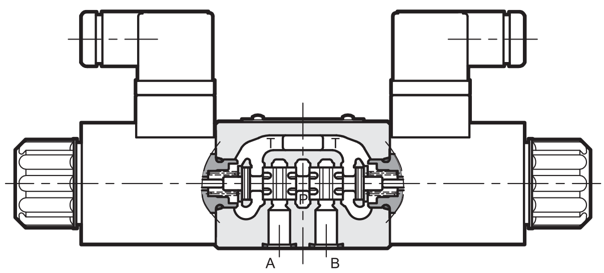
SUBPLATE MOUNTING
ISO 4401-03 (CETOP 03)

p max **350** bar
Q max **40** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



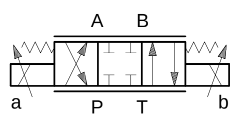
- The DSE3B valve is a directly operated directional control valve with electric proportional control and with ports, in compliance with ISO 4401-03 standards (CETOP RP 121H).
- It is used for directional and speed control of hydraulic actuators.
- Valve opening and hence flow rate can be modulated continuously 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 par. 10).

PERFORMANCES (obtained with mineral oil with viscosity of 36 cSt at 50°C and with the relative electronic control units)

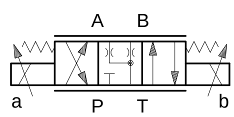
Max operating pressure: P - A - B ports T port	bar	 350 160
Nominal flow with p 10 bar P-T	l/min	8 - 16 - 26
Step response		see chapter 6
Hysteresis (with PWM 200 Hz)	% Q_{max}	< 6%
Repeatability	% Q_{max}	< ± 2%
Electrical characteristics		see chapter 5
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 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*



D

DSE3B
SERIES 10

1 - IDENTIFICATION CODE

D	S	E	3	B	-				/	10		-			/	

Directly operated directional control valve (DS)

Electric proportional control (E)

Size ISO 4401-03 (CETOP 03) (3)

Spool type:
C = closed centers
A = open centers

Spool nominal flow (see paragraph 2)

Solenoid position (omit for configuration with two solenoids):
SA = 1 solenoid on side A
SB = 1 solenoid on side B

NOTE:The valve is supplied with standard surface treatment of phosphatising black. On request we can supply these valves with other surface finishes.
Add suffix / W * at the end of the code.

W2 = mat epoxy painting black RAL 9005
thickness 20 ÷ 40

W4 = gas nitriding and oxidation process black colour

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 DIN 43650 (**standard**)
K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S

Manual override
(see par. 9)

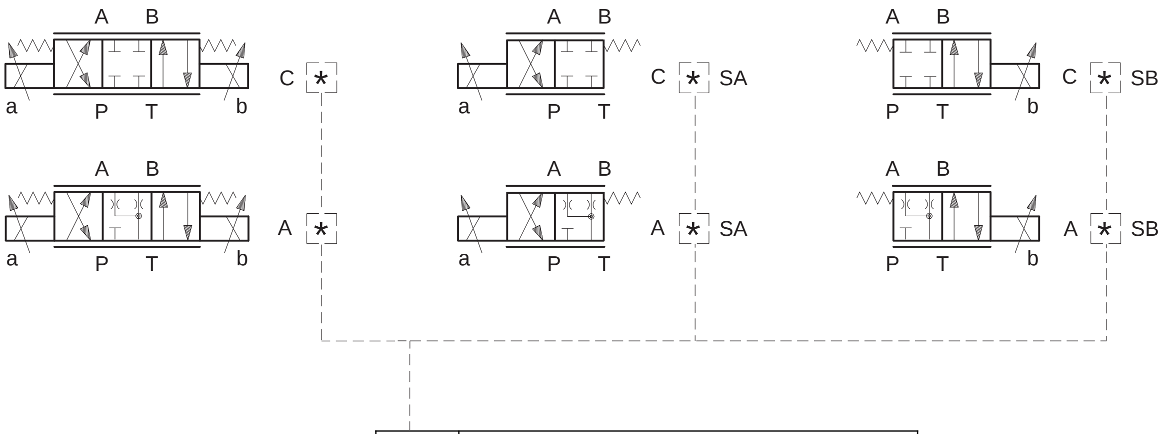
2 - CONFIGURATIONS

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**Ž configuration: 1 solenoid on side A.
2 positions (central + external) with spring centering

•**SB**Ž configuration: 1 solenoid on side B.
2 positions (central + external) with spring centering

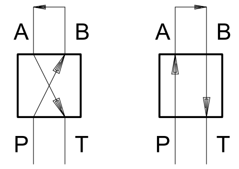


*	Controlled flow with p10 bar P-T
08	8 l/min
16	16 l/min
26	26 l/min

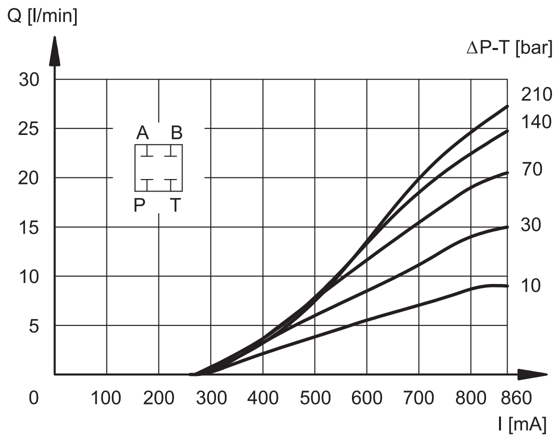
3 - CHARACTERISTIC CURVES (values measured with viscosity of 36 cSt at 50°C with valves connected to the relative electronic control units)

Typical constant flow rate control curves at p according to current supply to solenoid (D24 version, maximum current 860 mA), measured for the various spool types available.

The reference p values are measured between ports P and T on the valve.



SPOOL TYPE C08



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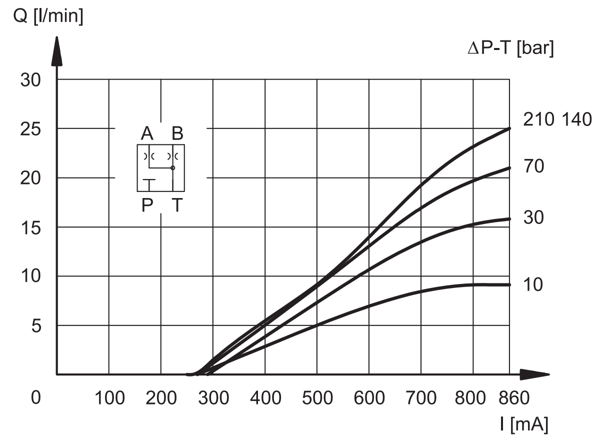
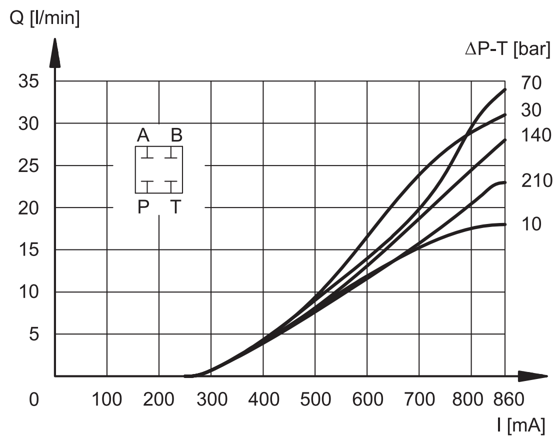


SPOOL TYPE C16



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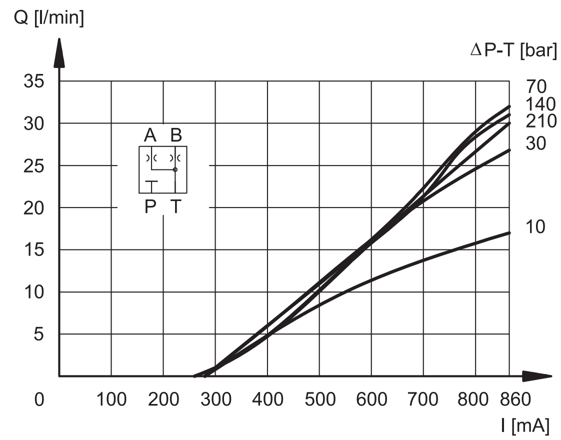
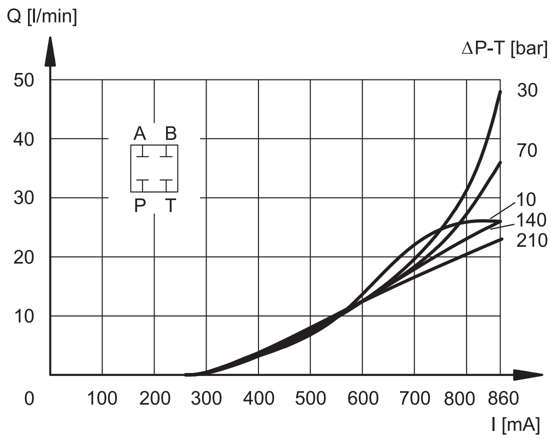
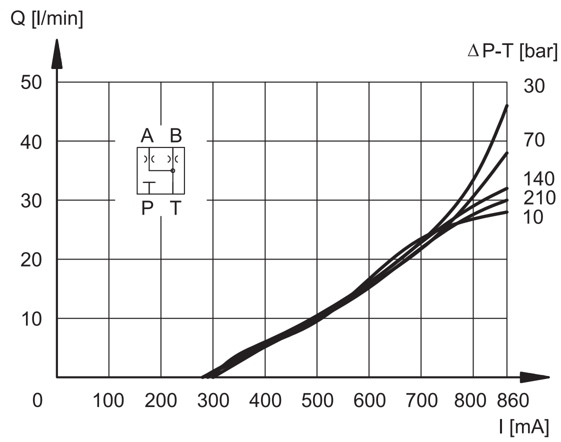


SPOOL TYPE C26



SPOOL TYPE A26



4 - 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.

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.

Protection from atmospheric agents CEI EN 60529

Plug-in type	IP 65	IP 69 K
K1 DIN 43650	x (*****)	
K7 DEUTSCH DT04 male	x	x (*****)

(*****) The protection degree is guaranteed only with the connector correctly connected and installed

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20°C)		4,4	18,6
MAXIMUM CURRENT	A	1,88	0,86
DUTY CYCLE	100%		
ELECTROMAGNETIC COMPATIBILITY (EMC)	according to 2004/108/EC		
CLASS OF PROTECTION: coil insulation (VDE 0580) impregnation	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 setted positioning value, following a step change of reference signal.

The table shows typical response times tested with spool type C16 and p = 30 bar P-T.

REFERENCE SIGNAL STEP	0 100%	100 0%
Step response [ms]		
DSE3B-A* **DSE3B-C***	50	40

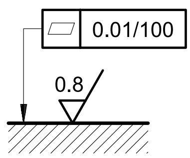
7 - INSTALLATION

DSE3B valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

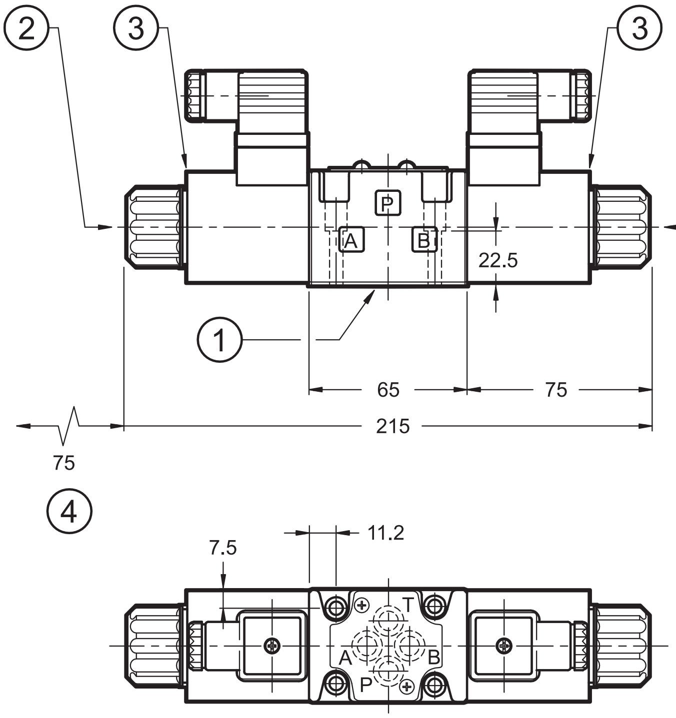
Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed fluid can easily leak between the valve and support surface.

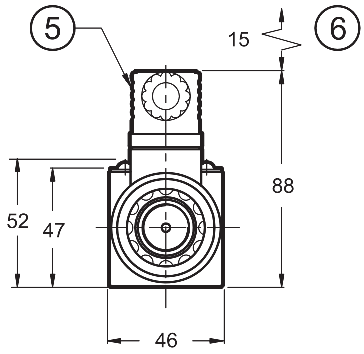
Surface finishing



9 - OVERALL AND MOUNTING DIMENSIONS

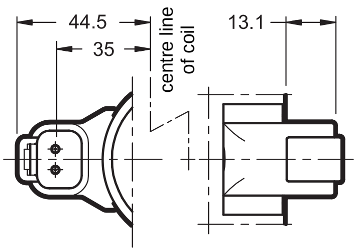
DSE3B-A*
DSEB3-C*

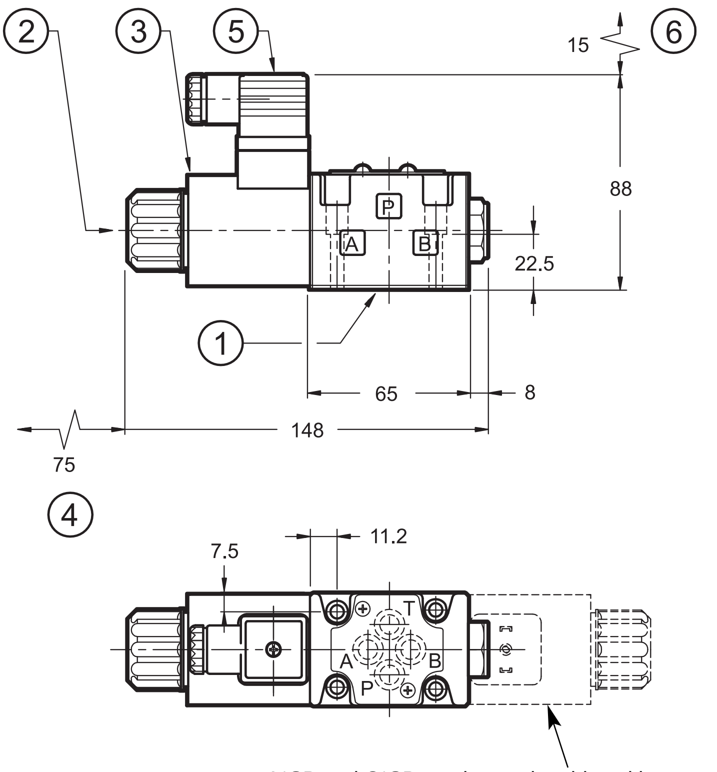




plug code **K7:** DEUTSCH DT04-2P for male connector DEUTSCH DT06-2S

DSE3B-A*SA
DSE3B-C*SA





A*SB and C*SB versions solenoid position

dimensions in mm

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 (included in the supply) see par. 9
3	Coil (360° revolving)
4	Coil removal space
5	DIN 43650 electric coil connector
6	Connector removal space

Fastening bolts: 4 SHCS M5x30
Torque: 5 Nm

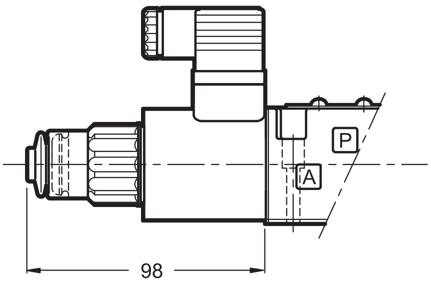
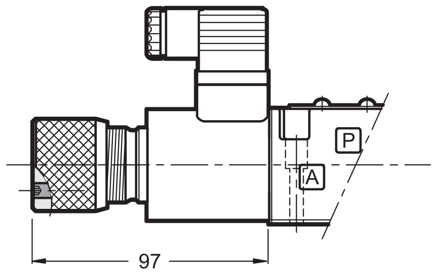
Locking ring tightening torque:
5 ± 0.5 Nm

9 - 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.
- **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.

Version CM	Version CS
	
Code: 3401150006	Code: 3401150009 Spanner for set screw: 3 mm

10 - 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. 89 250
EDM-M142	for solenoid 12V DC		

DSE3B - A* DSE3B - C*

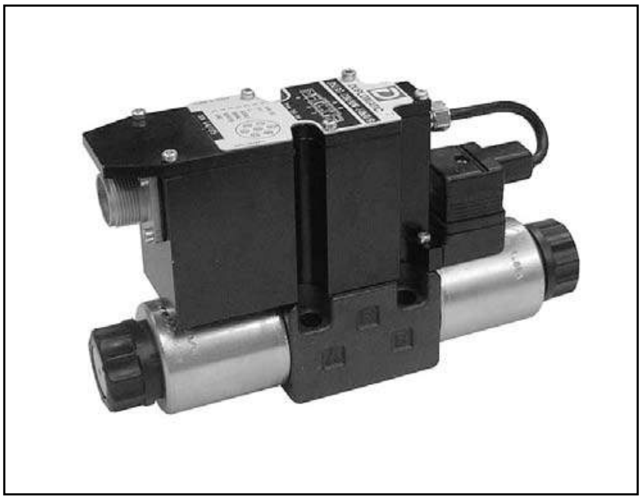
EDM-M212	24V DC solenoids	rail mounting DIN EN 50022	see cat. 89 250
EDM-M242	12V DC solenoids		

11 - SUBPLATES (see catalogue 51 000)

Type PMMD-AI3G ports on rear (3/8Ž BSP threaded)
Type PMMD-AL3G side ports (3/8Ž BSP threaded)

DUPLOMATIC OLEODINAMICA
DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

DUPLOMATIC OLEODINAMICA



DSE3G

DIRECTIONAL VALVE WITH PROPORTIONAL CONTROL AND INTEGRATED ELECTRONICS

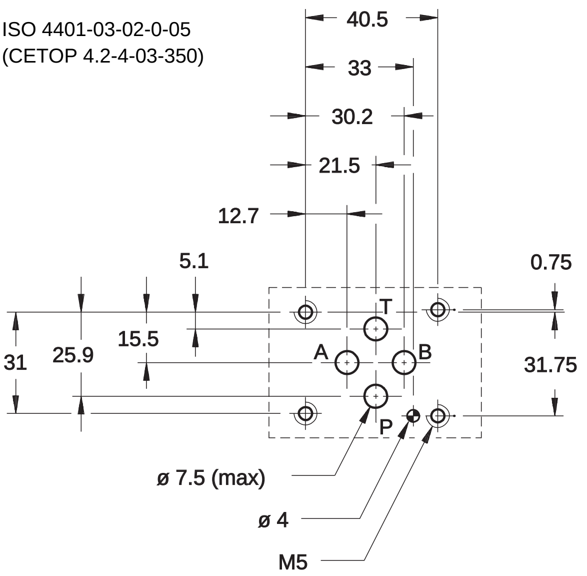
SERIES 11

SUBPLATE MOUNTING
ISO 4401-03 (CETOP 03)

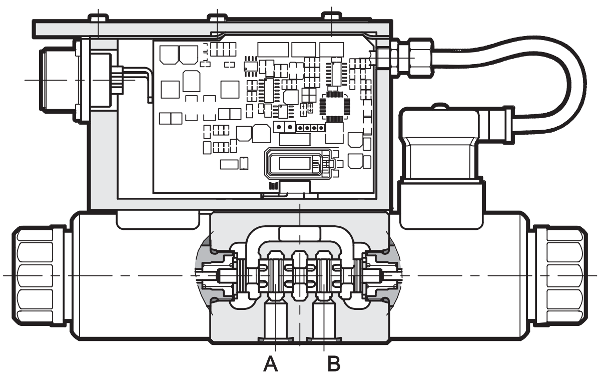
p max **350** bar
Q max **40** l/min

MOUNTING SURFACE

ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)



OPERATING PRINCIPLE



„ The DSE3G is a direct operated directional valve with integrated electric proportional control and mounting interface in compliance with ISO 4401 (CETOP RP 121H) standards.

„ It is normally used to control the positioning and the speed of hydraulic actuators.

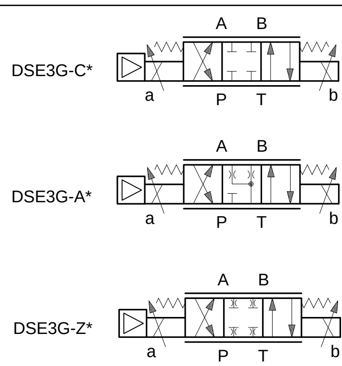
„ The valve opening and hence ”ow rate can be modulated continuously in proportion to the reference signal.

„ The valve is controlled directly by an integrated digital ampli“er (see par. 5).

PERFORMANCES (obtained with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronics)

Max operating pressure: - P - A - B ports - T port	bar	350 210
Nominal flow with p 10 bar P-T	l/min	4 - 8 - 16 - 26
Response times	see paragraph 4	
Hysteresis	% of Q_{max}	< 3%
Repeatability	% of Q_{max}	< ±1%
Electrical characteristics	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: single solenoid valve double solenoid valve	kg	1,9 2,4

HYDRAULIC SYMBOLS (typical)



1 - IDENTIFICATION CODE

D	S	E	3	G	-				/	11		-		K11	/		/	

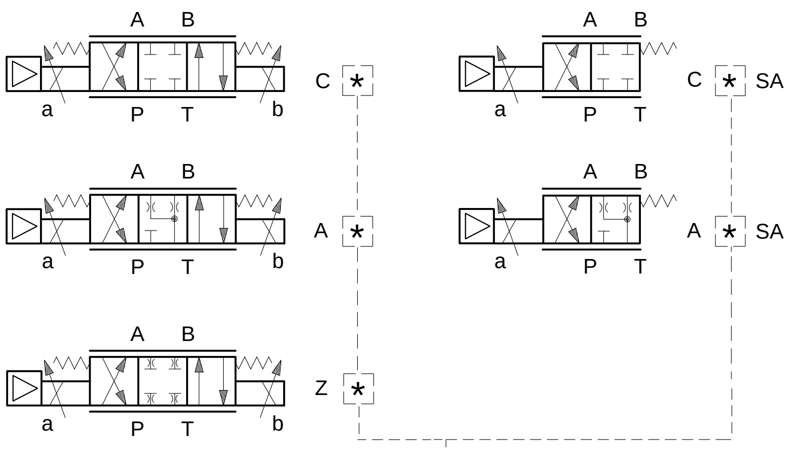
- DS: Direct operated directional control valve
- E: Electric proportional control
- 3: Size ISO 4401-03 (CETOP 03)
- G: Digital integrated electronics for open loop
- Spool type:
  C = closed centres
  A = open centres
  Z = zero overlap
- Nominal ”ow rate of the spool (see chart par. 2)
- Solenoid position (omit for 2 solenoids configuration):
  SA = 1 solenoid on side A
- 11: 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
- Reference signal:
  E0 = voltage ±10V
  E1 = current 4 / 20mA
- K11: Main connector 6 pin + PE
- **B** = standard version
  C = with connection for CAN communication
- Manual override (see paragraph 10)

2 - CONFIGURATIONS

Valve con“guration depends on the combination of the following elements:
number of proportional solenoids, spool type, rated ”ow.

Con“guration 2 solenoids :
3 positions with spring centering

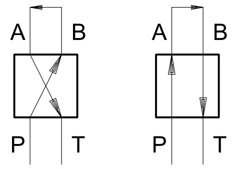
Con“guration 1 solenoid on side A • **SA**Ž:
2 positions (central + external) with spring centering



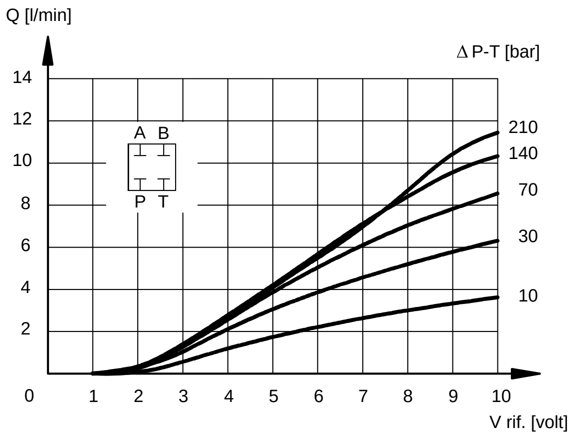
*	Controlled flow with p10 bar P-T
04	4 l/min
08	8 l/min
16	16 l/min
16/08	16 (P-A) / 08 (B-T) l/min
26	26 l/min
26/13	26 (P-A) / 13 (B-T) l/min

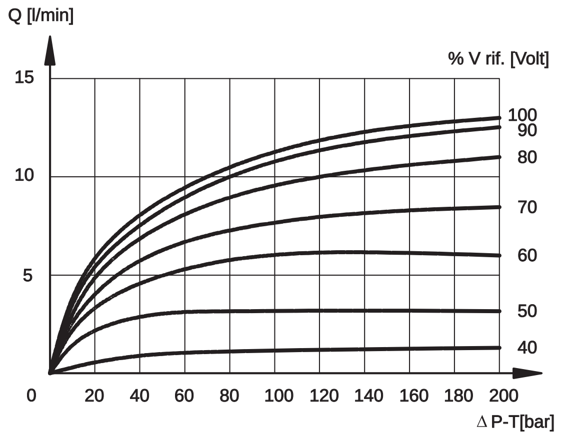
3 - CHARACTERISTIC CURVES (obtained with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronics)

Typical ”ow rate curves at constant p related to the reference signal and measured for the available spools. The p values are measured between P and T valve ports.
The curves are obtained after linearization in factory of the characteristic curve through the digital ampli“er. The linearization of the curve is performed with a constant p of 30 bar and by setting the value of ”ow start at 10% of the reference signal.
NOTE: for the zero overlap spool (Z), please refer to the characteristic curves of C type spool, considering that the starting ”ow rate value is approx. 150 mV.

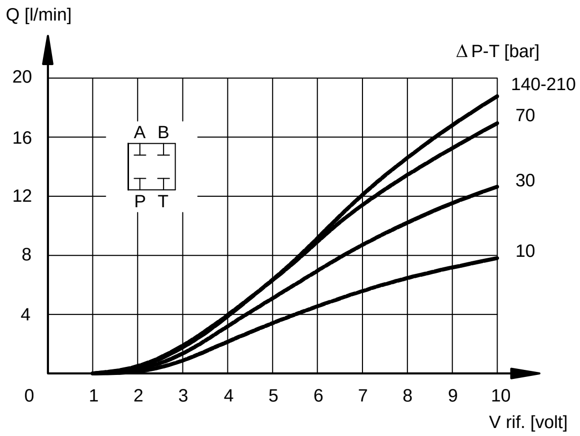


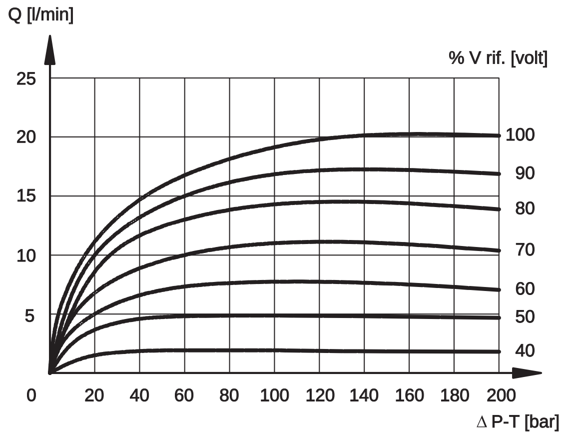
SPOOL TYPE C04



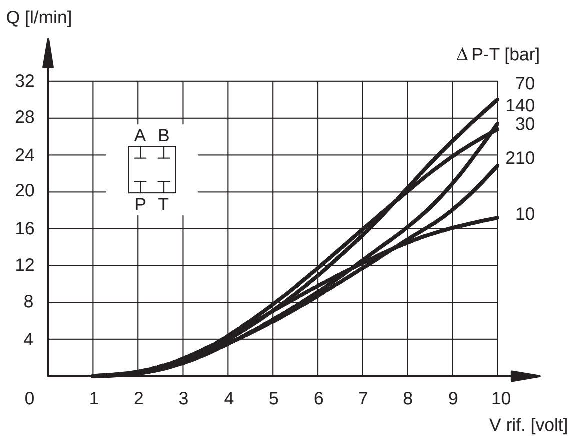


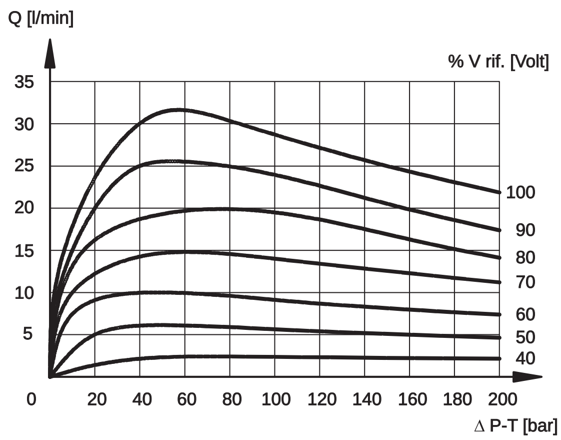
SPOOL TYPE C08



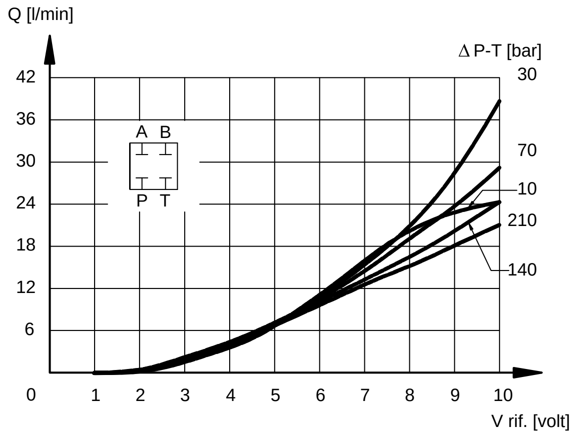


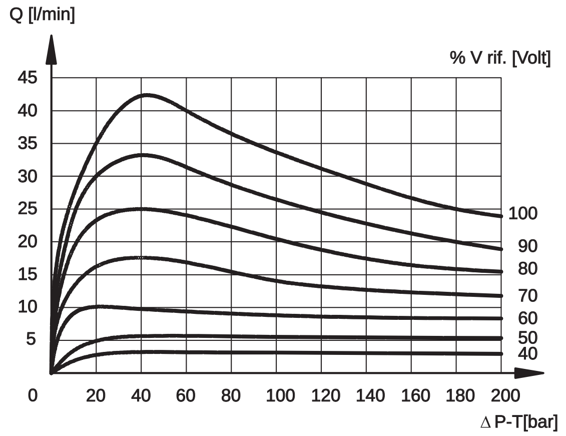
SPOOL TYPE C16



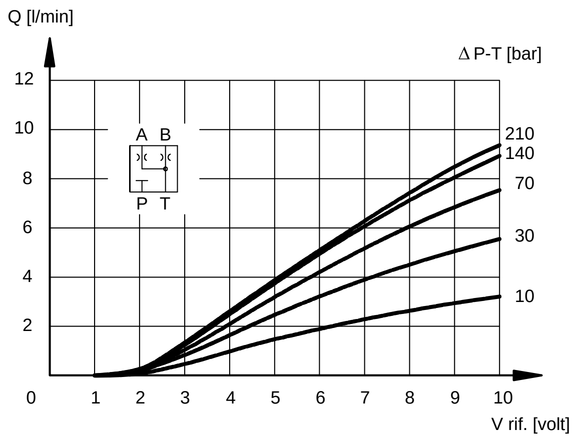


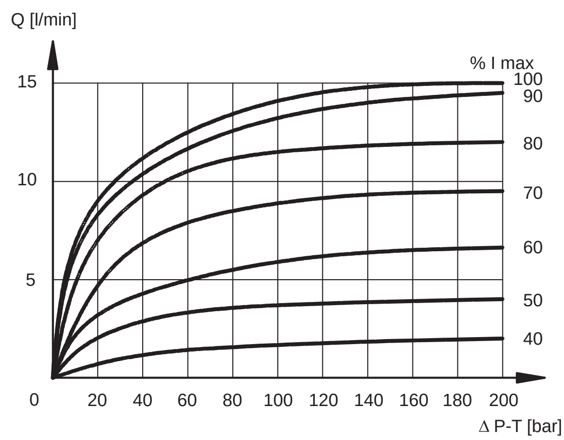
SPOOL TYPE C26



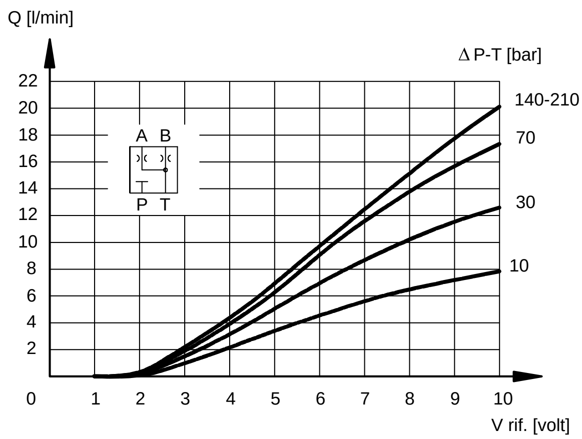


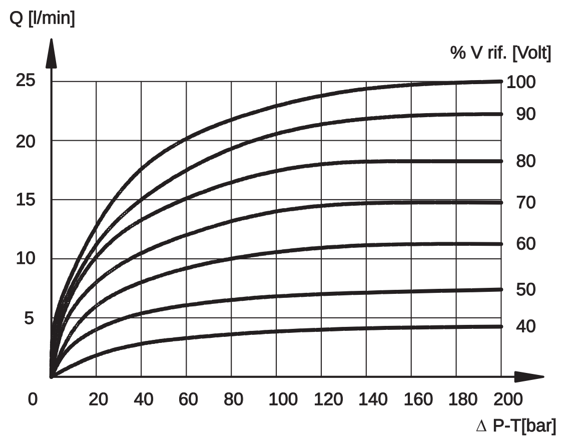
SPOOL TYPE A04



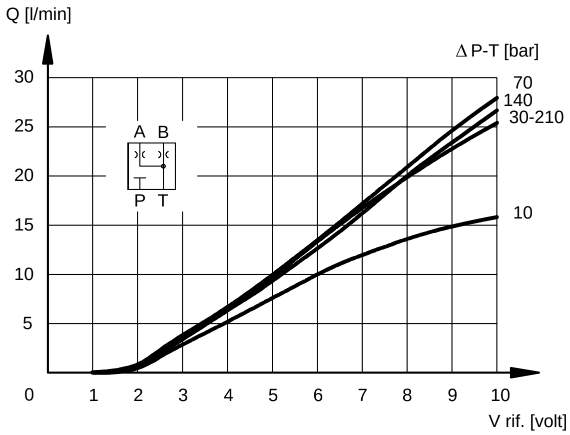


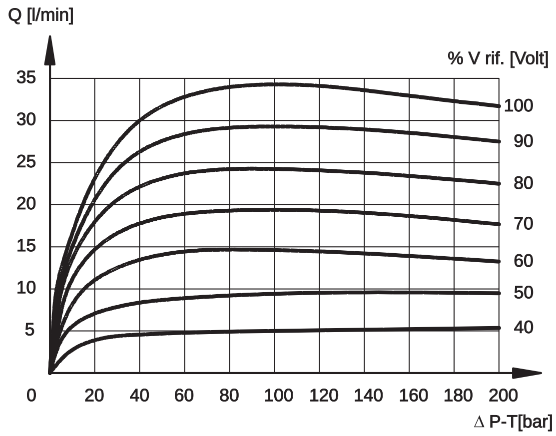
SPOOL TYPE A08



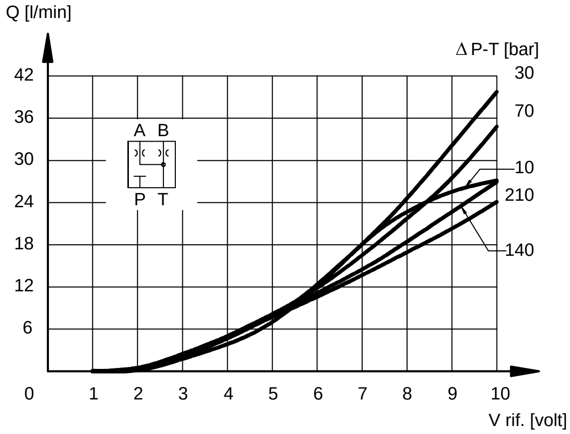


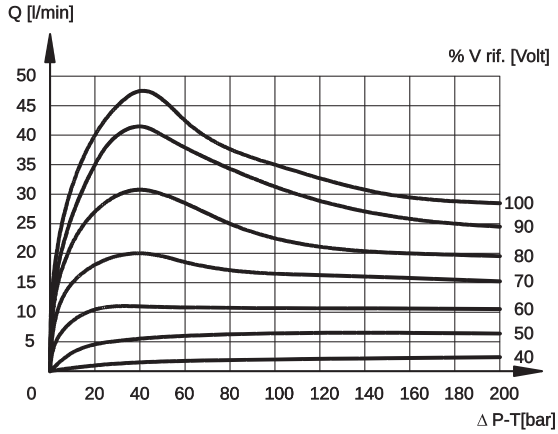
SPOOL TYPE A16



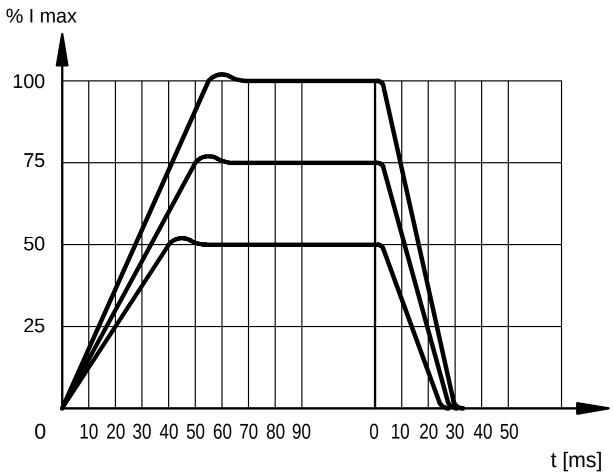


SPOOL TYPE A26





4 - RESPONSE TIMES (obtained with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronics)



With reference time ± 100%, the rising time is 50 ms, the fall time 25 ms

5 - ELECTRICAL CHARACTERISTICS

5.1 - Digital integrated electronics

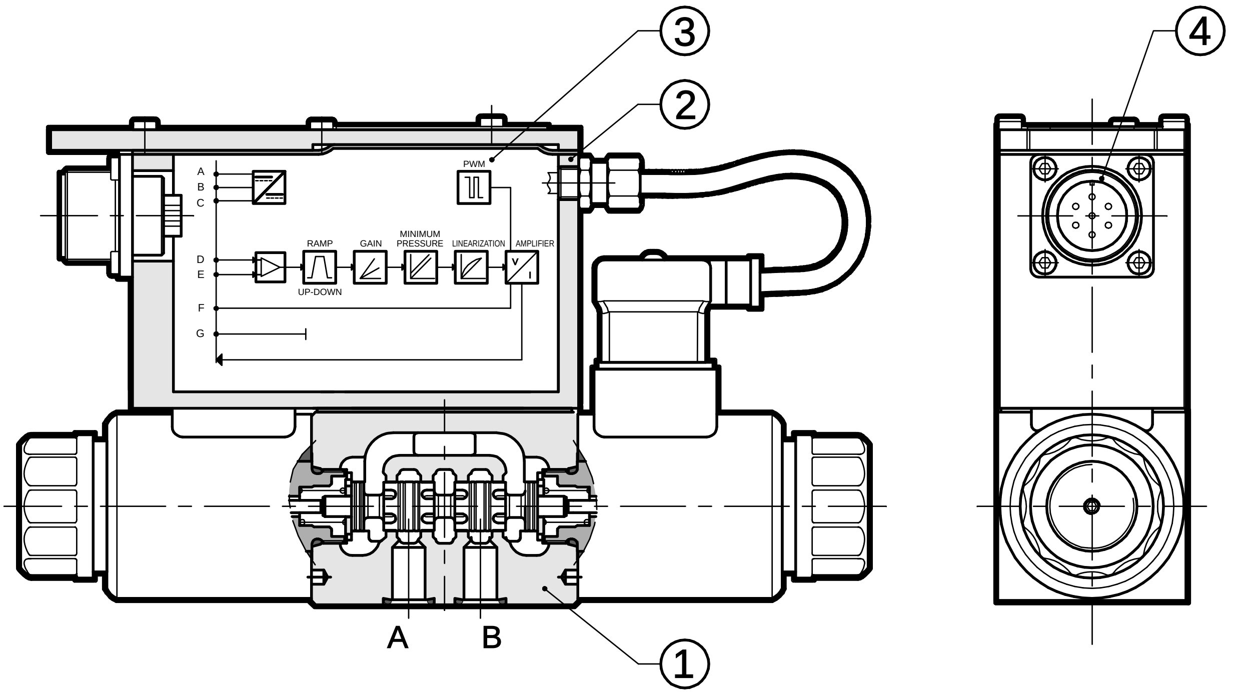
The proportional valve is controlled by a digital ampli“er (driver), which incorporates a microprocessor that controls, via sof tware, all the valve functions, such as:
- continuous converting (0,5ms) of the voltage reference signal (E0) or of the current reference signal (E1) in a digital value
- generation of up and down ramps (see note)
- gains limit (see note)
- compensation of the dead band
- linearization of the characteristic curve
- regulation of the current to the solenoid
- dynamic regulation of PWM frequency
- protection of the solenoid outputs against possible short circuits

NOTE: these parameters can be set through the connection to the CAN connector, by means of a personal computer and relevant software (see par. 6.3).

The digital driver enables the valve to reach better performance compared to the analogic version, such as:

- reduced hysteresis and better repeatability
- reduced response times
- linearization of the characteristic curve which is optimised in factory for each valve
- complete interchangeability in case of valve replacement
- possibility to set, via software, the functional parameters
- possibility to interface a CAN-Open network
- possibility to perform a diagnostic program by means of the CAN connection
- high immunity to electromagnetic troubles

5.2 - Functional block diagram



1	Valve with proportional solenoids	3	Digital card
2	Electronics envelope	4	Main connector

5.3 - Electrical characteristics

NOMINAL VOLTAGE	V DC	24 (from 19 to 35 VDC, ripple max 3 Vpp)
ABSORBED POWER	W	50
MAXIMUM CURRENT	A	1,88
DUTY CYCLE		100%
VOLTAGE SIGNAL (E0)	V DC	±10 (Impedance Ri > 50K)
CURRENT SIGNAL (E1)	mA	4 ÷ 20 (Impedance Ri = 500)
ALARMS		Overload and electronics overheating
COMMUNICATION		Interface of the optoisolated industrial Field-bus type CAN-Bus ISO 11898
MAIN CONNECTOR		7 - pin MIL-C-5015-G (DIN 43563)
CAN-BUS CONNECTOR		M12-IEC 60947-5-2
ELECTROMAGNETIC COMPATIBILITY ((EMC) emissions CEI EN 61000-6-4 immunity CEI EN 61000-4-2		According to 2004/108/CE standards
PROTECTION AGAINST ATMOSPHERIC AGENTS :		IP65 / IP67 (CEI EN 60529 standards)

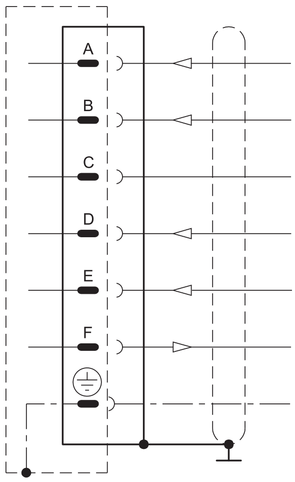
6 - OPERATING MODALITIES

The digital driver of DSE3G valve may be used with different functions and operating modalities, depending on the requested performances.

6.1 - Standard version with voltage reference signal (E0)

This is the most common version; it makes the valve completely interchangeable with the traditional proportional valves with analogic type integrated electronics. The valve has only to be connected as indicated below. This version doesn•t allow the setting of the valve parameters, for example the ramps must be performed in the PLC program, as well as the reference signal limit.

Connection scheme (B version - E0)

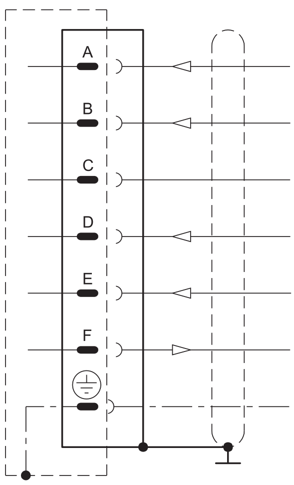


Pin	Values	Function	NOTES
A	24 VDC	Voltage	from 19 to 35 VDC (ripple max 3 Vpp) (see **NOTE 3**)
B	0 V	Power supply (zero)	0 V
C	----	Not used	----
D	± 10 V	Input rated command	Impedance R_i > 50 k (see **NOTE 1**)
E	0 V	Input rated command	----
F	± 10 V	Coil current	± 100% I_{MAX} (see **NOTE 2**)
PE	GND	Protective ground	----

6.2 - Standard version with current reference signal (E1)

This version has characteristics which are similar to the previous one, with the difference that in this case the reference signal is supplied in current 4 - 20 mA. With the 12 mA signal the valve is in central position, with the 20 mA signal the valve performs the con“guration P-A and B-T, while with 4 mA the con“guration is P-B and A-T. For •SAŽ single solenoid valves, with reference 20 mA to pin D, the valve full opening is P-B and A-T, while with 4 mA the valve is at rest. This con“guration may be modi“ed via software. If the current to solenoid is lower, than the card shows a BREAKDOWN CABLE error. To reset the error switch-off the supply.

Connection scheme (B version - E1)



Pin	Values	Function	NOTES
A	24 VDC	Voltage	from 19 to 35 VDC (ripple max 3 Vpp) (see **NOTE 3**)
B	0 V	Power supply (zero)	0 V
C	----	Not used	----
D	4 ÷ 20 mA	Input signal	Impedance R_i = 500
E	0 V	Zero reference	----
F	± 10 V	Coil current	± 100% I_{MAX} (see **NOTE 2**)
PE	GND	Protective ground	----

NOTE 1: The input signal is differential type on E0 version only. For double solenoid valves, with positive reference signal connected to pin D, the valve opening is P - A and B - T. With zero reference signal the valve is in central position. For •SAŽ single solenoid valves, with positive reference to pin D, the valve opening is P-B and A-T. The spool stroke is proportional to U_D - U_E.
If only one input signal (single-end) is available, the pin B (0V power supply) and the pin E (0V reference signal) must be connected through a jumper and both connected to GND, electric panel side.

NOTE for the wiring: connections must be made via the 7-pin plug mounted on the ampli“er. Recommended cable sizes are 0,75 mm^2 for cables up to 20m and 1,00 mm^2 for cables up to 40m, for power supply. The signal cables must be 0,50 mm^2. A suitable cable would have 7 cores, a separate screen for the signal wires and an overall screen.

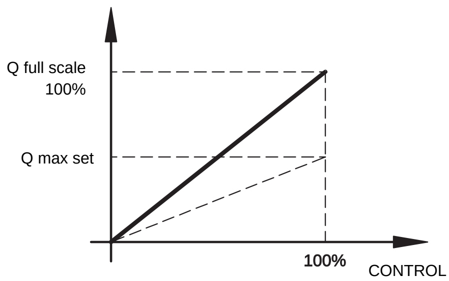
NOTE 2: read the test point pin F in relation to pin B (0V).

6.3 - Version with parameters set by means of CAN connector (version C)

This version enables the setting of some parameters of the valve, by connecting the CAN connector to a traditional computer.
To do this, it is necessary to order the interface device for USB port **CANPC-USB/20**, cod. 3898101002, with the relevant con“guration software, the communication cable (L=3 meters) and an hardware converter for connecting the valve to the PC USB port. The software is Microsoft Windows Xp© compliant.

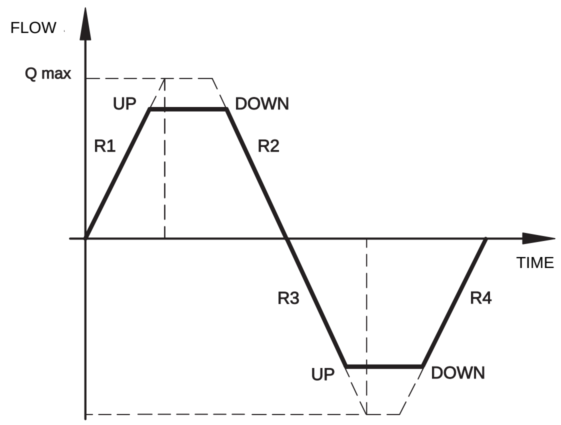
The parameters that can be set are described below:

Maximum current (Gain regulation)
Imax A and Imax B set the maximum current to the solenoid A corresponding to the positive value of the input reference. This parameter allows the reduction of the valve ”ow rate with the maximum reference.
Default value = 100% of full scale
Range: from 100% to 50% of full scale



PWM Frequency
Sets the PWM frequency, which is the pulsating frequency of the control current. The PWM decrease improves the valve accuracy, decreasing the regulation stability. The PWM increase improves the regulation stability, causing a higher hysteresis.
Default value = 300 Hz
Range 50 ÷ 500 Hz

Ramps
Increase time of Ramp R1 - solenoid A: sets the current increase time for a variation from 0 to 100% of the input reference from zero to -10V.
Decrease time of Ramp R2 - solenoid A: sets the current decrease time for a variation from 100 to 0% of the input reference from -10V to zero.
Increase time of Ramp R3 - solenoid B: sets the current increase time for a variation from 0 to 100% of the input reference from zero to -10V.
Decrease time of Ramp R4 - solenoid B: sets the current decrease time for a variation from 100 to 0% of the input reference from -10V to zero.
Min time = 0,001 sec
Max time = 40,000 sec
Default time = 0,001 sec.



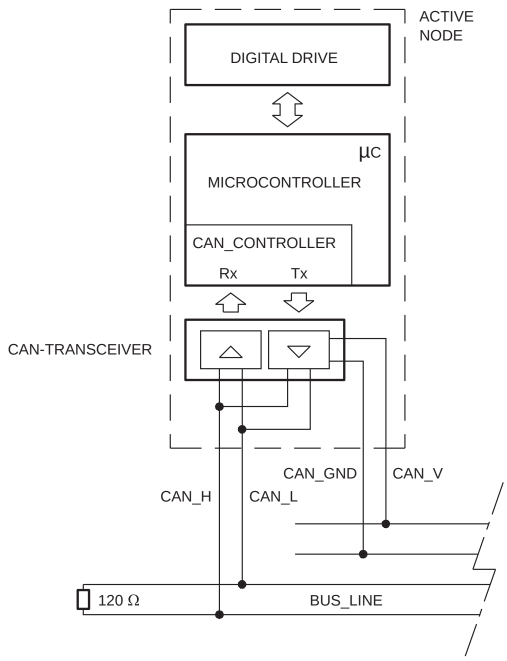
Diagnostics
Provides several information parameters, such as:
The electronic driver status (Working or Broken)
The active regulation
Input reference
Current value

6.4 - Version with CAN-Bus interface (version C)

This version allows the valve piloting through the industrial “eld bus CAN-Open, according to ISO 11898 standards.
The CAN connector must be connected (see scheme) as a slave node of the CAN-Open bus, while the main connector is wired only for the power supply (pin A and B + earth).

The most important characteristics of a CAN - Open connection are:
- Parameter storage also in PLC
- Parameters setting in real-time (PDO communication)
- On-line valve diagnostics
- Easy wiring with the serial connection
- Communication program according to international standards

For detailed information on the CAN-Open communication software, see cat. 89 800.



CAN connector connection scheme

Pin	Values	Function
1	CAN_SHLD	Monitor
2	CAN +24VDC	BUS + 24 VDC (max 30 mA)
3	CAN 0 DC	BUS 0 VDC
4	CAN_H	BUS line (high signal)
5	CAN_L	BUS line (low signal)

NOTE: If the valve is the closing node of the CAN web, insert a 120   resistance on the connector pins n° 4 and 5.

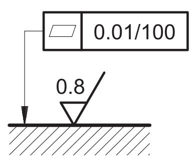
7 - INSTALLATION

DSE3G valves can be installed in any position without impairing correct operation.
Ensure that there is no air in the hydraulic circuit.
Valves are “xed by means of screws or tie rods on a ”at surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, ”uid can easily leak between the valve and support surface.

8 - HYDRAULIC FLUIDS

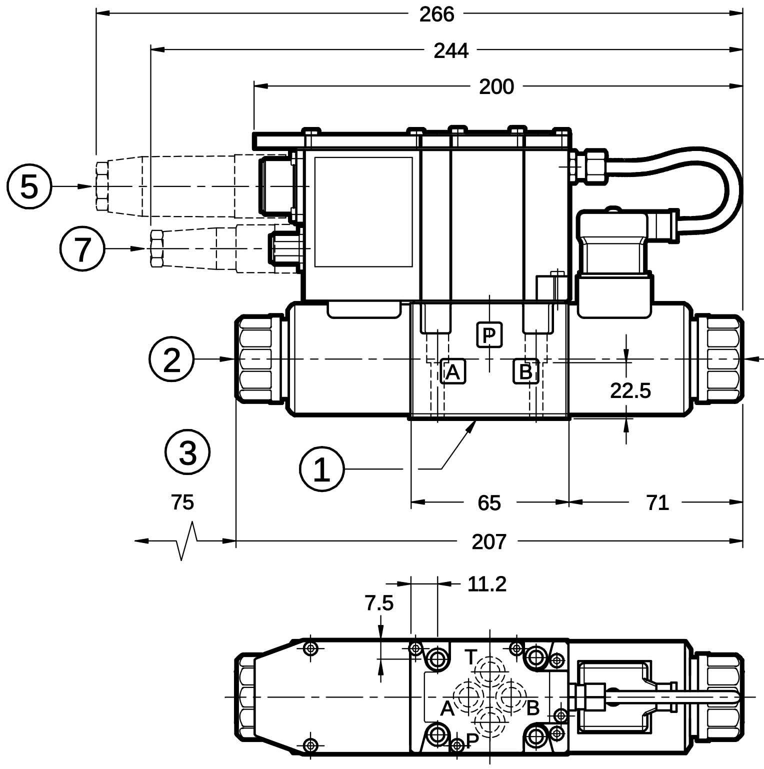
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.
Using fluids at temperatures 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.

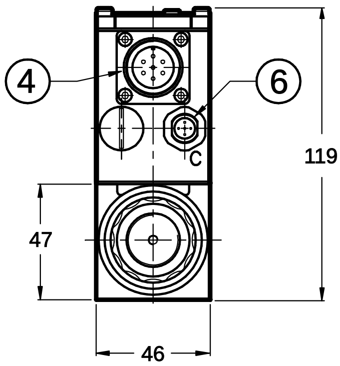
Surface “nishing



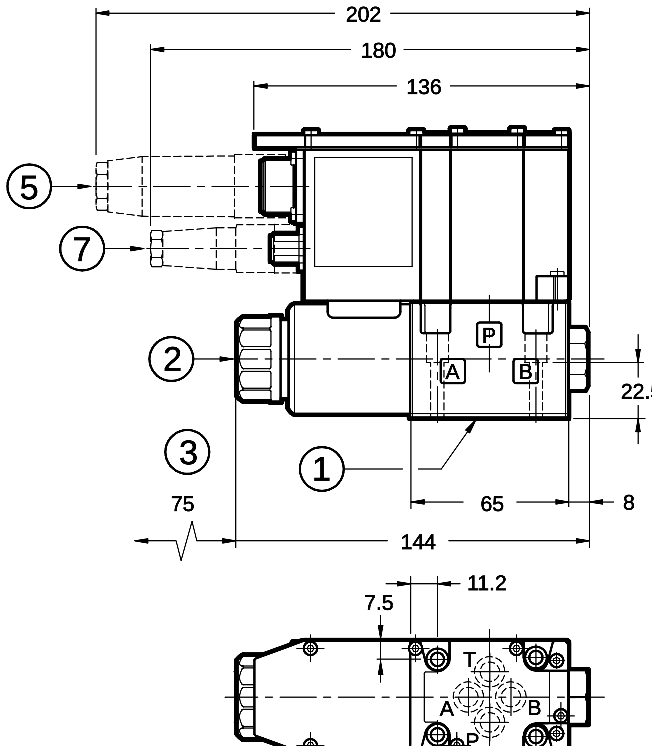
9 - OVERALL AND MOUNTING DIMENSIONS

DSE3G-A*
DSE3G-C*
DSE3G-Z*





DSE3G-A* SA
DSE3G-C* SA



dimensions in mm

1	Mounting surface with sealing rings: 4 OR type 2037 - 90 shore (9.25 x 1.78)
2	Standard manual override embedded in the pipe of the solenoid (included in the supply)
3	Coil removal space
4	Main connection
5	Electrical connector 7 pin DIN 43563 - IP67 PG11 EX7S/L/10 code 3890000003 (**to be ordered separately**)
6	CAN-Bus connection **(only for version C)**
7	Electrical connector 5 pin M12 - IP67 PG7 EC5S/M12L/10 code 3491001001 only for version C (**to be ordered separately**)

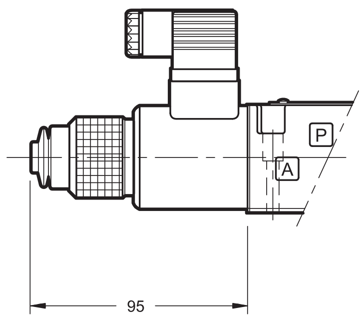
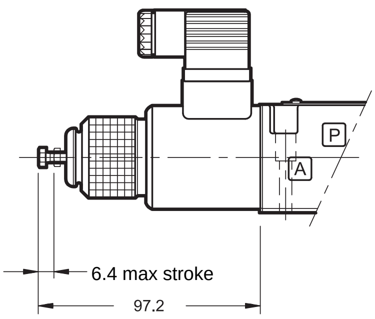
Fastening bolts: 4 bolts M5x30 - ISO 4762

Torque: 5 Nm

10 - 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, with metal ring nut provided with a M4 screw and a blocking locknut to allow the continuous mechanical operations.

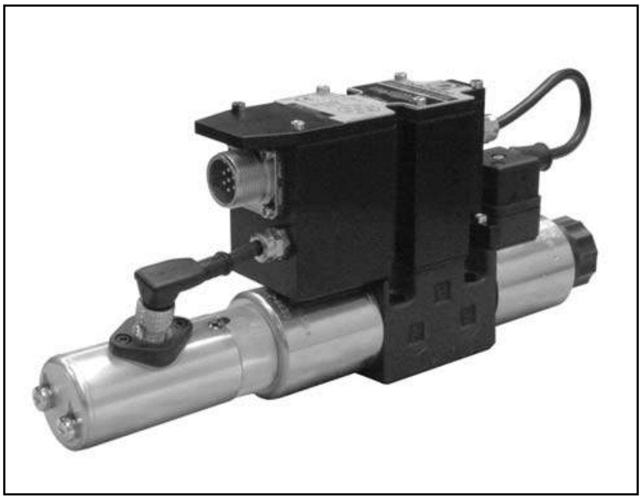
Version CM	Version CS
	
Code: 3803210003	Code: 3803210004

11 - SUBPLATES (see catalogue 51 000)

PMMD-AI3G rear ports
PMMD-AL3G side ports
Ports dimensions: P, T, A, B: 3/8Ž BSP

DUPLOMATIC OLEODINAMICA
DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

DUPLOMATIC OLEODINAMICA



DSE3J

DIRECTIONAL VALVE WITH PROPORTIONAL CONTROL FEEDBACK AND INTEGRATED ELECTRONICS

SERIES 20

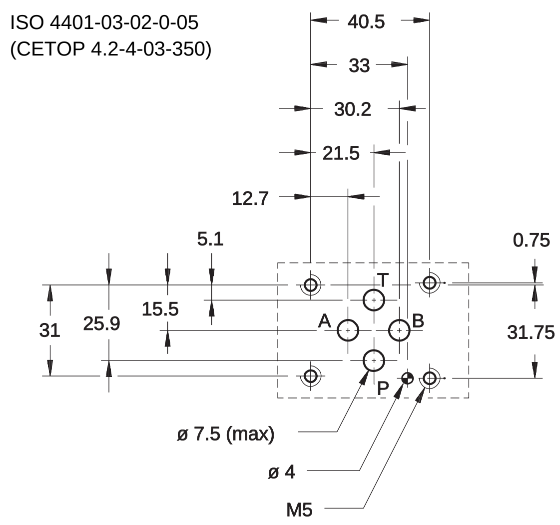
SUBPLATE MOUNTING

ISO 4401-03 (CETOP 03)

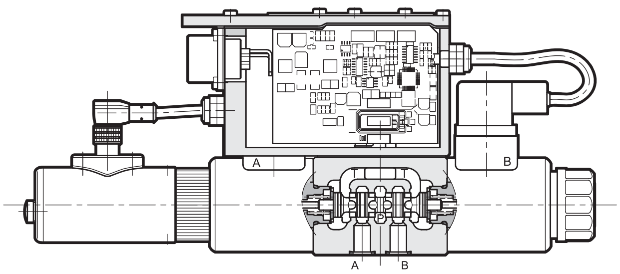
p max **350** bar

Q max **80** l/min

MOUNTING SURFACE



OPERATING PRINCIPLE



„ The DSE3J is a direct operated directional valve with integrated electric proportional control, feedback and mounting interface in compliance with ISO 4401 (CETOP RP 121H) standards.

„ The valve opening and hence ”ow rate can be modulated continuously in proportion to the reference signal. Transducer and digital card allow a “ne control of the positioning of the cursor, reducing hysteresis and response time and optimizing the performance of the valve.

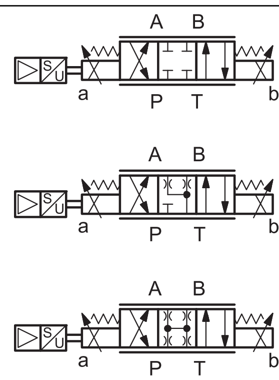
„ It is available with fail safe function.

„ The valve is easy to install. The driver directly manages digital settings (see par. 6). For special applications, it•s possible to customize the settings using the optional kit (see at paragraph 7).

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 p 10 bar P-T	l/min	4 - 12 - 30
Response times	see paragraph 4	
Hysteresis	% of Q max	< 0,2%
Repeatability	% of Q max	< 0,2%
Threshold		< 0,1%
Valve reproducibility		5%
Electrical characteristics, IP	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: single solenoid valve double solenoid valve	kg	2,2 2,7

HYDRAULIC SYMBOLS (typical)



1 - IDENTIFICATION CODE

D	S	E	3	J	-					/	20		-		K11

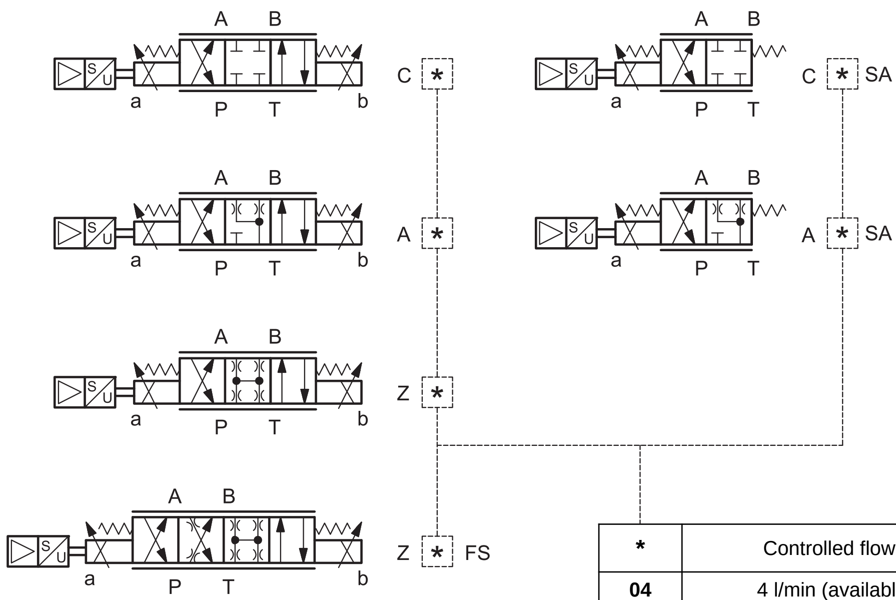
- Direct operated directional control valve (DS)
- Electric proportional control (E)
- Size ISO 4401-03 (CETOP 03) (3)
- Digital integrated electronics for valves with feedback (J)
- Spool type:
  C = closed centres
  A = open centres
  Z = zero overlap
- Nominal ”ow rate of the spool (see chart par. 2)
- **FS** = Fail safe option. Available on symmetrical spool type Z only. (omit if not required)
- Solenoid position (omit for 2 solenoids configuration):
  SA = 1 solenoid on side A
- Series No. (the overall and mounting dimensions remain unchanged from 10 to 19) (20)
- Seals:
  N = NBR seals for mineral oil (**standard**)
  V = FPM seals for special fluids
- Reference signal:
  E0 = voltage ±10V
  E1 = current 4 / 20mA
- Main connector 6 pin + PE (K11)

2 - CONFIGURATIONS

Valve con“guration depends on the combination of the following elements:
number of proportional solenoids, spool type, rated ”ow.

Con“guration 2 solenoids :
3 positions with spring centering

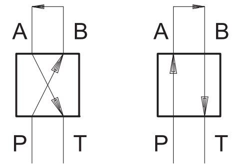
Con“guration 1 solenoid on side A •**SA**Ž:
2 positions (central + external) with spring centering

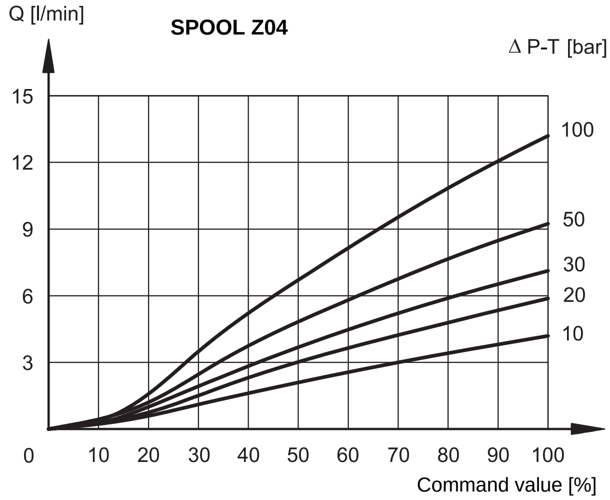


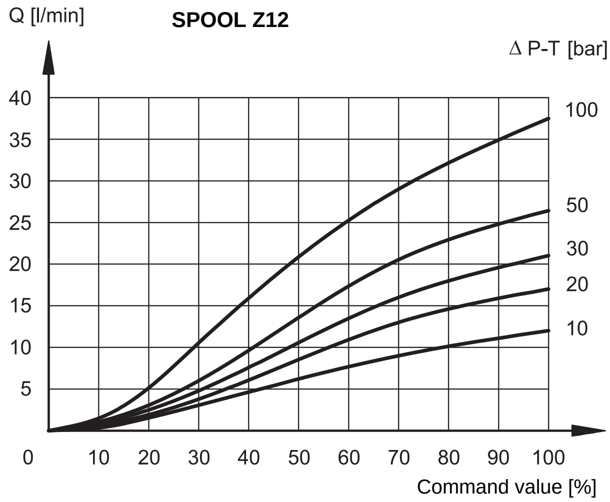
*	Controlled flow with p10 bar P-T
04	4 l/min (available for spools Z only)
12	12 l/min
30	30 l/min
30/15	30 (P-A) / 15 (P-B) l/min

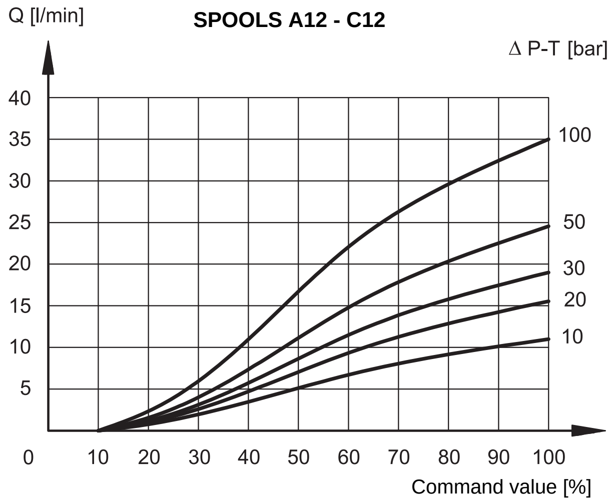
3 - CHARACTERISTIC CURVES (obtained with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronics)

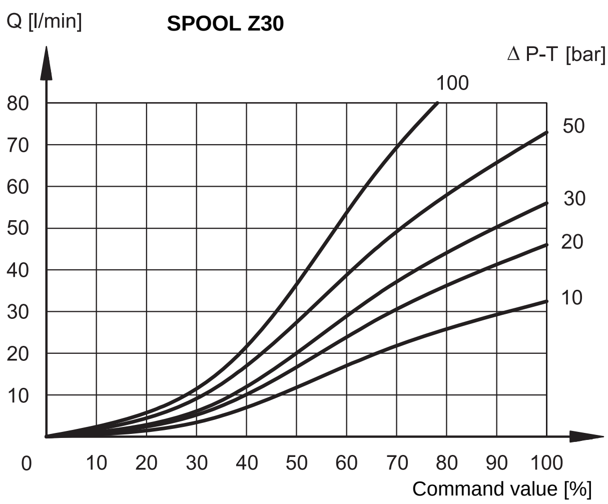
Typical ”ow rate curves at constant p related to the reference signal and measured for the available spools. The p values are measured between P and T valve ports.
The curves are obtained after linearization in factory of the characteristic curve through the digital ampli“er.

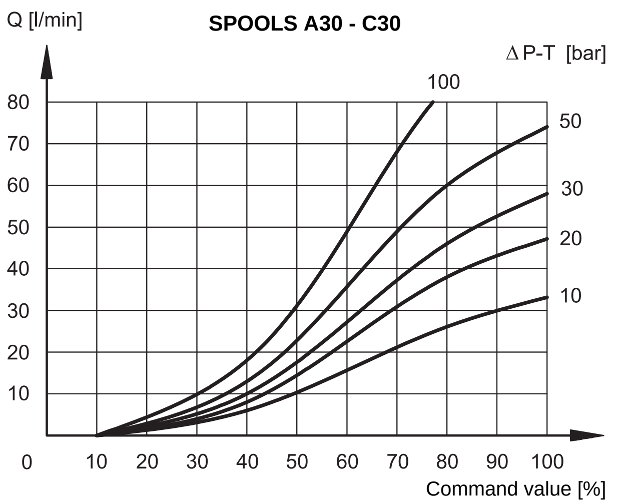




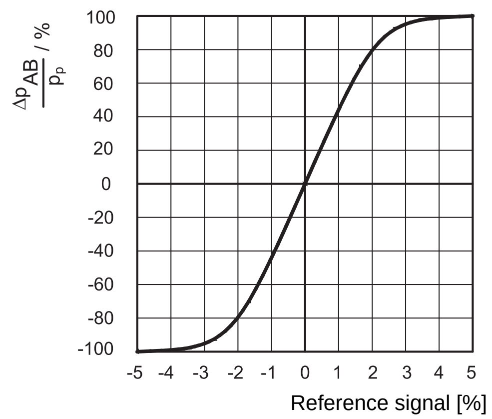








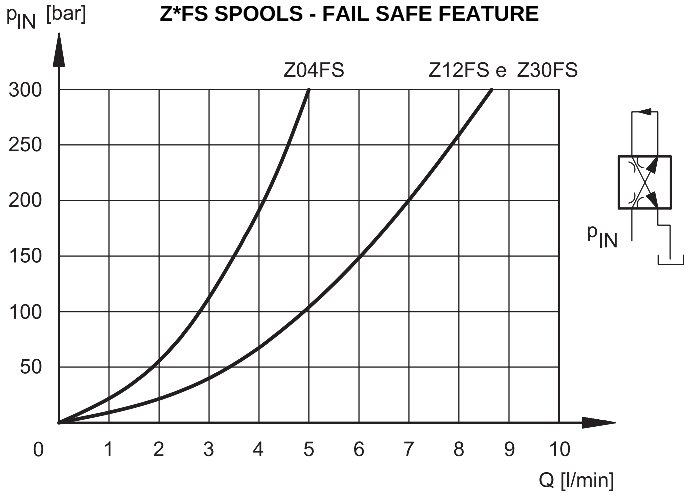
Z SPOOLS - PRESSURE GAIN



The diagram shows the valve pressure gain, expressed as % of the ratio between the port pressure variation in A or B (p 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.

Z*FS SPOOLS - FAIL SAFE FEATURE



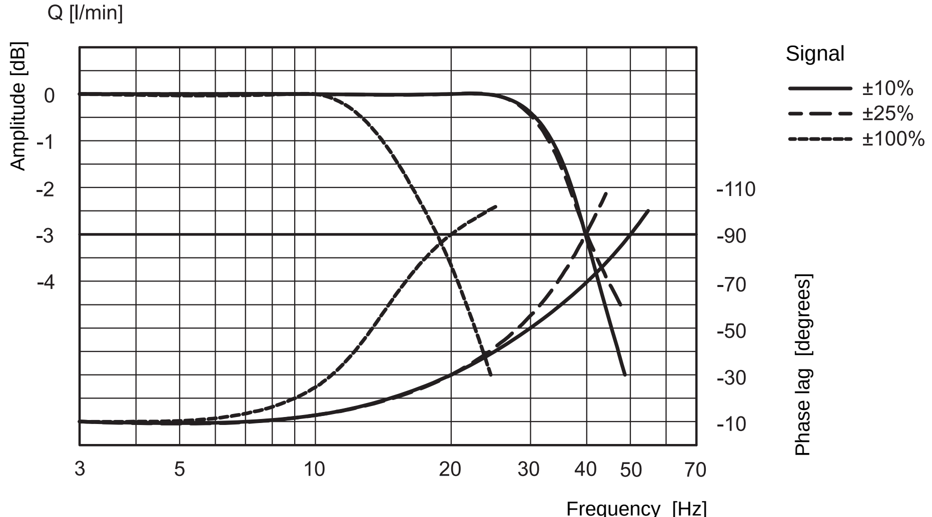
Flow P B / A T with valve in fail safe position, depending on the incoming pressure.

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.

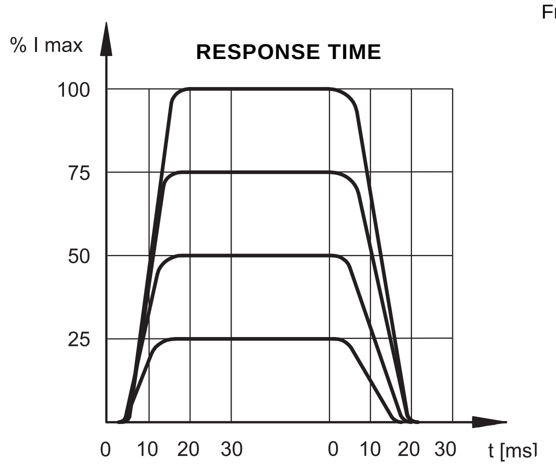
During the black-out the centering springs retain the spool in fail safe-position.

4 - RESPONSE TIME (obtained with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronics and p (P-T) 10 bar)

FREQUENCY RESPONSE (SPOOL Z)



RESPONSE TIME



5 - ELECTRICAL CHARACTERISTICS

5.1 - Digital integrated electronics

The proportional valve is controlled by a digital ampli“er (driver), which incorporates a microprocessor that controls, via software, all the valve functions, such as:

- continuous converting of the voltage reference signal (E0) or of the current reference signal (E1) in a digital value
- generation of up and down ramps
- gains limit
- compensation of the dead band
- protection of the solenoid outputs against possible short circuits

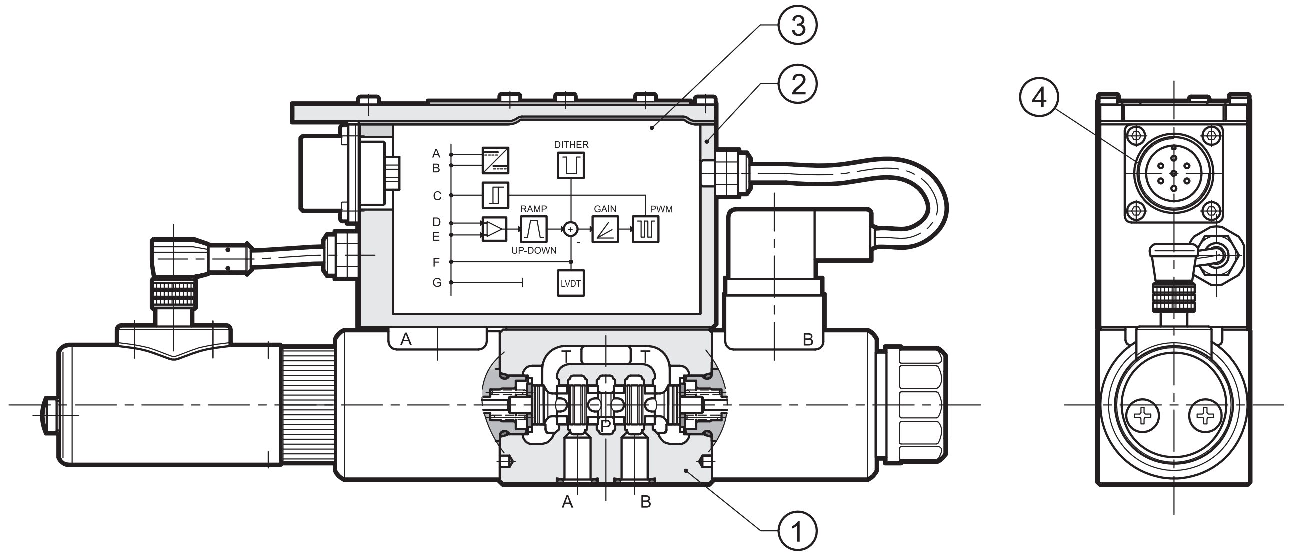
The digital driver enables the valve to reach better performances compared to the analogic version, such as:

- reduced response times
- optimization and reproducibility of the characteristic curve, optimised in factory for each valve
- complete interchangeability in case of valve replacement
- possibility to set, via software, the functional parameters
- possibility to perform a diagnostic program by means of the LIN connection
- high immunity to electromagnetic troubles

We deliver the DSE3J with these standard settings:

UP/DOWN ramp at minimum value, no deadband compensation, max valve opening (100% of spool stroke). It is possible to customize these parameters using the special kit, to be ordered separately (see par 7).

5.2 - Functional block diagram



1	Valve with proportional solenoids	3	Digital card
2	Electronics envelope	4	Main connector

5.3 - Electrical characteristics

NOMINAL VOLTAGE	V DC	24 (from 19 to 35 VDC, ripple max 3 Vpp) external fuse 5A (fast), max current 3A
ABSORBED POWER	W	70
MAXIMUM CURRENT	A	2.6
DUTY CYCLE		100%
VOLTAGE SIGNAL (E0)	V DC	±10 (Impedance Ri > 50K)
CURRENT SIGNAL (E1)	mA	4 ÷ 20 (Impedance Ri = 500)
ALARMS		Overload and electronics overheating, LVDT sensor error, cable breakdown or power failure or < 4mA.
COMMUNICATION		LIN-bus Interface (with the optional kit)
MAIN CONNECTOR		7 - pin MIL-C-5015-G (DIN 43563)
ELECTROMAGNETIC COMPATIBILITY (EMC) emissions CEI EN 61000-6-4 immunity CEI EN 61000-6-2		According to 2004/108/CE standards
PROTECTION AGAINST ATMOSPHERIC AGENTS		IP65 / IP67 (CEI EN 60529 standards)

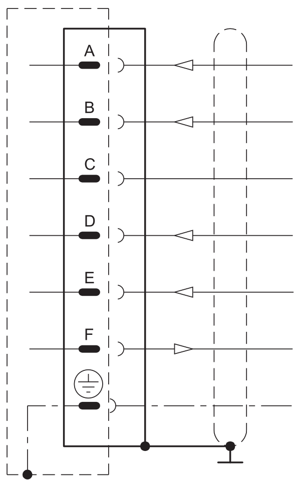
6 - OPERATING MODALITIES

The digital driver of DSE3J valve is available in two versions, with voltage or current reference signal.

6.1 - Version with voltage reference signal (E0)

This is the most common version; it makes the valve completely interchangeable with the traditional proportional valves with analogic type integrated electronics. The valve has only to be connected as indicated below. This version doesn•t allow the setting of the valve parameters, for example the ramps must be performed in the PLC program, as well as the reference signal limit.

Connection scheme E0

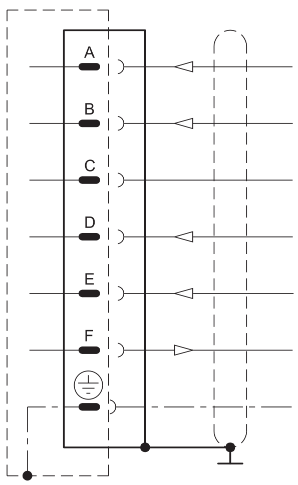


Pin	Values	Function	NOTES
A	24 V DC	Voltage	from 19 to 35 V DC (ripple max 3 Vpp) (see **NOTE 1**)
B	0 V	Power supply (zero)	0 V
C	24 V DC	Valve Enable	**NOTE 2**
D	± 10 V	Differential input	Impedance R_i > 50 k (see **NOTE 3**)
E	0 V	Differential input	---
F	6 - 10V o 2 - 6 -10V	Monitor feedback or Lin comm	see **NOTE 4**
PE	GND	Protective ground	---

6.2 - Version with current reference signal (E1)

The reference signal is supplied in current 4 - 20 mA. With the 12 mA signal the valve is in central position, with the 20 mA signal the valve performs the configuration P-A and B-T, while with 4 mA the configuration is P-B and A-T. For •SAŽ single solenoid valves, withreference 20 mA to pin D, the valve full opening is P-B and A-T, while with 4 mA the valve is at rest. If the current to solenoid is lower, than the card shows a BREAKDOWN CABLE error. To reset the error is sufficient to restore the current 4mA.

Connection scheme E1



Pin	Values	Function	NOTES
A	24 V DC	Voltage	from 19 to 35 V DC (ripple max 3 Vpp) (see **NOTE 1**)
B	0 V	Power supply (zero)	0 V
C	24 V DC	Valve Enable	**NOTE 2**
D	4 ÷ 20 mA	Input signal	Impedance R_i > 500 k
E	0 V	Zero reference	---
F	6 - 10V o 2 - 6 -10V	Monitor point or Lin comm	see **NOTE 4**
PE	GND	Protective ground	---

NOTE 1: preview on the Pin A (24 VDC) an external fuse for protecting electronics. Fuse characteristics: 5A/50V type fast.

NOTE 2: preview 24V DC on the PIN C to activate the card power stage.

NOTE 3: The input signal is differential type on E0 version only. For double solenoid valves, with positive reference signal connected to pin D, the valve opening is P - A and B - T. With zero reference signal the valve is in central position. For •SAŽ single solenoid valves, with positive reference to pin D, the valve opening is P-B and A-T. The spool stroke is proportional to U_D - U_E.
If only one input signal (single-end) is available, the pin B (0V power supply) and the pin E (0V reference signal) must be connected through a jumper and both connected to GND, electric panel side.

NOTE 4: This value changes, as shown in the table below. When MONITOR function is enabled and the card is enabled, read the test point pin F in relation to pin B (0V). When detect a failure or error of the sensor LVDT, the drive bring the valve back in central position and locks it. In this condition the pin F, referring to the pin B, indicates 0V DC output. To reset the fault, the card must be disabled and re-enable. When the card is disabled, the pin F referred to the pin B shows 2.7V DC output: this value is given by the voltage of the LIN bus communication and not by the MONITOR value.

double solenoid valves		single solenoid valve	
command (Pin D)	Pin F	command (Pin D)	Pin F
-10 V	10 V	-	-
0 V	6 V	0 V	6 V
+10 V	2 V	+10 V	10 V

NOTE for the wiring: connections must be made via the 7-pin plug mounted on the amplifier. Recommended cable sizes are 0,75 mm^2 for cables up to 20m and 1,00 mm^2 for cables up to 40m, for power supply. The signal cables must be 0,50 mm^2. A suitable cable would have 7 cores, a separate screen for the signal wires and an overall screen.

7 - OPTIONAL KIT LINPC-USB/10

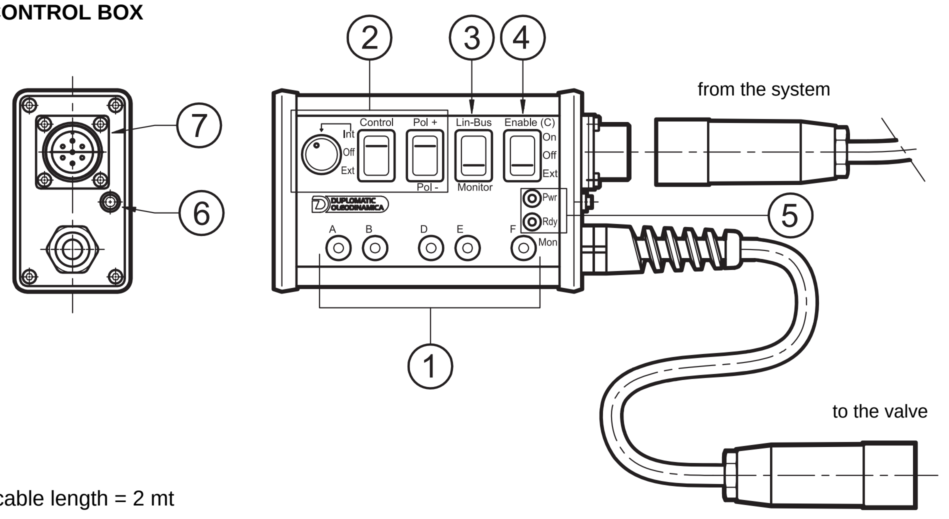
The kit (to be ordered separately, code 3898501001) includes control box with 7 poles connector, USB PC cable (1.8 m length), software for card configuration. The software is Microsoft XP© compliant.

The box has three main functions:

- It can be used to read the values from the external command (PLC, etc. ..) to the valve. In this case, the box simply acts as monitor through points of measurement.
- It may exclude the command from the PLC and controls the valve, choosing the direction and speed of movement (keys gr.2 and 4). This way you can test the response of the valve control input, and diagnose failures, malfunctions, simulating the valve working.
- The control box acts as interface between PC and electronic card (key 3) to allow customization of the parameters via software.

For more detailed information on the use of the box, see the documentation on the software CD.

CONTROL BOX



1	Test points
2	Keys for control of valve movements.
3	Switch LinBus/Monitor
4	Enable Switch
5	Leds
6	RS232 connection to PC
7	Main connector

cable length = 2 mt

7.1 - Programming the parameters via LIN Bus

The software included in the kit allows the customization of the following parameters:

Deadband compensation
You can change the mechanical spool overlap by adjusting the parameters V: MINA and V MINB.

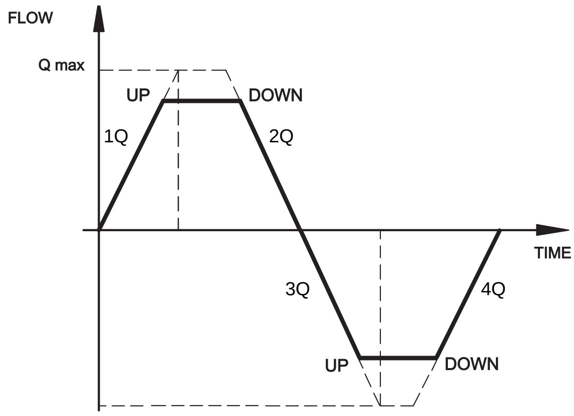
Gain Adjustment
You can change the parameters V and V MAXA: MAXB, which restrict the spool opening for positive and negative values of the reference signal.

AINW: W command input scaling
This command allows to scale the input signal and determine whether the input is enabled for signals in voltage or in current.

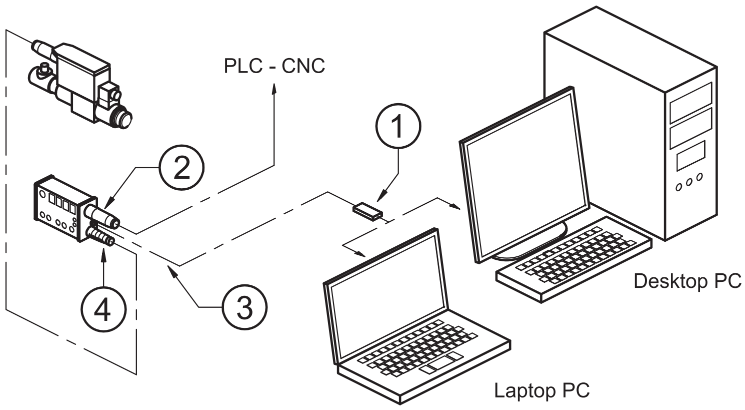
V: TRIGGER
Value in percentage by which you activate the deadband function of V: MinA and V: minB

Ramps

Ramps are divided into four quadrants and can be customized by setting the parameters 1Q, 2Q, 3Q and 4Q. They define the time variation of current in the solenoid in reference to input command.
range: 1 ÷ 60000 ms.



7.2 - Wiring scheme of Lin/Bus box



1	USB connector
2	Main connection from the system
3	Lin/Bus connection
4	7 poles connection to command the valve.

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.

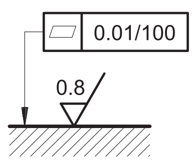
The fluid must be preserved in its physical and chemical characteristics.

9 - INSTALLATION

DSE3J valves can be installed in any position without impairing correct operation.
Ensure that there is no air in the hydraulic circuit.

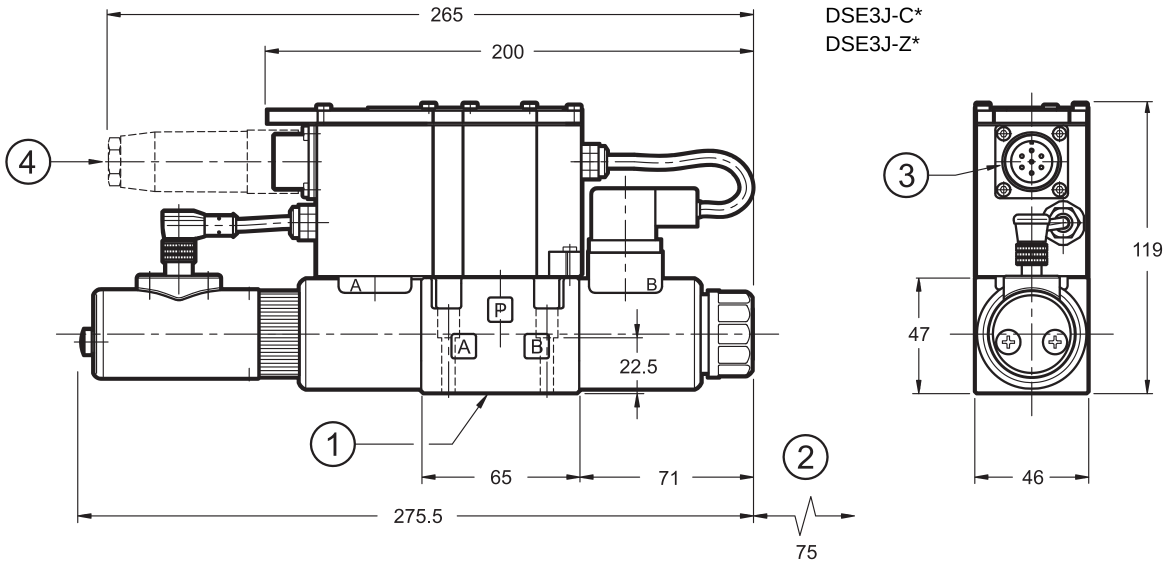
Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.

Surface “nishing

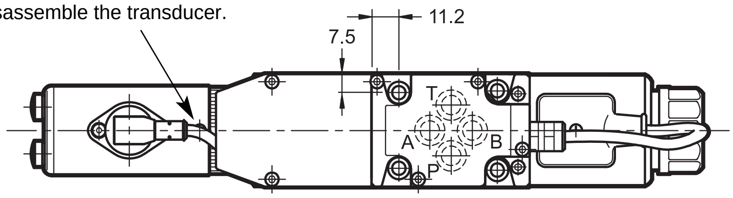


10 - OVERALL AND MOUNTING DIMENSIONS

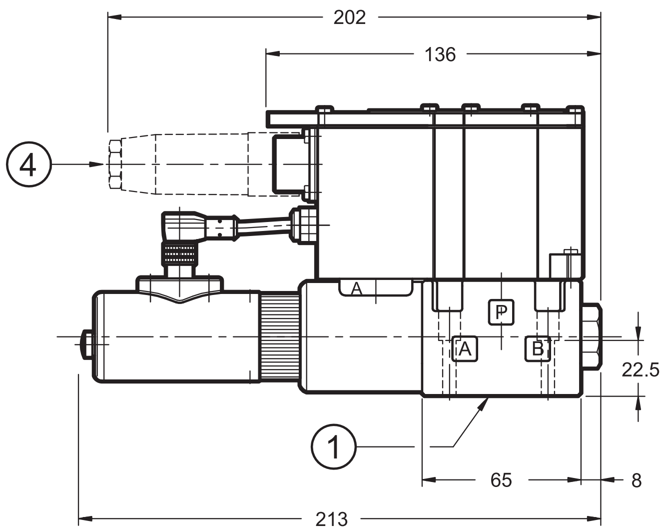
DSE3J-A*
DSE3J-C*
DSE3J-Z*



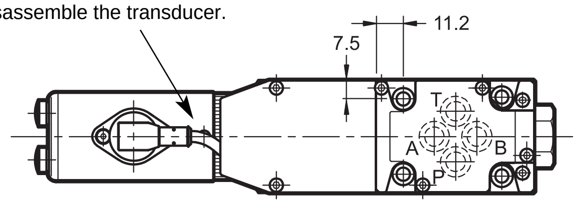
Adjustment sealing performed at factory.
Do not disassemble the transducer.



DSE3J-A* SA
DSE3J-C* SA



Adjustment sealing performed at factory.
Do not disassemble the transducer.



dimensions in mm

1	Mounting surface with sealing rings: 4 OR type 2037 (9.25 x 1.78) - 90 shore
2	Coil removal space (solenoid B only)
3	Main connection
4	Electrical connector 7 pin DIN 43563 IP67 PG11 EX7S/L/10 code 3890000003 **(to be ordered separately)**

Fastening bolts: 4 bolts M5x30 - ISO 4762
Torque: 5 Nm

11 - SUBPLATES (see catalogue 51 000)

PMMD-AI3G rear ports
PMMD-AL3G side ports
Ports dimensions: P, T, A, B: 3/8Ž BSP

DUPLOMATIC OLEODINAMICA

DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

DUPLOMATIC OLEODINAMICA

DSE3F

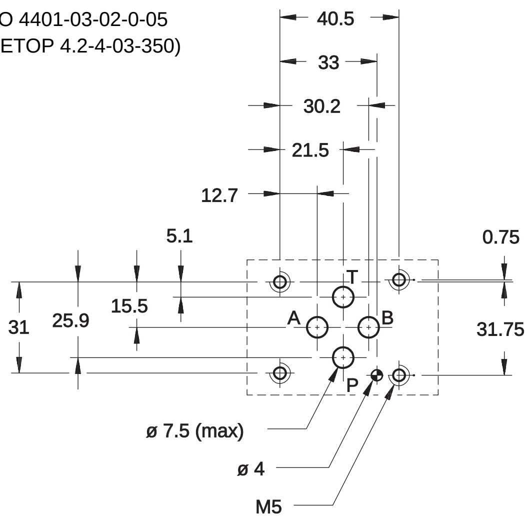
DIRECTIONAL VALVE WITH PROPORTIONAL CONTROL AND ELECTRICAL FEEDBACK

SERIES 11

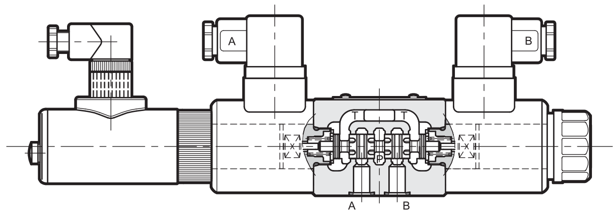
SUBPLATE MOUNTING
ISO 4401-03 (CETOP 03)

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.

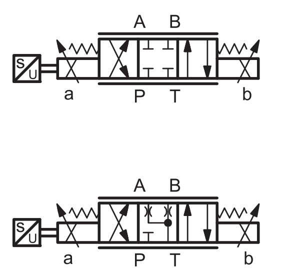
„ The valve opening and hence ”ow rate can be modulated continuously in proportion to the reference signal.

„ 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 p 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

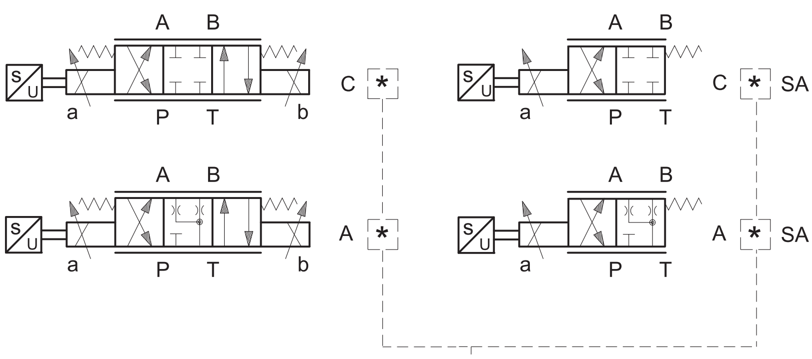
- Direct operated directional control valve
- Electric proportional control
- Size ISO 4401-03 (CETOP 03)
- Position feedback
- Spool type:
  C = closed centres
  A = open centres
- Nominal flow rate:
  08 = 8 l/min
  16 = 16 l/min
  26 = 26 l/min
- Solenoid position (omit for configuration with two solenoids):
  SA = 1 solenoid on side A
- 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 solenoid voltage 12 VDC
- Coil electrical connection: plug for connector type DIN 43650 (**standard**)

2 - CONFIGURATIONS

Valve con“guration depends on the combination of the following elements: number of proportional solenoids, spool type, rated ”ow.

Con“guration 2 solenoids :
3 positions with spring centering

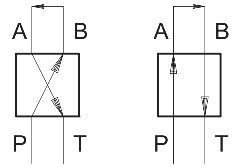
Con“guration 1 solenoid on side A •**SA**Ž:
2 positions (central + external) with spring centering



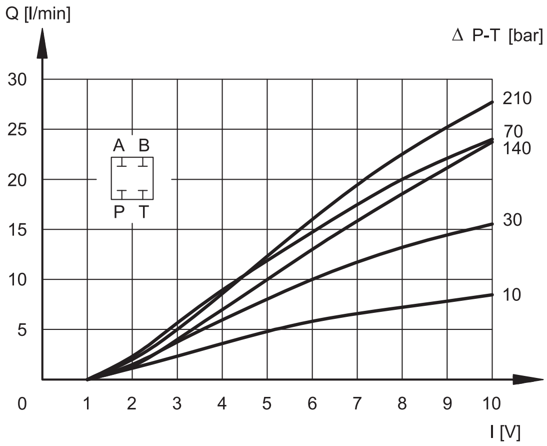
*	Controlled flow with p10 bar P-T
08	8 l/min
16	16 l/min
26	26 l/min

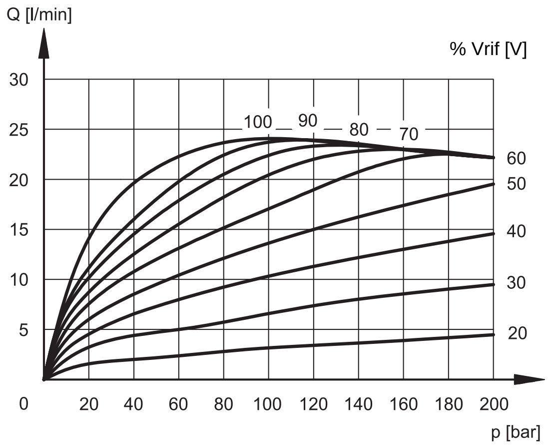
3 - CHARACTERISTIC CURVES (obtained with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronics)

Typical ”ow rate curves at constant p related to the reference signal and measured for the available spools. The p values are measured between P and T valve ports.

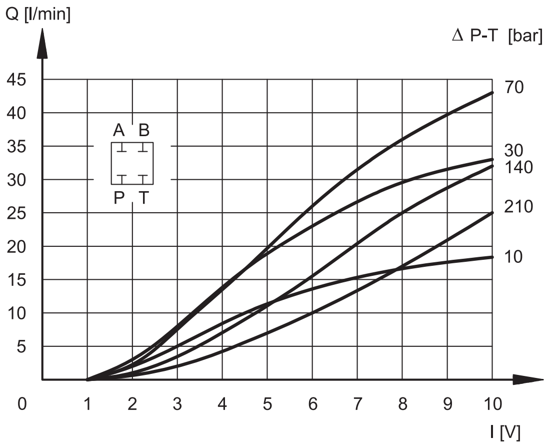


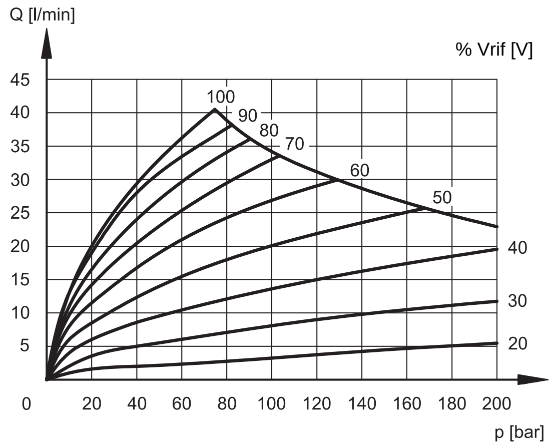
SPOOL C08



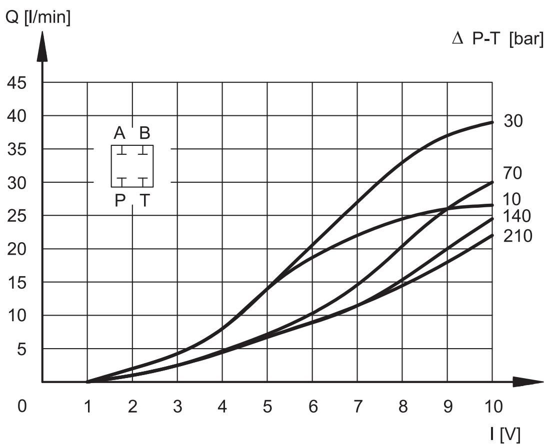


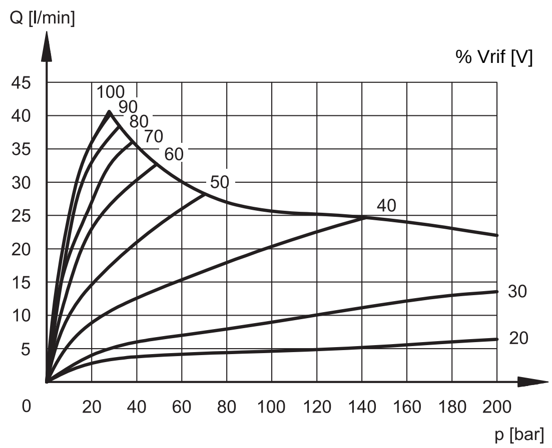
SPOOL C16



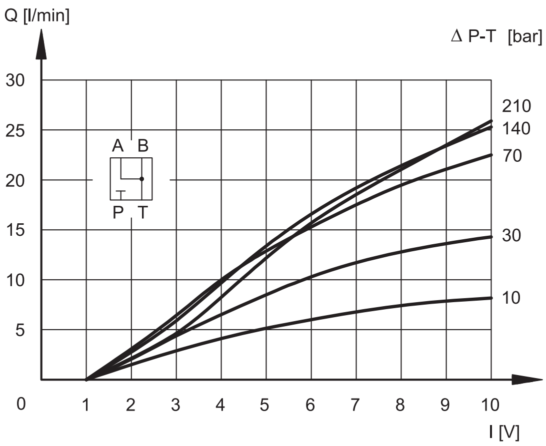


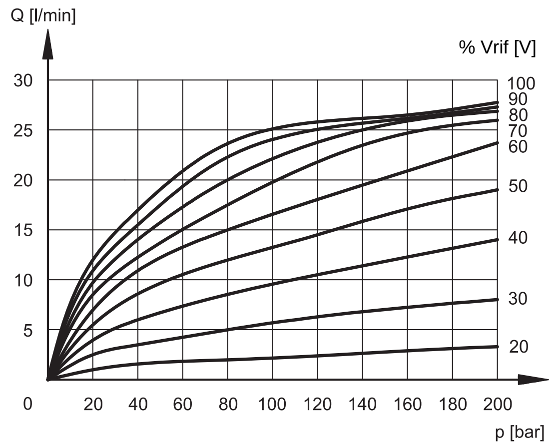
SPOOL C26



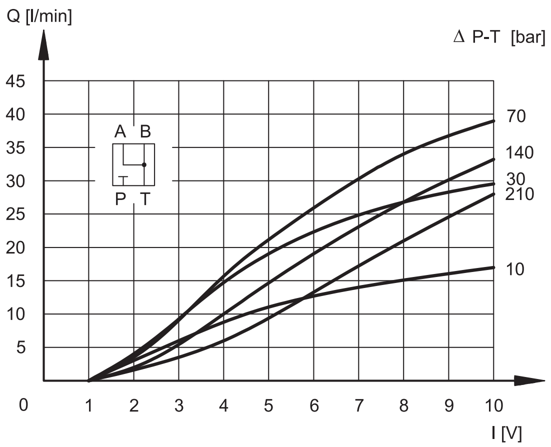


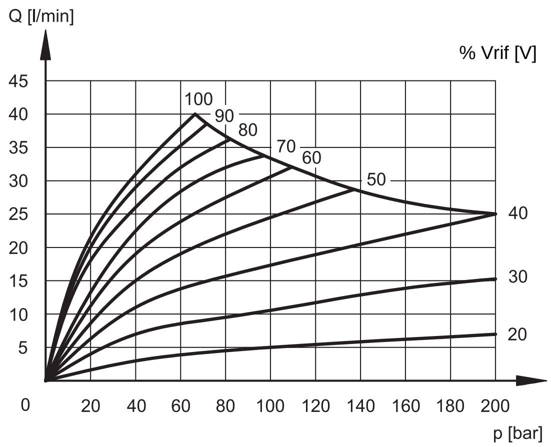
SPOOL A08



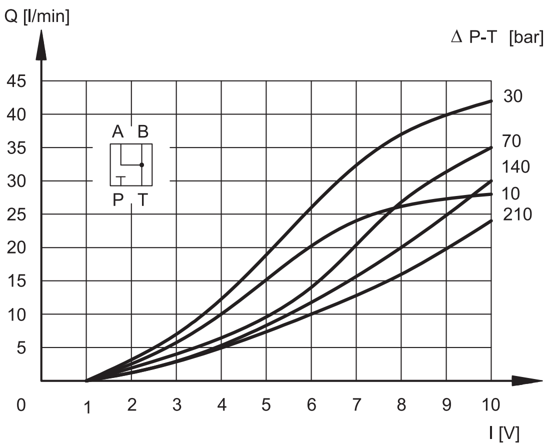


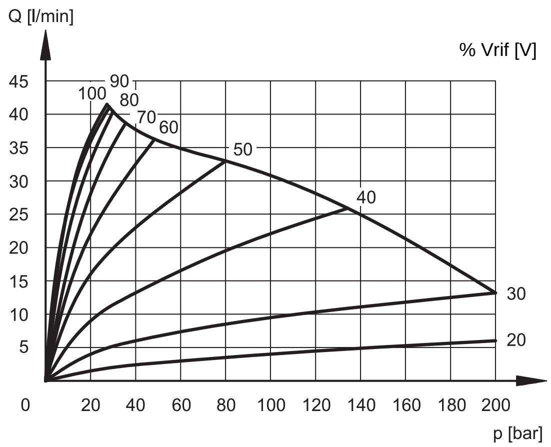
SPOOL A16





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

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.

NOMINAL VOLTAGE	V DC	**12**
RESISTANCE (at 20°C)		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	

5.2 - Positional transducer

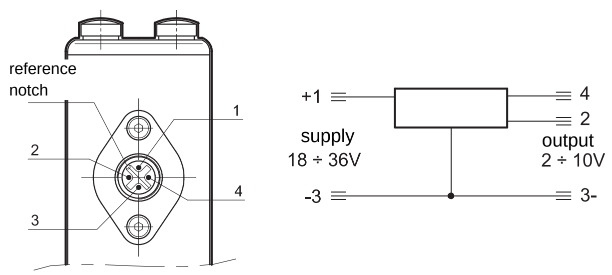
The DSE3F valve mounts an LVDT type positional transducer with amplified signal to enable precise control of the restrictor and the set flow rate, thus improving repeatability and hysteresis characteristics.

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 p = 30 bar P-T.

REFERENCE SIGNAL STEP	0 100%	100 0%
Step response [ms]	30	25

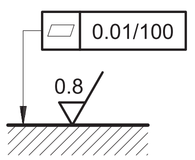
7 - INSTALLATION

DSE3F valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

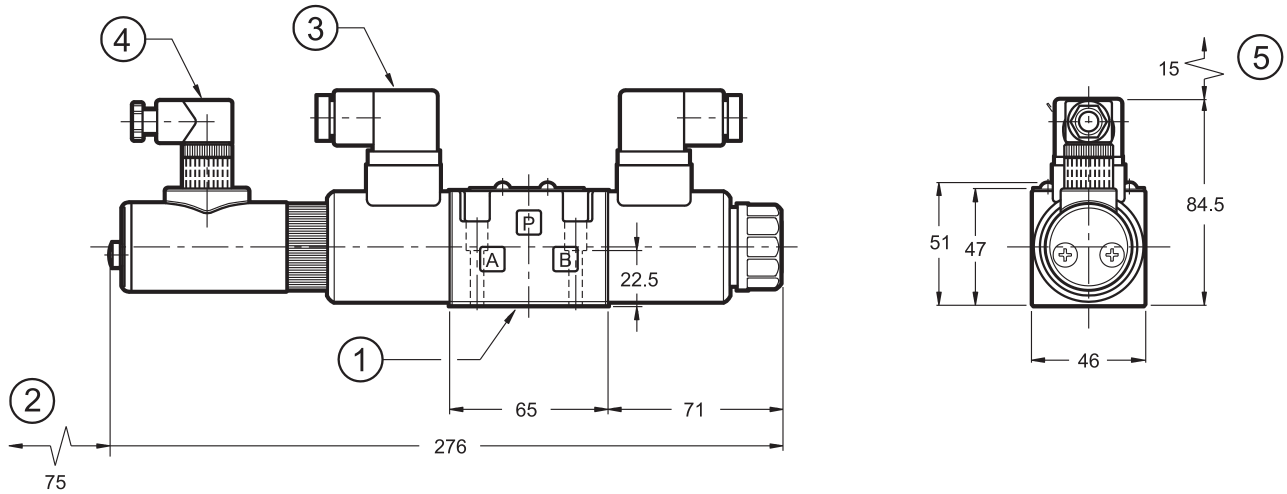
Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed fluid can easily leak between the valve and mounting surface.

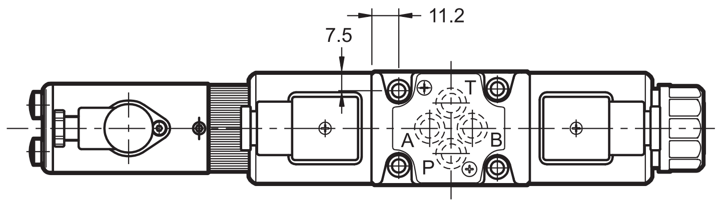
Surface finishing



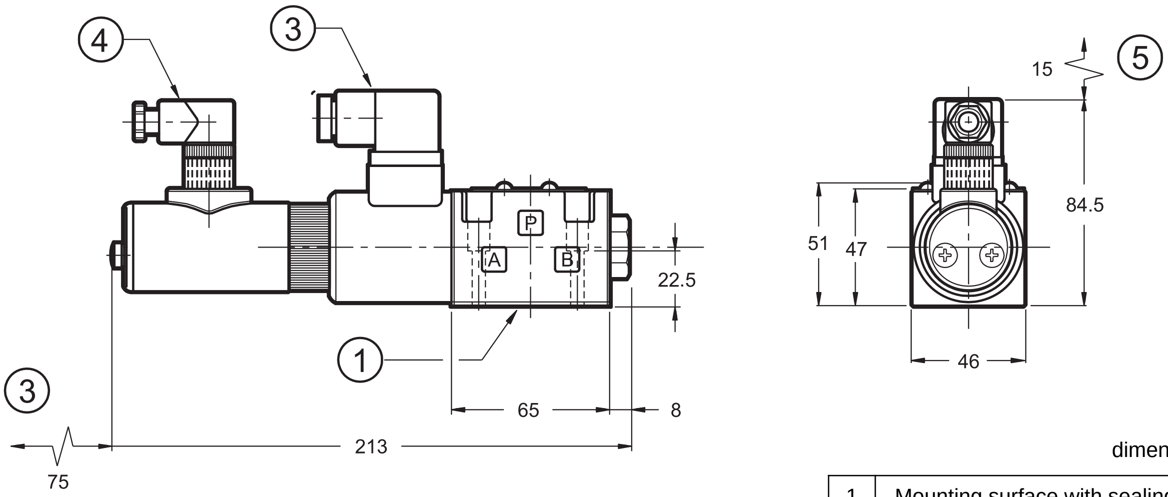
9 - OVERALL AND MOUNTING DIMENSIONS

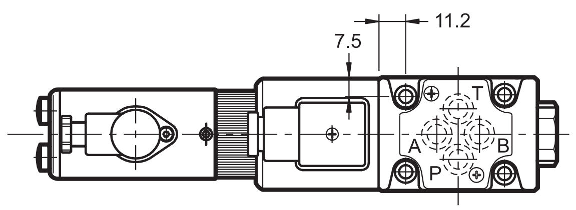
DSE3F-A*
DSE3F-C*





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: 3/8Ž BSP

DUPLOMATIC OLEODINAMICA

DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

DSE5

DIRECTIONAL VALVE WITH PROPORTIONAL CONTROL

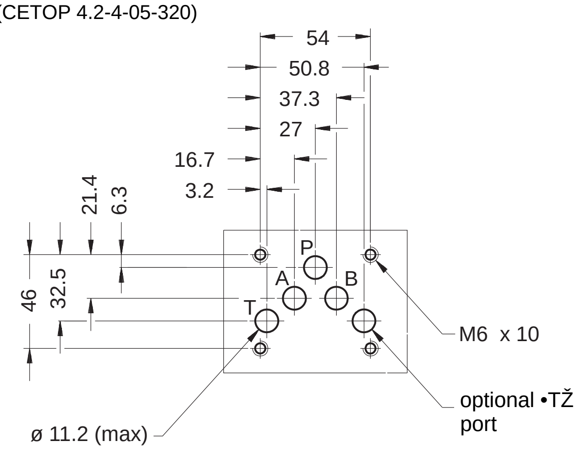
SERIES 10

SUBPLATE MOUNTING
ISO 4401-05 (CETOP 05)

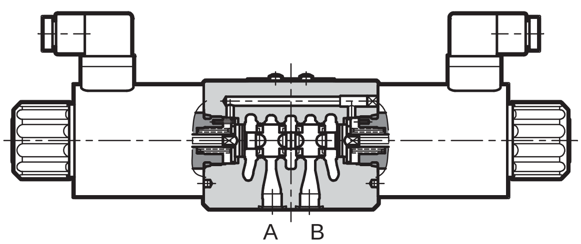
p max **320** bar
Q max **90** l/min

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 (CETOP RP 121H).
- 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 by means of the relative electronic control units to exploit valve performance to the full (see paragraph 11).
- The DSE5 valve is available in special version with Y external subplate drain port (see paragraph 9).

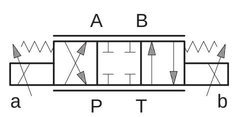
PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control cards)

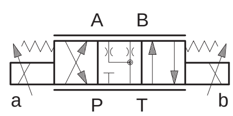
Maximum operating pressure: - P - A - B ports - T port : standard version version with Y port	bar	320 210 320
Maximum flow with p 10 bar P-T	l/min	30 - 60
Step response	see paragraph 6	
Hysteresis (with PWM 100 Hz)	% of Q max	< 6%
Repeatability	% of Q max	< ±1,5%
Electrical characteristics	see paragraph 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: 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		-		K1	

Directly operated directional control valve

Electric proportional control

Size ISO 4401-05 (CETOP 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

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: plug for connector type DIN 43650 (**standard**)

Manual override (see par. 10)

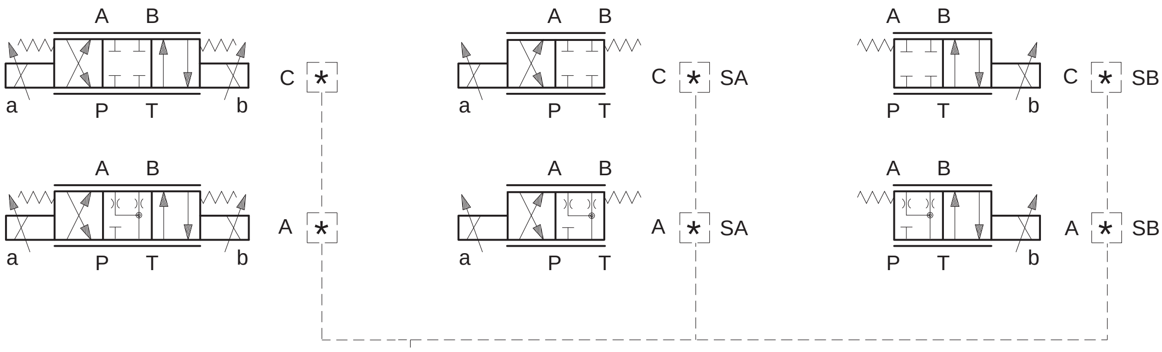
2 - CONFIGURATIONS

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**Ž configuration: 1 solenoid on side A.
2 positions (central + external) with spring centering

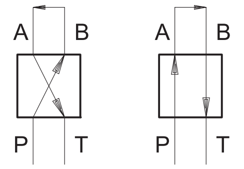
•**SB**Ž configuration: 1 solenoid on side B.
2 positions (central + external) with spring centering



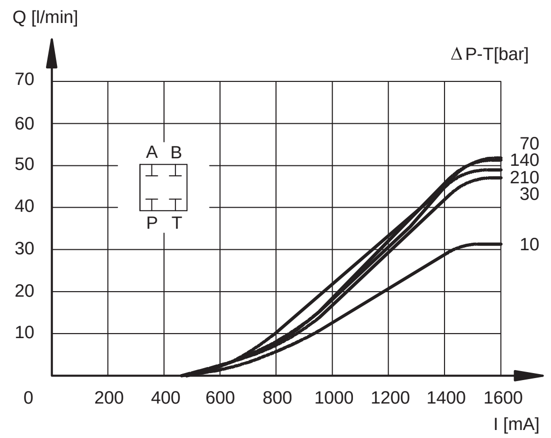
*	Controlled flow with Δp 10 bar P-T
30	30 l/min
60	60 l/min
60/30	60 (P-A) / 30 (B-T) l/min

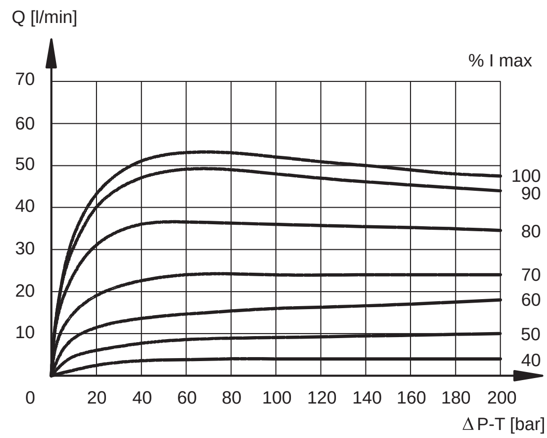
3 - CHARACTERISTIC CURVES (values measured with viscosity of 36 cSt at 50°C with valves connected to the relative electronic control units)

Typical constant flow rate control curves at p according to current supply to solenoid (D24 version, maximum current 1600 mA), measured for the various spool types available. The reference p values are measured between ports P and T on the valve.

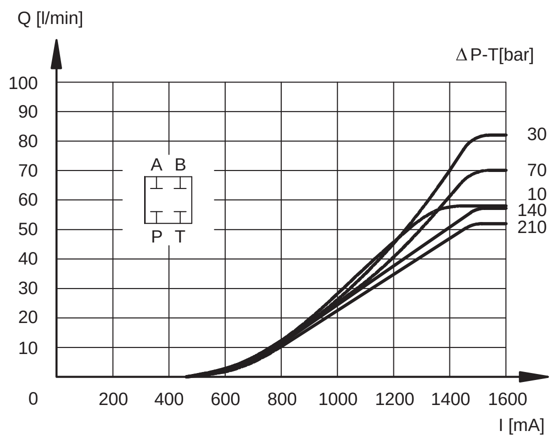


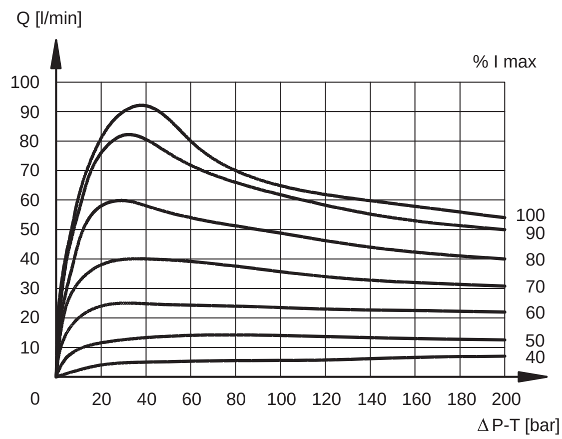
SPOOL TYPE C30



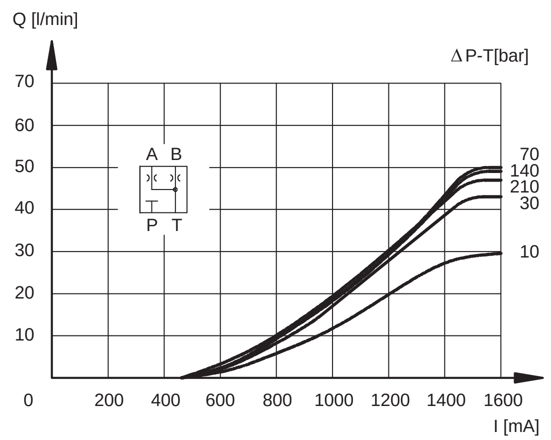


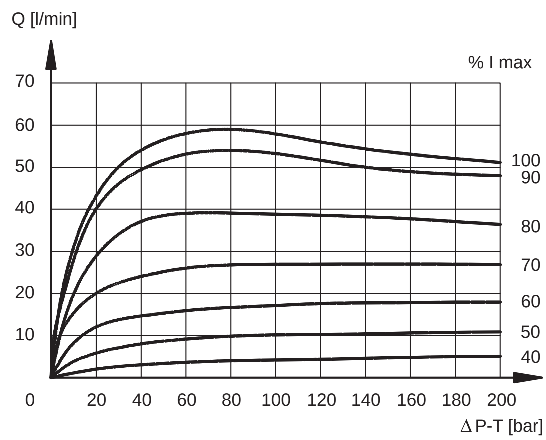
SPOOL TYPE C60



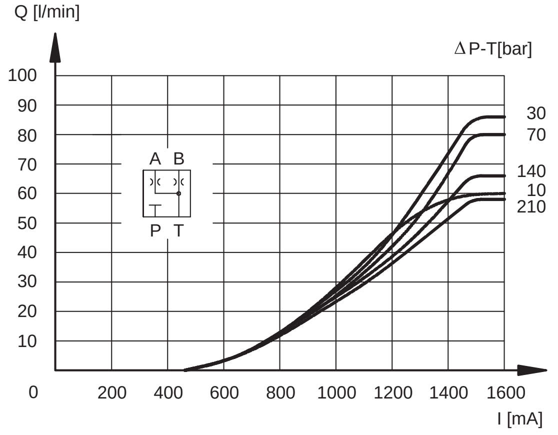


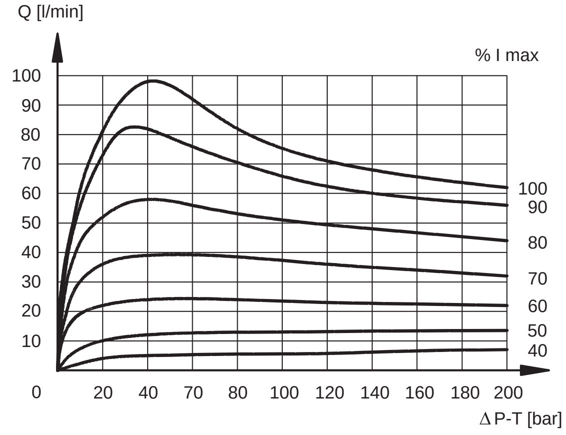
SPOOL TYPE A30





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)		3 - 3.4	8.65
MAXIMUM CURRENT	A	2.6	1.6
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 position value following a step change of reference signal.

The table shows typical response times tested with spool type C60 and p = 20 bar P-T.

REFERENCE SIGNAL STEP	0 100%	100% 0
Step response [ms]		
DSE5-A* **DSE5-C***	50	40

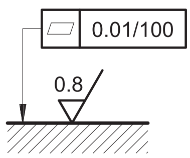
7 - INSTALLATION

DSE5 valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

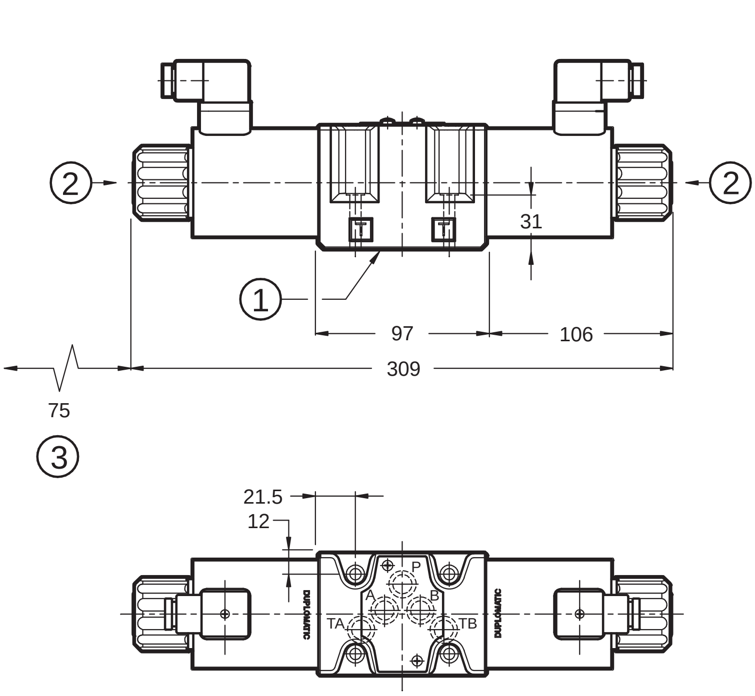
Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed fluid can easily leak between the valve and support surface.

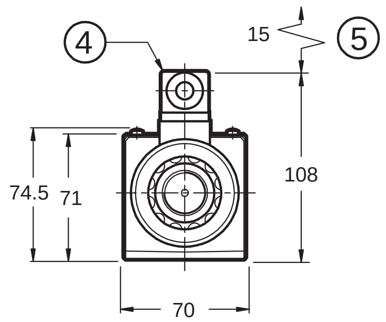
Surface finishing



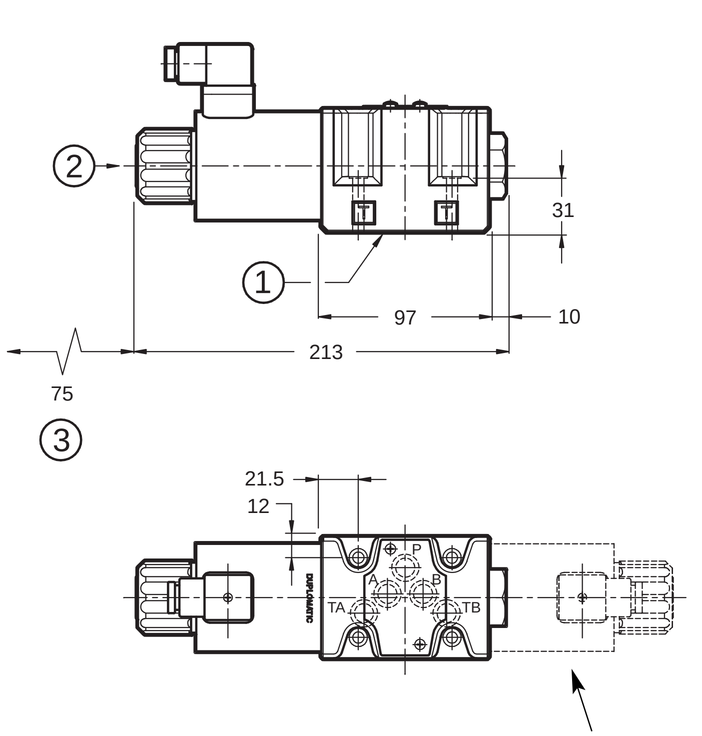
8 - OVERALL AND MOUNTING DIMENSIONS

DSE5-A*
DSE5-C*

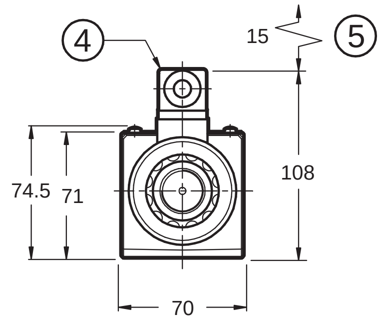




DSE5-A*SA
DSE5-C*SA



A*SB and C*SB versions solenoid position



dimensions in mm

1	Mounting surface with sealing rings: 5 OR type 2050 (12.42x1.78) - 90 Shore
2	Standard manual override integrated in the solenoid tube
3	Coil removal space
4	DIN 43650 electric coil connector
5	Connector removal space

Fastening bolts: 4 bolts M6x40 - ISO 4762
Torque: 8 Nm (bolts A 8.8)

9 - SPECIAL VERSION WITH Y EXTERNAL SUBPLATE DRAIN PORT

Identification Code

D	S	E	5	-				/	10		-		K1	/	Y

Directly operated directional control valve

Electric proportional control

ISO 4401-05 (CETOP 05) size

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

Port for subplate external drain

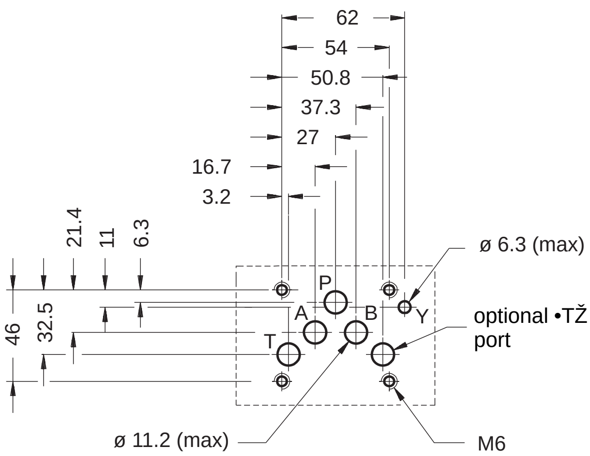
Coil electrical connection: plug for connector type DIN 43650 (**standard**)

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)

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 (CETOP 4.2-4-R05). 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.



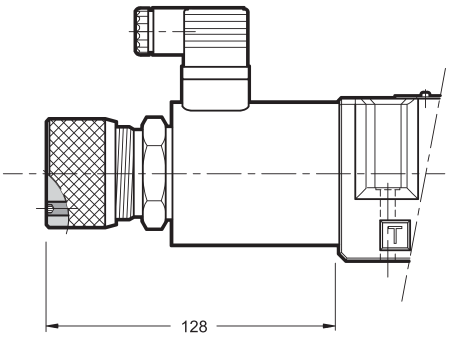
10 - MANUAL OVERRIDE

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.

The following manual override is available upon request:

- **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 - ELECTRONIC CONTROL UNITS

DSE5- * *SA (SB)

EDC-131	for solenoid 24V DC	plug version	see cat.89 120
EDC-151	for solenoid 12V DC		
EDM-M131	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250
EDM-M151	for solenoid 12V DC		

DSE5- A*   DSE5-C*

EDM-M231	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250
EDM-M251	for solenoid 12V DC		

12 - SUBPLATES (see cat. 51 000)

Type PMD4-AI4G with rear ports 3/4Ž BSP
Type PMD4-AL4G with side ports 1/2Ž BSP

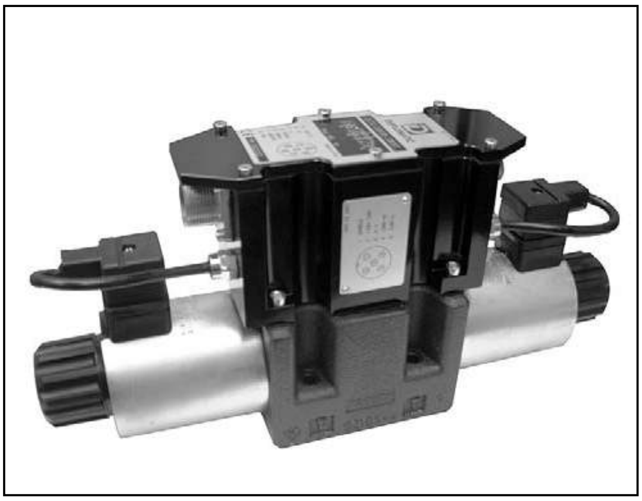
DUPLOMATIC OLEODINAMICA

DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

DSE5G

DIRECTIONAL VALVE WITH PROPORTIONAL CONTROL AND INTEGRATED ELECTRONICS

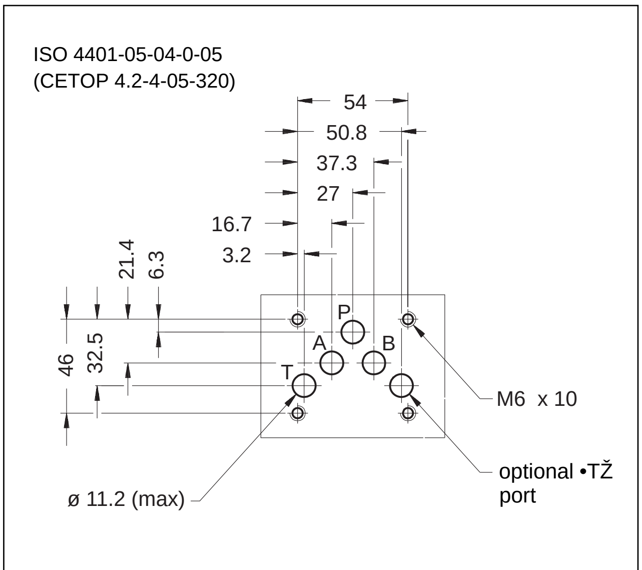
SERIES 10



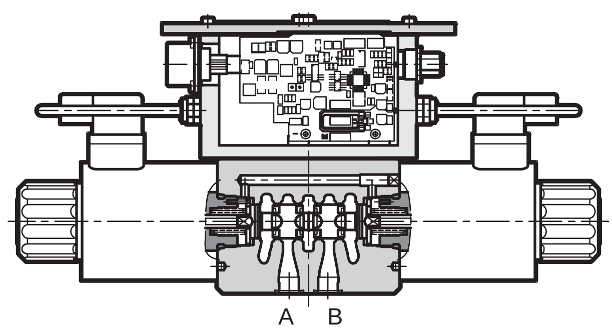
SUBPLATE MOUNTING
ISO 4401-05 (CETOP 05)

p max **320** bar
Q max **90** l/min

MOUNTING SURFACE



OPERATING PRINCIPLE



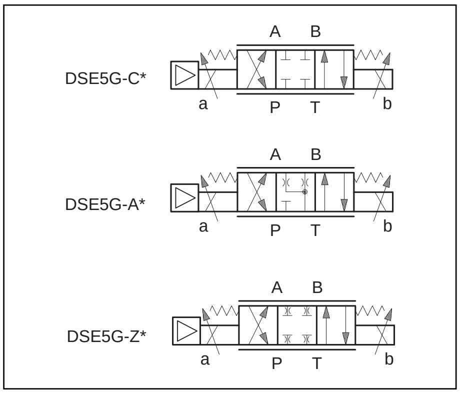
- The DSE5G is a direct operated directional valve with integrated electric proportional control and mounting interface in compliance with ISO 4401 (CETOP RP 121H) standards.
- It is normally used to control the positioning and the speed of hydraulic actuators.
- The valve opening and hence flow rate can be modulated continuously in proportion to the reference signal.
- The valve is controlled directly by an integrated digital amplifier (see par. 5).

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and integrated electronics)

Maximum operating pressure: - P - A - B ports - T port	bar	320 140
Maximum flow with p 10 bar P-T	l/min	30 - 60
Response times	see paragraph 4	
Hysteresis	% of Q max	< 3%
Repeatability	% of Q max	< ±1%
Electrical characteristics	see paragraph 5	
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	
Recommended viscosity	cSt	25
Mass: single solenoid valve double solenoid valve	kg	5,1 6,6

HYDRAULIC SYMBOLS (typical)



1 - IDENTIFICATION CODE

D	S	E	5	G	-				/	10		-		K11	/	

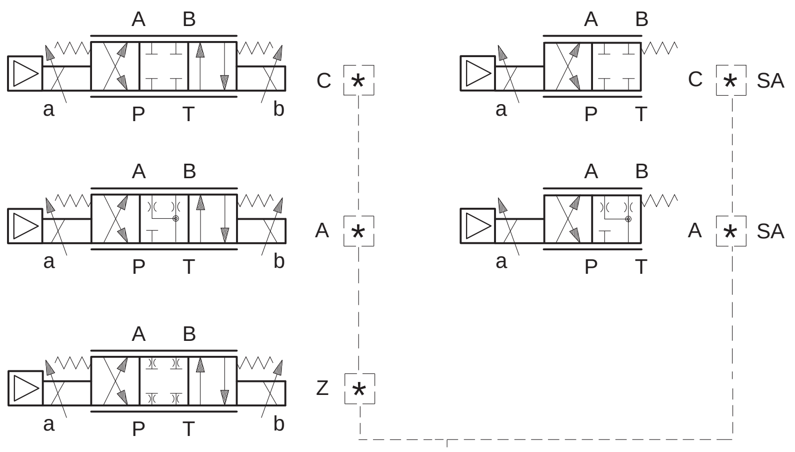
- Direct operated directional control valve (**DS**)
- Electric proportional control (**E**)
- Size ISO 4401-05 (CETOP 05) (**5**)
- Digital integrated electronics for open loop (**G**)
- Spool type:
  C = closed centres
  A = open centers
  Z = zero overlap
- Nominal flow rate of the spool (see chart par. 2)
- Solenoid position (omit for 2 solenoids configuration):
  SA = 1 solenoid on side A
- Series No. (the overall and mounting dimensions remain unchanged fron 10 to 19)
- Seals:
  N = NBR seals for mineral oil (**standard**)
  V = FPM seals for special fluids
- Reference signal:
  E0 = voltage ± 10V
  E1 = current 4 / 20mA
- Main connector 6 pin + PE (**K11**)
- **B** = standard version
  C = with CAN connector

2 - CONFIGURATION

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**Ž:
2 positions (central + external) with spring centering



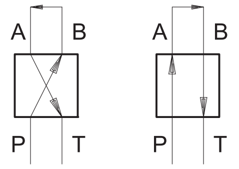
*	Controlled flow with 10 bar P-T
30	30 l/min
60	60 l/min
60/30	60 (P-A) / 30 (B-T) l/n

3 - CHARACTERISTIC CURVES (obtained with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronics)

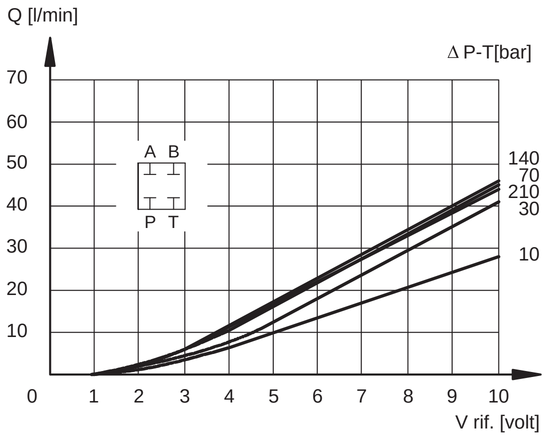
Typical flow rate curves at constant p related to the reference signal and measured for the available spools. The p values are measured between P and T valve ports.

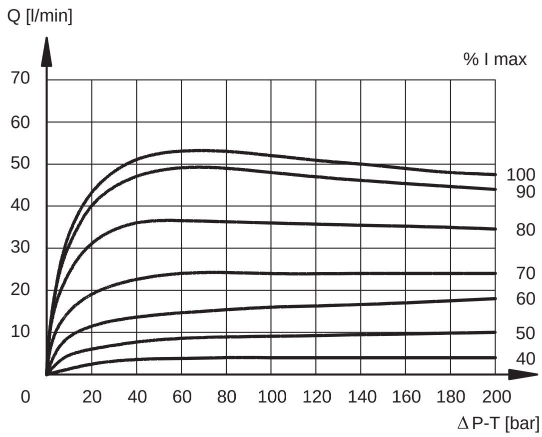
The curves are obtained after linearization in factory of the characteristic curve through the digital amplifier. The linearization of the curve is performed with a constant p of 30 bar and by setting the value of flow start at 10% of the reference signal.

NOTE: for the zero overlap spool (Z), please refer to the characteristic curves of C type spool, considering that the starting flow rate value is approx. 150 mV.

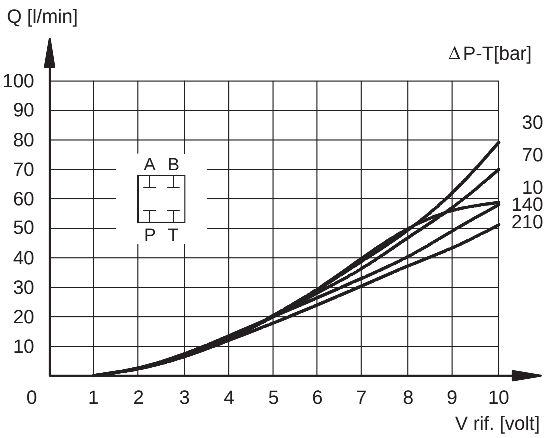


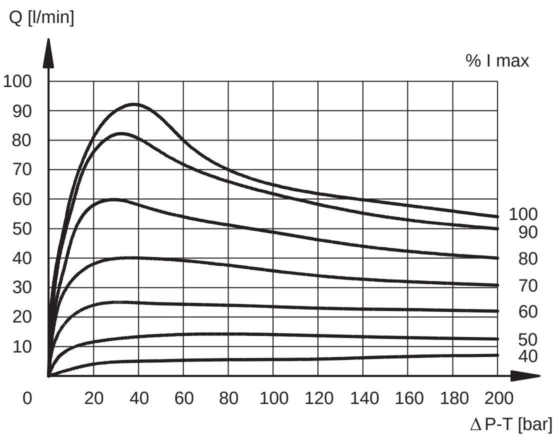
SPOOL TYPE C30



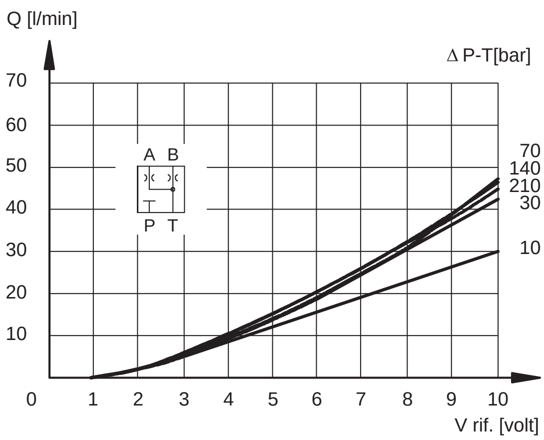


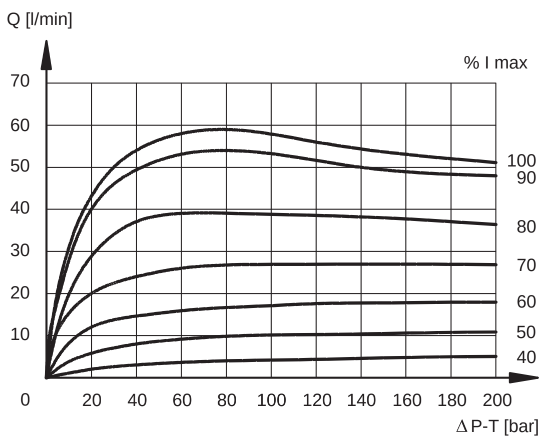
SPOOL TYPE C60



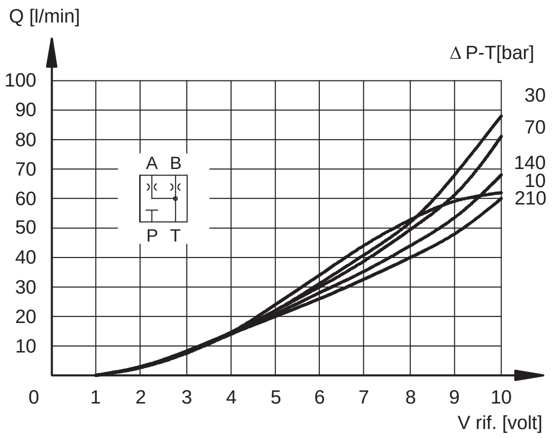


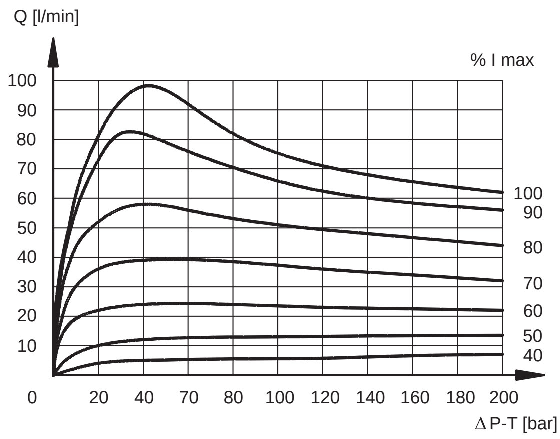
SPOOL TYPE A30



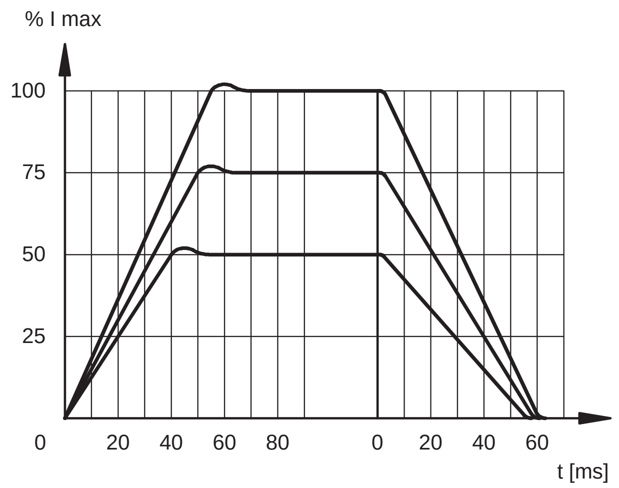


SPOOL TYPE A60





4 - RESPONSE TIMES (obtained with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronics)



5 - ELECTRICAL CHARACTERISTICS

5.1 - Digital integrated electronics

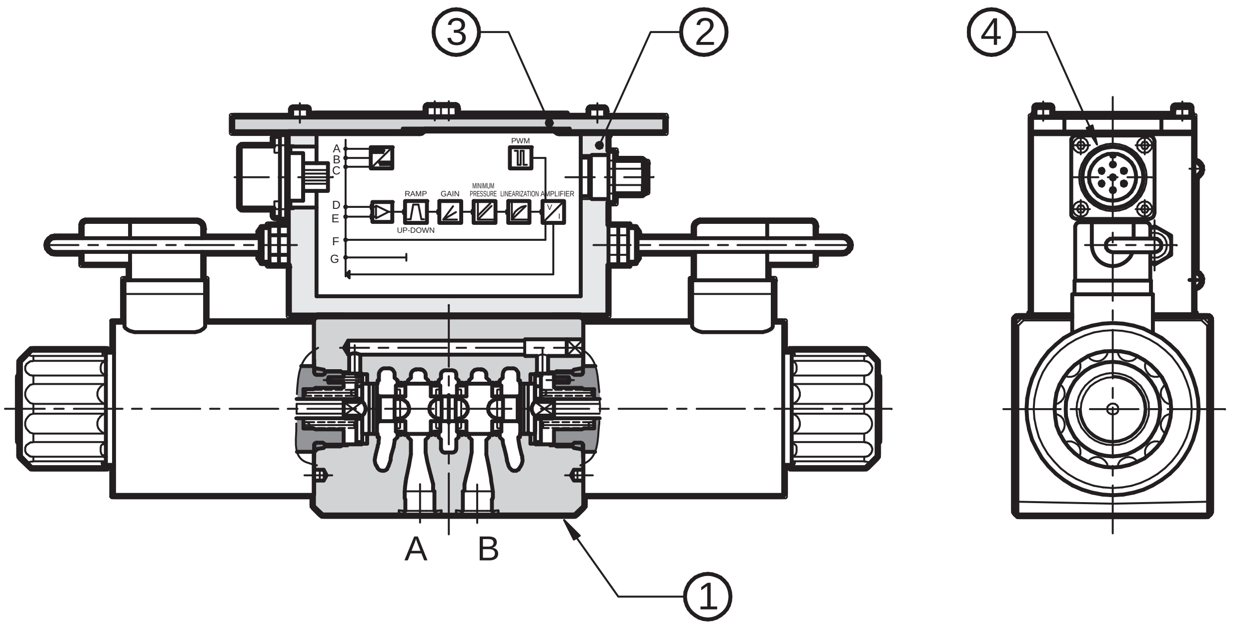
The proportional valve is controlled by a digital amplifier (driver), which incorporates a microprocessor that controls, via software, all the valve functions, such as:
- continuous converting (0,5 ms) of the voltage reference signal (E0) or of the current reference signal (E1) in a digital value
- generation of up and down ramps (see **NOTE**)
- gains limit (see **NOTE**)
- compensation of the dead band
- linearization of the characteristic curve
- regulation of the current to the solenoid
- dynamic regulation of PWM frequency
- protection of the solenoid outputs against possible short circuits

NOTE: these parameters can be set through the connection to the CAN connector, by means of a personal computer and relevant software (see paragraph 6.3)

The digital driver enables the valve to reach better perfomance compared to the analogic version, such as:

- reduced hysteresis and improved repeatability
- reduced response times
- linearization of the characteristic curve which is optimised in factory for each valve
- complete interchangeability in case of valve replacement
- possibility to set, via software, the functional parameters
- possibility to interface a CAN-Open network
- possibility to perform a diagnostic program by means of the CAN connection
- high immunity to electromagnetic troubles

5.2 - Functional block diagram



1	Valve with proportional solenoids	3	Digital card
2	Electronics envelope	4	Main connector

5.3 - Electrical characteristics

NOMINAL VOLTAGE	V DC	24 (from 19 to 35 VDC, ripple max 3 Vpp)
ABSORBED POWER	W	70
MAXIMUM CURRENT	A	2,60
DUTY CYCLE		100%
VOLTAGE SIGNAL (E0)	V DC	±10 (Impedence Ri > 50K)
CURRENT SIGNAL (E1)	mA	4 ÷ 20 (Impedence Ri = 500)
ALARMS		Overload and electronics overheating
COMMUNICATION		Interface of the optoisolated industrial Field-bus type CAN-Bus ISO 11898
MAIN CONNECTOR		7 - pin MIL-C-5015-G (DIN 43563)
CAN-BUS CONNECTOR		M12-IEC 60947-5-2
ELECTROMAGNETIC COMPATIBILITY ((EMC) emissions CEI EN 61000-6-4 immunity CEI EN 61000-4-2		According to 2004/108/CE standards
PROTECTION AGAINST ATMOSPHERIC AGENTS :		IP67 (CEI EN 60529 standards)

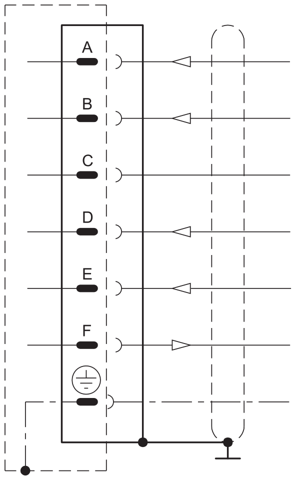
6 - OPERATING MODALITIES

The digital driver of DSE5G valve may be used with different functions and operating modalities, depending on the requested performances.

6.1 - Standard version with voltage reference signal (E0)

This is the most common version; it makes the valve completely interchangeable with the traditional proportional valves with analog type integrated electronics. The valve has only to be connected as indicated below. This version doesn•t allow the setting of the valve parameters, for example the ramps must be performed in the PLC program, as well as the reference signal limit.

Connection scheme (B version - E0)

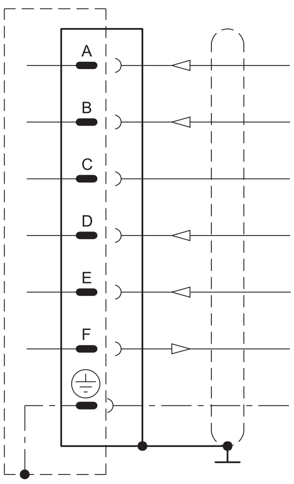


Pin	Values	Function	NOTES
A	24 VDC	Voltage	from 19 to 35 VDC (ripple max 3 Vpp) (see **NOTE 3**)
B	0 V	Power supply (zero)	0 V
C	----	Not used	----
D	± 10 V	Input rated command	Impedence R_i > 50 k (see **NOTE 1**)
E	0 V	Input rated command	----
F	± 10 V	Coil current	± 100% I_{MAX} (see **NOTE 2**)
PE	GND	Protective ground	----

6.2 - Standard version with current reference signal (E1)

This version has characteristics which are similar to the previous one, with the difference that in this case the reference signal is supplied in current 4 - 20 mA. With the 12 mA signal the valve is in central position, with the 20 mA signal the valve performs the configuration P-A and B-T, while with 4 mA the configuration is P-B and A-T. For •SAŽ single solenoid valves, with reference 20 mA to pin D, the valve full opening is P-B and A-T, while with 4 mA the valve is at rest. This configuration may be modified via software. If the current to solenoid is lower, than the card shows a BREAKDOWN CABLE error. To reset the error switch-off the supply.

Connection scheme (B- version - E1)



Pin	Values	Function	NOTES
A	24 VDC	Voltage	from 19 to 35 VDC (ripple max 3 Vpp) (see **NOTE 3**)
B	0 V	Power supply (zero)	0 V
C	----	Not used	----
D	4 ÷ 20 mA	Input signal	Impedence R_i = 500
E	0 V	Zero reference	----
F	± 10 V	Coil current	± 100% I_{MAX} (see **NOTE 2**)
PE	GND	Protective ground	----

NOTE 1: Only on version E0 (with voltage reference signal) the input signal is differential type. For double solenoid valves, with positive reference signal connected to pin D, the valve opening is P - A and B - T. With zero reference signal the valve is in central position. For •SAŽ single solenoid valves, with positive reference to pin D, the valve opening is P-B and A-T. The spool stroke is proportional to U_D - U_E.
If only one input signal (single-end) is available, the pin B (0V power supply) and the pin E (0V reference signal) must be connected through a jumper and both connected to GND, electric panel side.

NOTE 2: read the test point pin F in relation to pin B (0V)

NOTE 3: preview on the Pin A (24 VDC) an external fuse for protecting electronics. Fuse characteristics: 5A/50V type fast.

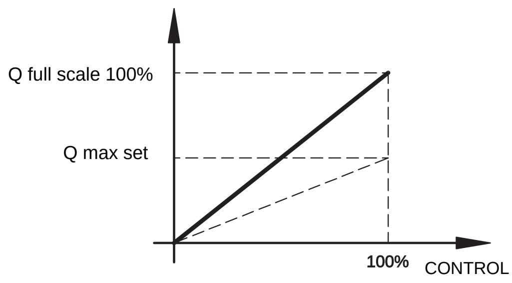
NOTE for the wiring: connections must be made via the 7-pin plug mounted on the amplifier. Recommended cable sizes are 0,75 mm^2 for cables up to 20m and 1,00 mm^2 for cables up to 40m, for power supply. The signal cables must be 0,50 mm^2. A suitable cable would have 7 cores, a separate screen for the signal wires and an overall screen.

6.3 - Version with parameters set by means of CAN connector (version C)

This version allow to set some parameters of the valve connecting a PC to the CAN connector.
To do this, you have to order the interface device for USB port **CANPC-USB/20** (code 3898101002), complete of the configuration software, a communication cable (lenght 3 mt) and a hardware converter needed to connect the valve to the USB port. The software is Microsoft Windows Xp© compliant.

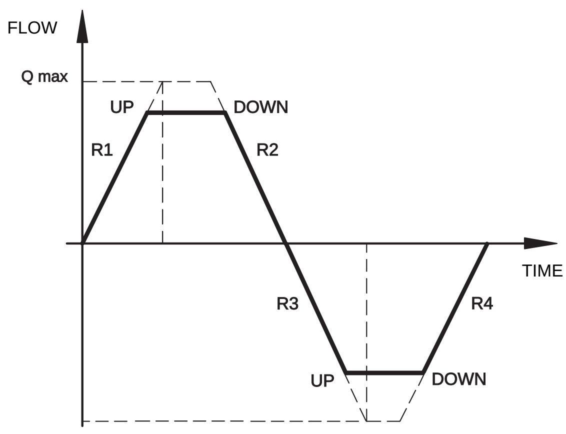
The parameters that can be set are described below:

Maximum current (Gain regulation)
Imax A and Imax B set the maximum current to the solenoid A corresponding to the positive value of the input reference. With this parameter is possible to reduce the valve flow with the maximum reference.
Default value = 100% of full scale
Range: from 100% to 50% of full scale



PWM Frequency
Sets the PWM frequency, which is the pulsating frequency of the control current. The PWM decrease improves the valve accuracy, decreasing the regulation stability.
The PWM increase improves the regulation stability, causing a higher hysteresis.
Default value = 200 Hz
Range 50 ÷ 500 Hz

Ramps
Increase time of Ramp R1 - solenoid A: sets the current increase time for a variation from 0 to 100% of the input reference from zero to -10V.
Decrease time of Ramp R2 - solenoid A: sets the current decrease time for a variation from 100 to 0% of the input reference from -10V to zero.
Increase time of Ramp R3 - solenoid B: sets the current increase time for a variation from 0 to 100% of the input reference from zero to +10V.
Decrease time of Ramp R4 - solenoid B: sets the current decrease time for a variation from 100 to 0% of the input reference from +10V to zero.
Min time = 0,001 sec
Max time = 40,000 sec
Default time = 0,001 sec.



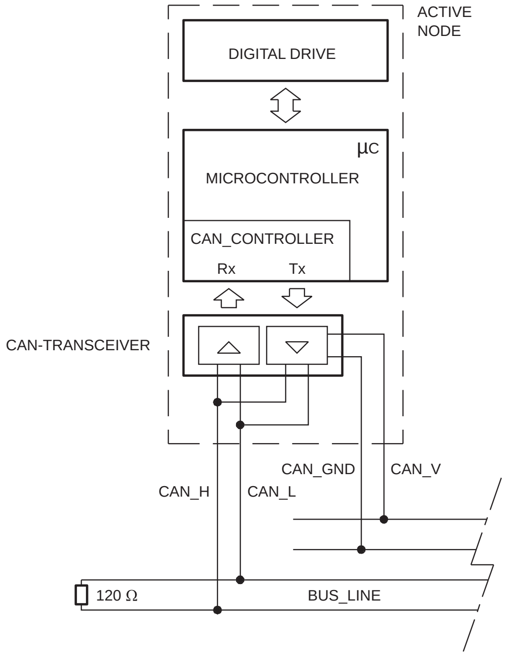
Diagnostics
Provides several information parameters, such as:
The electronic driver status (Working or Broken)
The active regulation
Input reference
Current value

6.4 - Version with CAN-Bus interface (version C)

This version allows the valve piloting through the industrial field bus CAN-Open, according to ISO 11898 standards.
The CAN connector must be connected (see scheme) as a slave node of the CAN-Open bus, while the main connector is wired only for the power supply (pin A and B + earth)

The most important characteristics of a CAN - Open connection are:
- Parameter storage also in PLC
- Parameters setting in real-time (PDO communication)
- On-line valve diagnostics
- Easy wiring with the serial connection
- Communication program according to international standards

For detailed information on the CAN-Open communication software, see cat. 89 800.



CAN connector connection scheme

Pin	Values	Function
1	CAN_SHLD	Monitor
2	CAN +24VDC	BUS + 24 VDC (max 30 mA)
3	CAN 0 DC	BUS 0 VDC
4	CAN_H	BUS line (high signal)
5	CAN_L	BUS line (low signal)

N.B. : insert a 120   resistance on pin 4 and pin 5 of the CAN connector when the valve is the closure knot of the CAN network.

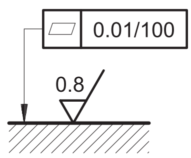
7 - INSTALLATION

DSE5G 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.

8 - HYDRAULIC FLUIDS

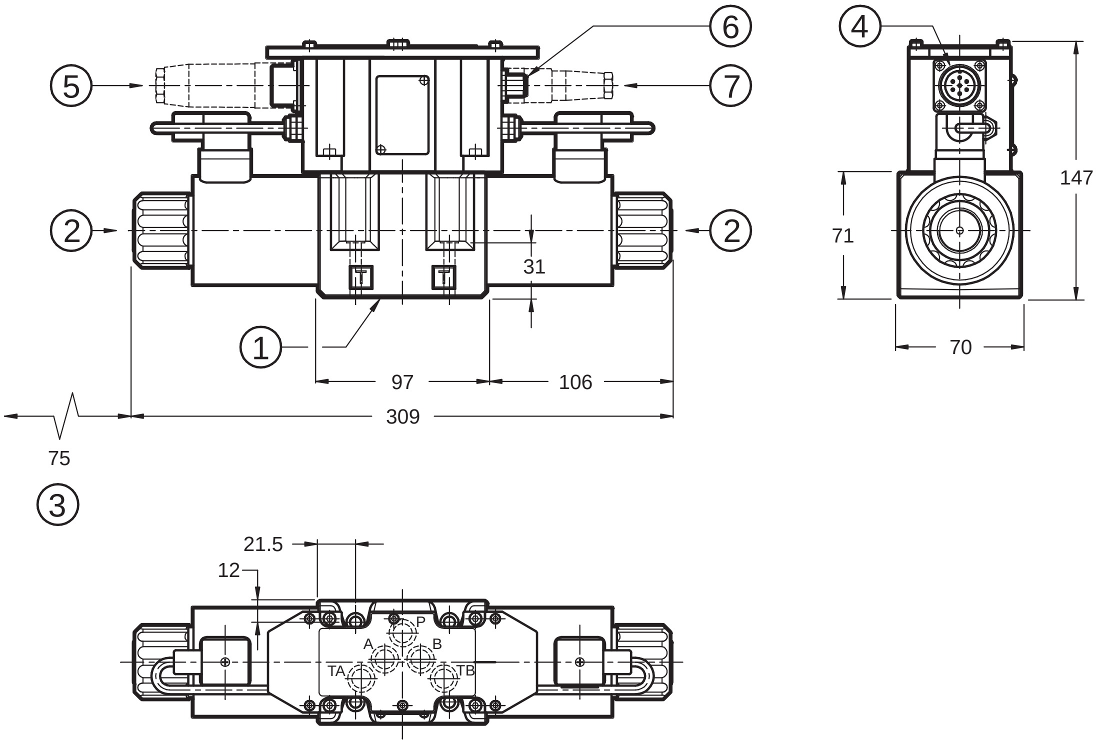
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N).
For fluids HFDR type (phosphate esters) use FPM seals (code V).
For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.
Using fluids at temperatures 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.

Surface finishing

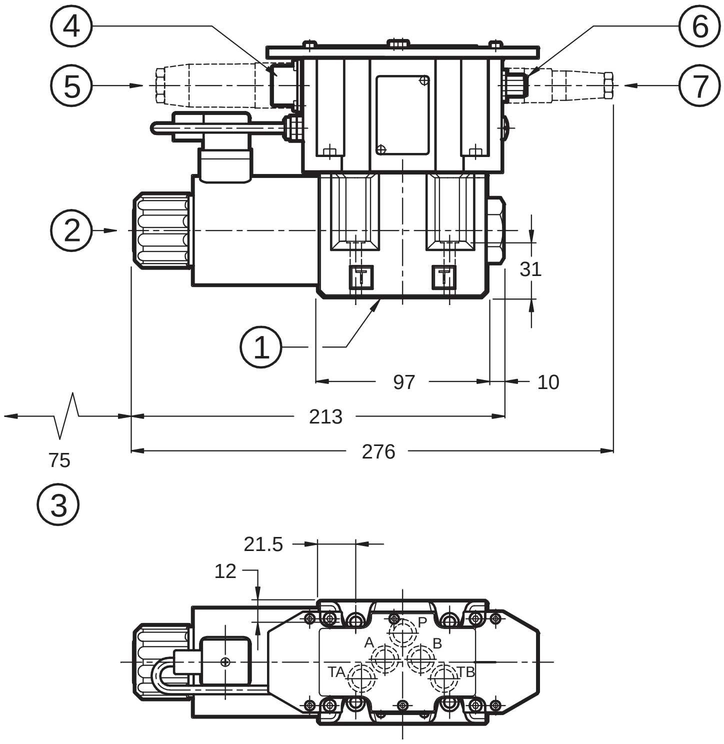


9 - OVERALL AND MOUNTING DIMENSIONS

DSE5G-A*
DSE5G-C*
DSE5G-Z*



DSE5G-A* SA
DSE5G-C* SA



Fastening bolts: 4 bolts M6x40 (advised class A12.9)

Torque: 8 Nm (bolts A8.8) - 14 Nm (bolts A12.9)

dimensions in mm

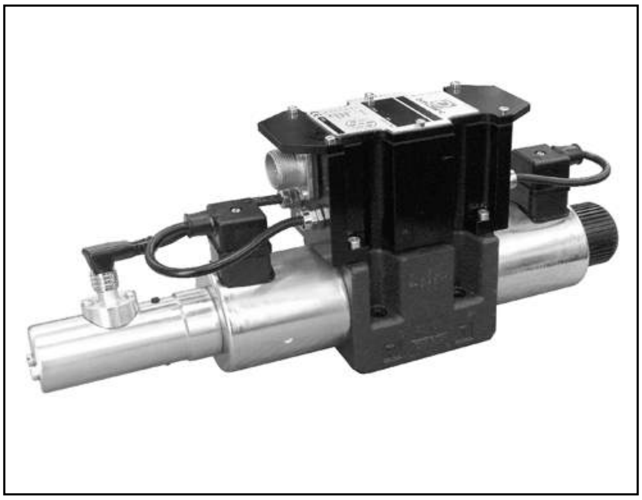
1	Mounting surface with sealing rings: 5 OR type 2050 (12.42x1.78) - 90 shore
2	Standard manual override embedded in the pipe of the solenoid
3	Coil removal space
4	Main connection
5	Electrical connector 7 pin DIN 43563 - IP67 PG11 EX7S/L/10 code 3890000003 (**to be ordered separately**)
6	CAN-Bus connection **(only for version C)**
7	Electrical connector 5 pin M12 - IP67 PG7 EC5S/M12L/10 code 3491001001 only for version C (**to be ordered separately**)

10 - SUBPLATES (See catalogue 51 000)

Type PMD4-AI4G rear ports 1/2Ž BSP
Type PMD4-AL4G side ports 1/2Ž BSP

DUPLOMATIC OLEODINAMICA

DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com



DSE5J

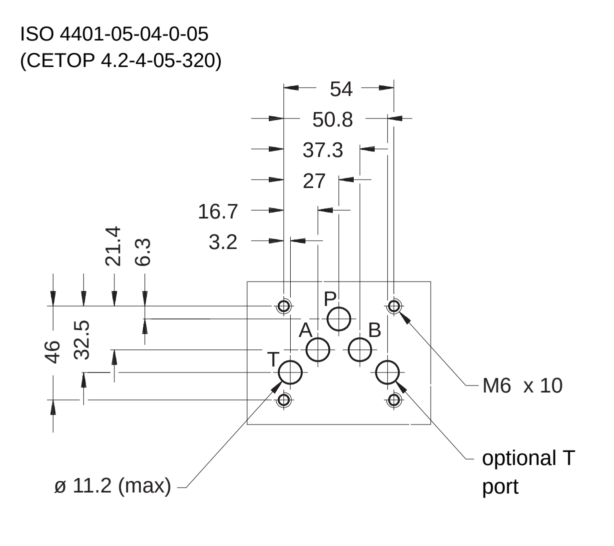
DIRECTIONAL VALVE WITH PROPORTIONAL CONTROL FEEDBACK AND INTEGRATED ELECTRONICS

SERIES 10

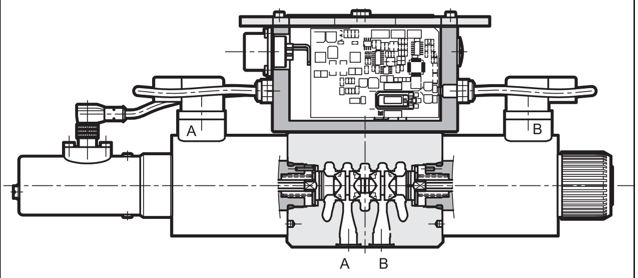
SUBPLATE MOUNTING
ISO 4401-05 (CETOP 05)

p max **320** bar
Q max **180** l/min

MOUNTING SURFACE



OPERATING PRINCIPLE



„ The DSE5J is a direct operated directional valve with integrated electric proportional control, feedback and mounting interface in compliance with ISO 4401 (CETOP RP 121H) standards.

„ It is normally used to control the direction and the speed of hydraulic actuators.

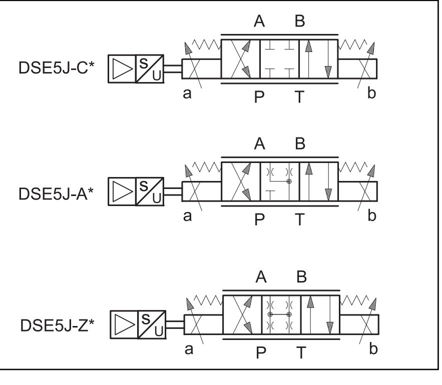
„ The valve opening and hence ”ow rate can be modulated continuously in proportion to the reference signal. Transducer and digital card allow a “ne control of the positioning of the cursor, reducing hysteresis and response time and optimizing the performance of the valve.

„ The valve is easy to install. The driver directly manages digital settings (see par. 6). In the case of special applications, you can customize the settings using the optional kit (see par. 7).

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 p 10 bar P-T	l/min	50 - 75
Response times	see paragraph 4	
Hysteresis	% of Q_{max}	< 0,2%
Repeatability	% of Q_{max}	< ± 0,1%
Threshold		< 0,1%
Valve reproducibility		5%
Electrical characteristics, IP	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: single solenoid valve double solenoid valve	kg	5,6 7,1

HYDRAULIC SYMBOLS (typical)



1 - IDENTIFICATION CODE

D	S	E	5	J	-				/	20		-		K11

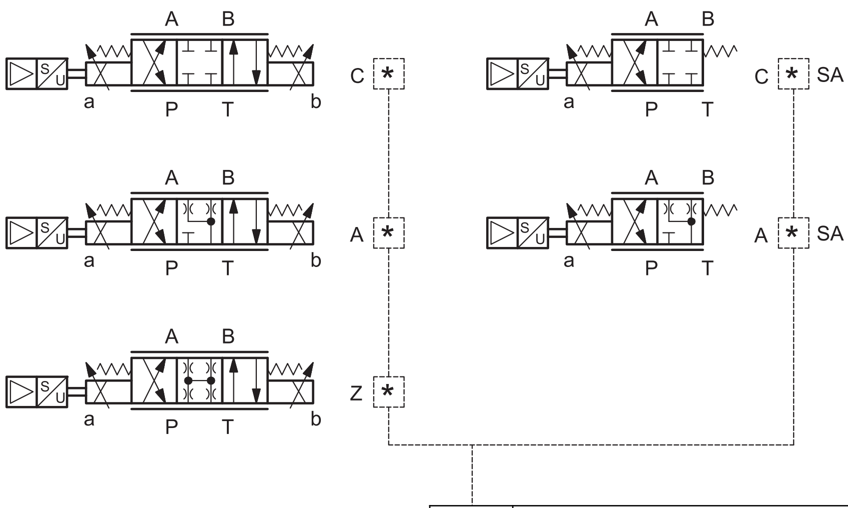
- Direct operated directional control valve
- Electric proportional control
- Size ISO 4401-05 (CETOP 05)
- Digital integrated electronics for valves with feedback
- Spool type:
  C = closed centres
  A = open centres
  Z = zero overlap
- Nominal ”ow rate of the spool (see chart par. 2)
- Solenoid position (omit for 2 solenoids configuration):
  SA = 1 solenoid on side A
- 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
- Reference signal:
  E0 = voltage ±10V
  E1 = current 4 / 20mA
- Main connector 6 pin + PE

2 - CONFIGURATIONS

Valve con“guration depends on the combination of the following elements:
number of proportional solenoids, spool type, rated ”ow.

Con“guration 2 solenoids :
3 positions with spring centering

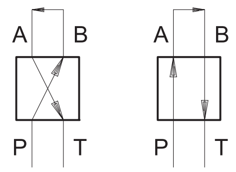
Con“guration 1 solenoid on side A •**SA**Ž:
2 positions (central + external) with spring centering



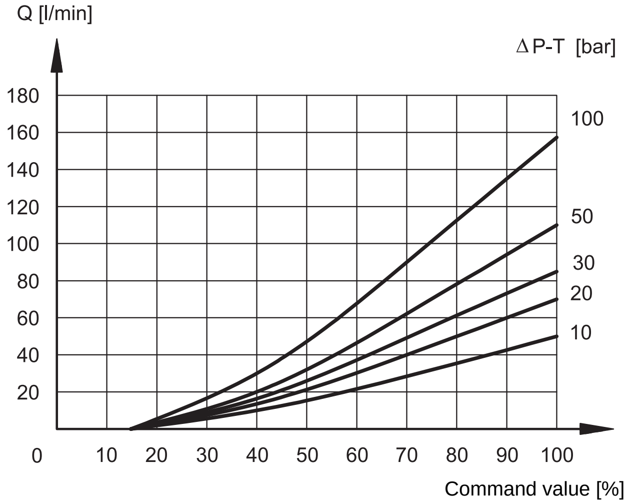
*	Controlled flow with p10 bar P-T
50	50 l/min
75	75 l/min
70/35	70 (P-A) / 35 (P-B) l/min

3 - CHARACTERISTIC CURVES (obtained with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronics)

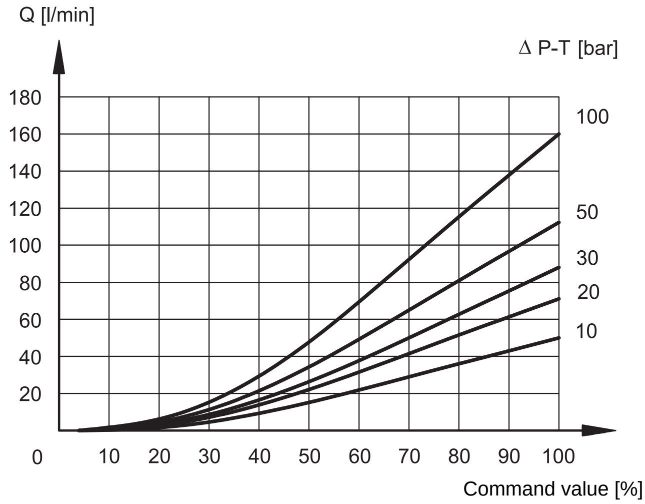
Typical ”ow rate curves at constant p related to the reference signal and measured for the available spools. The p values are measured between P and T valve ports.
The curves are obtained after linearization in factory of the characteristic curve through the digital ampli“er.



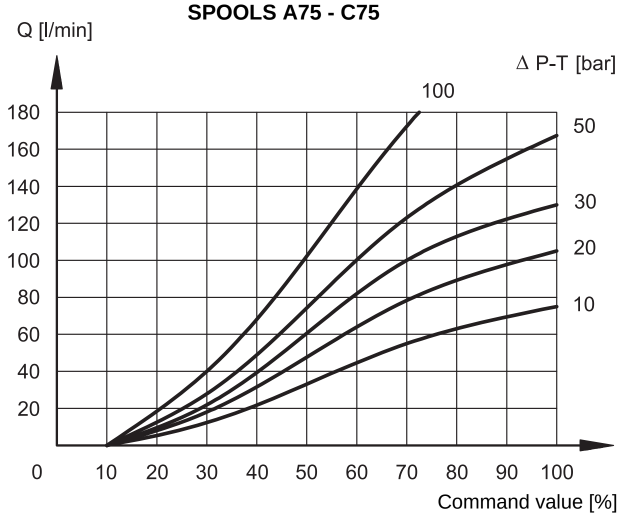
SPOOLS A50 - C50



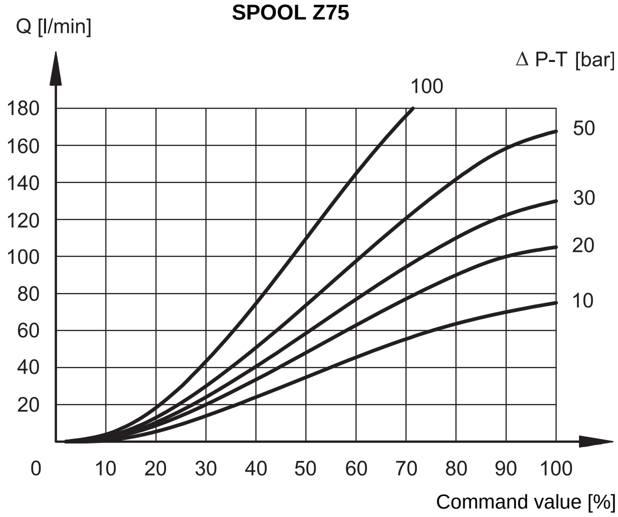
SPOOL Z50



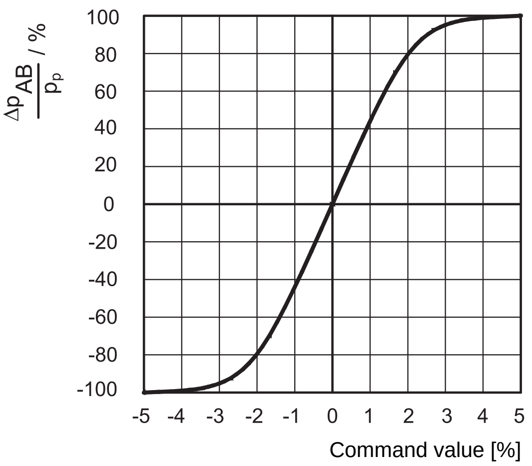
SPOOLS A75 - C75



SPOOL Z75



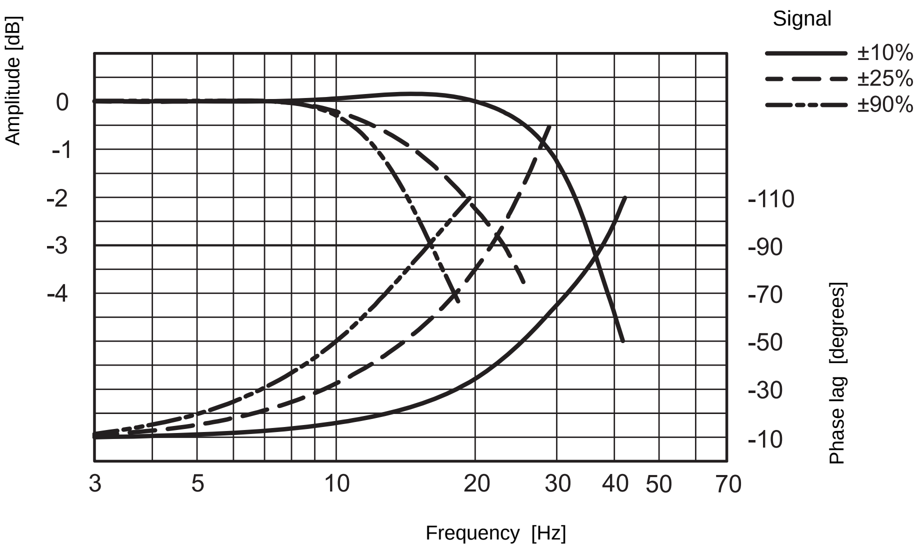
Z PRESSURE GAIN



The diagram shows the valve pressure gain, expressed as % of the ratio between the port pressure variation in A or B (p 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.

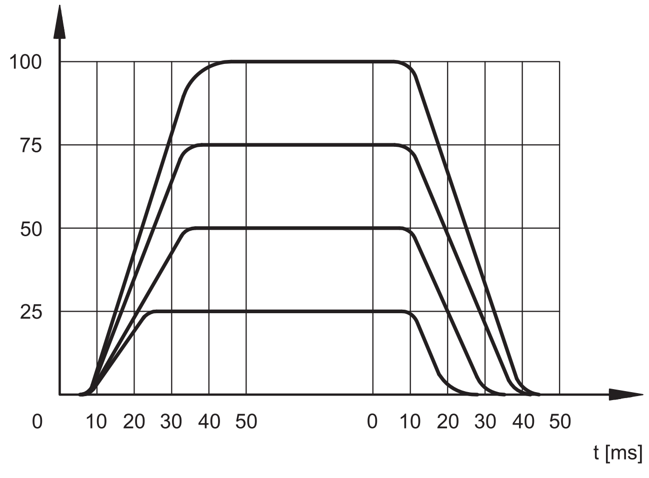
4 - RESPONSE TIME (obtained with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronics)

FREQUENCY RESPONSE (SPOOL Z - 4/3 valve)



These test amplitude are performed with 50% of max flow, and p (P-T) 10 bar.

RESPONSE TIME



5 - ELECTRICAL CHARACTERISTICS

5.1 - Digital integrated electronics

The proportional valve is controlled by a digital amplifier (driver), which incorporates a microprocessor that controls, via software, all the valve functions, such as:

- continuous converting of the voltage reference signal (E0) or of the current reference signal (E1) in a digital value
- generation of up and down ramps
- gains limit
- compensation of the dead band
- protection of the solenoid outputs against possible short circuits

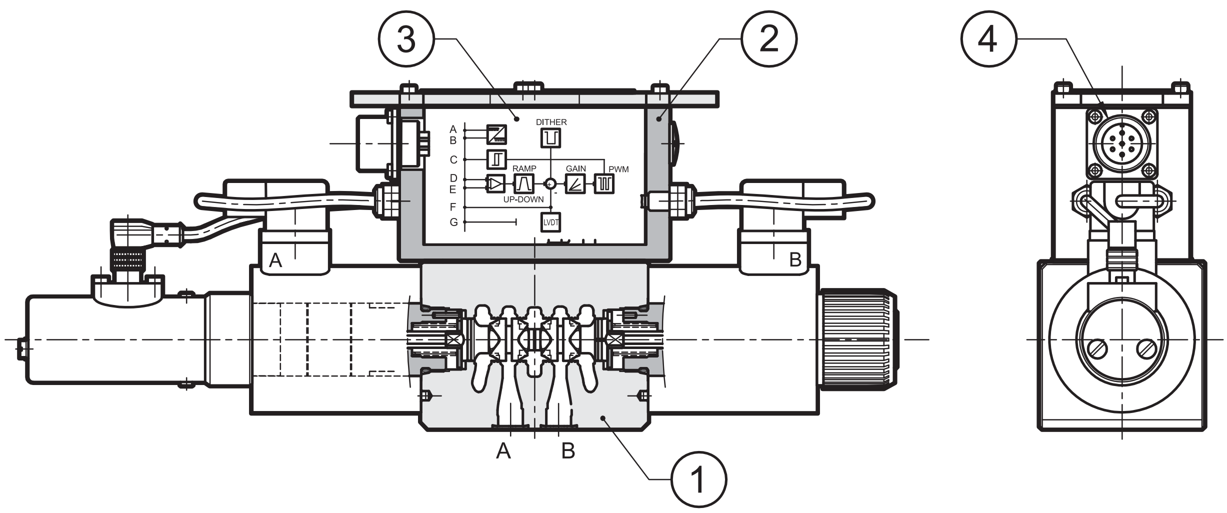
The digital driver enables the valve to reach better performance compared to the analogic version, such as:

- reduced response times
- optimization and reproducibility of the characteristic curve, optimised in factory for each valve
- complete interchangeability in case of valve replacement
- possibility to set, via software, the functional parameters
- possibility to perform a diagnostic program by means of the LIN connection
- high immunity to electromagnetic troubles

We deliver the DSE5J with these standard settings:

UP/DOWN ramp at minimum value, no deadband compensation, max valve opening (100% of spool stroke). It is possible to customize these parameters using the special kit, to be ordered separately (see par 7).

5.2 - Functional block diagram



1	Valve with proportional solenoids	3	Digital card
2	Electronics envelope	4	Main connector

5.3 - Electrical characteristics

NOMINAL VOLTAGE	V DC	24 (from 19 to 35 VDC, ripple max 3 Vpp) external fuse 5A (fast), max current 3A
ABSORBED POWER	W	70
MAXIMUM CURRENT	A	2.6
DUTY CYCLE		100%
VOLTAGE SIGNAL (E0)	V DC	±10 (Impedance Ri > 50 K)
CURRENT SIGNAL (E1)	mA	4 ÷ 20 (Impedance Ri = 500)
ALARMS		Overload and electronics overheating, LVDT sensor error, cable breakdown or power failure or < 4mA.
COMMUNICATION		LIN-bus Interface (with the optional kit)
MAIN CONNECTOR		7 - pin MIL-C-5015-G (DIN 43563)
ELECTROMAGNETIC COMPATIBILITY (EMC) emissions CEI EN 61000-6-4 immunity CEI EN 61000-6-2		According to 2004/108/CE standards
PROTECTION AGAINST ATMOSPHERIC AGENTS		IP65 / IP67 (CEI EN 60529 standards)

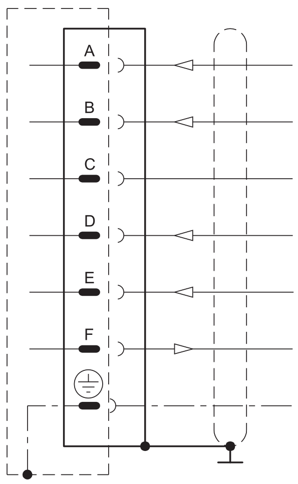
6 - OPERATING MODALITIES

The digital driver of DSE5J valve is available in two versions, with voltage or current reference signal.

6.1 - Version with voltage reference signal (E0)

This is the most common version; it makes the valve completely interchangeable with the traditional proportional valves with analogic type integrated electronics. The valve has only to be connected as indicated below. This version doesn•t allow the setting of the valve parameters, for example the ramps must be performed in the PLC program, as well as the reference signal limit.

Connection scheme E0

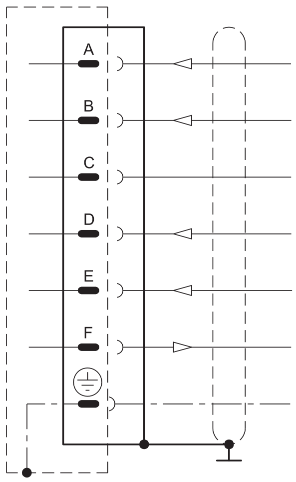


Pin	Values	Function	NOTES
A	24 V DC	Voltage	from 19 to 35 V DC (ripple max 3 Vpp) (see **NOTE 1**)
B	0 V	Power supply (zero)	0 V
C	24 V DC	Valve Enable	**NOTE 2**
D	± 10 V	Differential input	Impedance R_i > 50 k (see **NOTE 3**)
E	0 V	Differential input	---
F	6 - 10V o 2 - 6 -10V	Monitor feedback or Lin comm	see **NOTE 4**
PE	GND	Protective ground	---

6.2 - Version with current reference signal (E1)

The reference signal is supplied in current 4 - 20 mA. With the 12 mA signal the valve is in central position, with the 20 mA signal the valve performs the configuration P-A and B-T, while with 4 mA the configuration is P-B and A-T. For •SAŽ single solenoid valves, withreference 20 mA to pin D, the valve full opening is P-B and A-T, while with 4 mA the valve is at rest. If the current to solenoid is lower, than the card shows a BREAKDOWN CABLE error. To reset the error is sufficient to restore the current 4mA.

Connection scheme E1



Pin	Values	Function	NOTES
A	24 V DC	Voltage	from 19 to 35 V DC (ripple max 3 Vpp) (see **NOTE 1**)
B	0 V	Power supply (zero)	0 V
C	24 V DC	Valve Enable	**NOTE2**
D	4 ÷ 20 mA	Input signal	Impedance R_i > 500 k
E	0 V	Zero reference	---
F	6 - 10V o 2 - 6 -10V	Monitor point or Lin comm	see **NOTE 4**
PE	GND	Protective ground	---

NOTE 1: preview on the Pin A (24 VDC) an external fuse for protecting electronics. Fuse characteristics: 5A/50V type fast.

NOTE 2: preview 24V DC on the PIN C to activate the card power stage.

NOTE 3: The input signal is differential type on E0 version only. For double solenoid valves, with positive reference signal connected to pin D, the valve opening is P - A and B - T. With zero reference signal the valve is in central position. For •SAŽ single solenoid valves, with positive reference to pin D, the valve opening is P-B and A-T. The spool stroke is proportional to U_D - U_E.
If only one input signal (single-end) is available, the pin B (0V power supply) and the pin E (0V reference signal) must be connected through a jumper and both connected to GND, electric panel side.

NOTE 4: This value changes, as shown in the table below. When MONITOR function is enabled and the card is enabled, read the test point pin F in relation to pin B (0V). When detect a failure or error of the sensor LVDT, the drive bring the valve back in central position and locks it. In this condition the pin F, referring to the pin B, indicates 0V DC output. To reset the fault, the card must be disabled and re-enable. When the card is disabled, the pin F referred to the pin B shows 2.7V DC output: this value is given by the voltage of the LIN bus communication and not by the MONITOR value.

double solenoid valves		single solenoid valve	
command (Pin D)	Pin F	command (Pin D)	Pin F
-10 V	10 V	-	-
0 V	6 V	0 V	6 V
+10 V	2 V	+10 V	10 V

NOTE for the wiring: connections must be made via the 7-pin plug mounted on the amplifier. Recommended cable sizes are 0,75 mm^2 for cables up to 20m and 1,00 mm^2 for cables up to 40m, for power supply. The signal cables must be 0,50 mm^2. A suitable cable would have 7 cores, a separate screen for the signal wires and an overall screen.

7 - OPTIONAL KIT LINPC-USB/10

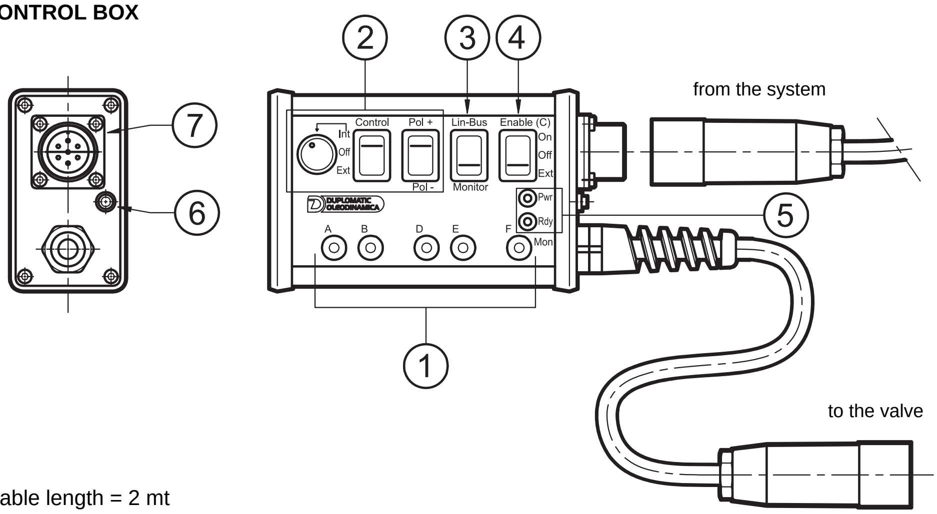
The kit (to be ordered separately, code 3898501001) includes control box with 7 poles connector, USB PC cable (1.8 m length), software for card configuration. The software is Microsoft XP© compliant.

The box has three main functions:

- It can be used to read the values from the external command (PLC, etc. ..) to the valve. In this case, the box simply acts as monitor through points of measurement.
- It may exclude the command from the PLC and controls the valve, choosing the direction and speed of movement (keys gr.2 and 4). This way you can test the response of the valve control input, and diagnose failures, malfunctions, simulating the valve working.
- The control box acts as interface between PC and electronic card (key 3) to allow customization of the parameters via software.

For more detailed information on the use of the box, see the documentation on the software CD.

CONTROL BOX



cable length = 2 mt

1	Test points
2	Keys for control of valve movements.
3	Switch LinBus/Monitor
4	Enable Switch
5	Leds
6	RS232 connection to PC
7	Main connector

7.1 - Programming the parameters via LIN Bus

The software included in the kit allows the customization of the following parameters:

Deadband compensation
You can change the mechanical spool overlap by adjusting the parameters V: MINA and V MINB.

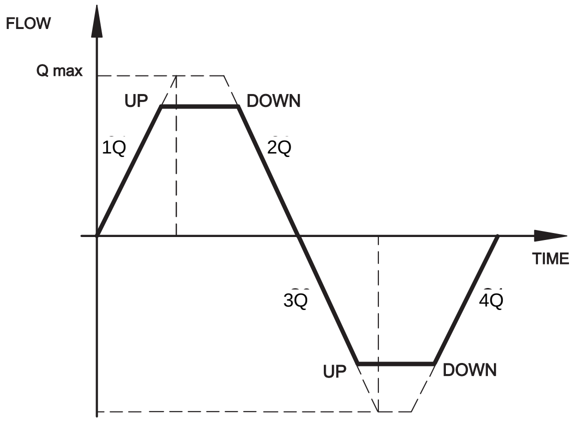
Gain Adjustment
You can change the parameters V and V MAXA: MAXB, which restrict the spool opening for positive and negative values of the reference signal.

AINW: W command input scaling
This command allows to scale the input signal and determine whether the input is enabled for signals in voltage or in current.

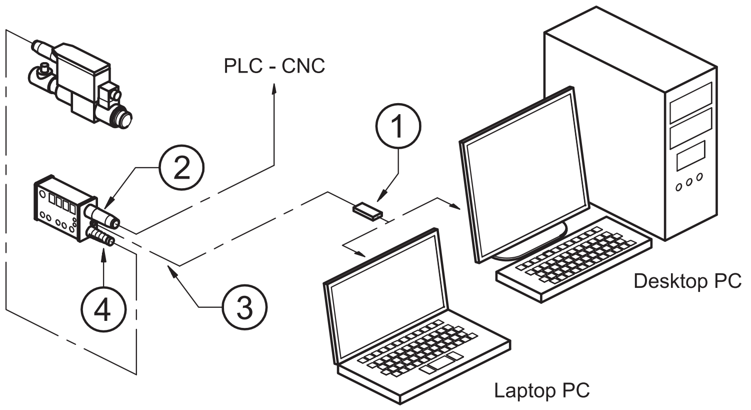
V: TRIGGER
Value in percentage by which you activate the deadband function of V: MinA and V: minB.

Ramps

Ramps are divided into four quadrants and can be customized by setting the parameters 1Q, 2Q, 3Q and 4Q. They define the time variation of current in the solenoid in reference to input command.
range: 1 ÷ 60000 ms.



7.2 - Wiring scheme of Lin/Bus box



1	USB connector
2	Main connection from the system
3	Lin/Bus connection
4	7 poles connection to command the valve.

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.

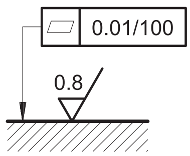
The fluid must be preserved in its physical and chemical characteristics.

9 - INSTALLATION

DSE5J valves can be installed in any position without impairing correct operation.
Ensure that there is no air in the hydraulic circuit.

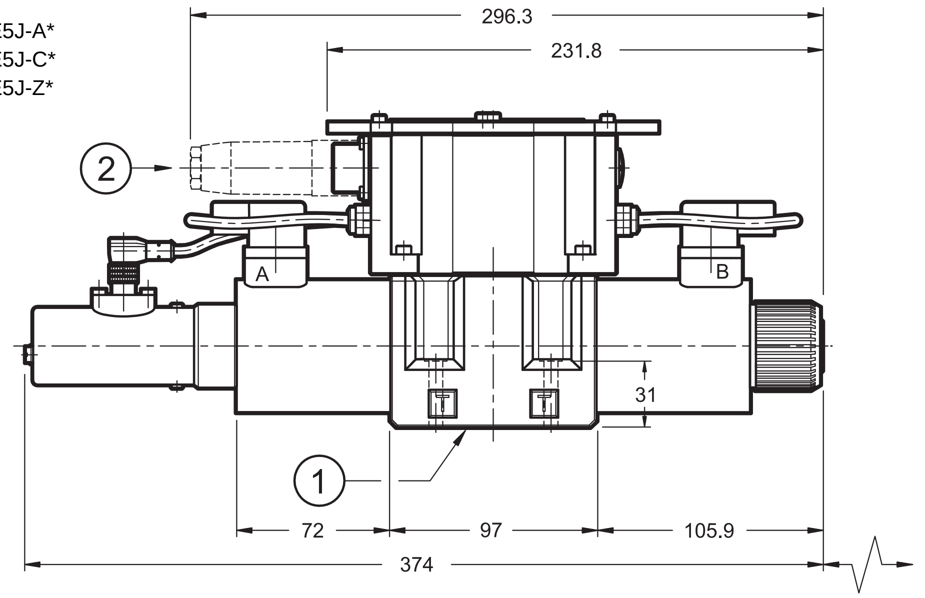
Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.

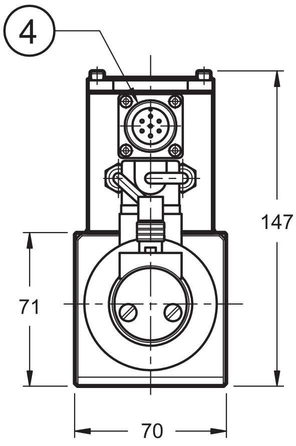
Surface “nishing



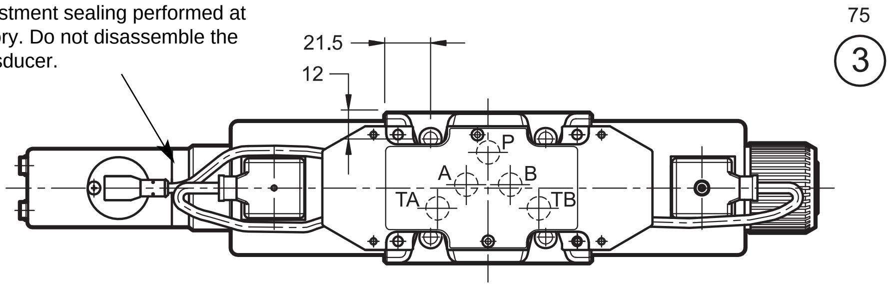
10 - OVERALL AND MOUNTING DIMENSIONS

DSE5J-A*
DSE5J-C*
DSE5J-Z*

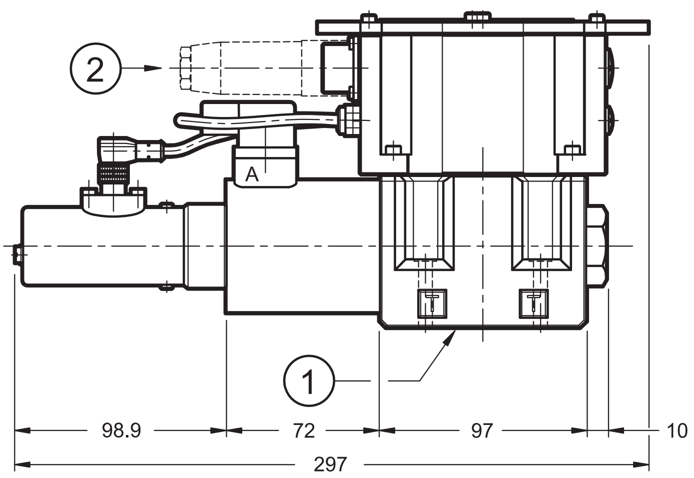




Adjustment sealing performed at factory. Do not disassemble the transducer.

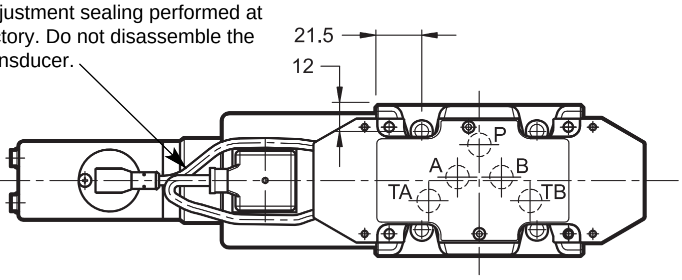


DSE5J-A* SA
DSE5J-C* SA



dimensions in mm

Adjustment sealing performed at factory. Do not disassemble the transducer.



1	Mounting surface with sealing rings: 5 OR type 2050 (12.42x1.78) 90 shore
2	Electrical connector 7 pin DIN 43563 - IP67 PG11 EX7S/L/10 code 3890000003 **(to be ordered separately)**
3	Coil removal space (solenoid B only)
4	Main connection

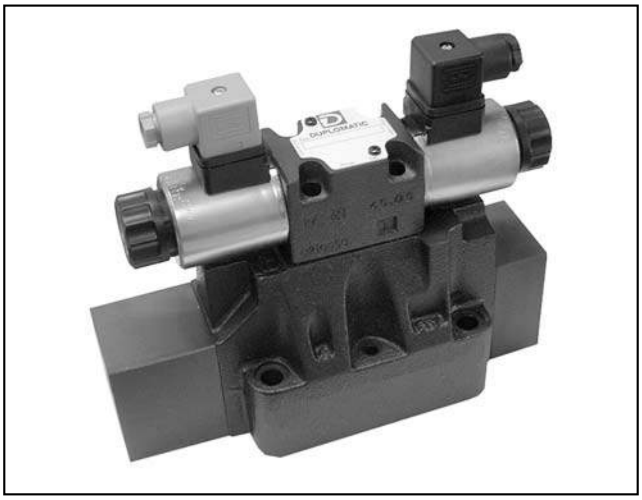
Fastening bolts: N. 4 bolts M6x40 - ISO 4762

Torque: 8 Nm (A8.8 bolts)

11 - SUBPLATES (see catalogue 51 000)

PMD4-AI4G rear ports 3/4Ž BSP
PMD4-AL4G side ports 1/2Ž BSP

DUPLOMATIC OLEODINAMICA
DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com



DSPE*

PILOT OPERATED DIRECTIONAL VALVE WITH PROPORTIONAL CONTROL

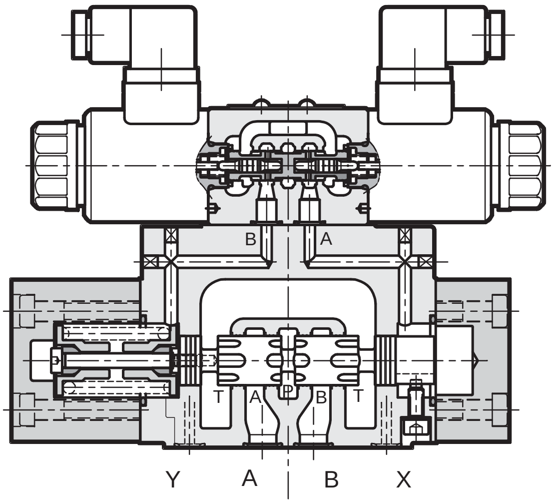
SERIES 11

DSPE5	**CETOP P05**
DSPE5R	**ISO 4401-05** (CETOP R05)
DSPE7	**ISO 4401-07** (CETOP 07)
DSPE8	**ISO 4401-08** (CETOP 08)
DSPE10	**ISO 4401-10** (CETOP 10)

p max (see performances table)

Q max (see performances table)

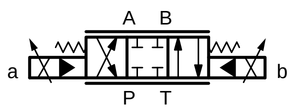
OPERATING PRINCIPLE



- The DSPE * are pilot operated directional control valves with electric proportional control and mounting interface in compliance with ISO 4401 (CETOP RP121H) standards.
- The valve opening (and hence the flow rate) can be modulated continuously in proportion to the current supplied to the proportional solenoids of the pilot valve.
- They 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. 15).
- They are available in CETOP P05, ISO 4401-05 (CETOP R05), ISO 4401-07 (CETOP 07), ISO 4401-08 (CETOP 08) and ISO 4401-10 (CETOP 10) sizes. Every size can be supplied with different controlled flow rates, up to 1600 l/min.

PERFORMANCES (obtained with viscosity of 36 cSt at 50°C with the relative electronic control units)		DSPE5 DSPE5R	DSPE7	DSPE8	DSPE10
Max operating: - P - A - B ports - T port	bar	350 see paragraph 6			
Controlled flow rate with p 10 bar P-T	l/min	see paragraph 2			
Step response		see paragraph 8			
Hysteresis (with PWM 100 Hz)	% Q_{max}	< 4%			
Repeatability	% Q_{max}	< ±2%			
Electrical characteristics		see paragraph 7			
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	7,1 7,5	9,3 9,7	15,6 16	52,5 53

HYDRAULIC SYMBOL (typical)



1 - IDENTIFICATION CODE

D	S	P	E		-				/	11		-			/		K1	/	

Pilot operated directional control 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)
10 = ISO 4401-10 (CETOP 10)

Spool type:
C = closed centres
A = open centres
RC = regenerative closed centres
RA = regenerative open centres

Spool nominal flow rate (see table par. 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. (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
Z = internal piloting with 30 bar fixed adj. pressure reducing valve (see par. 6)

Drainage: **I** = internal
E = external

D12 = voltage 12V DC
D24 = voltage 24V DC

Coil electrical connection: for connector type DIN 43650

Manual override: (see par. 15)

NOTE: This version is interchangeable with the model E4E Duplomatic

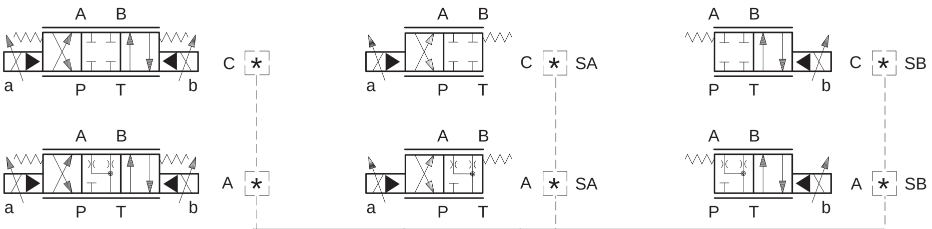
2 - AVAILABLE CONFIGURATIONS

The valve configuration depends on the combination of the following elements:
number of proportional solenoids, spool type, rated flow.

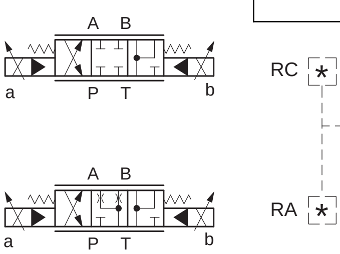
Configuration 2 solenoids:
3 positions with spring centering

1 solenoid for cross configuration •**SA**Ž:
2 positions (central + external)
with spring centering

1 solenoid for parallel configuration •**SB**Ž:
2 positions (central + external)
with spring centering



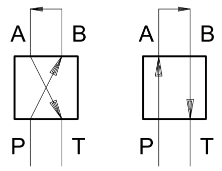
valve type	*	nominal flow rate with p 10 bar P-T
DSPE5 DSPE5R	**80**	80 l/min
	80/40	80 (P-A) / 40 (B-T) l/min
DSPE7	**100**	100 l/min
	150	150 l/min
	150/75	150 (P-A) / 75 (B-T) l/min
DSPE8	**200**	200 l/min
	300	300 l/min
	300/150	300 (P-A) / 150 (B-T) l/min
DSPE10	**350**	350 l/min
	500	500 l/min
	500/250	500 (P-A) / 250 (B-T) l/min



valve type	*	nominal flow rate with p 10 bar P-T
DSPE7	**150/75**	150 (P-A) / 75 (B-T) l/min
DSPE8	**300/150**	300 (P-A) / 150 (B-T) l/min
DSPE10	**500/250**	500 (P-A) / 250 (B-T) l/min

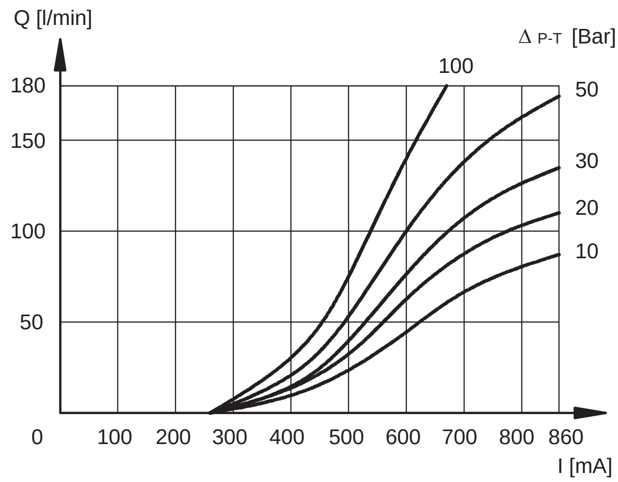
3 - CHARACTERISTIC CURVES (values measured with viscosity of 36 cSt at 50°C with valves in conjunction with the relative electronic control units)

Typical flow rate control curves at constant   p according to current supply to the solenoid (D24 version, 860 mA max current), measured for the available spool types.
The reference p values are measured between valve ports P and T.



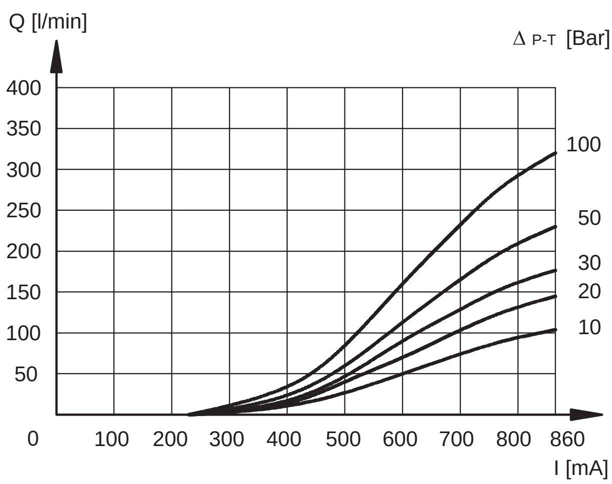
3.1 - Characteristic curves DSPE5 e DSPE5R

SPOOL C80 - A80

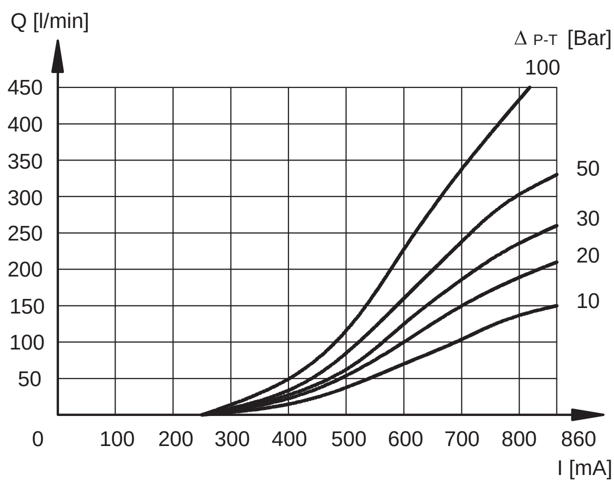


3.2 - Characteristic curves DSPE7

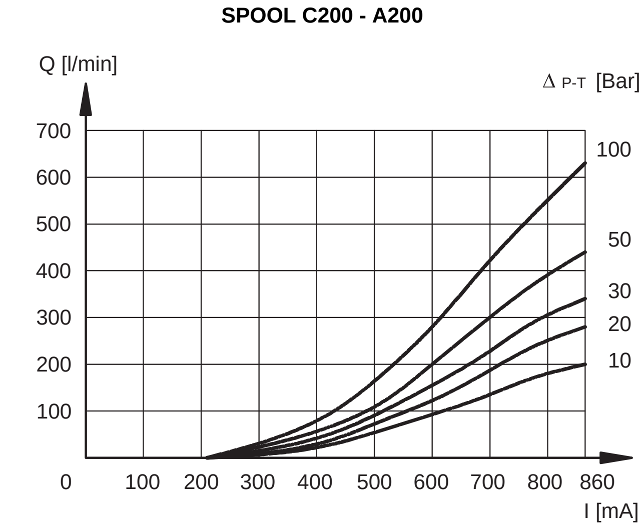
SPOOL C100 - A100

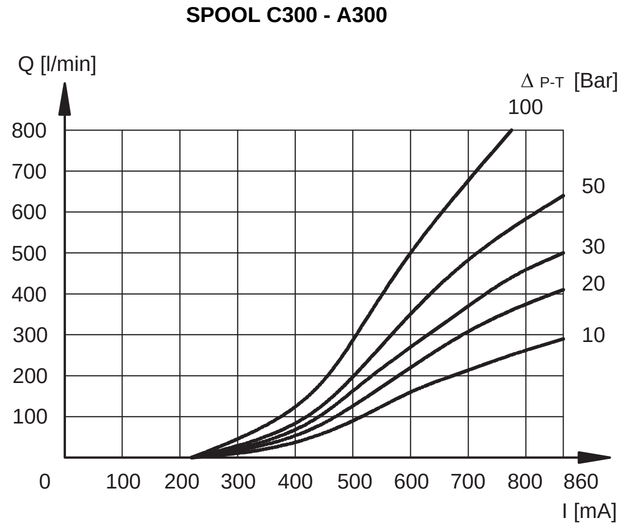


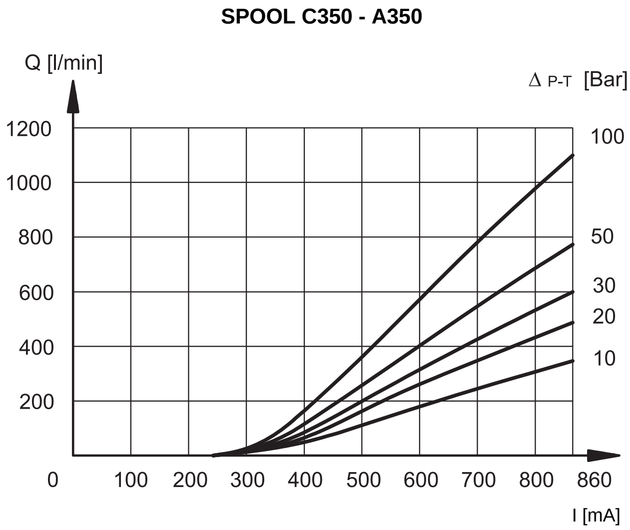
SPOOL C150 - A150

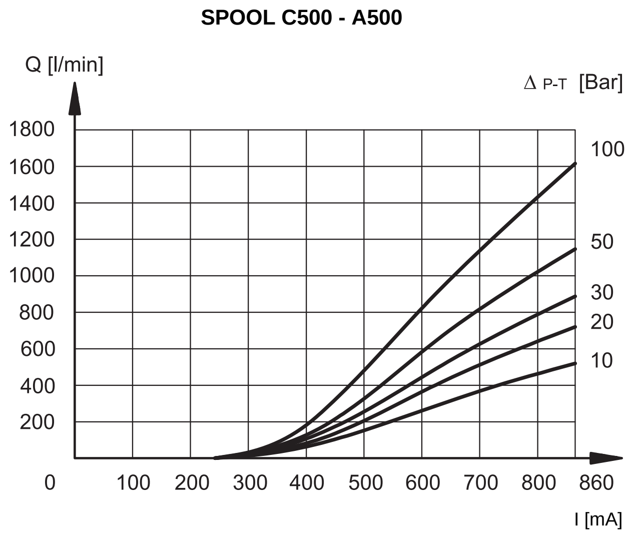


3.3 - Characteristic curves DSPE8









4 - HYDRAULIC CHARACTERISTICS (values measured with viscosity of 36 cSt at 50°C with valves in conjunction with the relative electronic control units)

		DSPE5 DSPER5	DSPE7	DSPE8	DSPE10
Max flow rate	l/min	180	450	800	1600
Piloting flow requested with operation 0 100%	l/min	3	5	9	13
Piloting volume requested with operation 0 100%	cm^3	1,7	3,2	9,1	21,6

5 - 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.

6 - PILOTING AND DRAINAGE

The DSPE valves are available with piloting and drainage, both internal and external.
The version with external drainage 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)

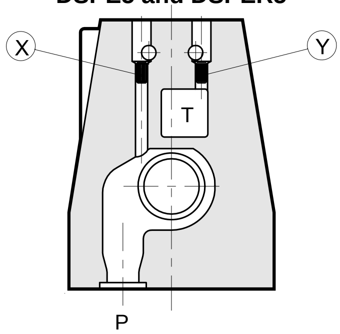
Pressure	MIN	MAX
Piloting pressure on X port	30	210 (**NOTE**)
Pressure on T port with interal drain	…	10
Pressure on T port with external drain	…	250

NOTE: the version with external pilot with reduced pressure must be used when higher pressures are needed.

Otherwise the valve with internal pilot and pressure reducing valve with 30 bar fixed adjustment can be ordered.

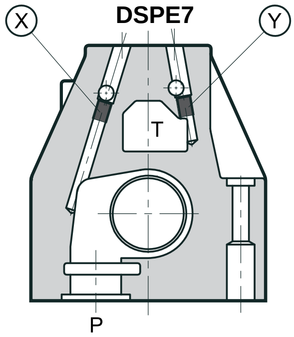
Add the letter Z to the identification code to order this option (see par. 1).

DSPE5 and DSPER5



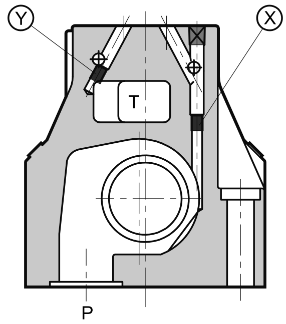
X: M5x6 plug for external pilot
Y: M5x6 plug for external drain

DSPE7



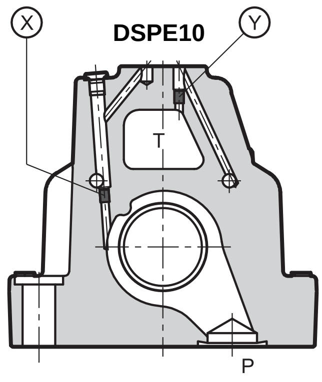
X: M6x8 plug for external pilot
Y: M6x8 plug for external drain

DSPE8



X: M6x8 plug for external pilot
Y: M6x8 plug for external drain

DSPE10



X: M6x8 plug for external pilot
Y: M6x8 plug for external drain

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.
It can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20°C)		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		

8 - STEP RESPONSE (measured with mineral oil with viscosity of 36 cSt at 50°C in conjunction 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.

The table shows the typical step response tested with static pressure 100 bar.

REFERENCE SIGNAL	0 100%	100 0%
	Step response [ms]	
DSPE5 and DSPE5R	50	40
DSPE7	80	50
DSPE8	100	70
DSPE10	200	120

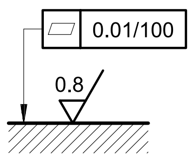
9 - INSTALLATION

The DSPE* valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

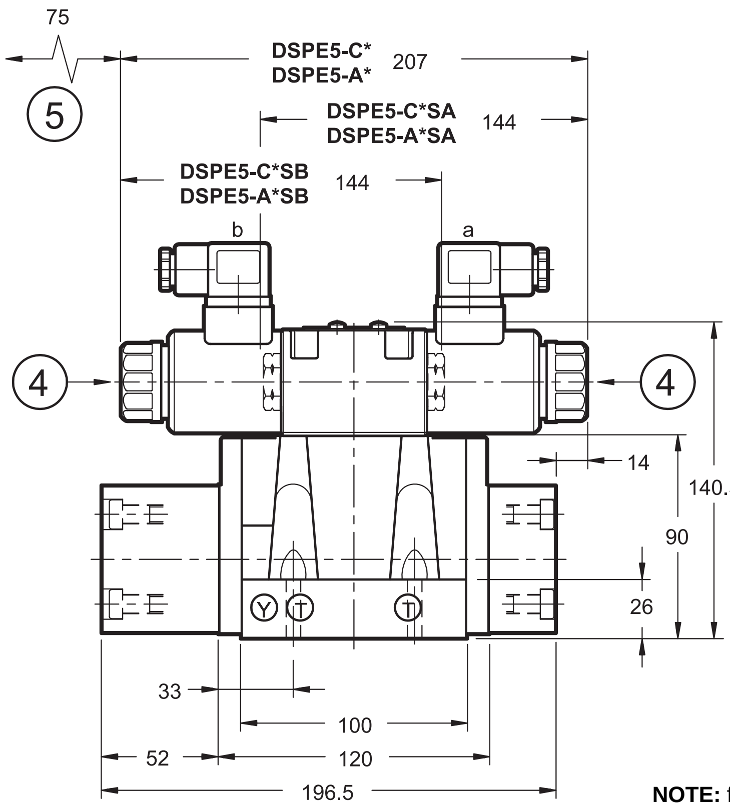
Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.

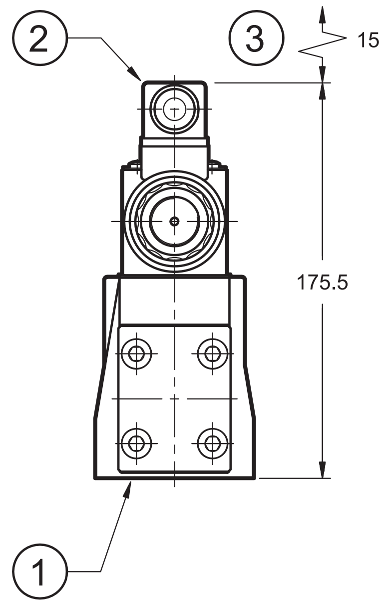
Surface finishing



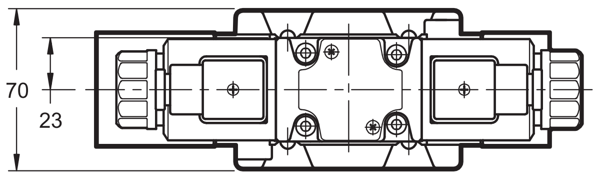
10 - OVERALL AND MOUNTING DIMENSIONS DSPE5 AND DSPE5R

dimensions in mm

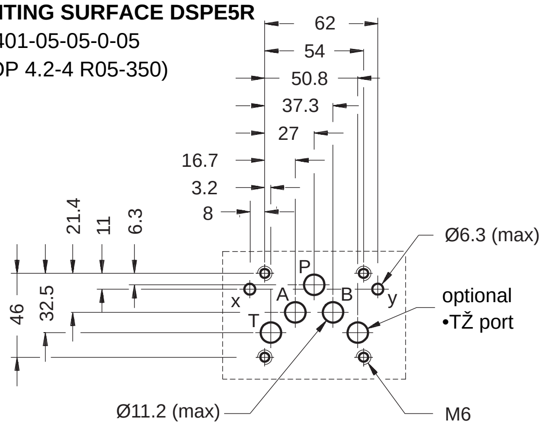




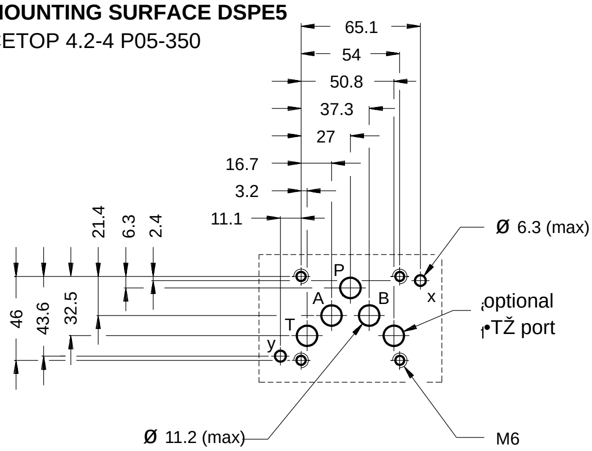
NOTE: for overall dimensions with Z option (fixed adjustment pressure reducing valve) see par. 14.



MOUNTING SURFACE DSPE5R
ISO 4401-05-05-0-05
(CETOP 4.2-4 R05-350)



MOUNTING SURFACE DSPE5
CETOP 4.2-4 P05-350

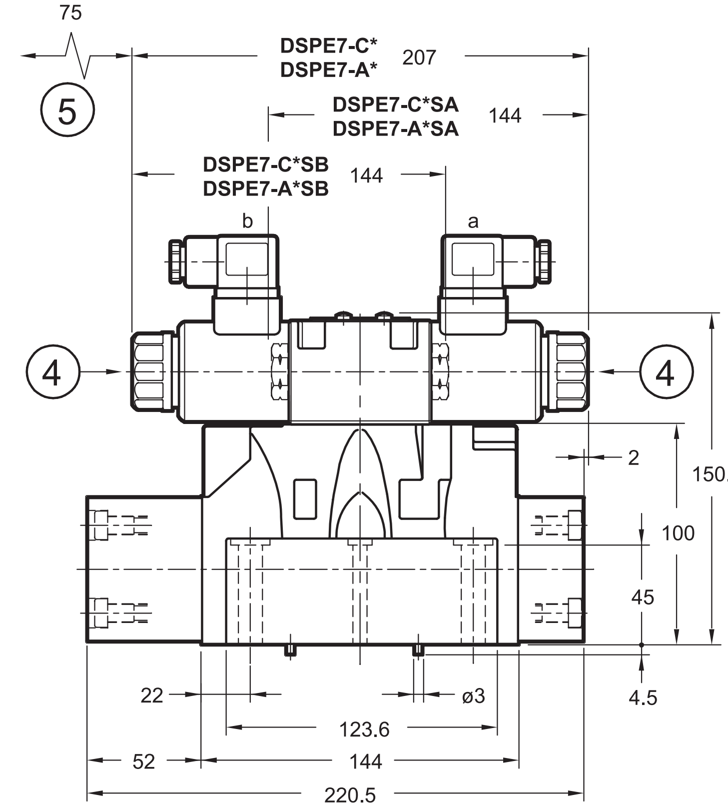


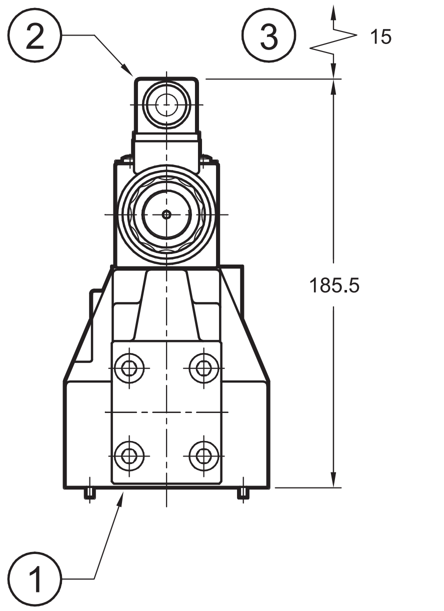
Valve fastening: N. 4 SHC screws M6x35 - ISO 4762
Tightening torque: 8 Nm (A 8.8 bolts)
Thread of mounting holes: M6x10
Sealing rings: N. 5 OR type 2050 (12.42x1.78) - 90 Shore N. 2 OR type 2037 (9.25x1.78) - 90 Shore

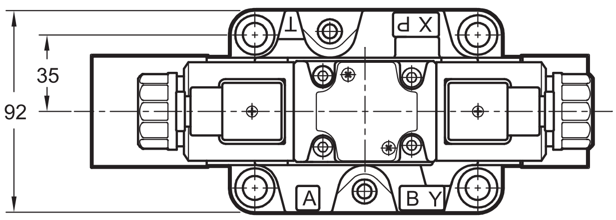
1	Mounting surface with sealing rings
2	DIN 43650 electrical connector
3	Connector removal space
4	Standard manual override integrated inside the solenoid tube (included in the supply - see par. 15).
5	Coil removal space

11 - OVERALL AND MOUNTING DIMENSIONS DSPE7

dimensions in mm

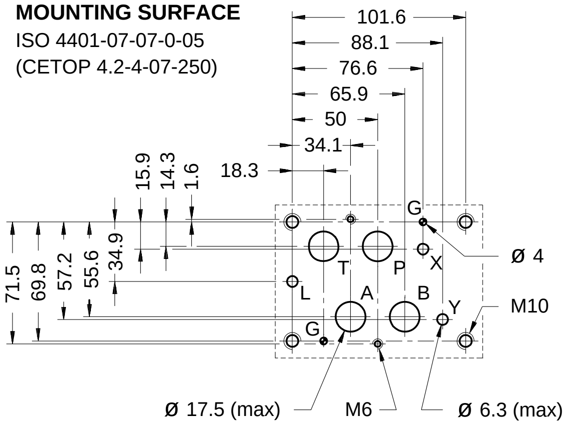






NOTE: for overall dimensions with Z option (fixed adjustment pressure reducing valve) see par. 14.

MOUNTING SURFACE
ISO 4401-07-07-0-05
(CETOP 4.2-4-07-250)

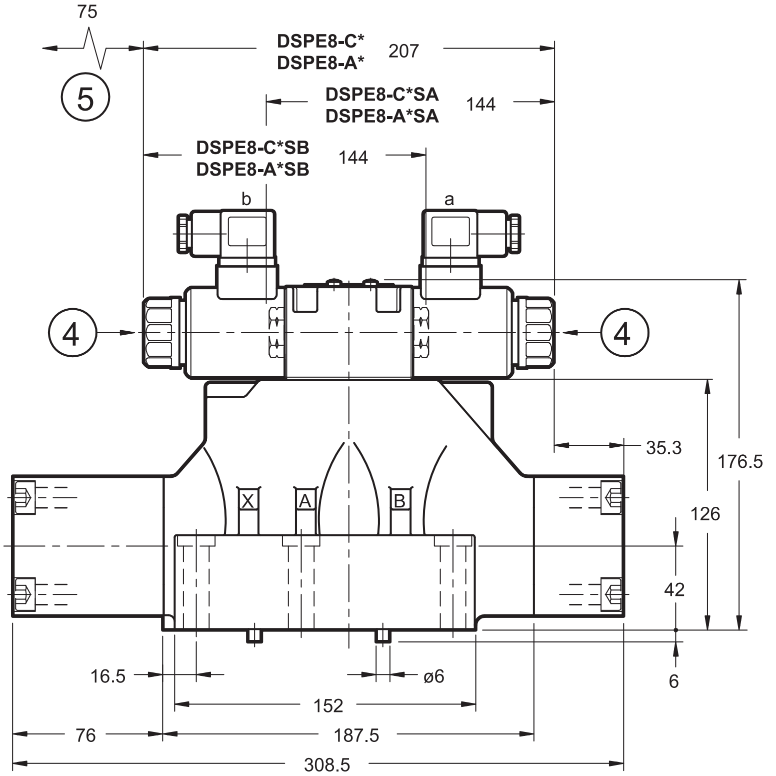


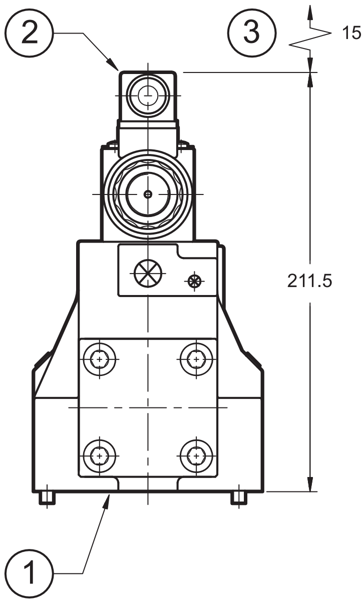
Single valve fastening:	N. 4 TCEI M10x60 bolts - ISO 4762 N. 2 TCEI M6x60 bolts - ISO 4762
Tightening torque M10x60: 40 Nm (A 8.8 bolts) M6x60: 8 Nm (A 8.8 bolts)	
Thread of mounting holes: M6x18; M10x18	
Sealing rings:	N. 4 OR type 130 (22.22x2.62) - 90 Shore N. 2 OR type 2043 (10.82x1.78) - 90 Shore

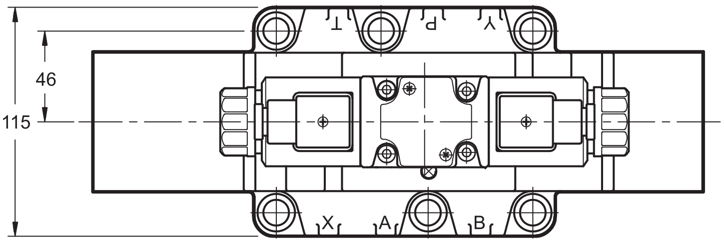
1	Mounting surface with sealing rings
2	DIN 43650 electrical connector
3	Connector removal space
4	Standard manual override integrated inside the solenoid tube (included in the supply - see par. 15).
5	Coil removal space

12 - OVERALL AND MOUNTING DIMENSIONS DSPE8

dimensions in mm

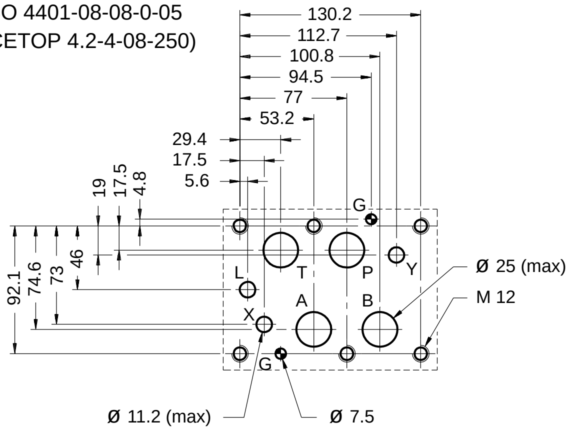






NOTE: for overall dimensions with Z option (fixed adjustment pressure reducing valve) see par. 14.

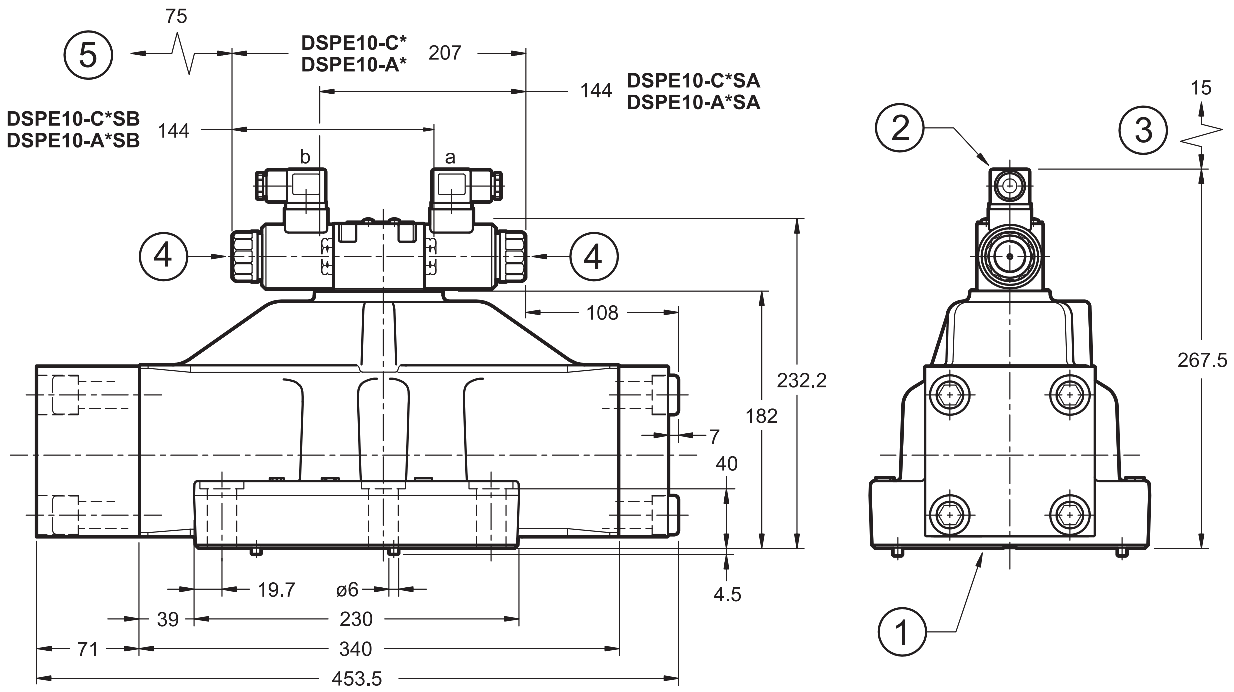
MOUNTING SURFACE
ISO 4401-08-08-0-05
(CETOP 4.2-4-08-250)

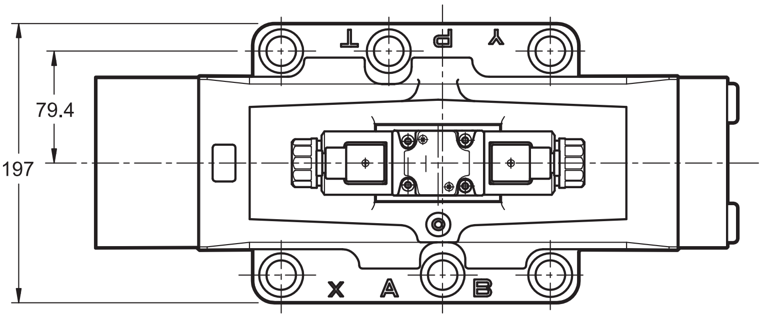


Valve fastening: N. 6 TCEI M12x60 bolts - ISO 4762
Tightening torque: 69 Nm (A 8.8 bolts)
Thread of mounting holes: M12x20
Sealing rings: N. 4 OR type 3118 (29.82x2.62) - 90 Shore N: 2 OR type 3081 (20.24x2.62) - 90 Shore

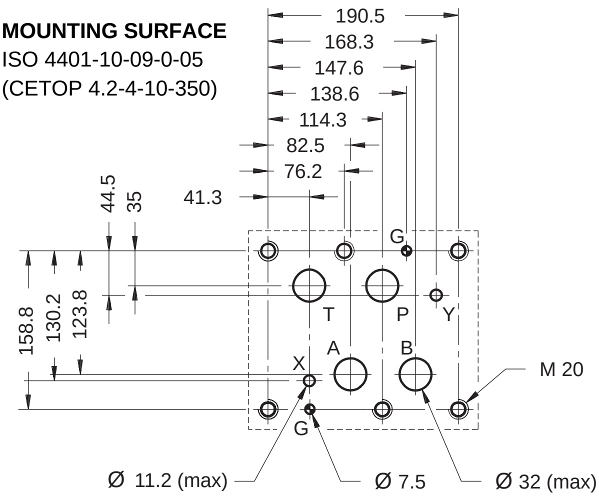
1	Mounting surface with sealing rings
2	DIN 43650 electrical connector
3	Connector removal space
4	Standard manual override integrated inside the solenoid tube (included in the supply - see par. 15).
5	Coil removal space

13 - OVERALL AND MOUNTING DIMENSIONS DSPE10





MOUNTING SURFACE
ISO 4401-10-09-0-05
(CETOP 4.2-4-10-350)



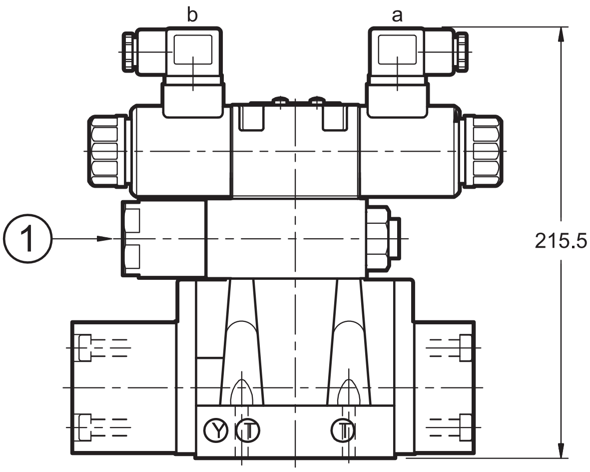
NOTE: for overall dimensions with Z option (fixed adjustment pressure reducing valve) see par. 14.

Valve fastening: N. 6 TCEI M12x70 bolts - ISO 4762
Tightening torque: 330 Nm (A 8.8 bolts)
Thread of mounting holes: M20x40
Sealing rings: N. 4 OR type 4150 (37.59x3.53) - 90 Shore N: 2 OR type 3081 (20.24x2.62) - 90 Shore

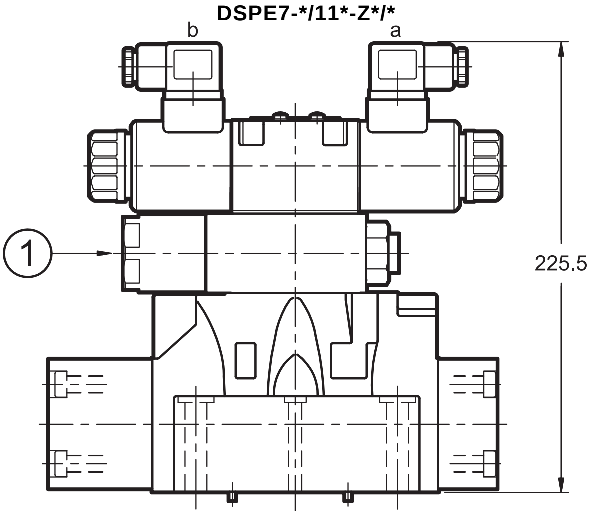
1	Mounting surface with sealing rings
2	DIN 43650 electrical connector
3	Connector removal space
4	Standard manual override integrated inside the solenoid tube (included in the supply - see par. 15).
5	Coil removal space

14 - OVERALL AND MOUNTING DIMENSIONS DSPE*-*/11*-Z*/*

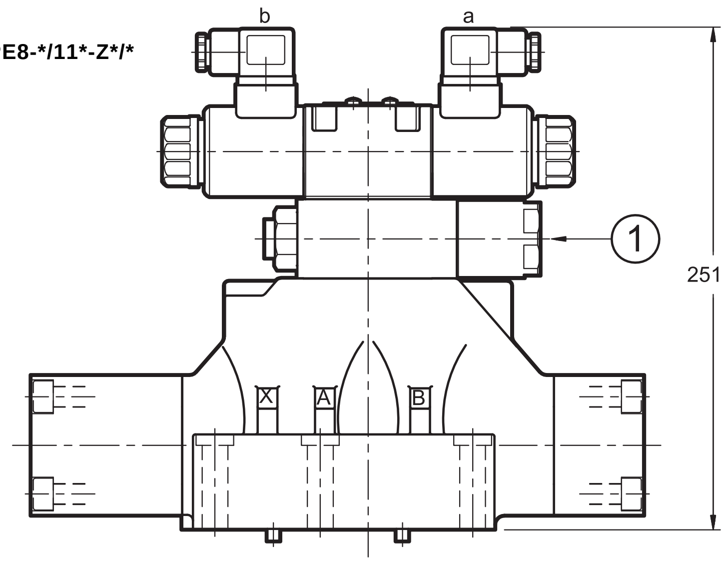
DSPE5-*/11*-Z*/*



DSPE7-*/11*-Z*/*



DSPE8-*/11*-Z*/*

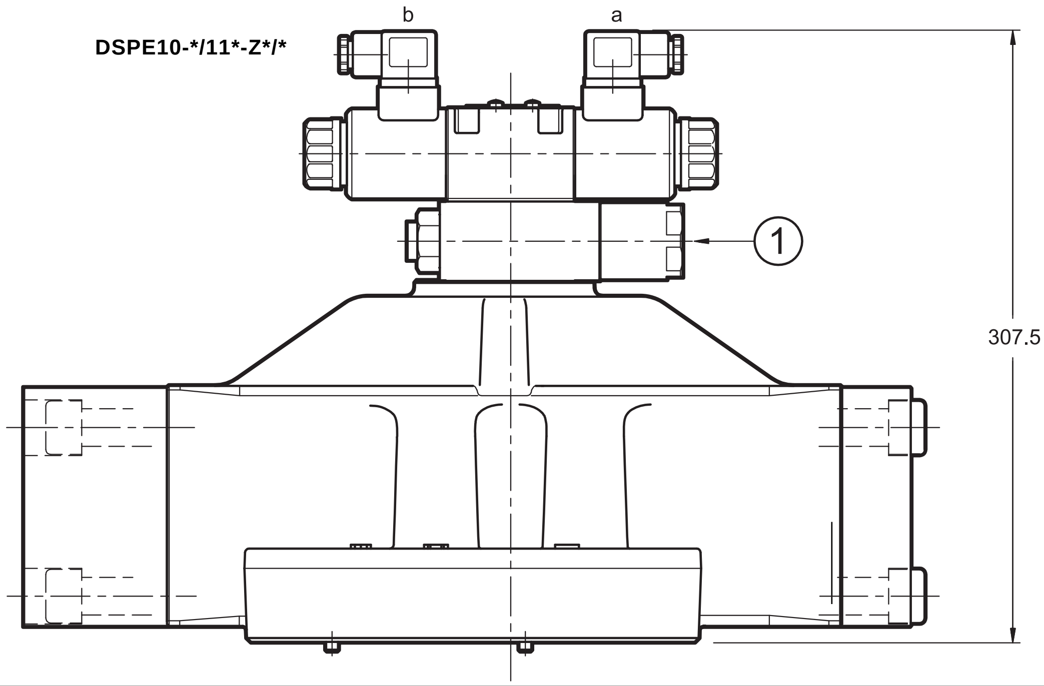


NOTE: for missing overall dimensions and characteristics see par. 10 - 11 - 12 - 13

dimensions in mm

1	30 bar fixed adjustment pressure reducing valve

DSPE10-*/11*-Z*/*



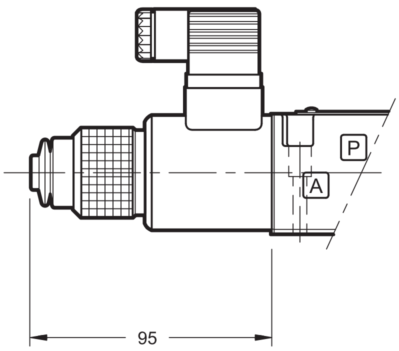
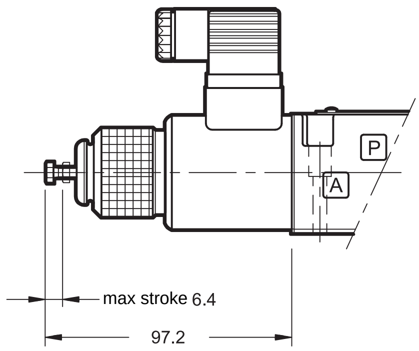
15 - MANUAL OVERRIDE

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, with metal ring nut provided with a M4 screw and a blocking locknut to allow the continuous mechanical operations.

NOTE: The manual override use doesn't allow any proportional regulation; in fact using this kind of override, the main stage spool will open completely and the valve will behave as an on-off valve.

CM Version	CS Version
	
Code: 3803210003	Code: 3803210004

16 - ELECTRONIC CONTROL UNITS

DSPE* - * * SA (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. 89 250
EDM-M141	for solenoid 12V DC		

DSPE* - A* DSPE* - C*

EDM-M211	for solenoid 24V DC	rail mounting DIN EN 50022	see cat. 89 250
EDM-M241	for solenoid 12V DC		

17 - SUBPLATES (see catalogue 51 000)

		DSPE5	DSPE7	DSPE8	DSPE10
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	3/4Ž BSP 1/4Ž BSP	1Ž BSP 1/4Ž BSP	1½Ž BSP 1/4Ž BSP	-

DUPLOMATIC OLEODINAMICA
DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

DSPE*G

PILOT OPERATED DIRECTIONAL VALVE WITH PROPORTIONAL CONTROL AND INTEGRATED ELECTRONICS

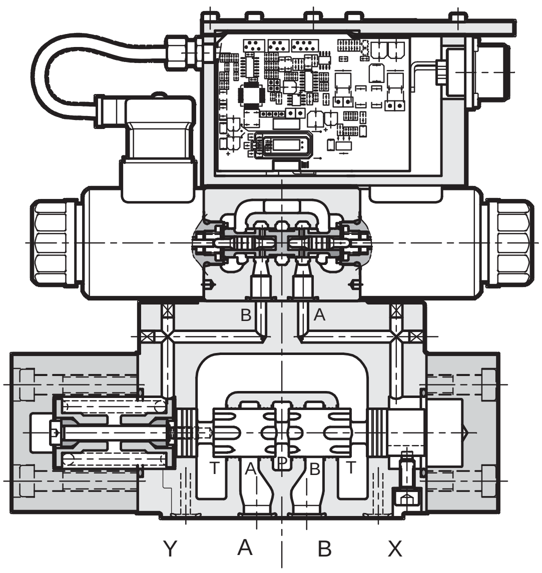
SERIES 11

SUBPLATE MOUNTING

DSPE5G	**CETOP P05**
DSPE5RG	**ISO 4401-05** (CETOP R05)
DSPE7G	**ISO 4401-07** (CETOP 07)
DSPE8G	**ISO 4401-08** (CETOP 08)
DSPE10G	**ISO 4401-10** (CETOP 10)

p max (see performance table)
Q max (see performance table)

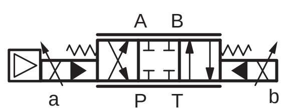
OPERATING PRINCIPLE



- The DSPE *G are pilot operated directional control valves with electric proportional control and integrated electronics and with mounting interface in compliance with ISO 4401 (CETOP RP121H) standards.
- The valve opening and hence the flow rate can be modulated continuously in proportion to the current supplied to the proportional solenoids of the pilot valve.
- They are controlled directly by an integrated digital amplifier (see par. 6).
- They are available in CETOP P05, ISO 4401-05 (CETOP R05), ISO 4401-07 (CETOP 07), ISO 4401-08 (CETOP 08) and ISO 4401-10 (CETOP 10) sizes. Every size can be supplied with different controlled flow rates, up to a maximum flow rate of 1600 l/min.

PERFORMANCES (obtained with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronics)		DSPE5G DSPE5RG	DSPE7G	DSPE8G	DSPE10G
Max operating pressure: P - A - B ports T port	bar	350 see paragraph 10			
Controlled flow with p 10 bar P-T	l/min	see paragraph 2			
Step response		see paragraph 5			
Hysteresis	% Q_{max}	< 2%			
Repeatability	% Q_{max}	< ± 1%			
Electrical characteristics		see paragraph 6			
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	7,4 / 7,9	9,6 / 10,1	15,9 / 16,4	52,8 / 53,3

HYDRAULIC SYMBOL (typical)



1 - IDENTIFICATION CODE

D	S	P	E		G	-				/	11		-			/		K11	/	

Pilot operated directional control valve

Electric proportional control

Nominal size:
5 = CETOP P05
5R = ISO 4401-05 (CETOP R05)
7 = ISO 4401-07 (CETOP 07)
8 = ISO 4401-08 (CETOP 08)
10 = ISO 4401-10 (CETOP 10)

Integrated electronics for open loop

Spool type:
C = closed centres
A = open centres
RC = regenerative closed centers
RA = regenerative open centers

Configurations for single solenoid version (omit for double solenoid version) :
SA = 1 solenoid for cross configuration (not available for DSPE8G and DSPE10G)
SB = 1 solenoid for parallel configuration (for DSPE8G and DSPE10G only)

Spool nominal flow rate (see table 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

Piloting: **I** = internal
E = external
Z = internal piloting with 30 bar fixed adjustment pressure reducing valve (see par. 10)

Drainage: **I** = internal
E = external

Reference signal:
E0 = voltage ± 10 V
E1 = current 4/20 mA

Main connector 6 pin + PE

B = standard version
C = with CAN connection

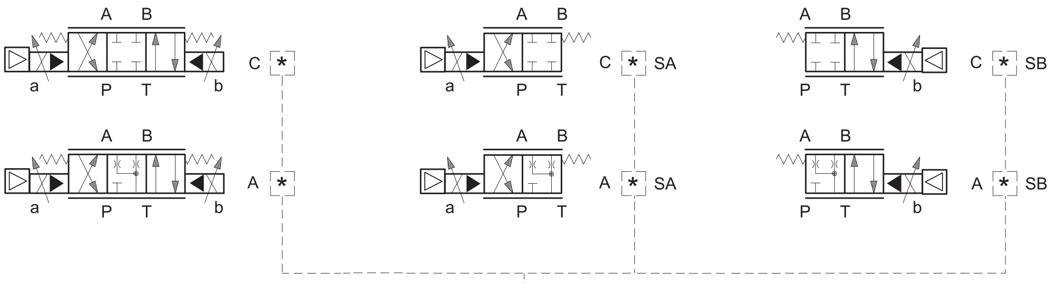
2 - AVAILABLE CONFIGURATIONS

The valve configuration depends on the combination of the following elements: number of proportional solenoids, spool type, rated flow.

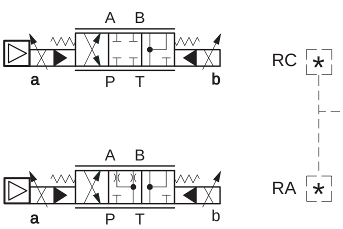
Configuration 2 solenoids:
3 positions with spring centering

1 solenoid for cross configuration •**SA**Ž:
2 positions (central + external) with spring centering
(**not available for DSPE8G and DSPE10G**)

1 solenoid for parallel configuration •**SB**Ž:
2 positions (central + external) with spring centering (**for DSPE8G and DSPE10G only**)



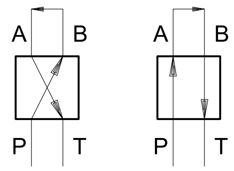
valve type	*	Nominal flow with p 10 bar P-T
DSPE5G DSPE5RG	**80**	80 l/min
	80/40	80 (P-A) /40 (B-T) l/min
DSPE7G	**100**	100 l/min
	150	150 l/min
	150/75	150 (P-A) /75 (B-T) l/min
DSPE8G	**200**	200 l/min
	300	300 l/min
	300/150	300 (P-A) /150 (B-T) l/min
DSPE10G	**350**	350 l/min
	500	500 l/min



valve type	*	Nominal flow with p 10 bar P-T
DSPE7G	**150/75**	150 (P-A) /75 (B-T) l/min
DSPE8G	**300/150**	300 (P-A) /150 (B-T) l/min
DSPE10G	**500/250**	500 (P-A) /250 (B-T) l/min

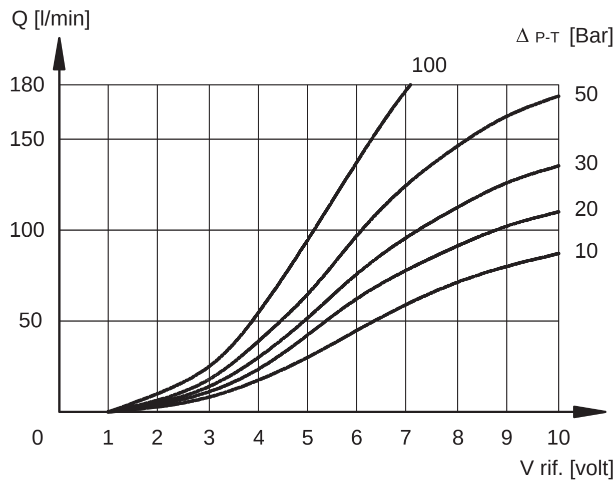
3 - CHARACTERISTIC CURVES (with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronics)

Typical flow rate curves at constant p related to the reference signal and measured for the available spools. The p values are measured between P and T valve ports.
The curves are obtained after linearization in factory of the characteristic curve through the digital amplifier. The adjustment of the curve is performed with a constant p of 30 bar by setting the value of flow start at 10% of the reference signal.



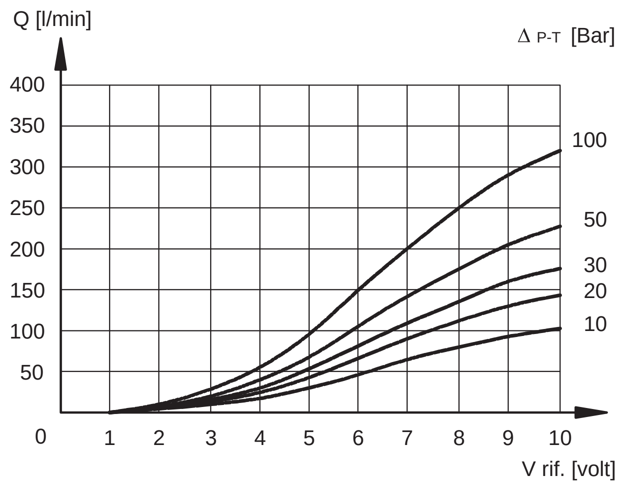
3.1 - Characteristic curves DSPE5G and DSPE5RG

SPOOL C80 - A80

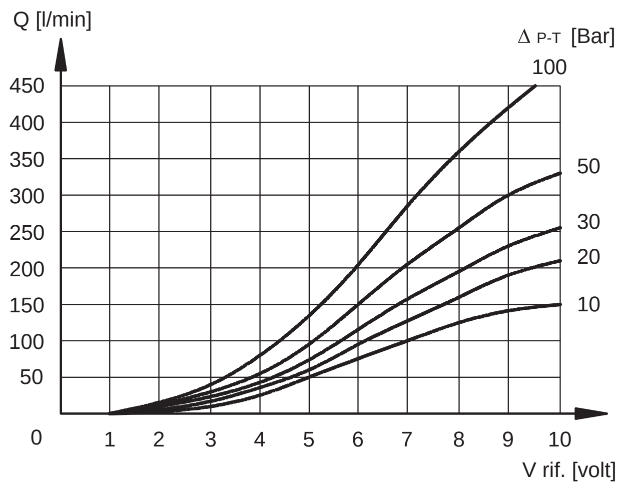


3.2 - Characteristic curves DSPE7G

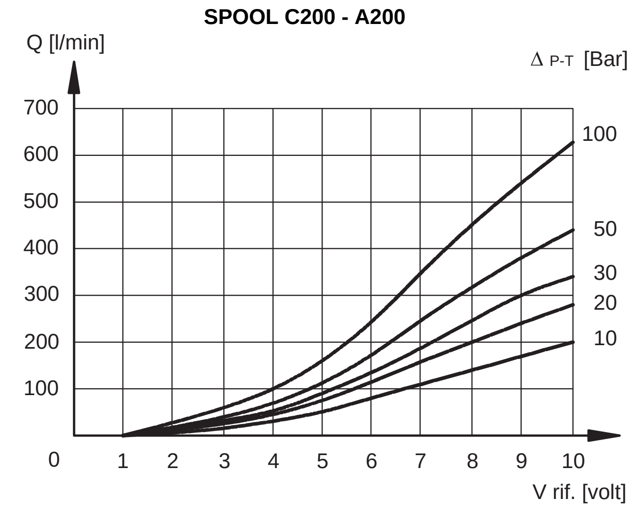
SPOOL C100 - A100

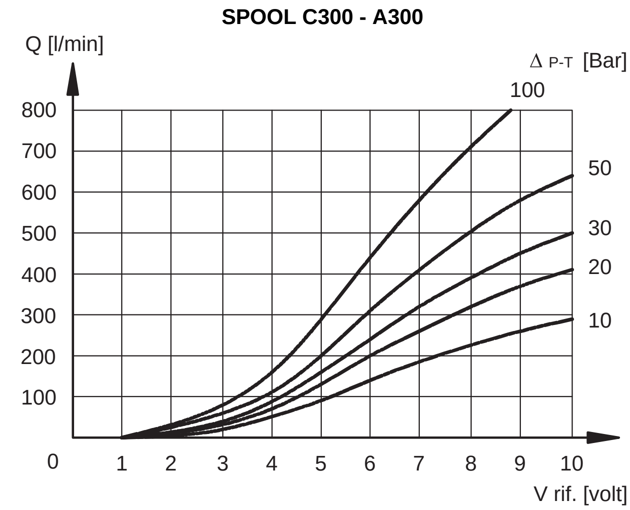


SPOOL C150 - A150

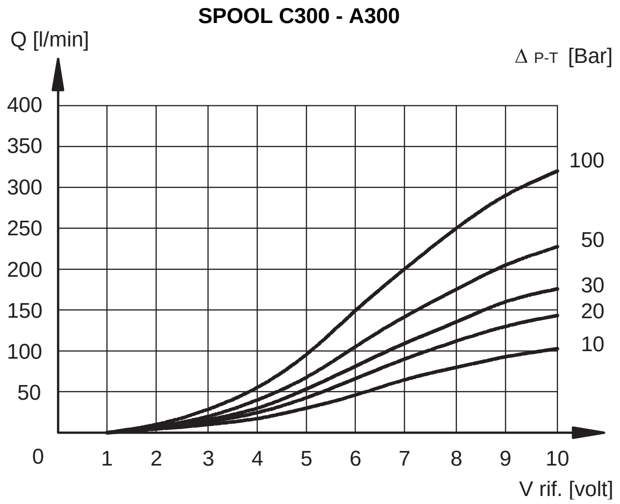


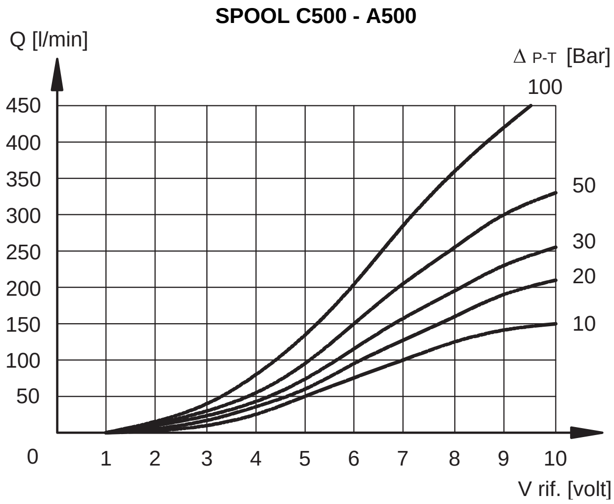
3.3 - Characteristic curves DSPE8G





3.4 - Characteristic curves DSPE10G



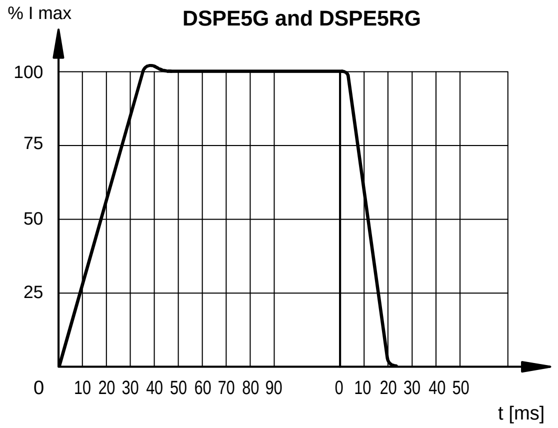


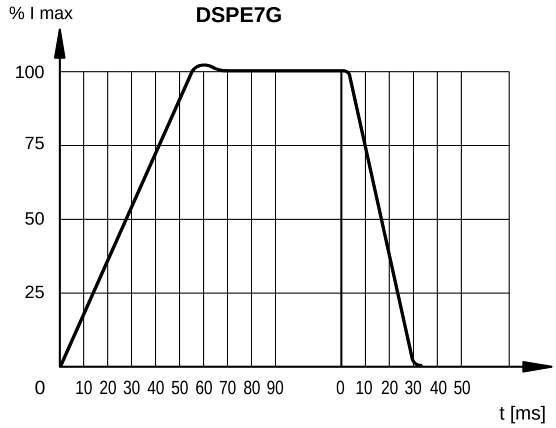
4 - HYDRAULIC CHARACTERISTICS (with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronics)

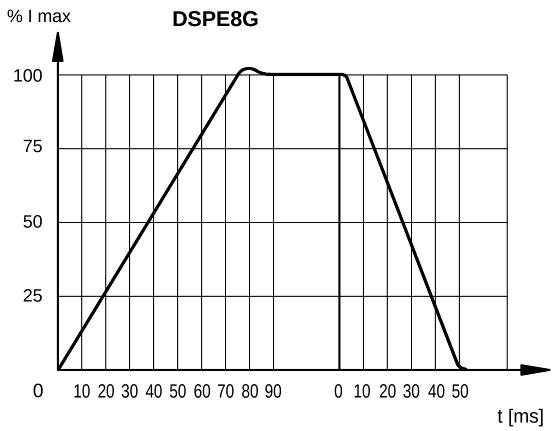
		DSPE5G DSPER5G	DSPE7G	DSPE8G	DSPE10G
Max flow rate	l/min	180	450	800	1600
Piloting flow requested with operation 0 100%	l/min	3,5	6	10,5	15
Piloting volume requested with operation 0 100%	cm^3	1,7	3,2	9,1	21,6

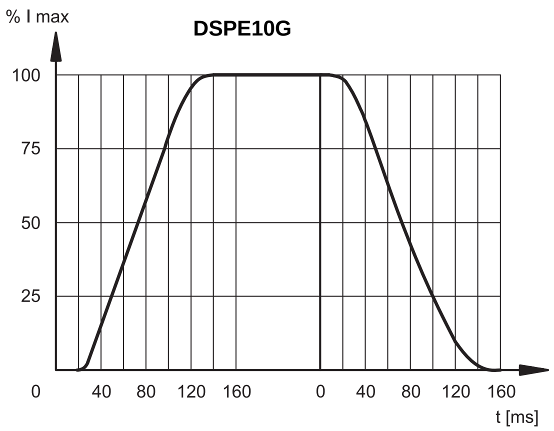
5 - STEP RESPONSE (obtained with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronics)

The table shows the typical step response tested with static pressure 100 bar.









6 - ELECTRICAL CHARACTERISTICS

6.1 - Digital integrated electronics

The proportional valve is controlled by a digital amplifier (driver), which incorporates a microprocessor that controls, via software, all the valve functions, such as:

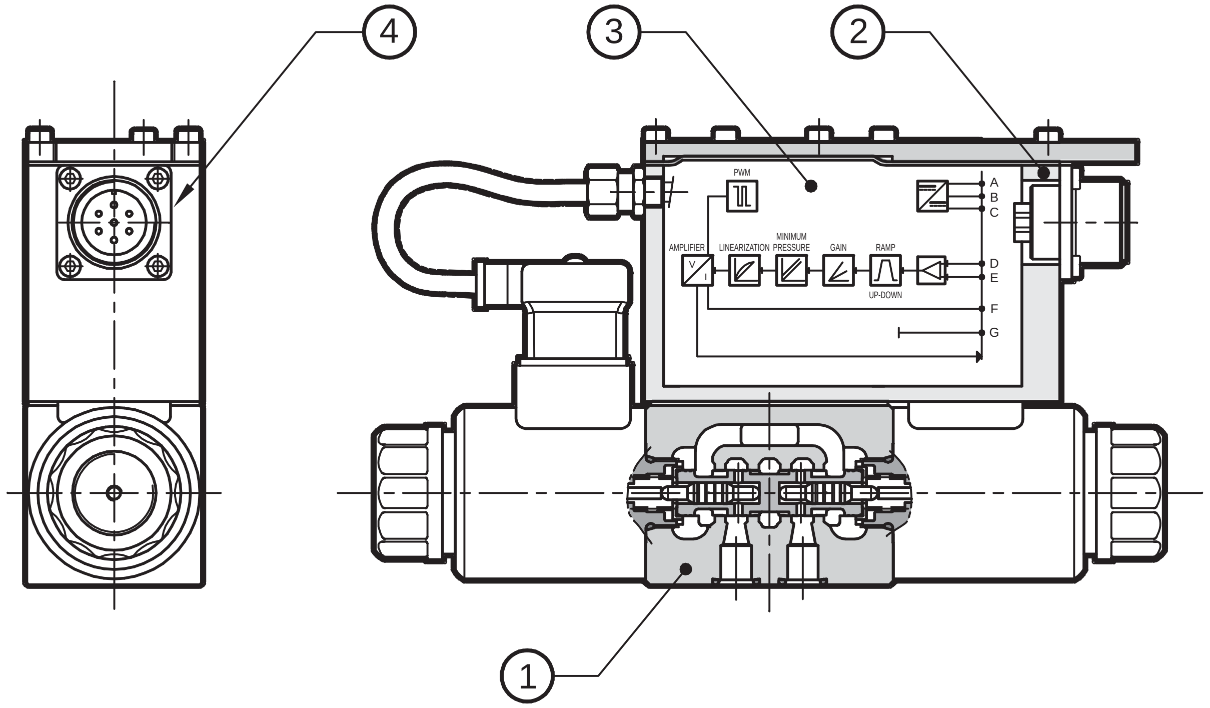
- continuous converting (0,5ms) of the voltage reference signal (E0) or of the current reference signal (E1) in a digital value
- generation of up and down ramps (see **NOTE**)
- gains limit (see **NOTE**)
- compensation of the dead band
- linearization of the characteristic curve
- regulation of the current to the solenoid
- dynamic regulation of PWM frequency
- protection of the solenoid outputs against possible short circuits

NOTE: These parameters can be set through the connection to the CAN connector, by means of a personal computer and relevant software (see par. 7.3)

The digital driver enables the valve to reach better performance compared to the analogic version, such as:

- reduced hysteresis and better repeatability
- reduced response times
- linearization of the characteristic curve which is optimised in factory for each valve
- complete interchangeability in case of valve replacement
- possibility to set, via software, the functional parameters
- possibility to interface a CAN-Open network
- possibility to perform a diagnostic program by means of the CAN connection
- high immunity to electromagnetic troubles

6.2 - Functional block diagram



1	Valve with proportional solenoids	3	Digital card
2	Electronics envelope	4	Main connector

6.3 - Electrical characteristics

NOMINAL VOLTAGE	VDC	24 VDC (from 19 to 35 VDC, ripple max 3 Vpp)
ABSORBED POWER	W	50
MAXIMUM CURRENT	A	1,88
DUTY CYCLE		100%
VOLTAGE SIGNAL (E0)	VDC	±10 (Impedance Ri > 50 K)
CURRENT SIGNAL (E1)	mA	4 ÷ 20 (Impedance Ri = 500)
ALARMS		Overload and electronics overheating
COMMUNICATION		Interface of the optoisolated industrial Field-bus type CAN-Bus ISO 11898
MAIN CONNECTOR		7 - pin MIL-C-5015-G (DIN 43563)
CAN-BUS CONNECTOR		M12-IEC 60947-5-2
ELECTROMAGNETIC COMPATIBILITY (EMC) **EMISSIONS** EN 61000-6-4 **IMMUNITY** EN 61000-6-2		according to 2004/108/CE standards
PROTECTION AGAINST ATMOSPHERIC AGENTS		IP65 / IP67 (CEI EN 60529 standards)

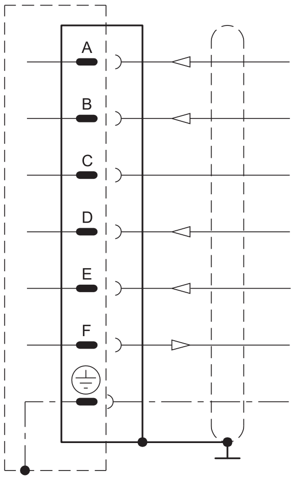
7 - OPERATING MODALITIES

The digital driver of DSPE*G valve may be used with different functions and operating modalities, depending on the requested performances.

7.1 -Standard version with voltage reference signal (E0)

This is the most common version; it makes the valve completely interchangeable with the traditional proportional valves with analogic type integrated electronics. The valve has only to be connected as indicated below. This version doesn•t allow the setting of the valve parameters, for example the ramps must be performed in the PLC program, as well as the reference signal limit.

E0 connection scheme (B version - E0)



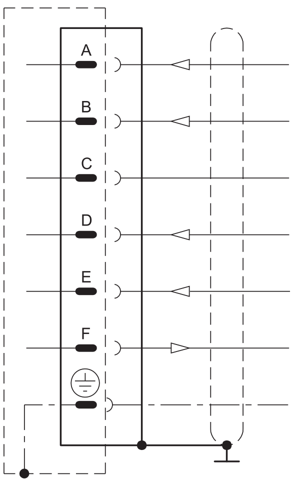
Pin	Values	Function	NOTES
A	24 VDC	Voltage	from 19 to 35 VDC (ripple max 3 Vpp) (see **NOTE 3**)
B	0 V	Power supply (zero)	0 V
C	----	Not used	----
D	± 10 V	Input rated command	Impedance R_i > 50 k (see **NOTE 1**)
E	0 V	Input rated command	----
F	± 10 V	Coil current	± 100% I_{MAX} (see **NOTE 2**)
PE	GND	Protective ground	----

7.2 - Standard version with current reference signal (E1)

This version has characteristics which are similar to the previous one, with the difference that in this case the reference signal is supplied in current 4 - 20 mA. With the 12 mA signal the valve is in central position, with the 20 mA signal the valve performs the configuration P-A and B-T, while with 4 mA the configuration is P-B and A-T. For •SAŽ single solenoid valves, with reference 20 mA to pin D, the valve full opening is P-B and A-T, while with 4 mA the valve is at rest. This configuration may be modified via software.

If the current to solenoid is lower, than the card shows a BREAKDOWN CABLE error. To reset the error switch-off the supply.

E1 connection scheme (B version - E1)



Pin	Values	Function	NOTES
A	24 VDC	Voltage	from 19 to 35 VDC (ripple max 3 Vpp) (see **NOTE 3**)
B	0 V	Power supply (zero)	0 V
C	----	Not used	----
D	4 ÷ 20 mA	Input signal	Impedance R_i = 500
E	0 V	Zero reference	----
F	± 10 V	Coil current	± 100% I_{MAX} (see **NOTE 2**)
PE	GND	Protective ground	----

NOTE 1: The input signal is differential type. For double solenoid valves, with positive reference signal connected to pin D, the valve opening is P - A and B - T. With zero reference signal the valve is in central position. For •SAŽ single solenoid valves, with positive reference to pin D, the valve opening is P-B and A-T. The spool stroke is proportional to U_D - U_E. If only one input signal (single-end) is available, the pin B (0V power supply) and the pin E (0V reference signal) must be connected through a jumper and both connected to GND, electric panel side.

NOTE 2: read the test point pin F in relation to pin B (0V).

NOTE 3: preview on the Pin A (24 VDC) an external fuse for protecting electronics. Fuse characteristics: 5A/50V type fast.

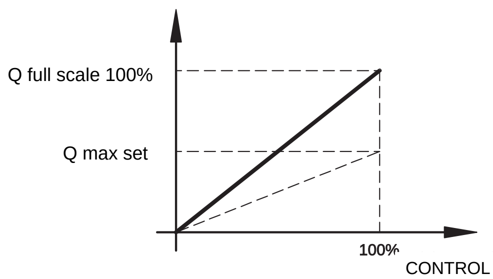
NOTE for the wiring: connections must be made via the 7-pin plug mounted on the amplifier. Recommended cable sizes are 0,75 mm^2 for cables up to 20m and 1,00 mm^2 for cables up to 40m, for power supply. The signal cables must be 0,50 mm^2 . A suitable cable would have 7 cores, a separate screen for the signal wires and an overall screen.

7.3 - Version with parameters set by means of CAN connector (version C)

This version enables the setting of some parameters of the valve, by connecting the CAN connector to a traditional computer.
To do this, it is necessary to order the interface device for USB port **CANPC-USB/20**, cod. 3898101002, with the relevant configuration software, the communication cable (L=3 meters) and an hardware converter for connecting the valve to the PC USB port. The software is Microsoft Windows Xp© compliant.

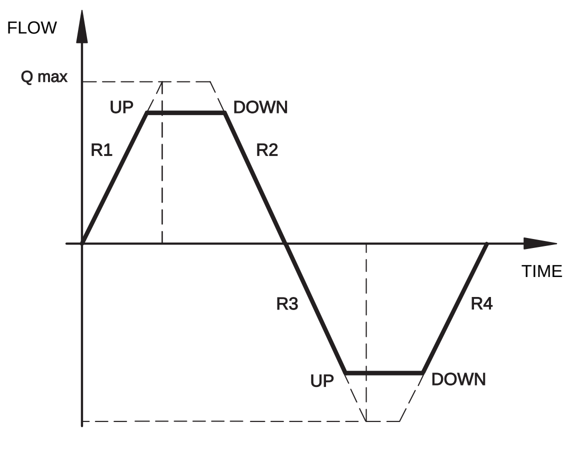
The parameters that can be set are described below:

Maximum current (Gain regulation)
Imax A and Imax B set the maximum current to the solenoid A corresponding to the positive value of the input reference. This parameter allows the reduction of the valve ”ow rate with the maximum reference.
Default value = 100% of full scale
Range: from 100% to 50% of full scale



PWM Frequency
Sets the PWM frequency, which is the pulsating frequency of the control current. The PWM decrease improves the valve accuracy, decreasing the regulation stability.
The PWM increase improves the regulation stability, causing a higher hysteresis.
Default value = 300 Hz
Range 50 ÷ 500 Hz

Ramps
Increase time of Ramp R1 - solenoid A: sets the current increase time for a variation from 0 to 100% of the input reference from zero to -10V.
Decrease time of Ramp R2 - solenoid A: sets the current decrease time for a variation from 100 to 0% of the input reference from -10V to zero.
Increase time of Ramp R3 - solenoid B: sets the current increase time for a variation from 0 to 100% of the input reference from zero to -10V.
Decrease time of Ramp R4 - solenoid B: sets the current decrease time for a variation from 100 to 0% of the input reference from -10V to zero.
Min time = 0,001 sec
Max time = 40,000 sec
Default time = 0,001 sec.



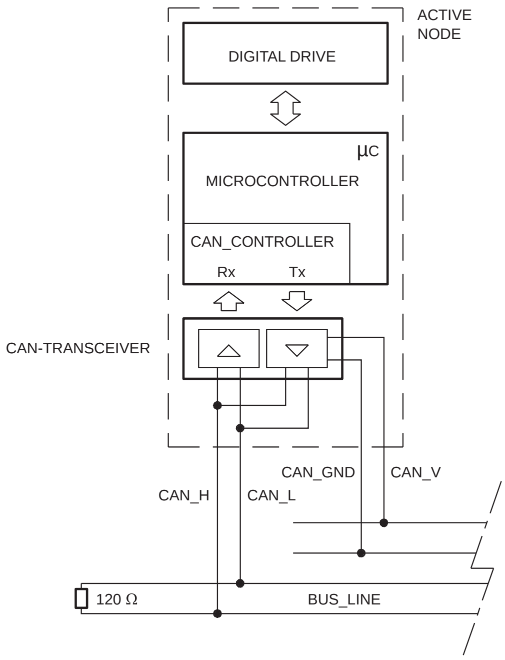
Diagnostics
Provides several information parameters, such as:
The electronic driver status (Working or Broken)
The active regulation
Input reference
Current value

7.4 - Version with CAN-Bus interface (version C)

This version allows the valve piloting through the industrial field bus CAN-Open, according to ISO 11898 standards.
The CAN connector must be connected (see scheme) as a slave node of the CAN-Open bus, while the main connector is wired only for the power supply (pin A and B + earth).

The most important characteristics of a CAN - Open connection are:
- Parameter storage also in PLC
- Parameters setting in real-time (PDO communication)
- On-line valve diagnostics
- Easy wiring with the serial connection
- Communication program according to international standards

For detailed information on the CAN-Open communication software, see cat. 89 800.



CAN connector connection scheme

Pin	Values	Function
1	CAN_SHLD	Monitor
2	CAN +24VDC	BUS + 24 VDC (max 30 mA)
3	CAN 0 DC	BUS 0 VDC
4	CAN_H	BUS line (high signal)
5	CAN_L	BUS line (low signal)

N.B. Insert a 120 resistance on pin 4 and 5 of the CAN connector when the valve is the closure knot of the CAN network.

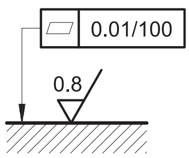
8 - INSTALLATION

The DSPE*G 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 apposite drain screw in the solenoid tube. Ensure that the solenoid tube is always filled with oil (see par. 11-12-13). At the end of the operation, make sure of having screwed correctly the drain screw.

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



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 - PILOTING AND DRAINAGE

The DSPE valves are available with piloting and drainage, both internal and external. The version with external drainage allows a higher back pressure on the unloading.

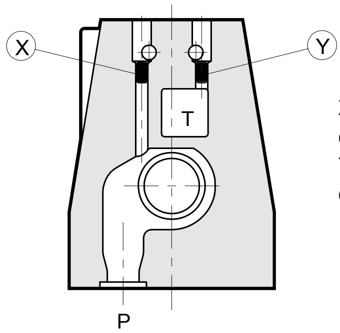
VALVE TYPE		Plug assembly	
		X	Y
IE	INTERNAL PILOT AND EXTERNAL DRAIN	NO	YES
II	INTERNAL PILOT AND INTERNAL DRAIN	NO	NO
EE	EXTERNAL PILOT AND EXTERNAL DRAIN	YES	YES
EI	EXTERNAL PILOT AND INTERNAL DRAIN	YES	NO

PRESSURES (bar)

Pressure	MIN	MAX
Piloting pressure on X port	30	210 (**NOTE**)
Pressure on T port with interal drain	…	10
Pressure on T port with external drain	…	250

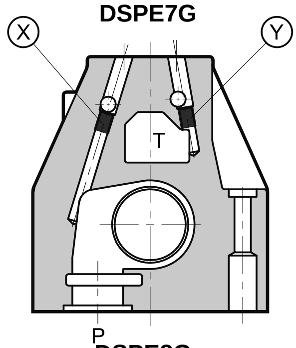
NOTE: The version with external pilot with reduced pressure must be used when higher pressures are needed. Otherwise the valve with internal pilot and pressure reducing valve with 30 bar fixed adjustment can be ordered. Add the letter Z to the identification code to order this option (see par. 1).

DSPE5G e DSPE5RG

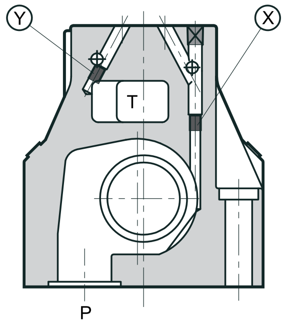


X: M5x6 plug for external pilot
Y: M5x6 plug for external drain

DSPE7G

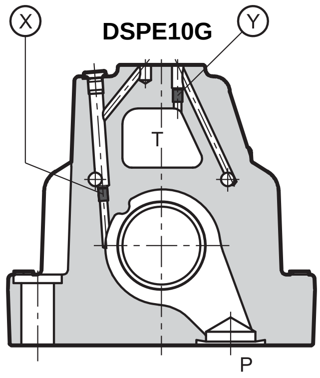


DSPE8G



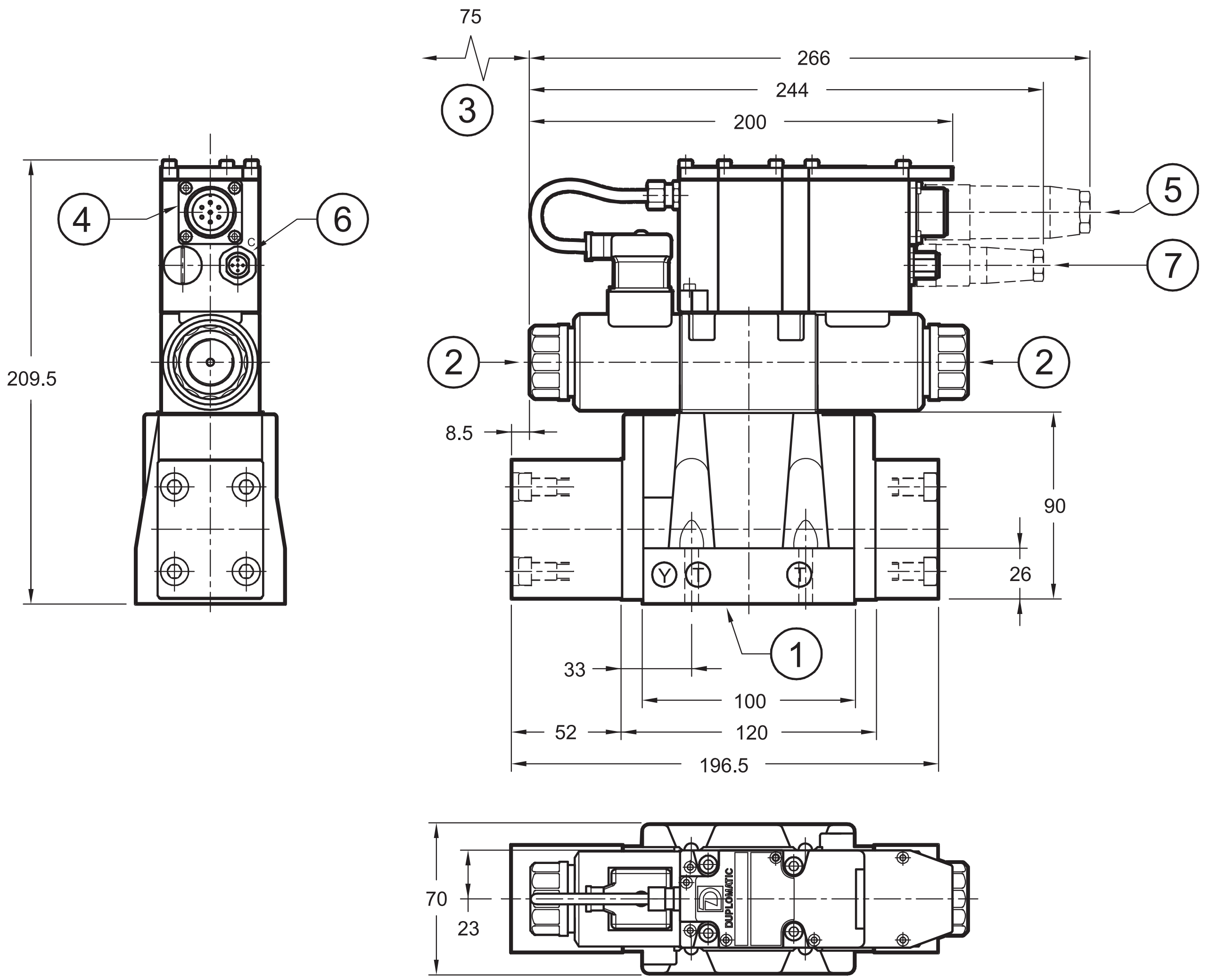
X: M6x8 plug for external pilot
Y: M6x8 plug for external drain

DSPE10G



X: M6x8 plug for external pilot
Y: M6x8 plug for external drain

11 - OVERALL AND MOUNTING DIMENSIONS DSPE5G and DSPE5RG



NOTES:

- for single solenoid overall dimensions see par. 15.

- for overall dimensions with Z option (fixed adjustment pressure reducing valve) see par. 16.

- for mounting surface see par. 17.

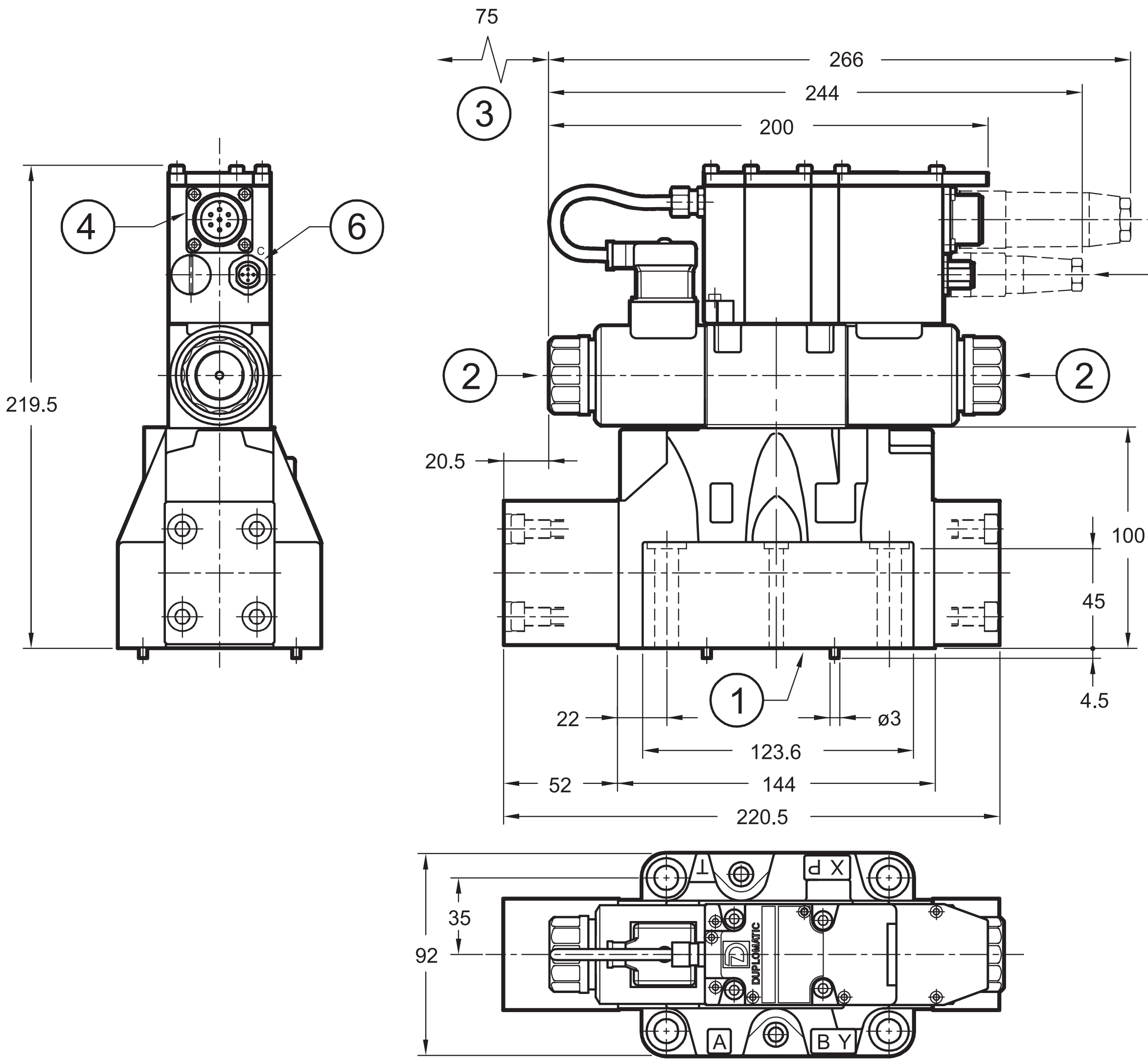
- at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

Valve fastening: 4 bolts M6x35 - ISO 4762
Tightening torque: 8 Nm (bolts A 8.8)
Thread of mounting holes: M6x10
Sealing rings: 5 OR type 2050 (12.42x1.78) - 90 Shore 2 OR type 2037 (9.25x1.78) - 90 Shore

dimensions in mm

1	Mounting surface with sealing rings
2	Breather (male hexagonal spanner 4)
3	Coil removal space
4	Main connection
5	Electrical connector 7 pin DIN 43563 - IP67 PG11 EX7S/L/10 code 3890000003 (**to be ordered separately**)
6	CAN-Bus connection **(only for version C)**
7	Electrical connector 5 pin M12 - IP67 PG7 EC5S/M12L/10 code 3491001001 only for version C (**to be ordered separately**)

12 - OVERALL AND MOUNTING DIMENSIONS DSPE7G



NOTES:

- for single solenoid overall dimensions see par. 15.

- for overall dimensions with Z option (fixed adjustment pressure reducing valve) see par. 16.

- for mounting surface see par. 17.

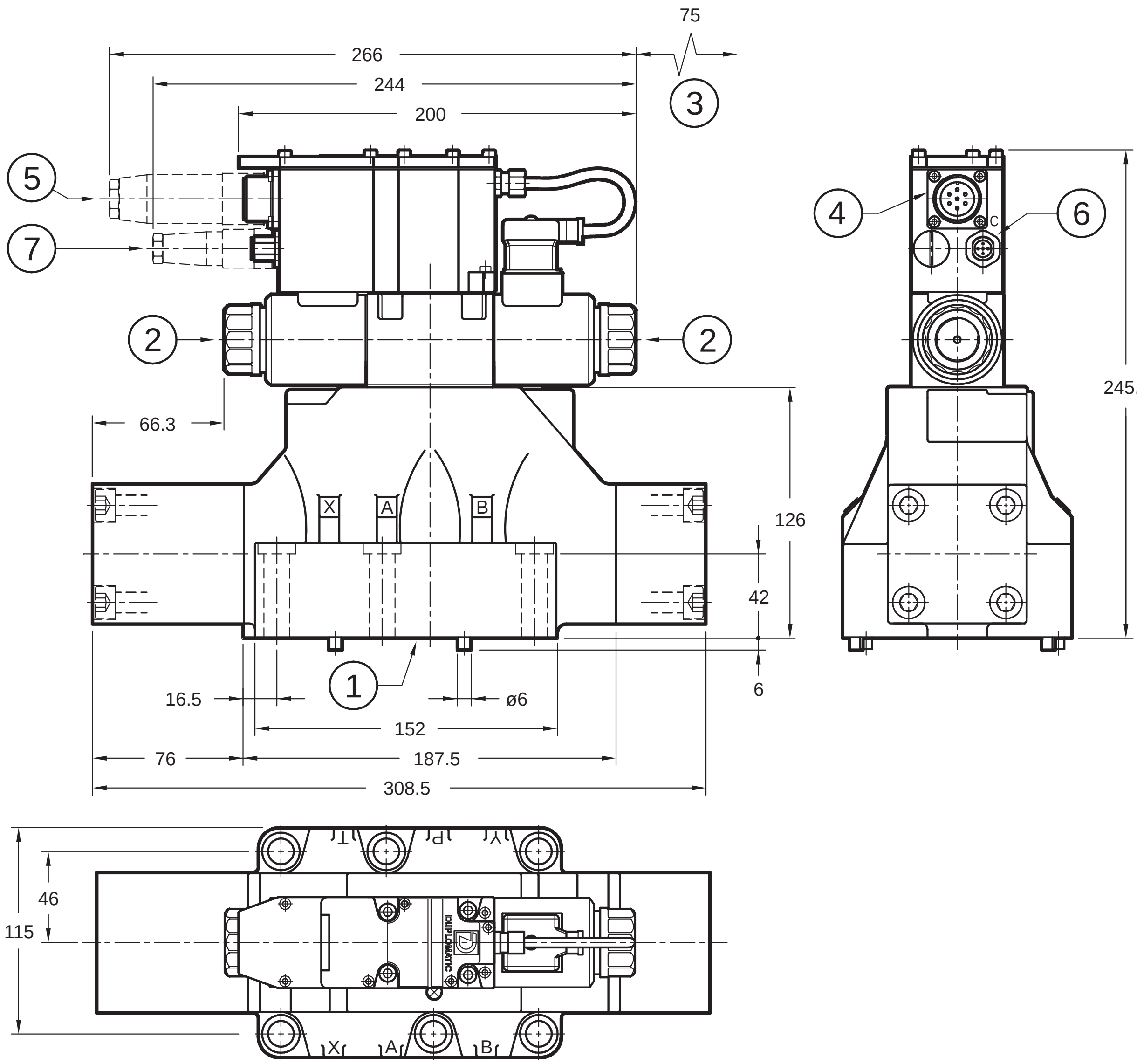
- at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

dimensions in mm

Valve fastening: 4 bolts M10x60 - ISO 4762 2 bolts M6x60 - ISO 4762	
Tightening torque M10x60: 40 Nm (bolts A 8.8) M6x60: 8 Nm (bolts A 8.8)	
Thread of mounting holes: M6x18; M10x18	
Sealing rings: 4 OR type 130 (22.22x2.62) - 90 Shore 2 OR type 2043 (10.82x1.78) - 90 Shore	

1	Mounting surface with sealing rings
2	Breather (male hexagonal spanner 4)
3	Coil removal space
4	Main connection
5	Electrical connector 7 pin DIN 43563 - IP67 PG11 EX7S/L/10 code 3890000003 (**to be ordered separately**)
6	CAN-Bus connection **(only for version C)**
7	Electrical connector 5 pin M12 - IP67 PG7 EC5S/M12L/10 code 3491001001 only for version C (**to be ordered separately**)

13 - OVERALL AND MOUNTING DIMENSIONS DSPE8G



NOTES:

- for single solenoid overall dimensions see par. 15.

- for overall dimensions with Z option (fixed adjustment pressure reducing valve) see par. 16.

- for mounting surface see par. 17.

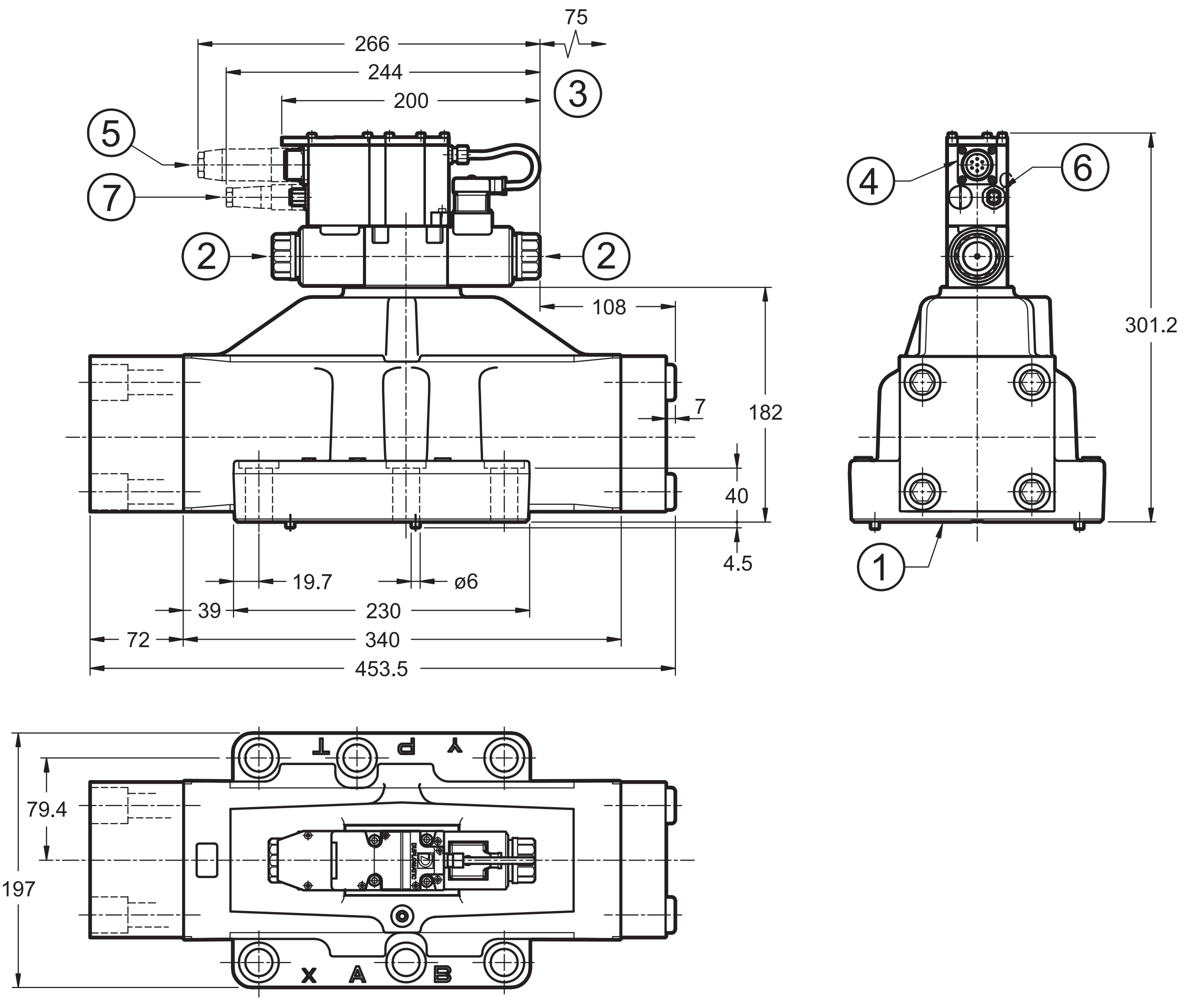
- at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

dimensions in mm

1	Mounting surface with sealing rings
2	Breather (male hexagonal spanner 4)
3	Coil removal space
4	Main connection
5	Electrical connector 7 pin DIN 43563 - IP67 PG11 EX7S/L/10 code 3890000003 (**to be ordered separately**)
6	CAN-Bus connection **(only for version C)**
7	Electrical connector 5 pin M12 - IP67 PG7 EC5S/M12L/10 code 3491001001 only for version C (**to be ordered separately**)

Valve fastening: 6 bolts M12x60 - ISO 4762
Tightening torque: 69 Nm (bolts A 8.8)
Thread of mounting holes: M12x20
Sealing rings: 4 OR type 3118 (29.82x2.62) - 90 Shore 2 OR type 3081 (20.24x2.62) - 90 Shore

14 - OVERALL AND MOUNTING DIMENSIONS DSPE10G



NOTES:

- for overall dimensions with Z option (fixed adjustment pressure reducing valve) see par. 16.

- for mounting surface see par. 17.

- 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.

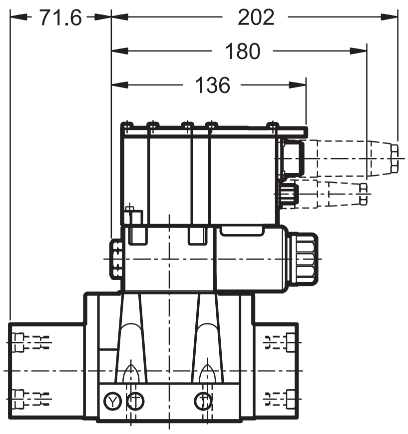
Valve fastening: N. 6 SHC screws M12x70 - ISO 4762
Tightening torque: 330 Nm (A 8.8 bolts)
Thread of mounting holes: M20x40
Sealing rings: N. 4 OR type 4150 (37.59x3.53) - 90 Shore N: 2 OR type 3081 (20.24x2.62) - 90 Shore

1	Mounting surface with sealing rings
2	Breather (male hexagonal spanner 4)
3	Coil removal space
4	Main connection
5	Electrical connector 7 pin DIN 43563 - IP67 PG11 EX7S/L/10 code 3890000003 (**to be ordered separately**)
6	CAN-Bus connection (**only for version C**)
7	Electrical connector 5 pin M12 - IP67 PG7 EC5S/M12L/10 code 3491001001 only for version C (**to be ordered separately**)

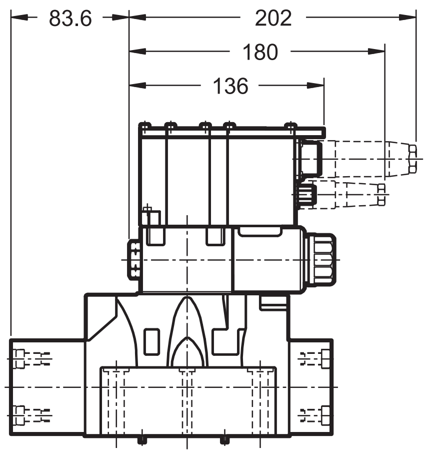
15 - OVERALL AND MOUNTING DIMENSIONS SINGLE SOLENOID VALVES

dimensions in mm

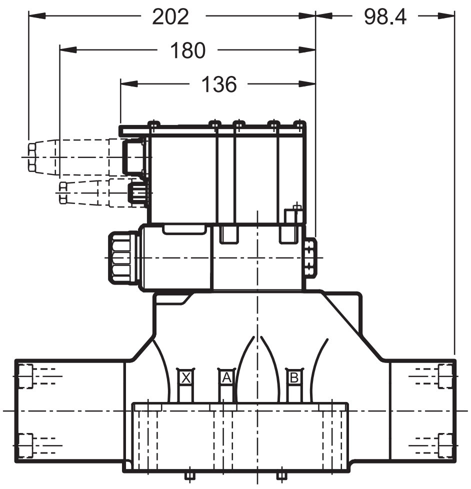
DSPE5G-*SA



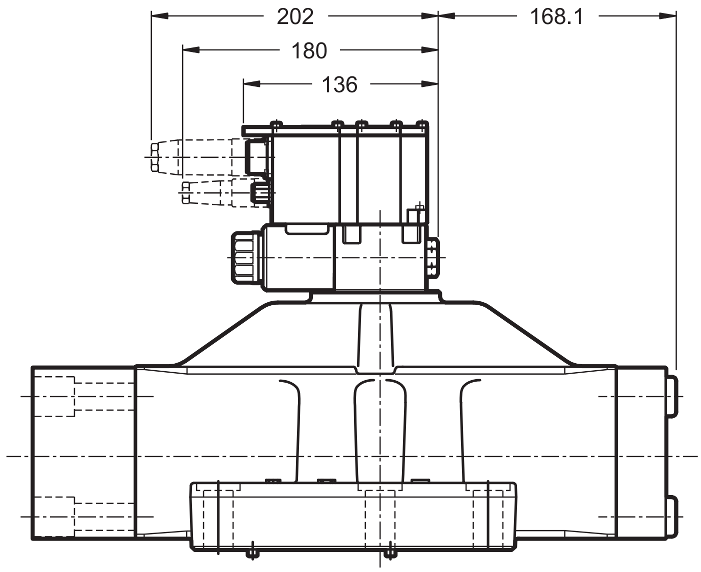
DSPE7G-*SA



DSPE8G-*SB



DSPE10G-*SB

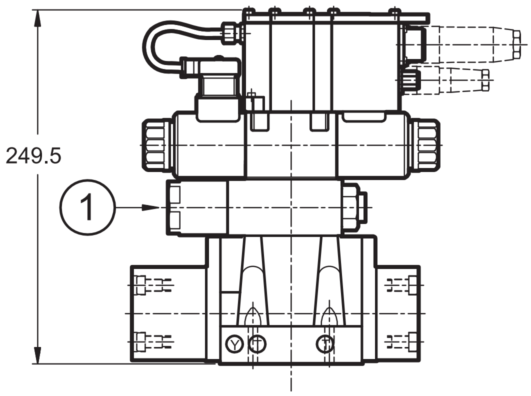


NOTE: for the missing overall dimensions and characteristics see par. 11 - 12 - 13 - 14.

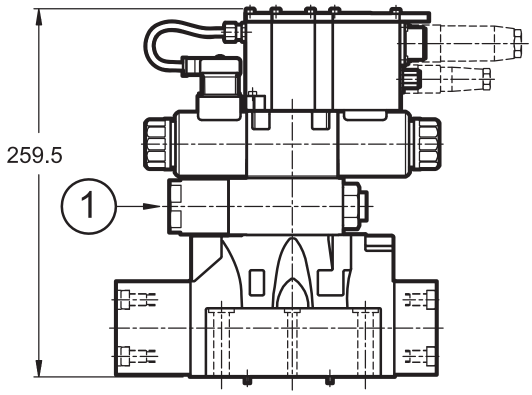
16 - OVERALL AND MOUNTING DIMENSIONS DSPE*G-*/11*-Z*/*

dimensions in mm

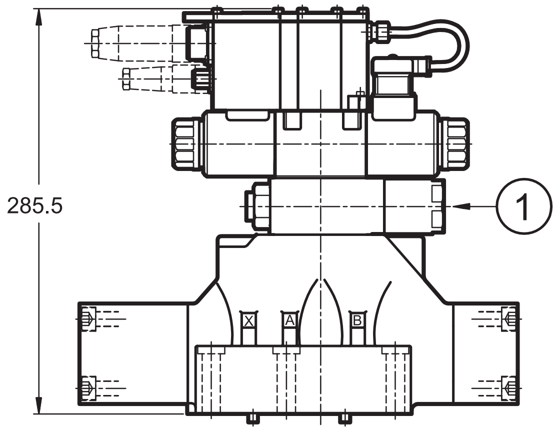
DSPE5G-*/11*-Z*/*



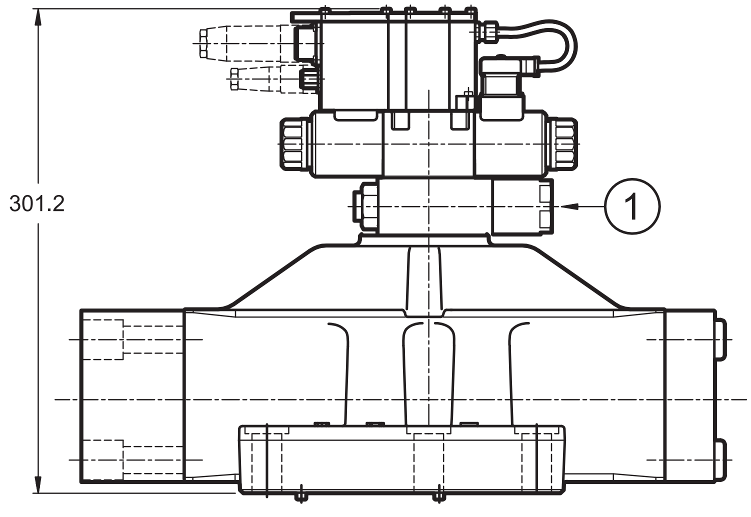
DSPE7G-*/11*-Z*/*



DSPE8G-*/11*-Z*/*



DSPE10G-*/11*-Z*/*

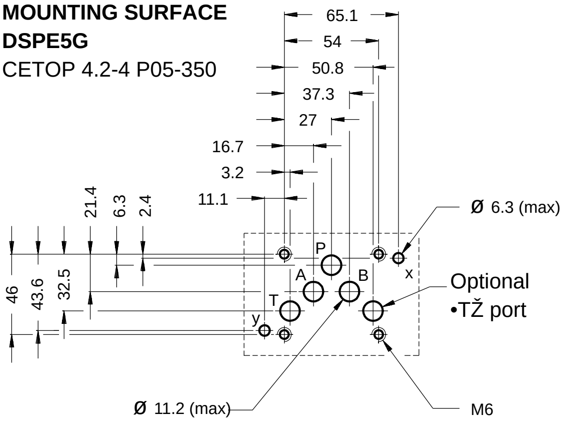


NOTE: for the missing overall dimensions and characteristics see par. 11 - 12 - 13 - 14.

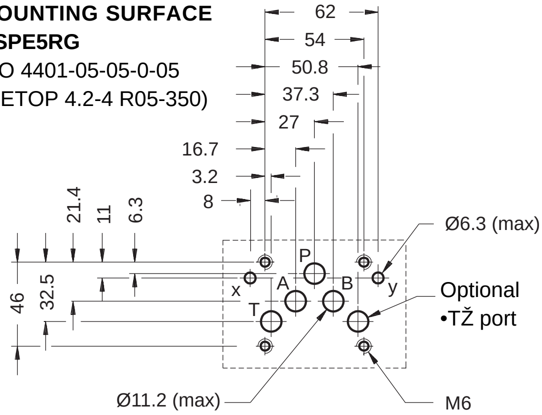
1	30 bar fixed adjustment pressure reducing valve

17 - MOUNTING SURFACES

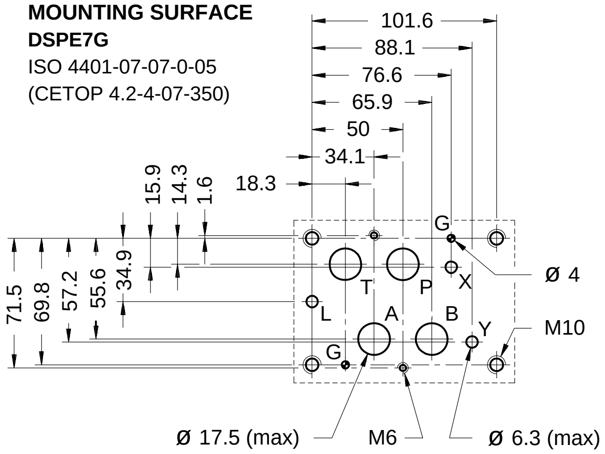
MOUNTING SURFACE
DSPE5G
CETOP 4.2-4 P05-350



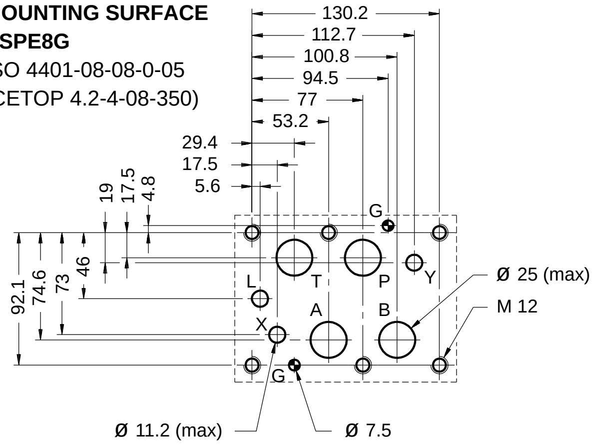
MOUNTING SURFACE
DSPE5RG
ISO 4401-05-05-0-05
(CETOP 4.2-4 R05-350)



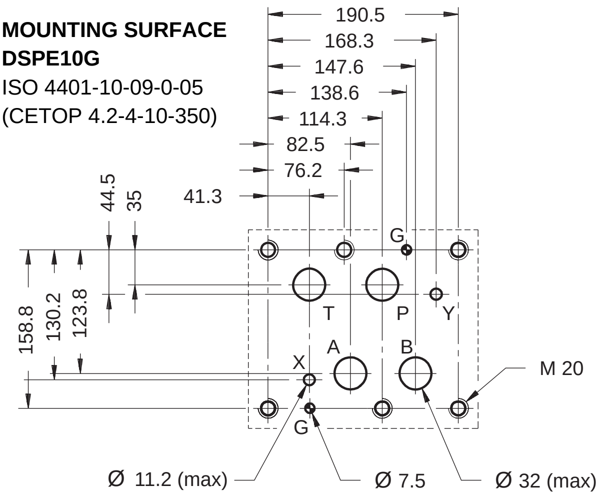
MOUNTING SURFACE
DSPE7G
ISO 4401-07-07-0-05
(CETOP 4.2-4-07-350)



MOUNTING SURFACE
DSPE8G
ISO 4401-08-08-0-05
(CETOP 4.2-4-08-350)



MOUNTING SURFACE
DSPE10G
ISO 4401-10-09-0-05
(CETOP 4.2-4-10-350)

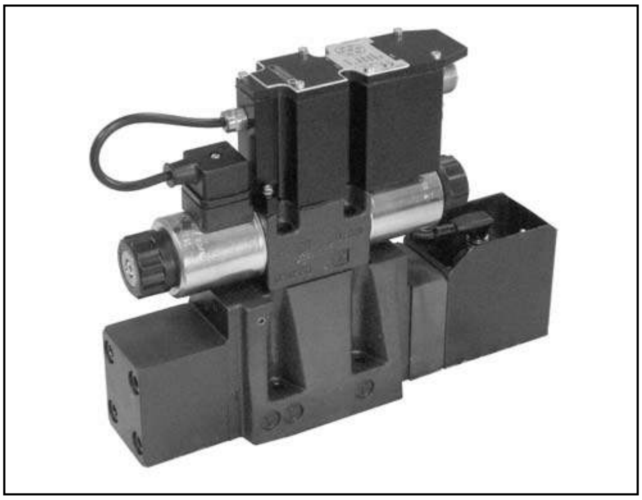


18 - SUBPLATES (see catalogue 51 000)

		DSPE5G	DSPE7G	DSPE8G	DSPE10G
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	3/4Ž BSP 1/4Ž BSP	1Ž BSP 1/4Ž BSP	1½Ž BSP 1/4Ž BSP	-

DUPLOMATIC OLEODINAMICA

DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com



DSPE*J

PROPORTIONAL DIRECTIONAL VALVE PILOT OPERATED WITH FEEDBACK AND INTEGRATED ELECTRONICS

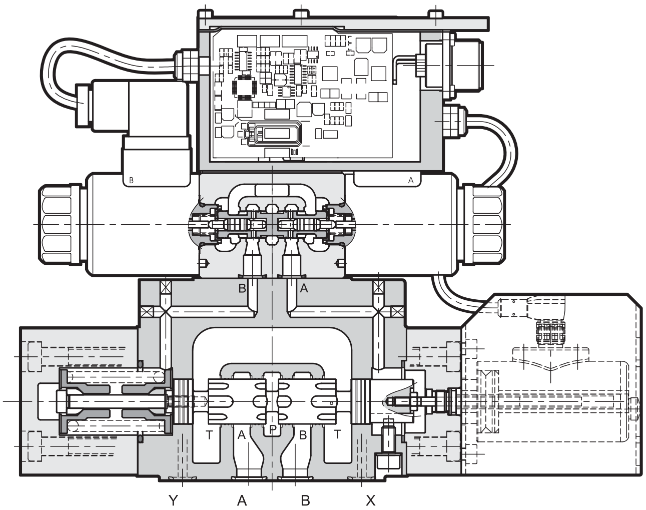
SERIES 20

SUBPLATE MOUNTING

DSPE5J **CETOP P05**
DSPE5RJ **ISO 4401-05** (CETOP R05)
DSPE7J **ISO 4401-07** (CETOP 07)
DSPE8J **ISO 4401-08** (CETOP 08)

p max (see performance table)
Q max (see performance table)

OPERATING PRINCIPLE



„ The DSPE*J are pilot operated directional control valves with electric proportional control, feedback and integrated electronics and with mounting interface in compliance with ISO 4401 (CETOP RP121H) standards.

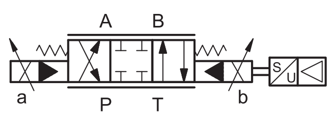
„ The valve opening and hence ”ow rate can be modulated continuously in proportion to the current supplied to the proportional solenoids of the pilot valve. Transducer and digital card allow a “ne control of the positioning of the cursor, reducing hysteresis and response time and optimizing the performance of the valve.

„ 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 different controlled flow rates, up to a maximum flow rate of 800 l/min.

„ The valve is easy to install. The driver directly manages digital settings (see par. 6). In the case of special applications, you can customize the settings using the optional kit (see par. 8).

PERFORMANCES (obtained with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronics)		**DSPE5J DSPE5RJ**	**DSPE7J**	**DSPE8J**
Max operating pressure: P - A - B ports T port	bar	350 see paragraph 11		
Controlled flow with p 10 bar P-T	l/min	see paragraph 2		
Step response		see paragraph 5		
Hysteresis	% Q $_{max}$	< 0,5%		
Repeatability	% Q $_{max}$	< ± 0,2%		
Electrical characteristics		see paragraph 6		
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	8,5 9	10,5 11	17 17,4

HYDRAULIC SYMBOL (typical)



1 - IDENTIFICATION CODE

D	S	P	E		J	-				/	20		-			/		K11

Pilot operated directional control valve (D S P)

Electric proportional control (E)

Nominal size:
5 = CETOP P05
5R = ISO 4401-05 (CETOP R05)
7 = ISO 4401-07 (CETOP 07)
8 = ISO 4401-08 (CETOP 08)

Digital integrated electronics for valves with feedback (J)

Spool type:
C = closed centres
A = open centres
RC = regenerative closed centers
RA = regenerative open centers

Configurations for single solenoid version (omit for double solenoid version) :
SA = 1 solenoid for cross configuration (not available for DSPE8J)
SB = 1 solenoid for parallel configuration (for DSPE8J only)

Spool nominal flow rate (see table par. 2)

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
Z = internal piloting with 30 bar fixed adjustment pressure reducing valve (see par. 11)

Drainage: **I** = internal
E = external

Reference signal:
E0 = voltage ± 10 V
E1 = current 4/20 mA

Main connector 6 pin + PE (K11)

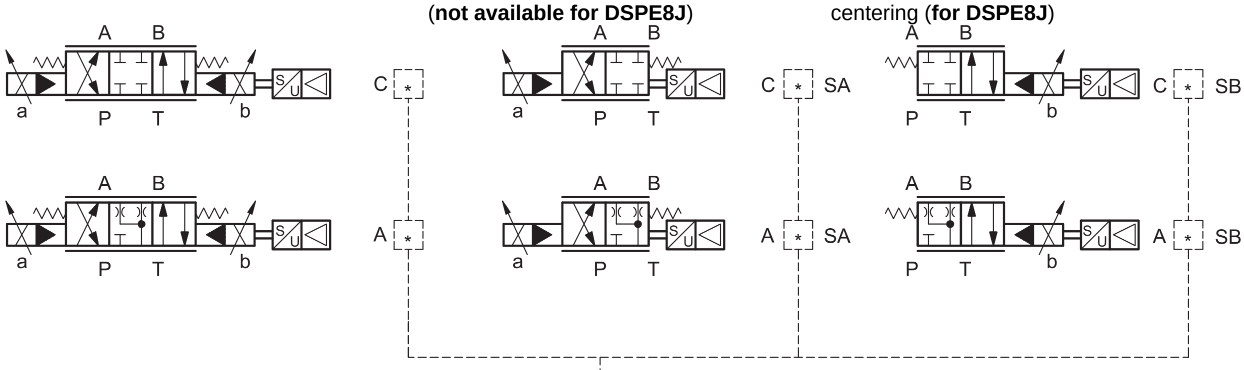
2 - AVAILABLE CONFIGURATIONS

The valve configuration depends on the combination of the following elements:
number of proportional solenoids, spool type, rated flow.

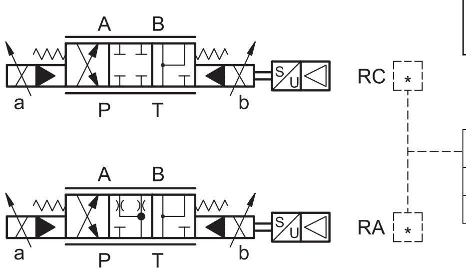
Configuration 2 solenoids:
3 positions with spring centering

1 solenoid for cross configuration •**SA**Ž:
2 positions (central + external) with spring centering
(**not available for DSPE8J**)

1 solenoid for parallel configuration •**SB**Ž:
2 positions (central + external) with spring centering (**for DSPE8J**)



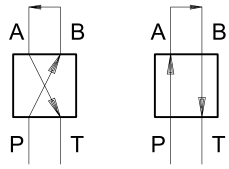
valve type	*	Controlled flow with p 10 bar P-T
DSPE5J DSPE5RJ	**80**	80 l/min
	80/40	80 (P-A) /40 (B-T) l/min
DSPE7J	**100**	100 l/min
	150	150 l/min
	150/75	150 (P-A) /75 (B-T) l/min
DSPE8J	**200**	200 l/min
	300	300 l/min
	300/150	300 (P-A) /150 (B-T) l/min



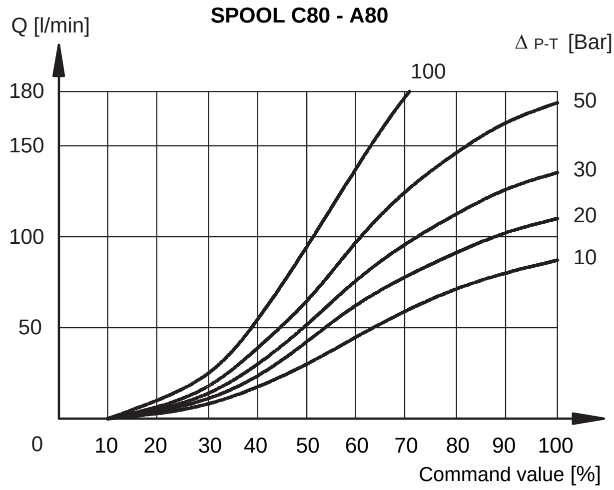
valve type	*	Controlled flow with p 10 bar P-T
DSPE7J	**150/75**	150 (P-A) /75 (B-T) l/min
DSPE8J	**300/150**	300 (P-A) /150 (B-T) l/min

3 - CHARACTERISTIC CURVES (with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronics)

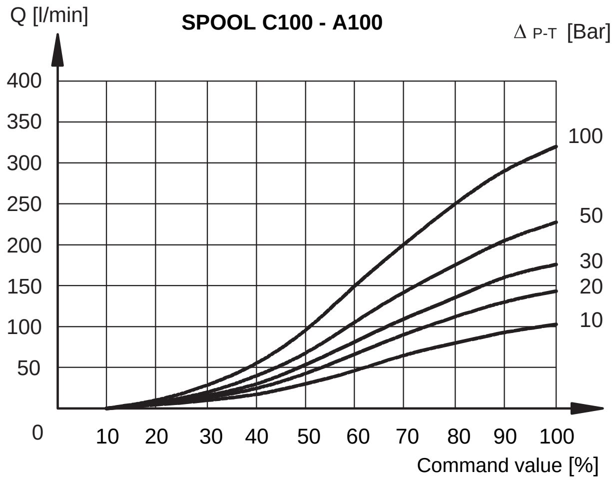
Typical ”ow rate curves at constant p related to the reference signal and measured for the available spools. The p values are measured between P and T valve ports.
The curves are obtained after linearization in factory of the characteristic curve through the digital ampli“er.

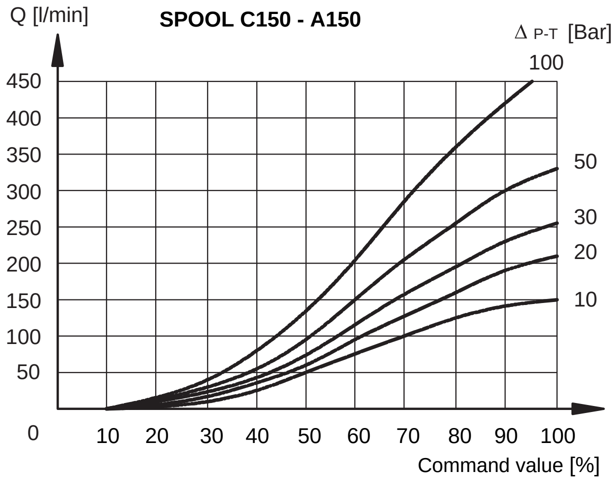


3.1 - Characteristic curves DSPE5J and DSPE5RJ

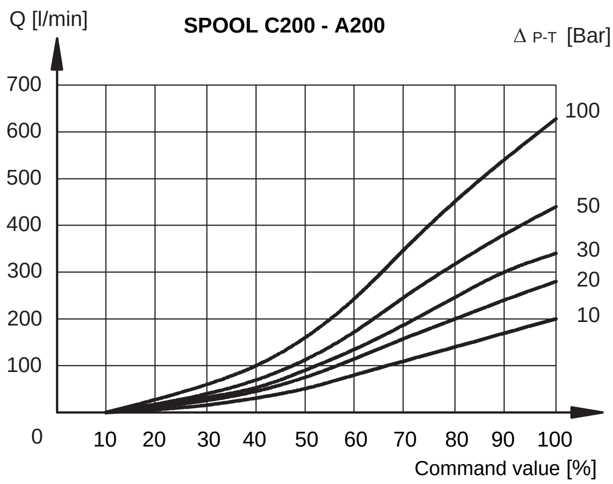


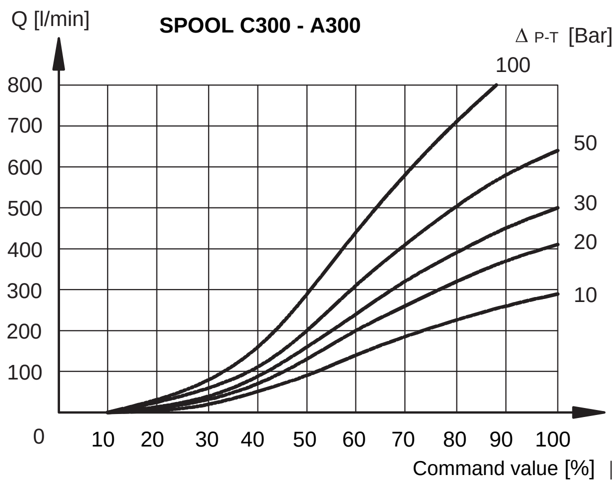
3.2 - Characteristic curves DSPE7J





3.3 - Characteristic curves DSPE8J



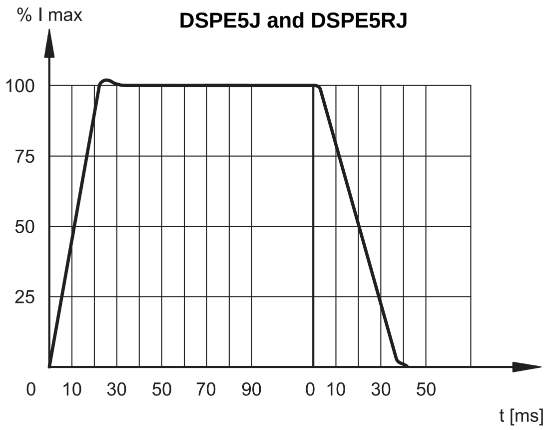


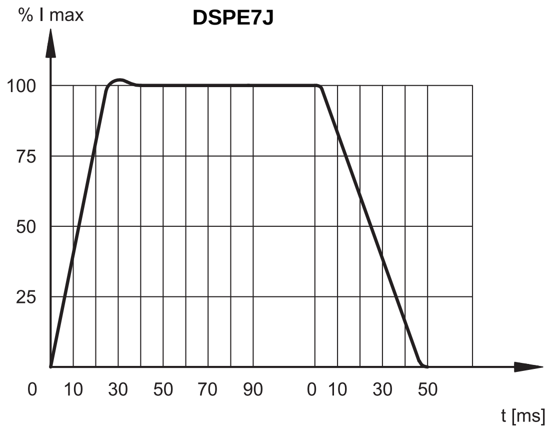
4 - HYDRAULIC CHARACTERISTICS (with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronics)

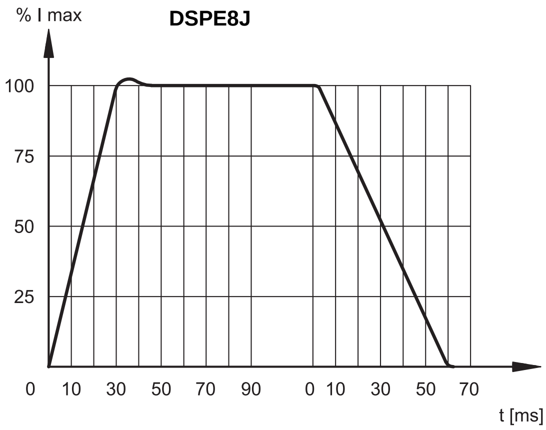
		DSPE5J DSPER5G	DSPE7J	DSPE8J
Max flow rate	l/min	180	450	800
Piloting flow requested with operation 0 100%	l/min	4,7	7,6	16
Piloting volume requested with operation 0 100%	cm^3	1,7	3,2	10

5 - STEP RESPONSE (obtained with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronics)

The table shows the typical step response tested with static pressure 100 bar.







6 - ELECTRICAL CHARACTERISTICS

6.1 - Digital integrated electronics

The proportional valve is controlled by a digital ampli“er (driver), which incorporates a microprocessor that controls, via software, all the valve functions, such as:

- continuous converting of the voltage reference signal (E0) or of the current reference signal (E1) in a digital value
- generation of up and down ramps
- gains limit
- compensation of the dead band
- protection of the solenoid outputs against possible short circuits

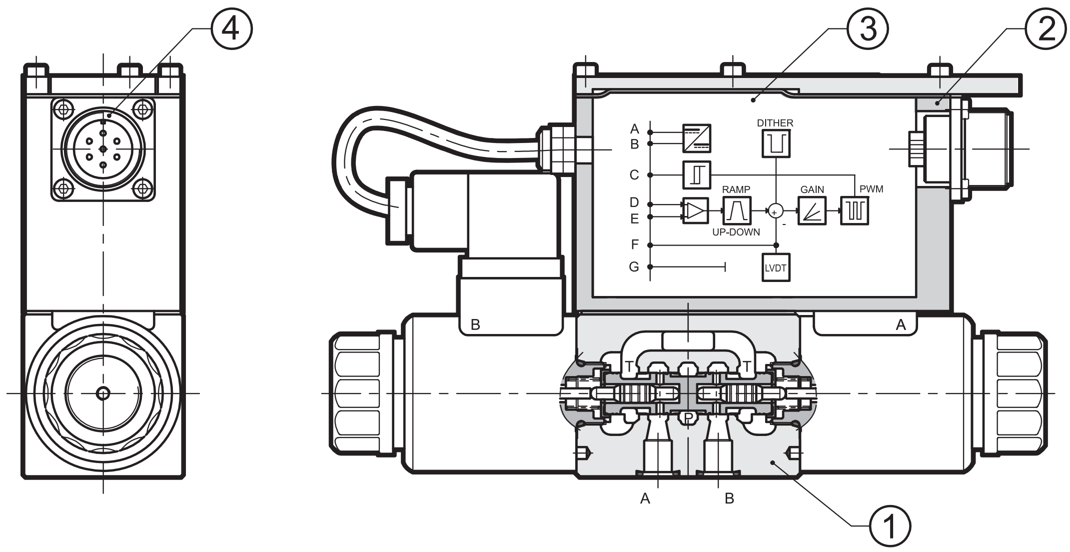
The digital driver enables the valve to reach better performance compared to the analogic version, such as:

- reduced response times
- optimization and reproducibility of the characteristic curve, optimised in factory for each valve
- complete interchangeability in case of valve replacement
- possibility to set, via software, the functional parameters
- possibility to perform a diagnostic program by means of the LIN connection
- high immunity to electromagnetic troubles

We deliver the DSPE*J with these standard settings:

UP/DOWN ramp at minimum value, no deadband compensation, max valve opening (100% of spool stroke). It is possible to customize these parameters using the special kit, to be ordered separately (see par 8).

6.2 - Functional block diagram



1	Valve with proportional solenoids	3	Digital card
2	Electronic envelope	4	Main connector

6.3 - Electrical characteristics

NOMINAL VOLTAGE	V DC	24 (from 19 to 35 VDC, ripple max 3 Vpp) external fuse 5A (fast), max current 3A
ABSORBED POWER	W	70
MAXIMUM CURRENT	A	2.6
DUTY CYCLE		100%
VOLTAGE SIGNAL (E0)	V DC	±10 (Impedance Ri > 50 K)
CURRENT SIGNAL (E1)	mA	4 ÷ 20 (Impedance Ri = 500)
ALARMS		Overload and electronics overheating, LVDT sensor error, cable breakdown or power failure or < 4mA.
COMMUNICATION		LIN-bus Interface (with the optional kit)
MAIN CONNECTOR		7 - pin MIL-C-5015-G (DIN 43563)
ELECTROMAGNETIC COMPATIBILITY ((EMC) emissions CEI EN 61000-6-4 immunity CEI EN 61000-6-2		According to 2004/108/CE standards
PROTECTION AGAINST ATMOSPHERIC AGENTS		IP65 / IP67 (CEI EN 60529 standards)

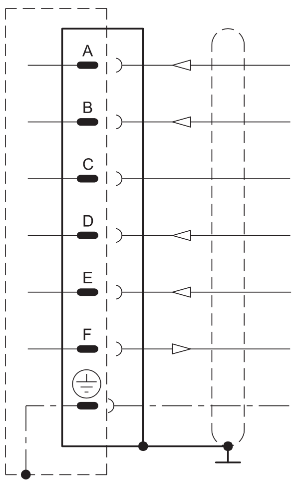
7 - OPERATING MODALITIES

The digital driver of DSPE*J valves is available in two versions, with voltage or current reference signal.

7.1 - Version with voltage reference signal (E0)

This is the most common version; it makes the valve completely interchangeable with the traditional proportional valves with analogic type integrated electronics. The valve has only to be connected as indicated below. This version doesn•t allow the setting of the valve parameters, for example the ramps must be performed in the PLC program, as well as the reference signal limit.

Connection scheme E0

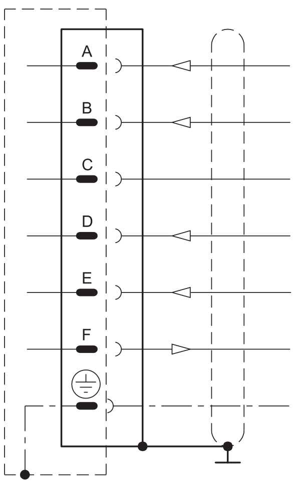


Pin	Values	Function	NOTES
A	24 V DC	Voltage	from 19 to 35 V DC (ripple max 3 Vpp) (see **NOTE 1**)
B	0 V	Power supply (zero)	0 V
C	24 V DC	Valve Enable	**NOTE 2**
D	± 10 V	Differential input	Impedance R_i > 50 k (see **NOTE 3**)
E	0 V	Differential input	---
F	6 - 10V o 2 - 6 -10V	Monitor feedback or Lin comm	see **NOTE 4**
PE	GND	Protective ground	---

7.2 - Version with current reference signal (E1)

The reference signal is supplied in current 4 - 20 mA. With the 12 mA signal the valve is in central position, with the 20 mA signal the valve performs the configuration P-A and B-T, while with 4 mA the configuration is P-B and A-T. For •SAŽ single solenoid valves, withreference 20 mA to pin D, the valve full opening is P-B and A-T, while with 4 mA the valve is at rest. If the current to solenoid is lower, than the card shows a BREAKDOWN CABLE error. To reset the error is sufficient to restore the current 4mA.

Connection scheme E1



Pin	Values	Function	NOTES
A	24 V DC	Voltage	from 19 to 35 V DC (ripple max 3 Vpp) (see **NOTE 1**)
B	0 V	Power supply (zero)	0 V
C	24 V DC	Valve Enable	**NOTE2**
D	4 ÷ 20 mA	Input signal	Impedance R_i > 500 k
E	0 V	Zero reference	---
F	6 - 10V o 2 - 6 -10V	Monitor point or Lin comm	see **NOTE 4**
PE	GND	Protective ground	---

NOTE 1: preview on the Pin A (24 VDC) an external fuse for protecting electronics. Fuse characteristics: 5A/50V type fast.

NOTE 2: preview 24V DC on the PIN C to activate the card power stage.

NOTE 3: The input signal is differential type on E0 version only. For double solenoid valves, with positive reference signal connected to pin D, the valve opening is P - A and B - T. With zero reference signal the valve is in central position. For •SAŽ single solenoid valves, with positive reference to pin D, the valve opening is P-B and A-T. The spool stroke is proportional to U_D - U_E.
If only one input signal (single-end) is available, the pin B (0V power supply) and the pin E (0V reference signal) must be connected through a jumper and both connected to GND, electric panel side.

NOTE 4: This value changes, as shown in the table below. When MONITOR function is enabled and the card is enabled, read the test point pin F in relation to pin B (0V). When detect a failure or error of the sensor LVDT, the drive bring the valve back in central position and locks it. In this condition the pin F, referring to the pin B, indicates 0V DC output. To reset the fault, the card must be disabled and re-enable. When the card is disabled, the pin F referred to the pin B shows 2.7V DC output: this value is given by the voltage of the LIN bus communication and not by the MONITOR value.

double solenoid valves		single solenoid valve	
command (Pin D)	Pin F	command (Pin D)	Pin F
-10 V	10 V	-	-
0 V	6 V	0 V	6 V
+10 V	2 V	+10 V	10 V

NOTE for the wiring: connections must be made via the 7-pin plug mounted on the amplifier. Recommended cable sizes are 0,75 mm^2 for cables up to 20m and 1,00 mm^2 for cables up to 40m, for power supply. The signal cables must be 0,50 mm^2. A suitable cable would have 7 cores, a separate screen for the signal wires and an overall screen.

8 - OPTIONAL KIT LINPC-USB/10

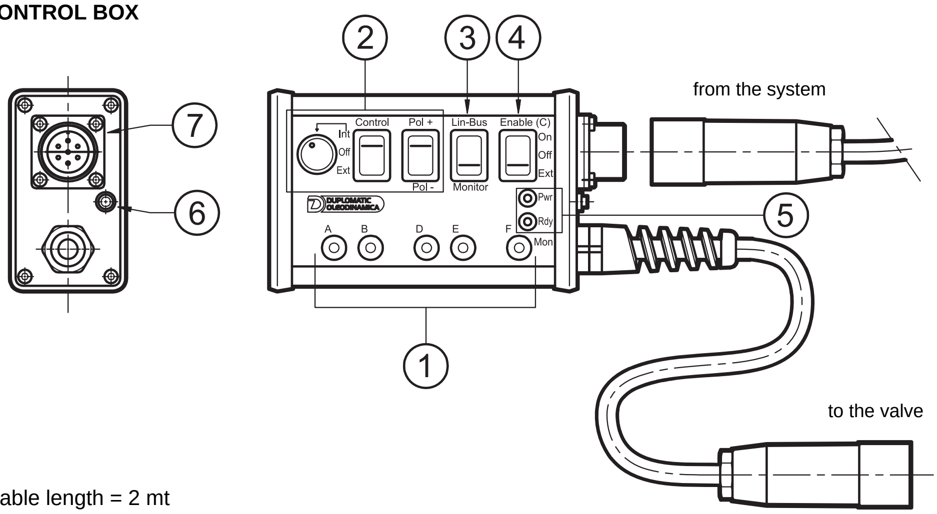
The kit (to be ordered separately, code 3898501001) includes control box with 7 poles connector, USB PC cable (1.8 m length), software for card configuration. The software is Microsoft XP®, Microsoft Windows Vista® and Windows 7® compliant.

The box has three main functions:

- It can be used to read the values from the external command (PLC, etc. ..) to the valve. In this case, the box simply acts as monitor through points of measurement.
- It may exclude the command from the PLC and controls the valve, choosing the direction and speed of movement (keys gr. 2 and 4). This way you can test the response of the valve control input, and diagnose failures, malfunctions, simulating the valve working.
- The control box acts as interface between PC and electronic card (key 3) to allow customization of the parameters via software.

For more detailed information on the use of the box, see the documentation on the software CD.

CONTROL BOX



cable length = 2 mt

1	Test points
2	Keys for control of valve movements.
3	Switch LinBus/Monitor
4	Enable Switch
5	Leds
6	RS232 connection to PC
7	Main connector

8.1 - Programming the parameters via LIN Bus

The software included in the kit allows the customization of the following parameters:

Deadband compensation
You can change the mechanical spool overlap by adjusting the parameters V: MINA and V MINB.

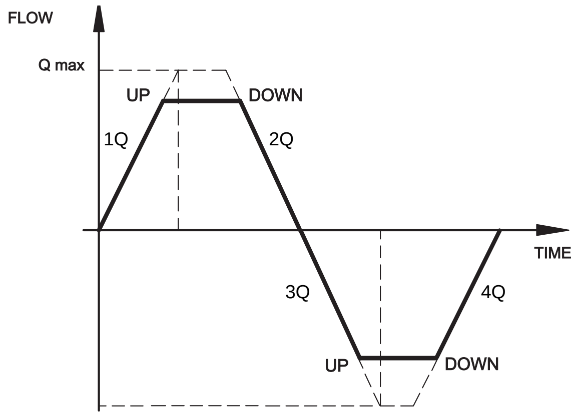
Gain Adjustment
You can change the parameters V and V MAXA: MAXB, which restrict the spool opening for positive and negative values of the reference signal.

AINW: W command input scaling
This command allows to scale the input signal and determine whether the input is enabled for signals in voltage or in current.

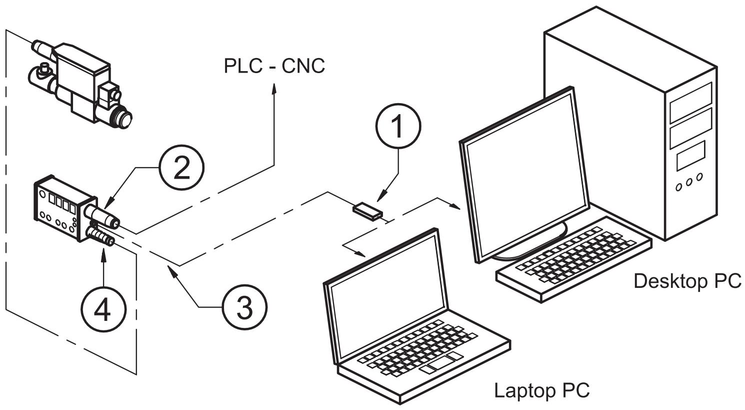
V: TRIGGER
Value in percentage by which you activate the deadband function of V: MinA and V: minB

Ramps

Ramps are divided into four quadrants and can be customized by setting the parameters 1Q, 2Q, 3Q and 4Q. They define the time variation of current in the solenoid in reference to input command.
range: 1 ÷ 60000 ms.



8.2 - Wiring scheme of Lin/Bus box



1	USB connector
2	Main connection from the system
3	Lin/Bus connection
4	7 poles connection to command the valve.

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.

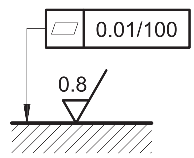
The fluid must be preserved in its physical and chemical characteristics.

10 - INSTALLATION

DSPE*J 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 bolts 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 “nishing



11 - PILOTING AND DRAINAGE

The DSPE valves are available with piloting and drainage, both internal and external. The version with external drainage allows a higher back pressure on the unloading.

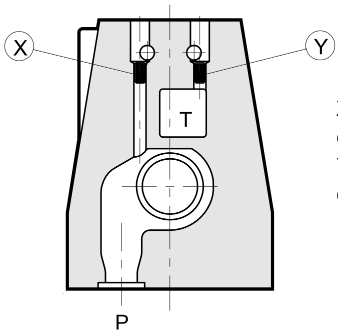
VALVE TYPE		Plug assembly	
		X	**Y**
IE	INTERNAL PILOT AND EXTERNAL DRAIN	NO	YES
II	INTERNAL PILOT AND INTERNAL DRAIN	NO	NO
EE	EXTERNAL PILOT AND EXTERNAL DRAIN	YES	YES
EI	EXTERNAL PILOT AND INTERNAL DRAIN	YES	NO

PRESSURES (bar)

Pressure	MIN	MAX
Piloting pressure on X port	30	210 (**NOTE**)
Pressure on T port with interal drain	…	10
Pressure on T port with external drain	…	250

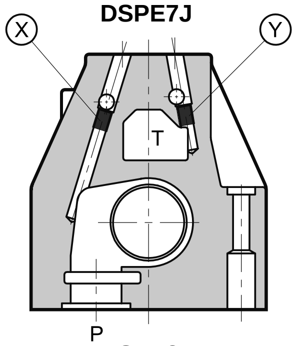
NOTE: The version with external pilot with reduced pressure must be used when higher pressures are needed. Otherwise the valve with internal pilot and pressure reducing valve with 30 bar fixed adjustment can be ordered. Add the letter Z to the identification code to order this option (see par. 1).

DSPE5J and DSPE5RJ

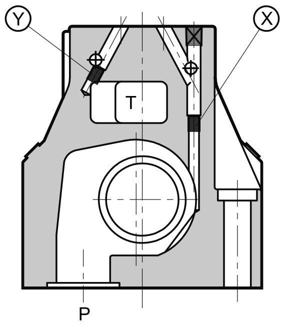


X: M5x6 plug for external pilot
Y: M5x6 plug for external drain

DSPE7J

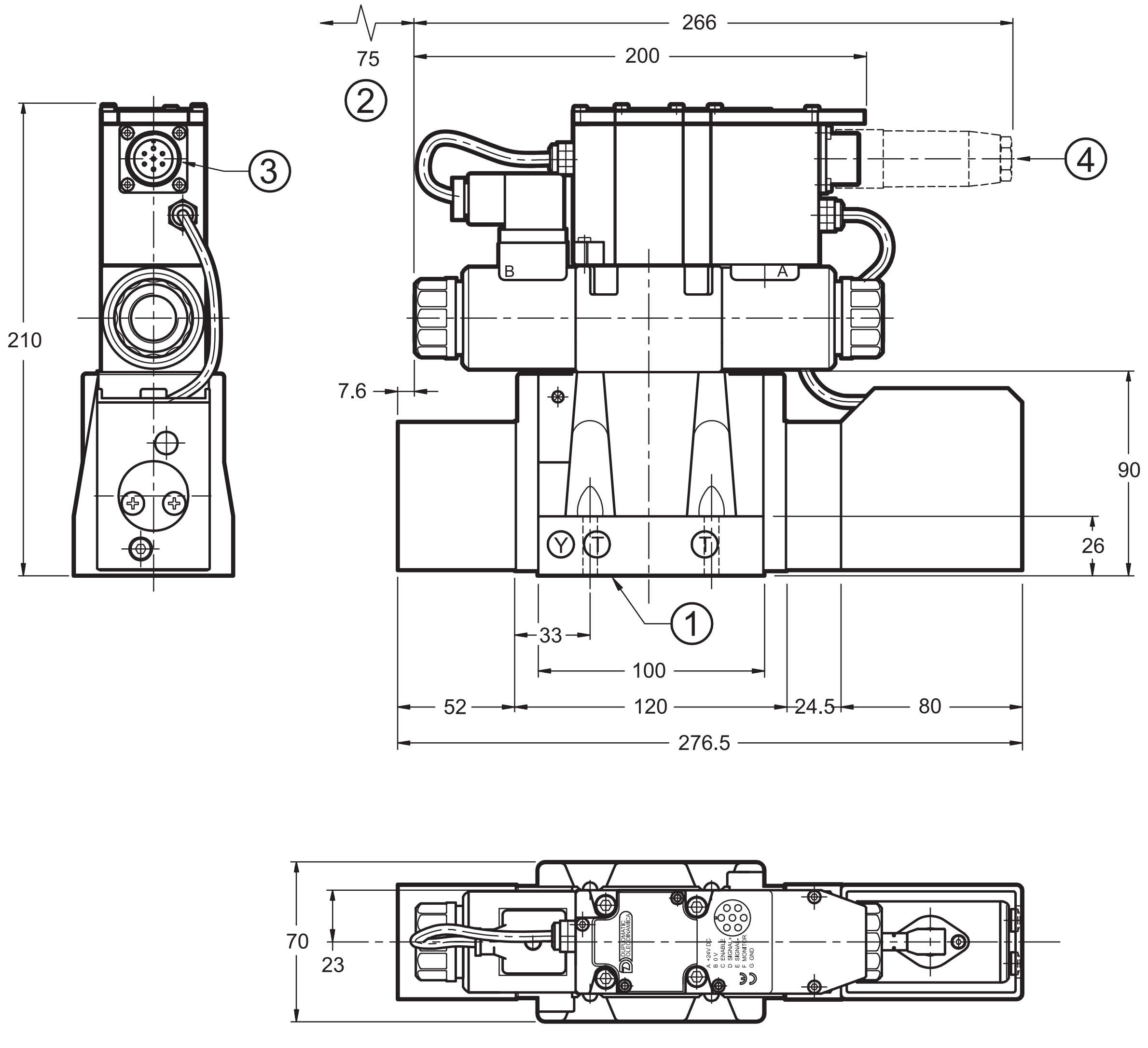


DSPE8J



X: M6x8 plug for external pilot
Y: M6x8 plug for external drain

12 - OVERALL AND MOUNTING DIMENSIONS DSPE5J and DSPE5RJ



NOTES:

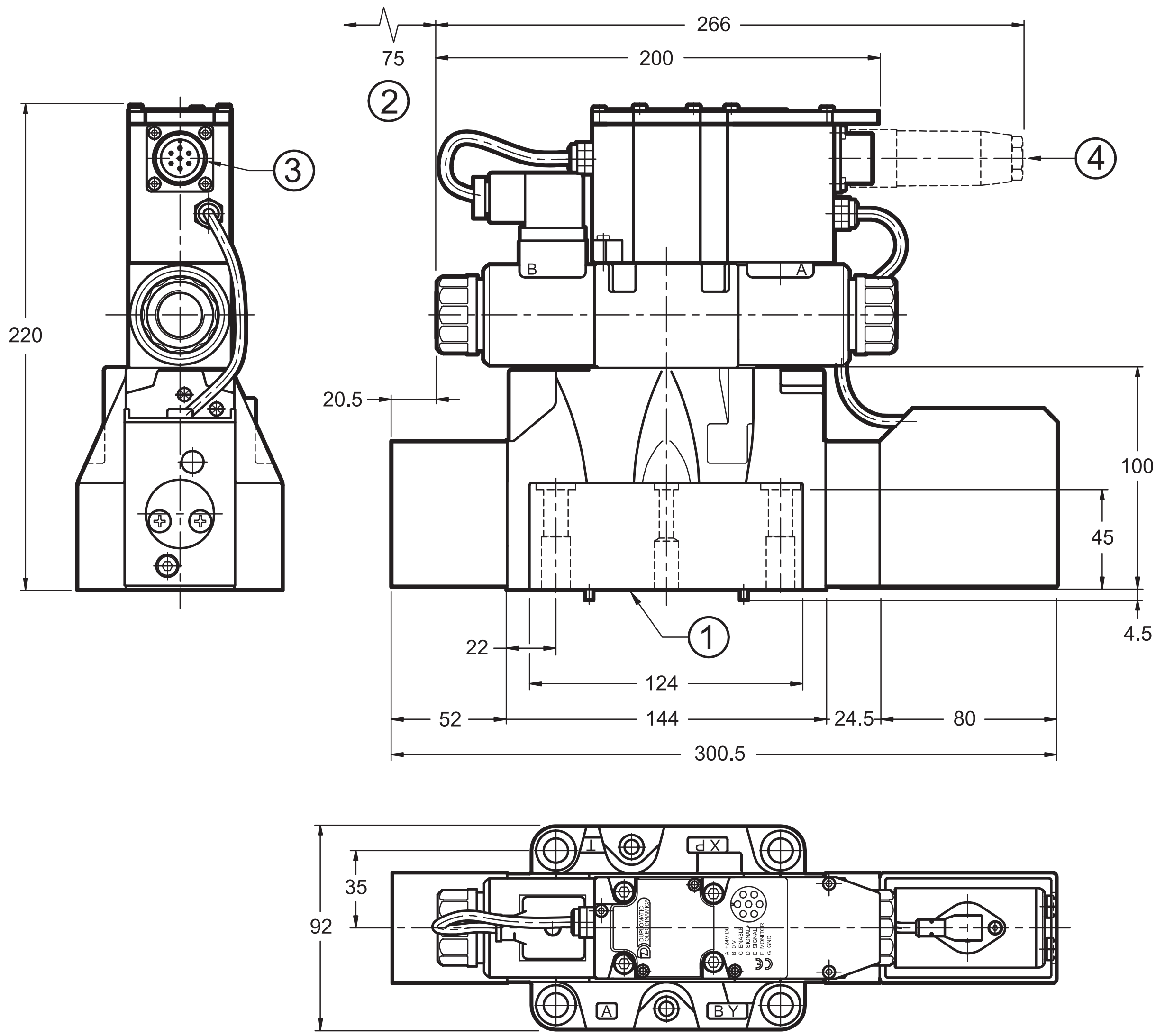
- for single solenoid overall dimensions see par. 15.
- for overall dimensions with Z option (fixed adjustment pressure reducing valve) see par. 16.
- for mounting surface see par. 17.
- is recommended not to disassemble the transducer.

dimensions in mm

Valve fastening: N. 4 bolts M6x35 - ISO 4762
Tightening torque: 8 Nm (bolts A 8.8)
Threads of mounting holes: M6x10
Sealing rings: 5 OR type 2050 (12.42x1.78) - 90 Shore 1 OR type 2037 (9.25x1.78) - 90 Shore

1	Mounting surface with sealing rings
2	Coil removal space
3	Main connection
4	Electrical connector 7 pin DIN 43563 - IP67 PG11 EX7S/L/10 code 3890000003 **(to be ordered separately)**

13 - OVERALL AND MOUNTING DIMENSIONS DSPE7J



NOTES:

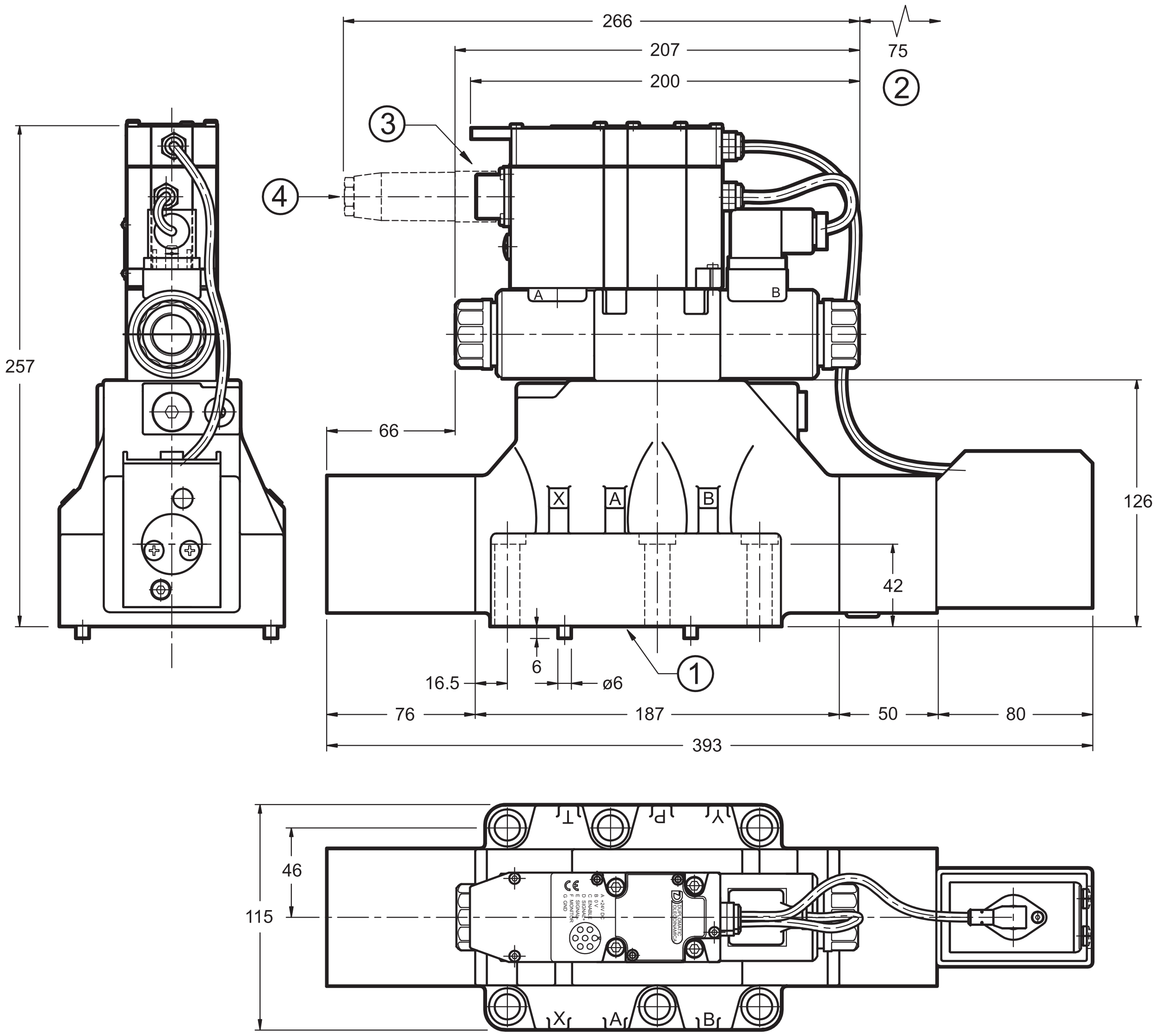
- for single solenoid overall dimensions see par. 15.
- for overall dimensions with Z option (fixed adjustment pressure reducing valve) see par. 16.
- for mounting surface see par. 17.
- is recommended not to disassemble the transducer.

dimensions in mm

Valve fastening:	N. 4 bolts M10x60 - ISO 4762 N. 2 bolts M6x60 - ISO 4762
Tightening torque	M10x60: 40 Nm (bolts A 8.8) M6x60: 8 Nm (bolts A 8.8)
Threads of mounting holes: M6x18; M10x18	
Sealing rings:	4 OR type 130 (22.22X2.62) - 90 Shore 2 OR type 2043 (10.82x1.78) - 90 Shore

1	Mounting surface with sealing rings
2	Coil removal space
3	Main connection
4	Electrical connector 7 pin DIN 43563 - IP67 PG11 EX7S/L/10 code 3890000003 **(to be ordered separately)**

14 - OVERALL AND MOUNTING DIMENSIONS DSPE8J



NOTES:

- for single solenoid overall dimensions see par. 15.
- for overall dimensions with Z option (fixed adjustment pressure reducing valve) see par. 16.
- for mounting surface see par. 17.
- is recommended not to disassemble the transducer.

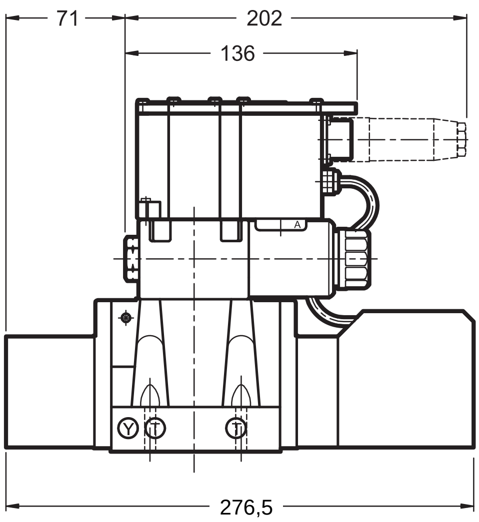
Fastening of single valve: N. 6 bolts M12X60 - ISO 4762
Tightening torque: 69 Nm (bolts A 8.8)
Threads of mounting holes: M12X20
Sealing rings: 4 OR type 3118 (29.82x2.62) - 90 Shore 2 OR type 3081 (20.24x2.62) - 90 Shore

1	Mounting surface with sealing rings
2	Coil removal space
3	Main connection
4	Main connection for Electrical connector 7 pin DIN 43563 - IP67 PG11 EX7S/L/10 code 3890000003 **(to be ordered separately)**

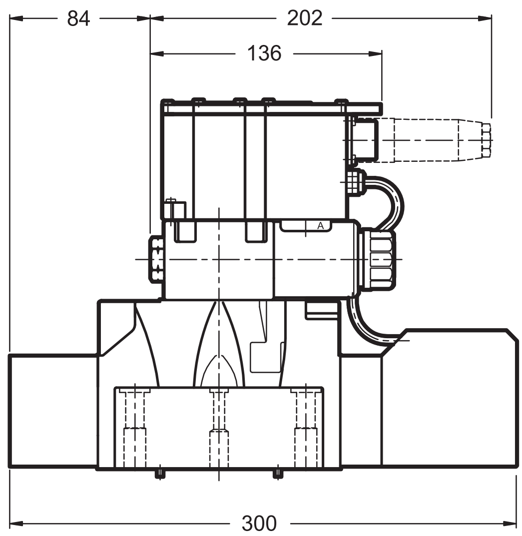
15 - OVERALL AND MOUNTING DIMENSIONS SINGLE SOLENOID VALVES

dimensions in mm

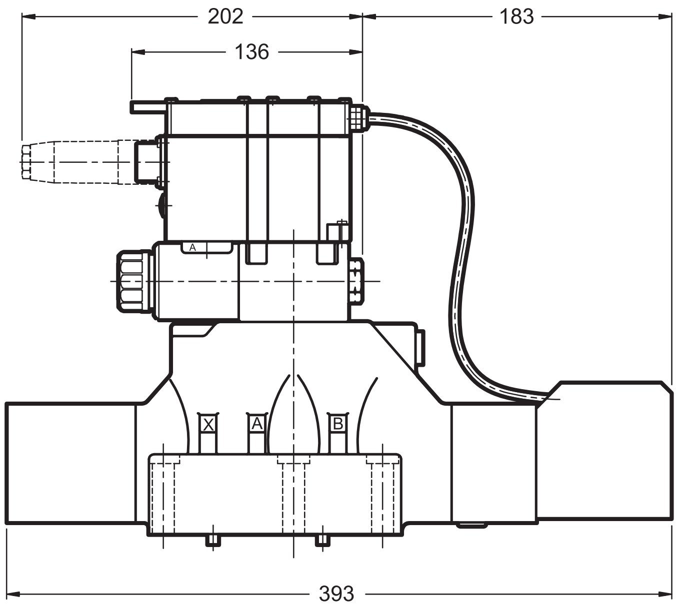
DSPE5J-*SA



DSPE7J-*SA



DSPE8J-*SB

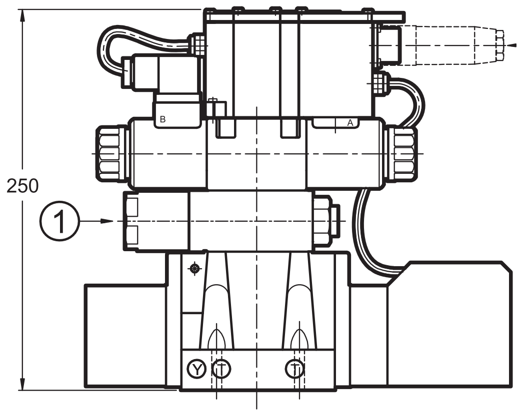


NOTE: for the missing overall dimensions and characteristics see par. 12 - 13 - 14.

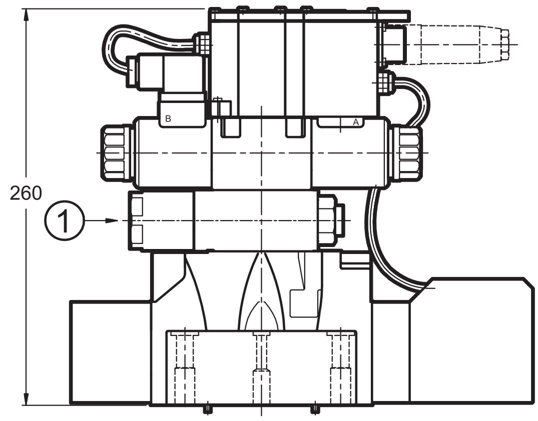
16 - OVERALL AND MOUNTING DIMENSIONS DSPE*J-*-Z*

dimensions in mm

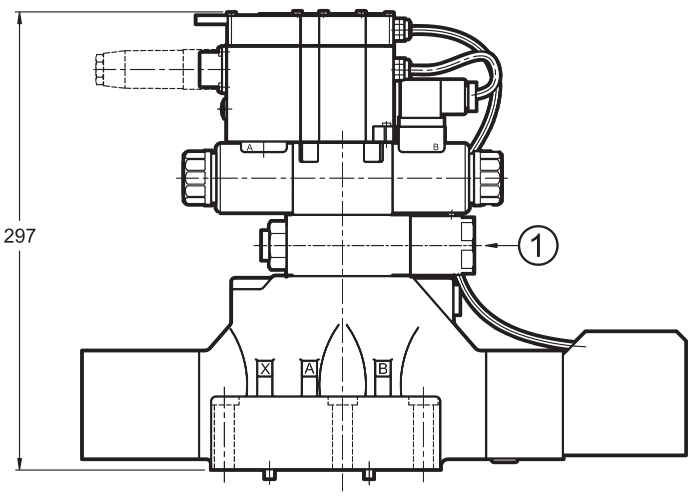
DSPE5J-*-Z*



DSPE7J-*-Z*



DSPE8J-*-Z*

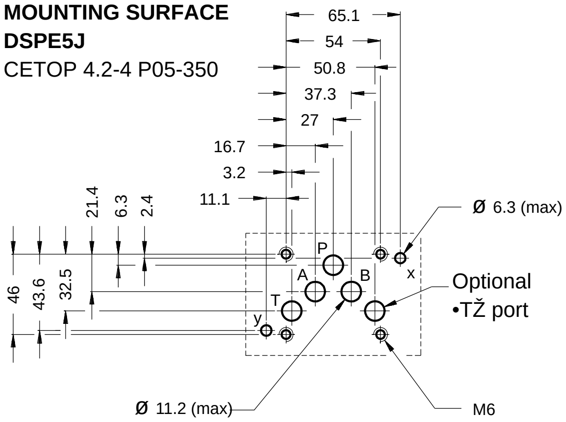


NOTE: for the missing overall dimensions and characteristics see par. 12 - 13 - 14.

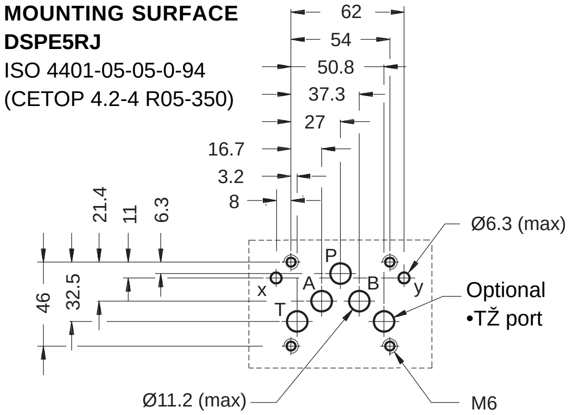
1	30 bar fixed adjustment pressure reducing valve

17 - MOUNTING SURFACES

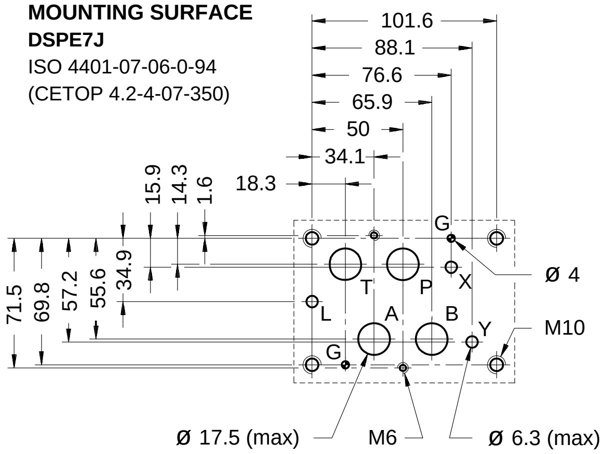
MOUNTING SURFACE
DSPE5J
CETOP 4.2-4 P05-350



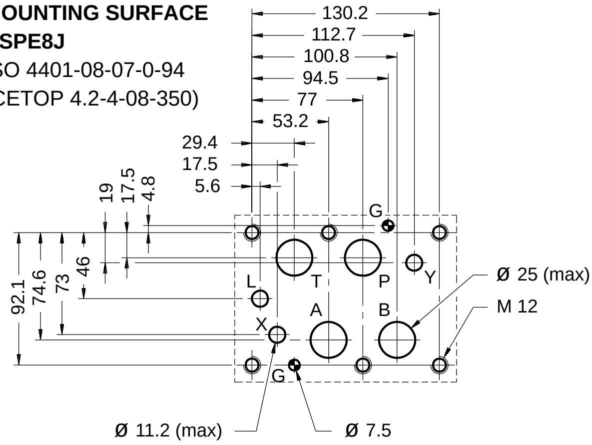
MOUNTING SURFACE
DSPE5RJ
ISO 4401-05-05-0-94
(CETOP 4.2-4 R05-350)



MOUNTING SURFACE
DSPE7J
ISO 4401-07-06-0-94
(CETOP 4.2-4-07-350)



MOUNTING SURFACE
DSPE8J
ISO 4401-08-07-0-94
(CETOP 4.2-4-08-350)

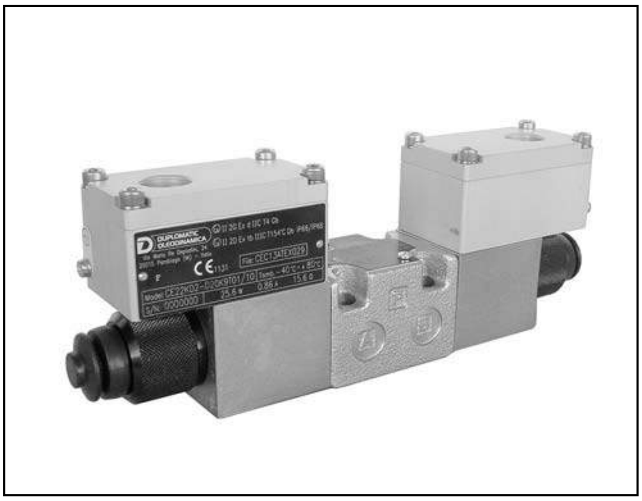


18 - SUBPLATES (see catalogue 51 000)

	DSPE5J	DSPE7J	DSPE8J	DSPE10G
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	3/4Ž BSP 1/4Ž BSP	1Ž BSP 1/4Ž BSP	1½Ž BSP 1/4Ž BSP	-

DUPLOMATIC OLEODINAMICA

DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com



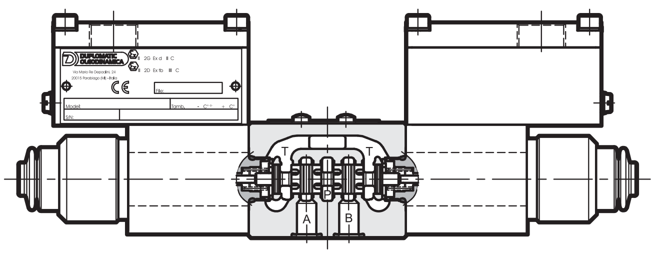
DS(P)E*KD2

EXPLOSION-PROOF VERSION DIRECTIONAL VALVES WITH PROPORTIONAL CONTROL in compliance with ATEX 94/9/EC

DSE3KD2 **ISO 4401-03** (CETOP 03)

DSPE5KD2 **CETOP P05**
DSPE5RKD2 **ISO 4401-05** (CETOP R05)
DSPE7KD2 **ISO 4401-07** (CETOP 07)
DSPE8KD2 **ISO 4401-08** (CETOP 08)
DSPE10KD2 **ISO 4401-10** (CETOP 10)

OPERATING PRINCIPLE



TYPE EXAMINATION CERTIFICATE No: 1131-CEC 13 ATEX 030

- The explosion-proof directional valves with proportional control are in compliance with ATEX 94/9/EC standards and are suitable for the use in potentially explosive atmospheres, that fall within the ATEX II 2GD either for gas or for dust classification. See par. 4 for ATEX classification, operating temperatures and electrical characteristics.
- These valves are direct operated type, ISO 4401-03 (CETOP 03) size and pilot operated type, CETOP P05, ISO 4401-05 (CETOP R05), ISO 4401-07 (CETOP 07), ISO 4401-08 (CETOP 08) and ISO 4401-10 (CETOP 10).
- With the valve and the distributor the statement of conformity to the up mentioned standards is always supplied.
- The DSE3KD2 valves are supplied with a finishing surface treatment (zinc-nickel) 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 DSPE*KD2 valves, this treatment is available upon request.

PERFORMANCES (obtained with viscosity of 36 cSt at 50°C with the relative electronic control units)		DSE3KD2	DSPE5KD2 DSPE5RKD2	DSPE7KD2	DSPE8KD2	DSPE10KD2
Max operating pressure: P - A - B ports T ports	bar	350 210	350 see par. 8			
Controlled flow rate with p 10 bar P-T	l/min	see par. 2	see par. 7			
Step response		see par. 10				
Hysteresis	% of Q_{max}	<6%(PWM 200Hz)	< 4% (PWM 100Hz)			
Repeatability	% of Q_{max}	< ±1,5%	< ±2%			
Electrical characteristics		see par. 4.4				
Ambient temperature range	°C	-20 / +80 (NBR and FPM) -40 / +80 (NL)				
Fluid temperature range	°C	-20 / +80 (NBR and FPM) -40 / +80 (NL)				
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	7,5 8,3	9,9 10,7	16,1 16,9	52,8 53,5

1 - IDENTIFICATION OF DIRECT OPERATED SOLENOID VALVES DSE3KD2

1.1 - Identification code

D	S	E	3	KD2	-				/	10		-		K9		/	

Direct operated solenoid valve

Electric proportional control

Size: ISO 4401-03 (CETOP 03)

Explosion-proof version, according to ATEX - II 2GD for gas or for dust (protection type of the coil: •dŽ)

Spool type:
C = closed centers
A = open centers

Spool nominal flow rate (see table par. 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 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)

NOTE: zinc-nickel standard finishing surface treatment.

Manual override:
CM = manual override, 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)
CH = lever manual override
For dimension details of CB and CH versions, see paragraph 18

Connection type for cable gland
Available for upper connection:
T01 = M20x1.5 - ISO 261
T02 = Gk 1/2 - UNI EN 10226-2
T03 = 1/2Ž NPT - ANSI B1.20.1 (ex ANSI B2.1)
Available for side connection:
S04 = M16x1.5 - ISO 261
(only for power supply D24)
S01 = M20x1.5 - ISO 261
(available upon request only)

Coil electrical connection: electrical connection by terminal block

Nominal solenoid voltage:
D12 = 12V DC
D24 = 24V DC

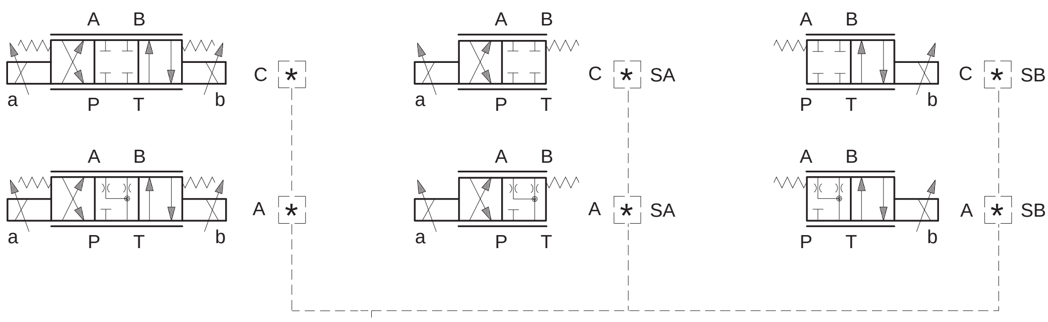
1.2 - Available spools

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**Ž configuration: 1 solenoid on side A.
2 positions (central + external) with spring centering

•**SB**Ž configuration: 1 solenoid on side B.
2 positions (central + external) with spring centering



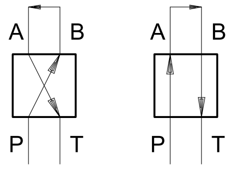
*	Controlled flow with p10 bar P-T
01	1,3 l/min (**NOTE**)
04	4 l/min
08	8 l/min
16	16 l/min
16/08	16 (P-A) / 08 (B-T) l/min
26	26 l/min
26/13	26 (P-A) / 13 (B-T) l/min

NOTE: the 01 spool is available in version **C** (closed center) only.

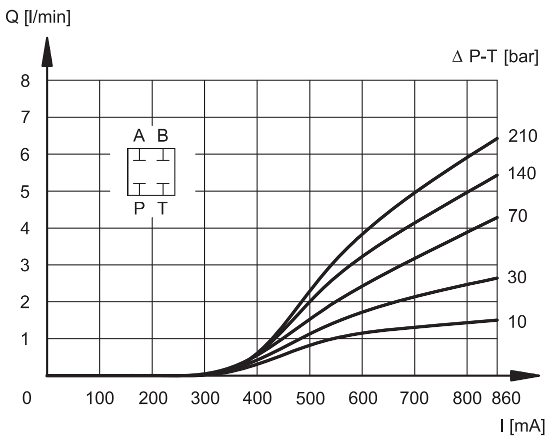
2 - CHARACTERISTIC CURVES OF DIRECT OPERATED SOLENOID VALVES DSE3KD2

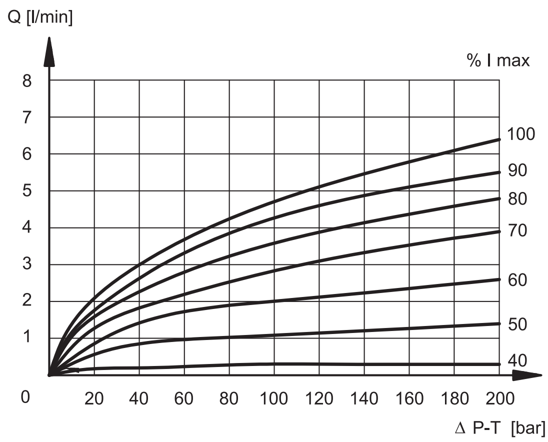
(values measured with viscosity of 36 cSt at 50°C with valves connected to the relative electronic control units)

Typical constant flow rate control curves at p according to current supply to solenoid (D24 version, maximum current 860 mA), measured for the various spool types available. The reference p values are measured between ports P and T on the valve.

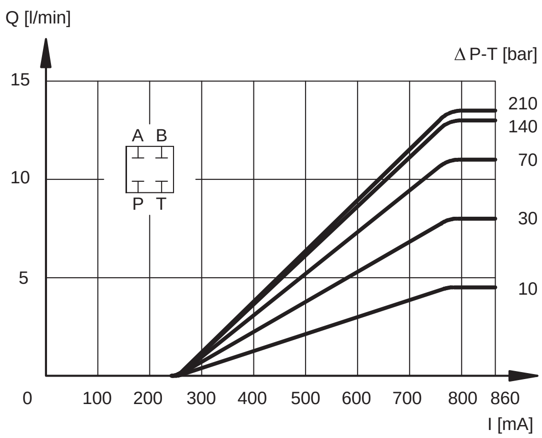


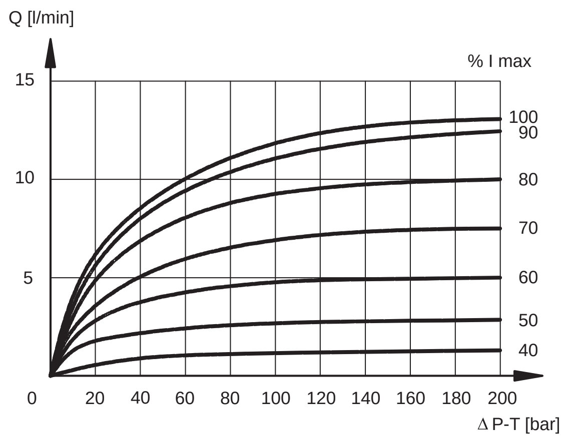
SPOOL TYPE C01



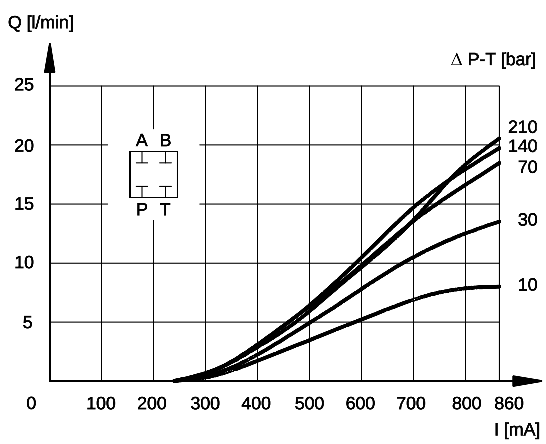


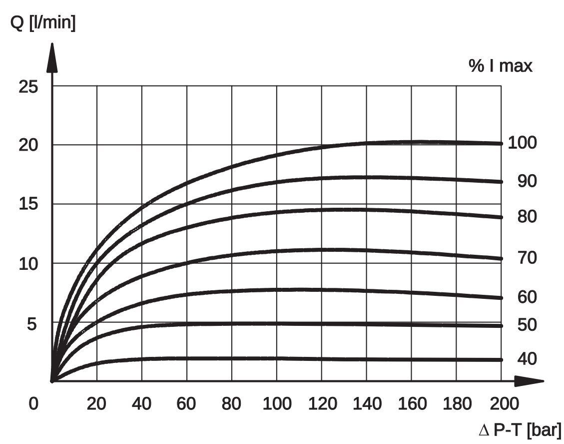
SPOOL TYPE C04



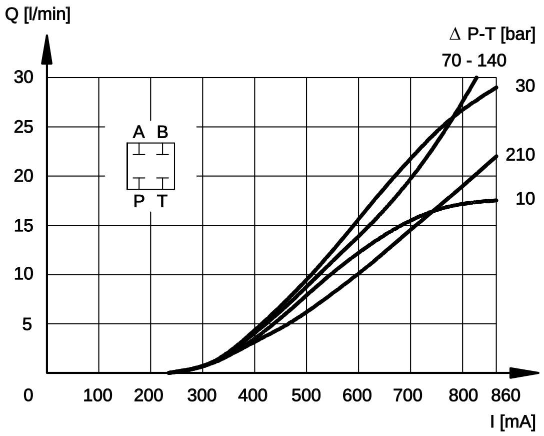


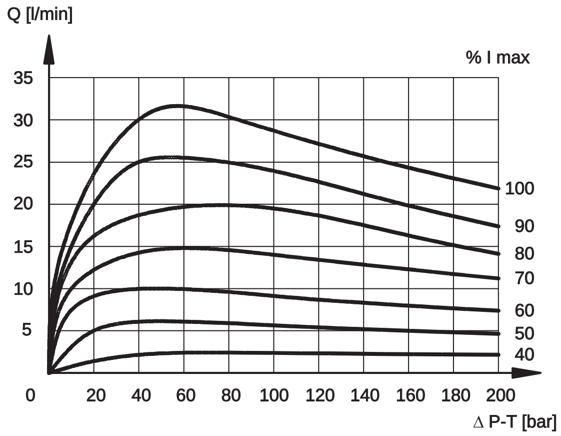
SPOOL TYPE C08



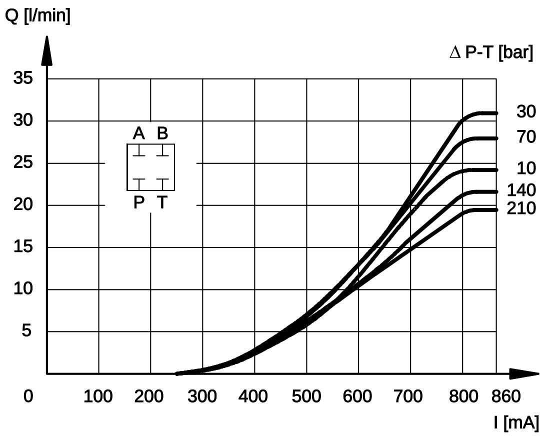


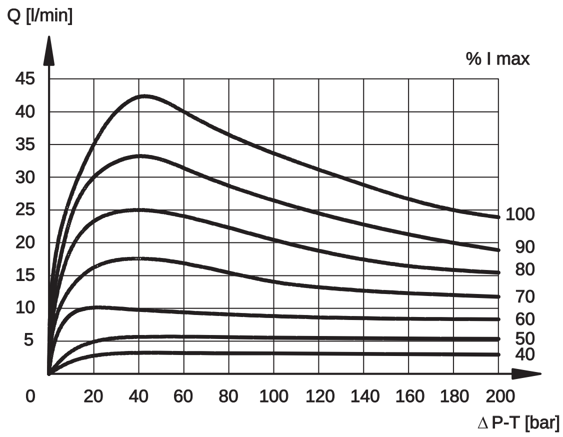
SPOOL TYPE C16



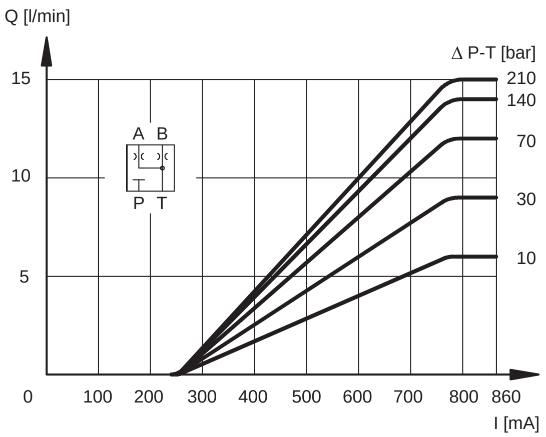


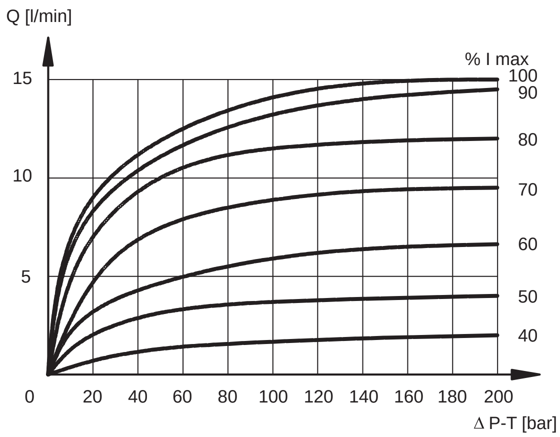
SPOOL TYPE C26



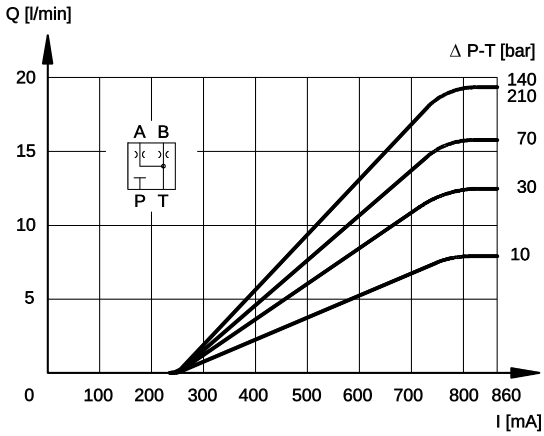


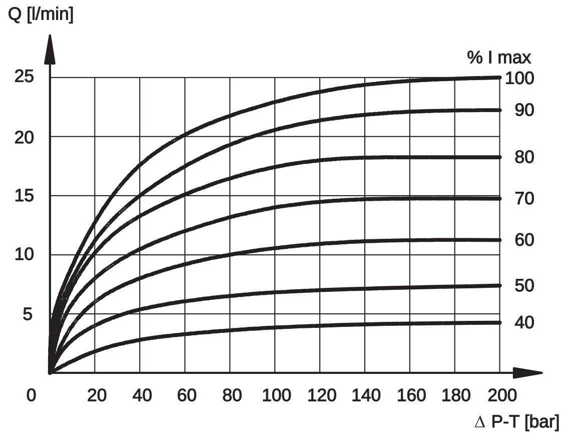
SPOOL TYPE A04



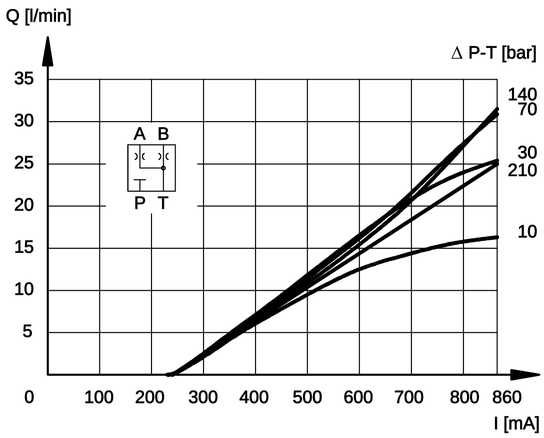


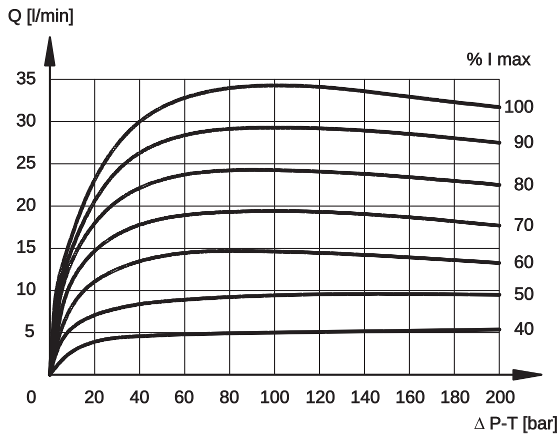
SPOOL TYPE A08



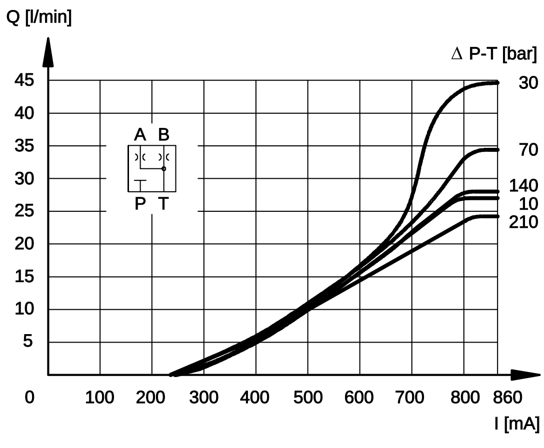


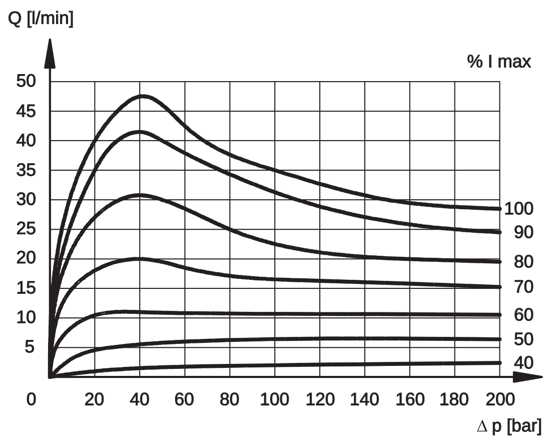
SPOOL TYPE A16





SPOOL TYPE A26

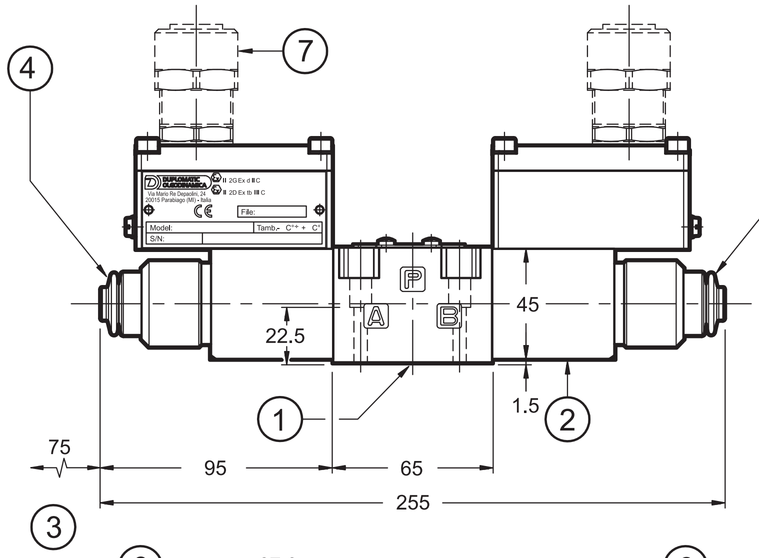


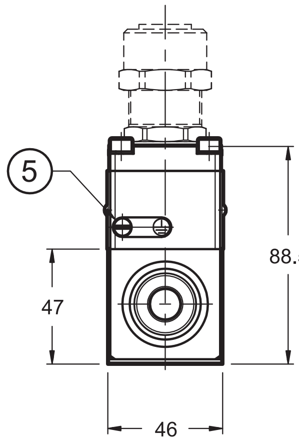


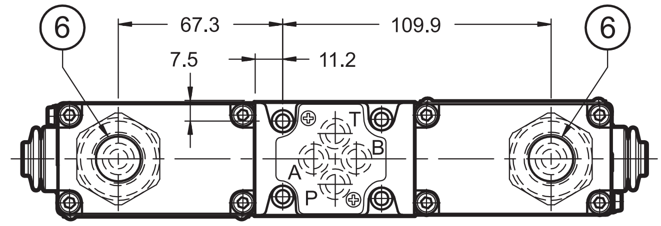
3 - DSE3KD2 OVERALL AND MOUNTING DIMENSIONS

DSE3KD2-A*/10*-*K9T*/CM
DSE3KD2-C*/10*-*K9T*/CM

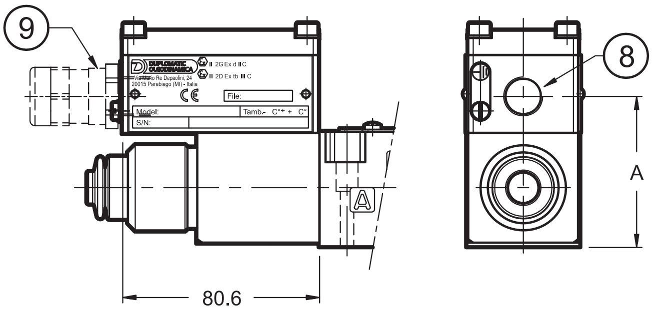
dimensions in mm





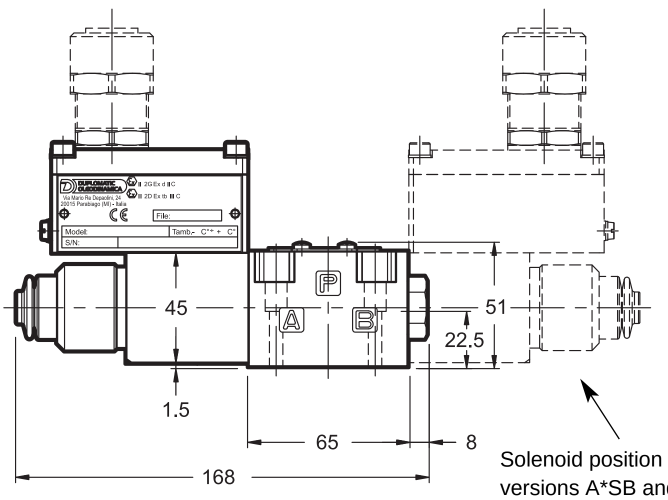


DSE3KD2-*/10*-*K9S*/CM



Side port type	Dimension A
S01	60.5
S04	61.5

DSE3KD2-A*SA/10*-*K9T*/CM
DSE3KD2-C*SA/10*-*K9T*/CM



Solenoid position for versions A*SB and C*SB

1	Mounting surface with sealing rings
2	Explosion-proof coil
3	Coil removal space
4	Manual override, boot protected (**standard for both N and V seals**) - for blind ring nut dimensions (standard for NL seals) see par. 18
5	Terminal for supplementary earth connection
6	Upper port for cable gland
7	Cable gland (upper port shown). To be ordered separately, see paragraph 19
8	Side port for cable gland
9	Cable gland (side port shown). To be ordered separately, see paragraph 19

Fastening of single valve: 4 SHC screws ISO 4762 M5x30
Tightening torque: 5 Nm (A8.8 screws)
Threads of mounting holes: M5x10
Sealing rings: 4 OR type 2037 (9.25x1.78) - 90 Shore

4 - ATEX CLASSIFICATION, OPERATING TEMPERATURES AND ELECTRICAL CHARACTERISTICS

For valves suitable for application and installation in potentially explosive atmospheres, according to ATEX directive prescriptions, Duplomatic certificates the combination valve-coil; **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.

4.1 - Valve ATEX classification

The valves can be used for applications and installations in potentially explosive atmospheres that fall within either the ATEX II 2G or the ATEX II 2D classification, with the follow marking:

MARKING FOR GASES, VAPOURS, MISTS

for N and V seals:

Ex **II 2G IIC T4 Gb (-20°C Ta +80°C)**

fori NL seals:

Ex **II 2G IIC T4 Gb (-40°C Ta +80°C)**

EX Specific marking of explosion protection as ATEX 94/9/EC directive and related technical specification requests.

II: Group II for surface plants

2: Category 2 high protection, eligible for zone 1 (therefore also eligible for category 3 zone 2)

G: Type of atmosphere with gases, vapours, mists

IIC: Gas group (therefore also eligible for group IIA and IIB)

T4: Temperature class (max surface temperature)

Gb EPL protection level for electrical devices

-20°C Ta +80°C: Ambient temperature range for valves with both N and V seals

-40°C Ta +80°C: Ambient temperature range for valves with NL seals

MARKING FOR DUSTS

for N and V seals:

Ex **II 2D IIIC T154°C Db IP66/IP68 (-20°C Ta +80°C)**

for NL seals:

Ex **II 2D IIIC T154°C Db IP66/IP68 (- 40°C Ta +80°C)**

EX Specific marking of explosion protection as ATEX 94/9/EC directive and related technical specification requests.

II: Group II for surface plants

2: Category 2 high protection, eligible for zone 21 (therefore also eligible for category 3 zone 22)

D: Type of atmosphere with dusts

IIIC: Dusts group (therefore also eligible for group IIIA and IIIB)

T154°C: Temperature class (max surface temperature)

Db EPL protection level for electrical devices

IP66/IP68: Protection degree from atmospheric agents according to IEC EN 60529

-20°C Ta +80°C: Ambient temperature range for valves with both N and V seals

-40°C Ta +80°C: Ambient temperature range for valves with NL seals

4.2 - Coils ATEX classification

The coil of the explosion-proof valves is identified with its own tag, which 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 dŽ type protection (explosion-proof coil).**

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

Here below you find the coils marking:

MARKING FOR GASES, VAPOURS, MISTS

Ex **II 2G Ex d IIC T4 Gb (- 40°C Ta +80°C)**

EX: Specific marking of explosion protection as ATEX 94/9/EC directive and related technical specification requests.

II: Group II for surface plants

2: Category 2 high protection, eligible for zone 1 (therefore also eligible for category 3 zone 2)

G: Type of atmosphere with gases, vapours, mists

Ex d: •dŽ protection type, explosion-proof case

IIC: Gas group (therefore also eligible for group IIA and IIB)

T4: Temperature class (max surface temperature)

Gb: EPL protection level for electrical devices

-40°C Ta +80°C: Ambient temperature range

MARKING FOR DUSTS

Ex **II 2D Ex tb IIIC T154°C Db IP66/IP68 (- 40°C Ta +80°C)**

EX Specific marking of explosion protection as ATEX 94/9/EC directive and related technical specification requests.

II: Group II for surface plants

2: Category 2 high protection, eligible for zone 21 (therefore also eligible for category 3 zone 22)

D: Type of atmosphere with dusts

Ex tb: •tb• protection type

IIIC: Dusts group (therefore also eligible for group IIIA and IIIB)

T154°C: Temperature class (max surface temperature)

Db: EPL protection level for electrical devices

IP66/IP68: Protection degree from atmospheric agents according to IEC EN 60529

-40°C Ta +80°C: Ambient temperature range

4.3 - Operating temperatures

The operating ambient temperature must be between -20 / +80 °C, for valves with both N and V seals and -40°C / +80°C, for valves with NL seals.

The fluid temperature must be between -20 / +80 °C, for valves with both N and V seals and -40°C / +80°C, for valves with NL seals.

The valves are classified in T4 temperature class (T 154 °C), therefore they are eligible for operation also at higher class temperature (T3, T2, T1 for gas and T200° C for dust).

4.4 - Electrical characteristics (values ± 5%)

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (AT 20°C)		3,4	15,6
NOMINAL CURRENT	A	1,88	0,86

DUTY CYCLE	100%
EXPLOSION-PROOF VERSION	According to ATEX 94/9/EC
ELECTROMAGNETIC COMPATIBILITY (EMC) (NOTE)	According to 2004/108/CE
CLASS OF PROTECTION: Atmospheric agents Coil insulation (VDE 0580)	 IP66 / IP68 class H

5 - ELECTRICAL CONNECTION

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.

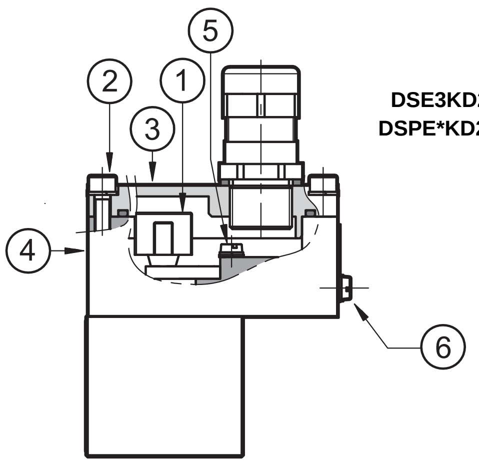
The electrical connection is polarity-independent.

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.

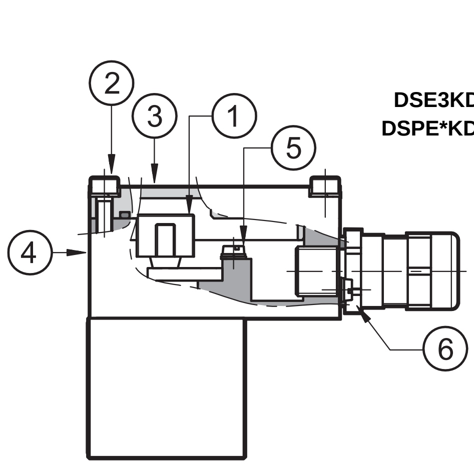
On the external body of the coil there is a grounding point (6) (M4 screw) that allow to ensure equipotentiality between the valve and the general grounding line of the system; connecting this point the regulation of the EN 13463-1 standard, that impose to verify the equipotentiality of the elements included in a potentially explosive environment (the maximum resistance between the elements must be 100), 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 ATEX standards.



DSE3KD2-*/10*-*K9T*/*
DSPE*KD2-*/10*-*/*K9T*/*



DSE3KD2-*/10*-*K9S*/*
DSPE*KD2-*/10*-*/*K9S*/*

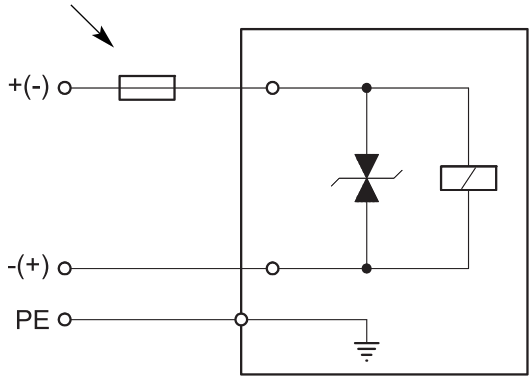
Characteristics of the cables connectable for wiring are indicated in the table below:

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 paragraph 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 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 - IDENTIFICATION OF PILOT OPERATED SOLENOID VALVES DSPE*KD2

6.1 - Identification code

D	S	P	E		KD2	-				/	10		-			/		K9		/		

Pilot operated directional valve

Electric proportional control

Nominal size:
5 = CETOP P05
5R = ISO 4401-05 (CETOP R05)
7 = ISO 4401-07 (CETOP 07)
8 = ISO 4401-08 (CETOP 08)
10 = ISO 4401-10 (CETOP 10)

Explosion-proof version, according to ATEX - II 2GD for gas or for dust (protection type of the coil: •dŽ)

Spool type:
C = closed centres
A = open centres
RC = regenerative closed centres
RA = regenerative open centres

Spool nominal flow rate (see table par. 6.2)

Configurations for single solenoid version (omit for double solenoid version):
SA = 1 solenoid for cross configuration
SB = 1 solenoid for parallel configuration

Series No. (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)

Piloting: **I** = internal
E = external
Z = internal piloting with 30 bar fixed adjustment pressure reducing valve

Drainage: **I** = internal
E = external

Nominal solenoid voltage:
D12 = 12V DC
D24 = 24V DC

Coil electrical connection: electrical connection by terminal block

Connection type for cable gland
Upper connection:
T01 = M20x1.5 - ISO 261
T02 = Gk 1/2 - UNI EN 10226-2
T03 = 1/2Ž NPT - ANSI B1.20.1 (ex ANSI B2.1)
Side connection:
S04 = M16x1.5 - ISO 261 (only for power supply D24)
S01 = M20x1.5 - ISO 261 (available upon request only)

Manual override:
CM = manual override, 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)
For dimension details of CB versions, see paragraph 18

Option: surface treatment not standard. Omit if not required (see **NOTE 1**)

NOTE 1: the valve is 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; for this option add the suffix **/W7** at the end of the identification code.

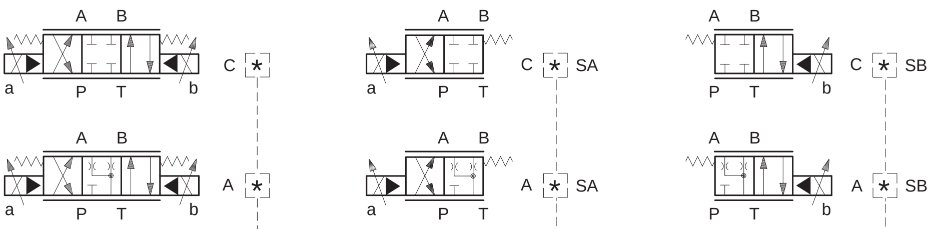
6.2 - Configurations

The valve configuration depends on the combination of the following elements: number of proportional solenoids, spool type, rated flow.

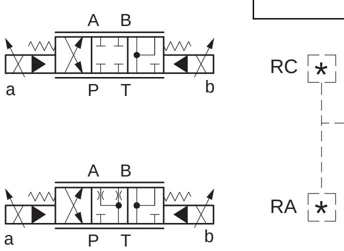
Configuration 2 solenoids:
3 positions with spring centering

1 solenoid for cross configuration •**SA**Ž:
2 positions (central + external)
with spring centering

1 solenoid for parallel configuration •**SB**Ž:
2 positions (central + external)
with spring centering



valve type	*	nominal flow rate with p 10 bar P-T
DSPE5KD2 DSPE5RKD2	**80**	80 l/min
	80/40	80 (P-A) / 40 (B-T) l/min
DSPE7KD2	**100**	100 l/min
	150	150 l/min
	150/75	150 (P-A) / 75 (B-T) l/min
DSPE8KD2	**200**	200 l/min
	300	300 l/min
	300/150	300 (P-A) / 150 (B-T) l/min
DSPE10KD2	**350**	350 l/min
	500	500 l/min
	500/250	500 (P-A) / 250 (B-T) l/min

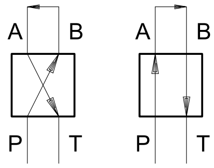


valve type	*	nominal flow rate with p 10 bar P-T
DSPE7KD2	**150/75**	150 (P-A) / 75 (B-T) l/min
DSPE8KD2	**300/150**	300 (P-A) / 150 (B-T) l/min
DSPE10KD2	**500/250**	500 (P-A) / 250 (B-T) l/min

7 - CHARACTERISTIC CURVES OF PILOT OPERATED SOLENOID VALVES DSPE*KD2

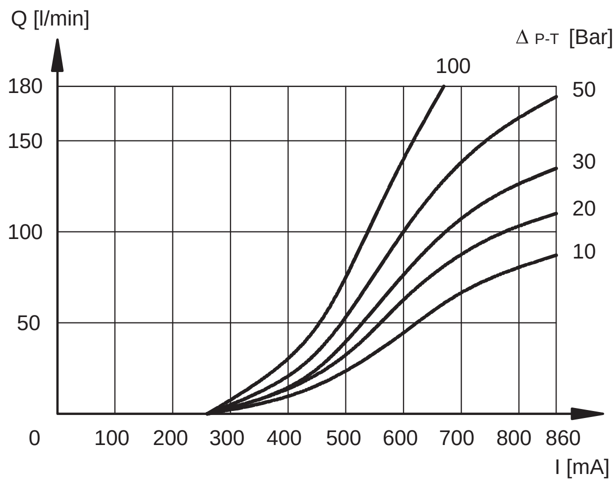
(values measured with viscosity of 36 cSt at 50°C with valves in conjunction with the relative electronic control units)

Typical flow rate control curves at constant p according to current supply to the solenoid (D24 version, 860 mA max current), measured for the available spool types.
The reference p values are measured between valve ports P and T.



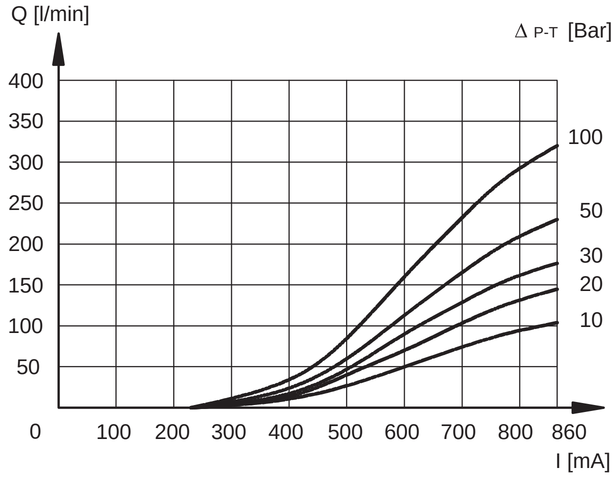
7.1 - Characteristic curves DSPE5KD2 and DSPE5RKD2

SPOOL C80 - A80

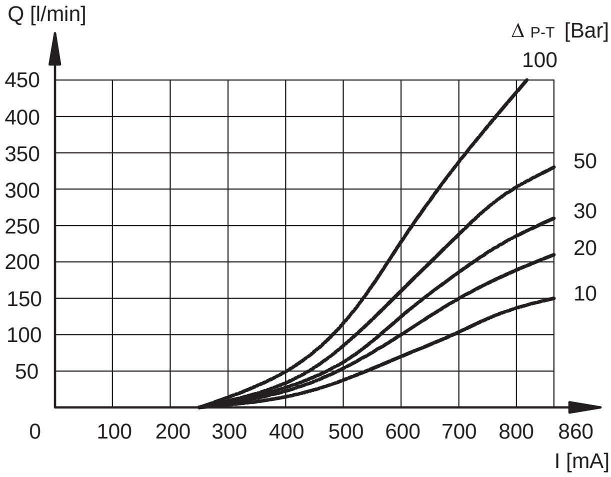


7.2 - Characteristic curves DSPE7KD2

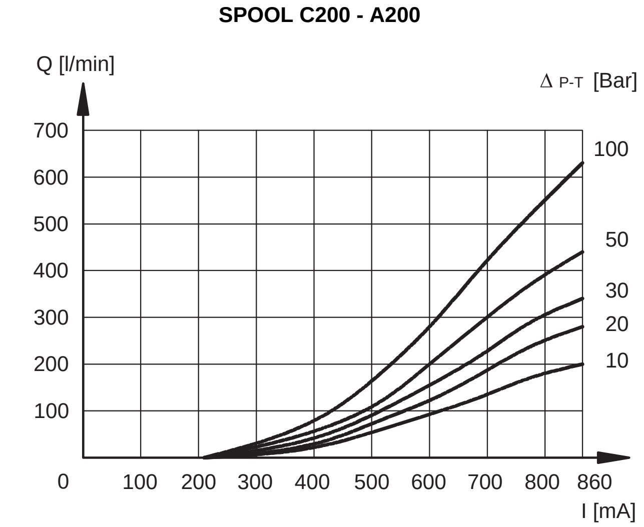
SPOOL C100 - A100

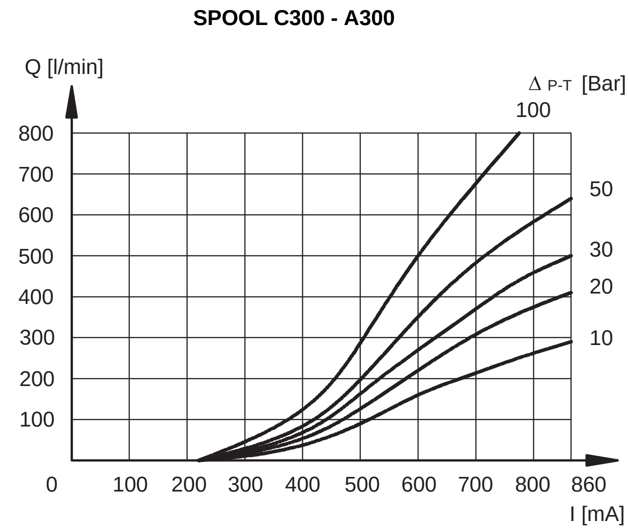


SPOOL C150 - A150

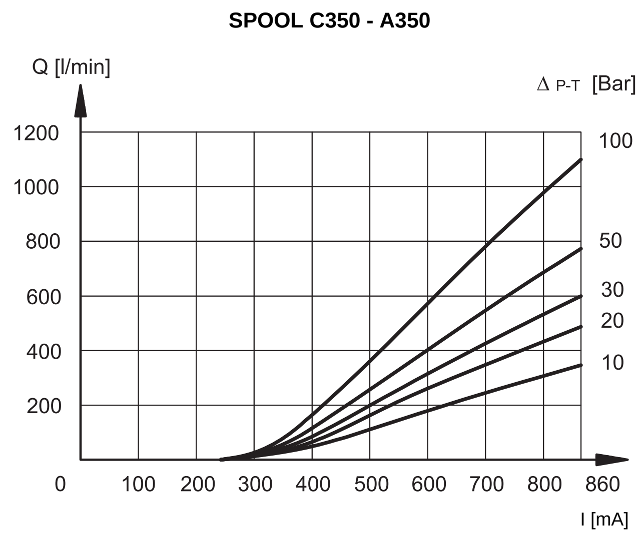


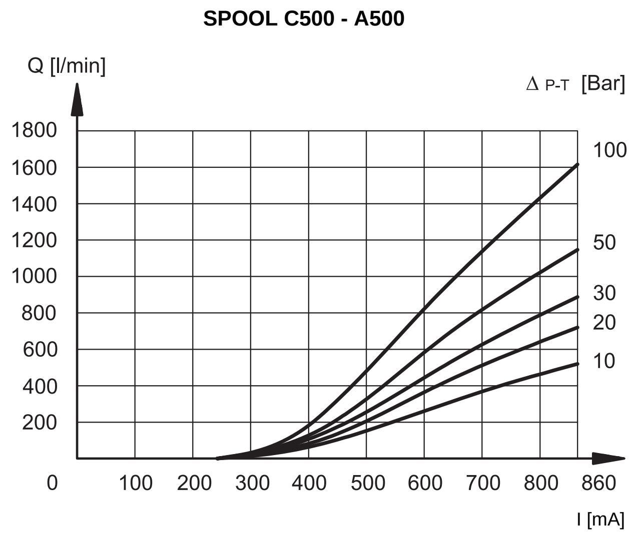
7.3 - Characteristic curves DSPE8KD2





7.4 - Characteristic curves DSPE10KD2





8 - PRESSURES

Pressure	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 par. 6.1). Consider that, by adding the pressure reducing valve, the overall dimensions increase 40 mm in height.

9 - HYDRAULIC CHARACTERISTICS (values measured with viscosity of 36 cSt at 50°C with valves in conjunction with the relative electronic control units)

		DSPE5KD2 DSPER5KD2	**DSPE7KD2**	**DSPE8KD2**	**DSPE10KD2**
Max flow rate	l/min	180	450	800	1600
Piloting flow requested with operation 0 100%	l/min	3	5	9	13
Piloting volume requested with operation 0 100%	cm^3	1,7	3,2	9,1	21,6

10 - STEP RESPONSE (measured with mineral oil with viscosity of 36 cSt at 50°C in conjunction 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.

The table shows the typical step response tested with static pressure 100 bar.

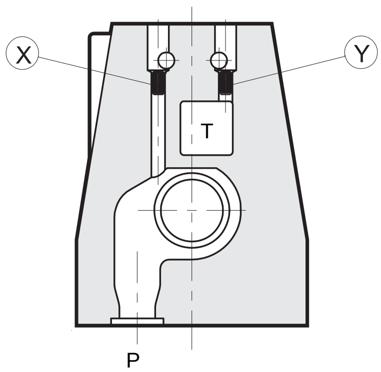
REFERENCE SIGNAL	0 100%	100 0%
	Step response [ms]	
DSE3KD2	50	40
DSPE5KD2 and DSPE5RKD2	50	40
DSPE7KD2	80	50
DSPE8KD2	100	70
DSPE10KD2	200	120

11 - PILOTING AND DRAINAGE

DSPE*KD2 valves are available with piloting and drainage, both internal and external.
The version with external drainage allows for a higher back pressure on the outlet.

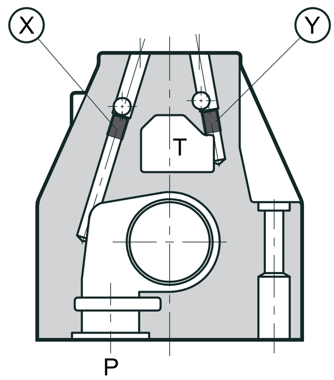
TYPE OF VALVE		Plug assembly	
		X	Y
IE	INTERNAL PILOT AND EXTERNAL DRAIN	NO	YES
II	INTERNAL PILOT AND INTERNAL DRAIN	NO	NO
EE	EXTERNAL PILOT AND EXTERNAL DRAIN	YES	YES
EI	EXTERNAL PILOT AND INTERNAL DRAIN	YES	NO

X: plug M5x6 for external pilot
Y: plug M5x6 for external drain



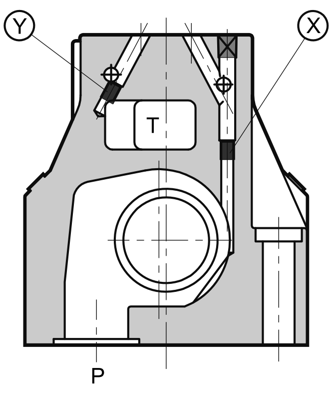
DSPE5KD2
DSPE5RKD2

X: plug M6x8 for external pilot
Y: plug M6x8 for external drain



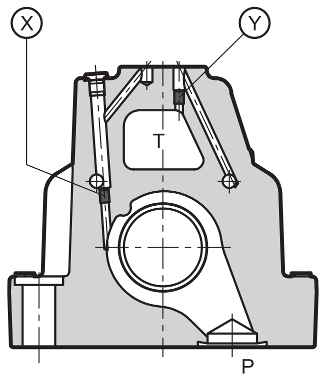
DSPE7KD2

X: plug M6x8 for external pilot
Y: plug M6x8 for external drain



DSPE8KD2

X: plug M6x8 for external pilot
Y: plug M6x8 for external drain

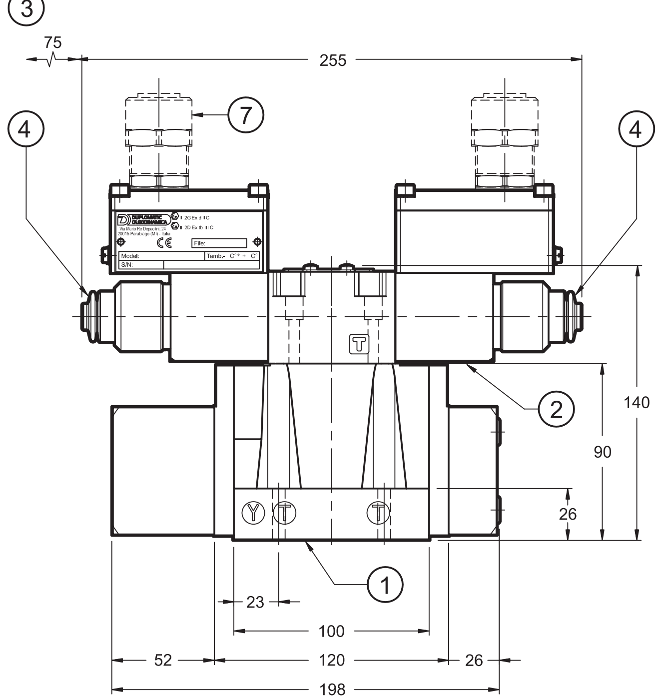


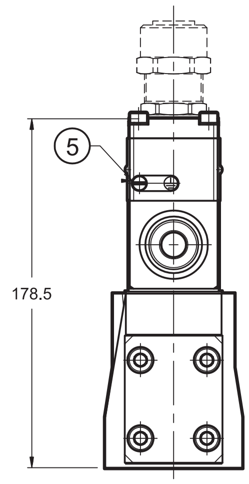
DSPE10KD2

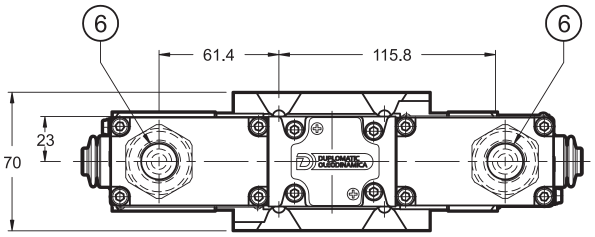
12 - DSPE5KD2 and DSPE5RKD2 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

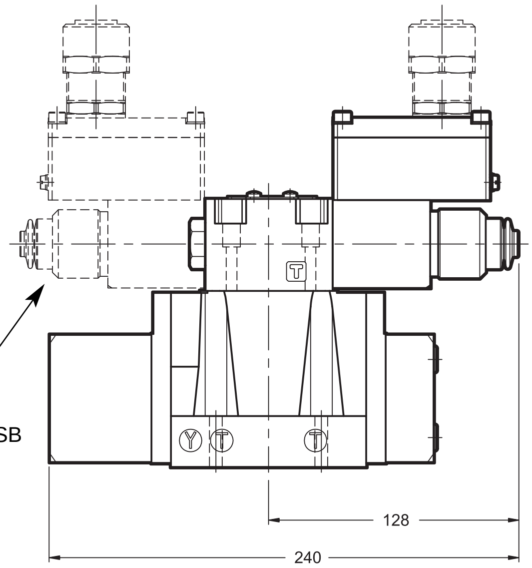
DSPE5KD2-A*/10*-*/*K9T*/CM
DSPE5KD2-C*/10*-*/*K9T*/CM







DSPE5KD2-A*SA/10*-*/*K9T*/CM
DSPE5KD2-C*SA/10*-*/*K9T*/CM



Solenoid position for versions A*SB and C*SB

NOTE 1: for overall dimensions with Z option (fixed adjustment pressure reducing valve) consider an increase of 40 mm in height.
NOTE 2: for side port cable gland see paragraph 16

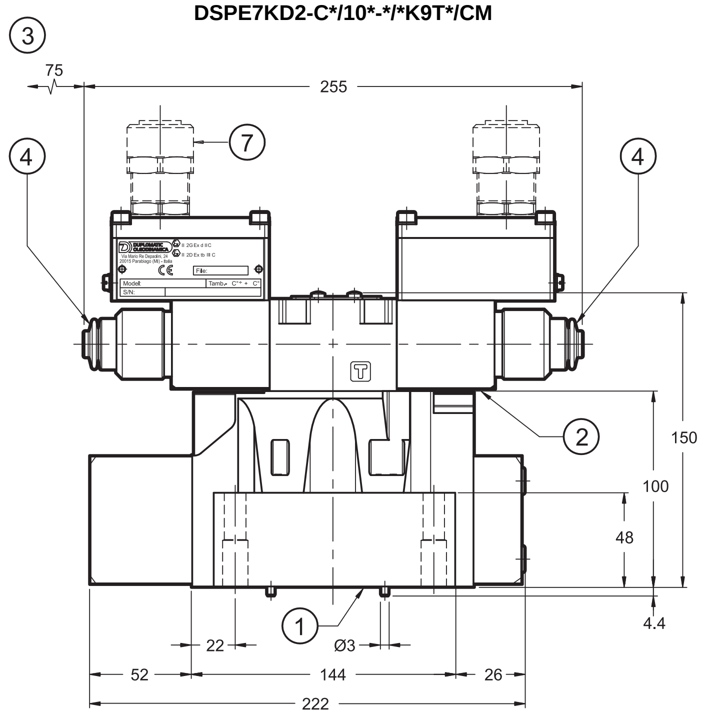
1	Mounting surface with sealing rings
2	Explosion-proof coil
3	Coil removal space
4	Manual override, boot protected (**standard for both N and V seals**) - for blind ring nut dimensions (standard for NL seals) see par. 18
5	Terminal for supplementary earth connection
6	Upper port for cable gland
7	Cable gland (upper port shown). To be ordered separately, see paragraph 19

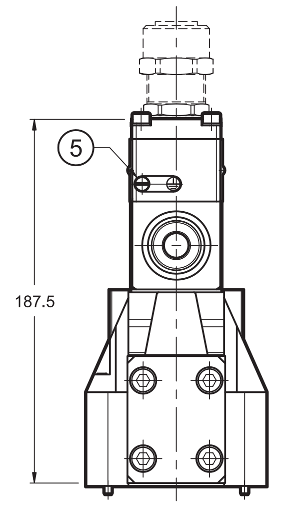
Fastening of single valve: 4 SHC ISO 4762 screws M6x35
Tightening torque: 8 Nm (A8.8 screws)
Threads of mounting holes: M6x10
Sealing rings: 5 OR type 2050 (12.42x1.78) - 90 Shore 2 OR type 2037 (9.25x1.78) - 90 Shore

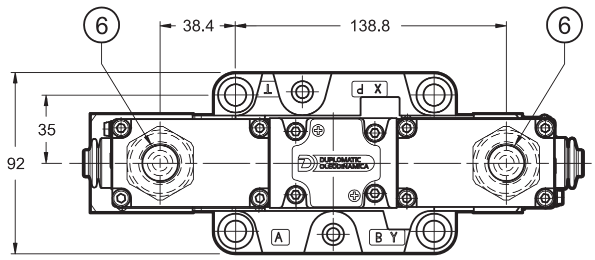
13 - DSPE7KD2 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

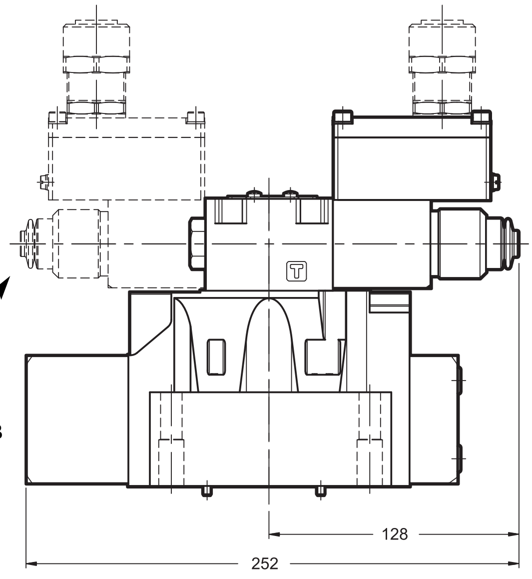
DSPE7KD2-A*/10*-*/*K9T*/CM
DSPE7KD2-C*/10*-*/*K9T*/CM







DSPE7KD2-A*SA/10*-*/*K9T*/CM
DSPE7KD2-C*SA/10*-*/*K9T*/CM



Solenoid position for versions A*SB and C*SB

NOTE 1: for overall dimensions with Z option (fixed adjustment pressure reducing valve) consider an increase of 40 mm in height.
NOTE 2: for side port cable gland see paragraph 16

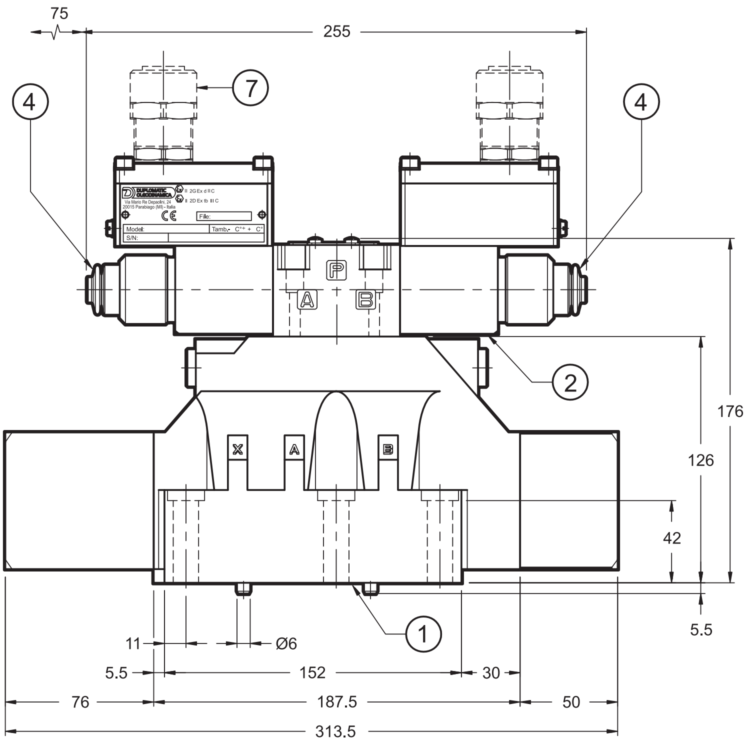
1	Mounting surface with sealing rings
2	Explosion-proof coil
3	Coil removal space
4	Manual override, boot protected (**standard for both N and V seals**) - for blind ring nut dimensions (standard for NL seals) see par. 18
5	Terminal for supplementary earth connection
6	Upper port for cable gland
7	Cable gland (upper port shown). To be ordered separately, see paragraph 19

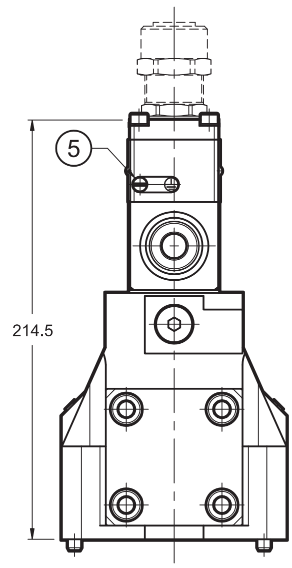
Fastening of single valve: 4 SHC screws ISO 4762 M10x60 2 SHC screws ISO 4762 M6x60
Tightening torque: M10x60: 40 Nm (A8.8 screws) M6x60: 8 Nm (A8.8 screws)
Threads of mounting holes: M6x18; M10x18
Sealing rings: 4 OR type 130 (22.22X2.62) - 90 Shore 2 OR type 2043 (10.82x1.78) - 90 Shore

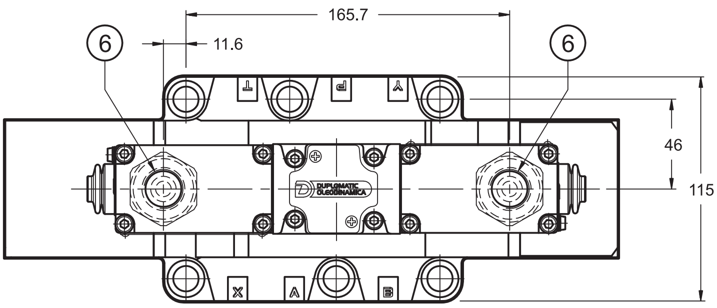
14 - DSPE8KD2 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

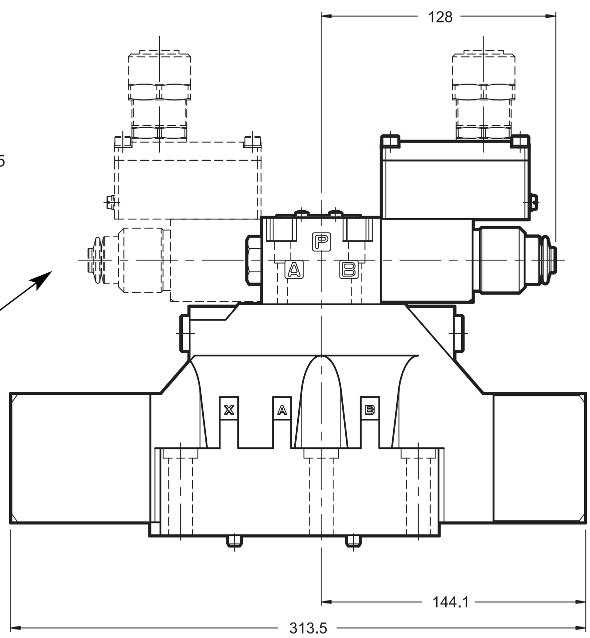
DSPE8KD2-A*/10*-*/*K9T*/CM
DSPE8KD2-C*/10*-*/*K9T*/CM







DSPE8KD2-A*SA/10*-*/*K9T*/CM
DSPE8KD2-C*SA/10*-*/*K9T*/CM



Solenoid position for versions A*SB and C*SB

NOTE 1: for overall dimensions with Z option (fixed adjustment pressure reducing valve) consider an increase of 40 mm in height.
NOTE 2: for side port cable gland see paragraph 16.

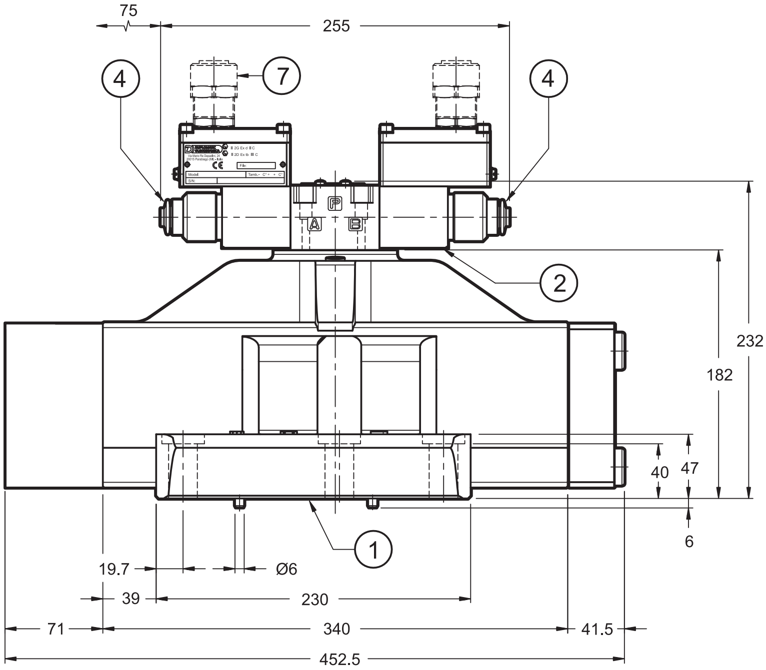
1	Mounting surface with sealing rings
2	Explosion-proof coil
3	Coil removal space
4	Manual override, boot protected (**standard for both N and V seals**) - for blind ring nut dimensions (standard for NL seals) see par. 18
5	Terminal for supplementary earth connection
6	Upper port for cable gland
7	Cable gland (upper port shown). To be ordered separately, see paragraph 19

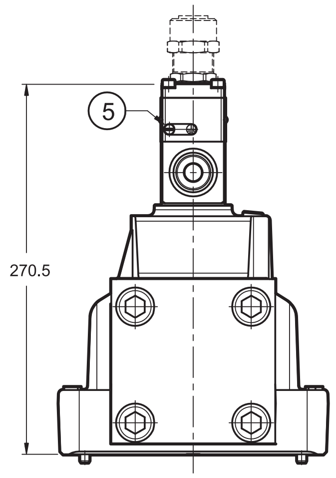
Fastening of single valve: 6 SHC ISO 4762 screws M12x60
Tightening torque: 69 Nm (A8.8 screws)
Threads of mounting holes: M12x20
Sealing rings: 4 OR type 3118 (29.82x2.62) - 90 Shore 2 OR type 3081 (20.24x2.62) - 90 Shore

15 - DSPE10KD2 OVERALL AND MOUNTING DIMENSIONS

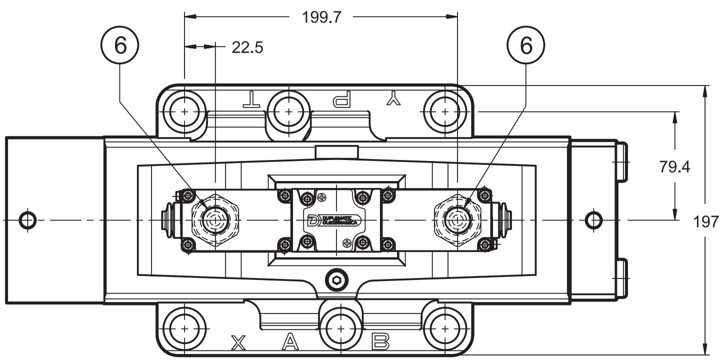
dimensions in mm

3 **DSPE10KD2-A*/10*-*/*K9T*/CM**
DSPE10KD2-C*/10*-*/*K9T*/CM

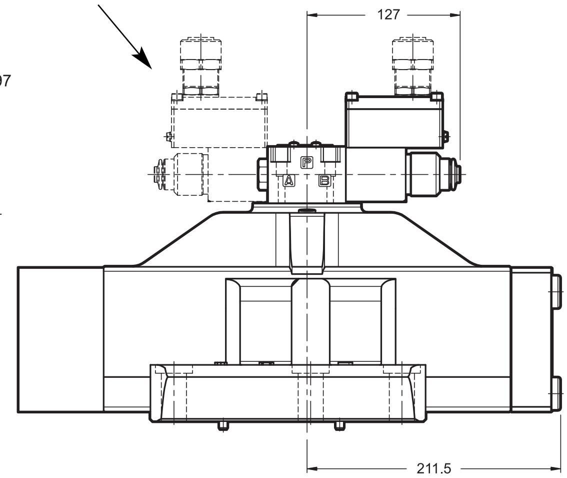




DSPE10KD2-A*SA/10*-*/*K9T*/CM
DSPE10KD2-C*SA/10*-*/*K9T*/CM



Solenoid position for versions A*SB and C*SB



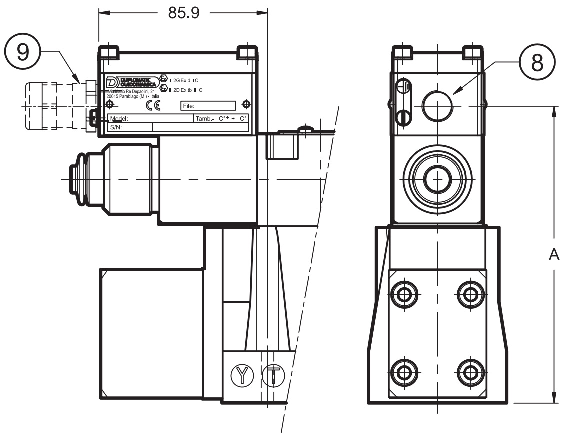
NOTE 1: for overall dimensions with Z option (fixed adjustment pressure reducing valve) consider an increase of 40 mm in height.
NOTE 2: for side port cable gland see paragraph 16.

1	Mounting surface with sealing rings
2	Explosion-proof coil
3	Coil removal space
4	Manual override, boot protected (**standard for both N and V seals**) - for blind ring nut dimensions (standard for NL seals) see par. 18
5	Terminal for supplementary earth connection
6	Upper port for cable gland
7	Cable gland (upper port shown). To be ordered separately, see paragraph 19

Fastening of single valve: 6 SHC screws ISO 4762 M20x70
Tightening torque: 330 Nm (A8.8 screws)
Threads of mounting holes: M20x40
Sealing rings: 4 OR type 4150 (37.59x3.53) - 90 shore 2 OR type 3081 (20.24x2.62) - 90 shore

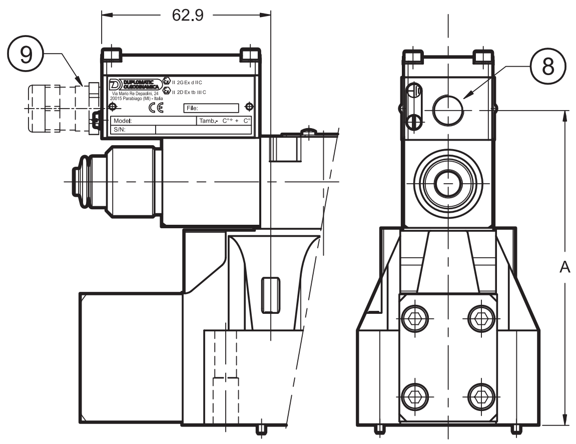
16 - DSPE*KD2-*/10*-*/*K9S*/* (SIDE CONNECTION) OVERALL AND MOUNTING DIMENSIONS

DSPE5KD2-*/10*-*/*K9S*/*
DSPE5RKD2-*/10*-*/*K9S*/*



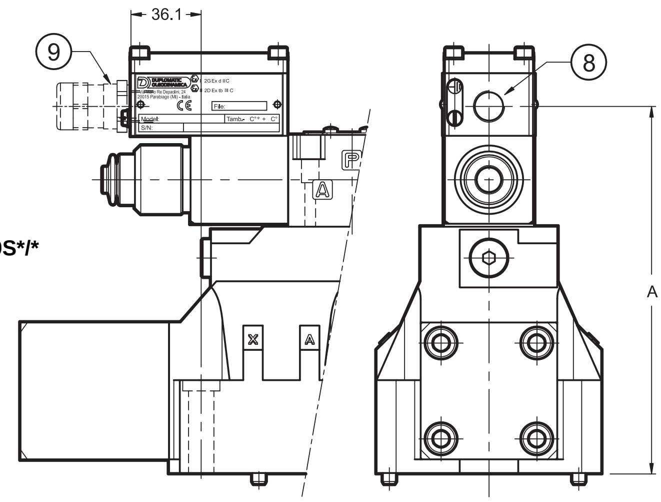
Side port type	Dimension A
S01	150.5
S04	151.5

DSPE7KD2-*/10*-*/*K9S*/*



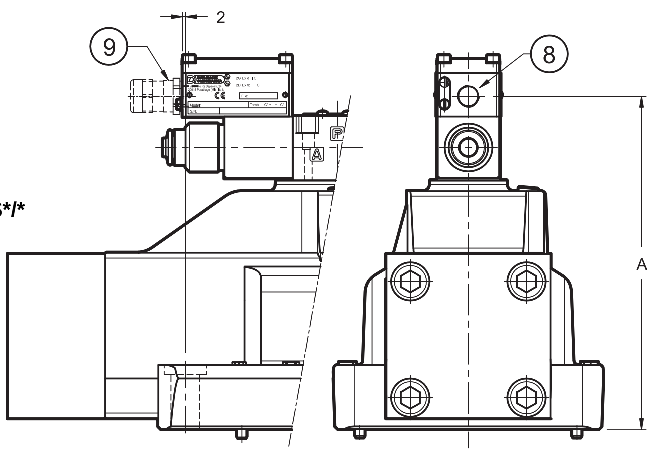
Side port type	Dimension A
S01	157.5
S04	158.5

DSPE8KD2-*/10*-*/*K9S*/*



Side port type	Dimension A
S01	186.5
S04	187.5

DSPE10KD2-*/10*-*/*K9S*/*



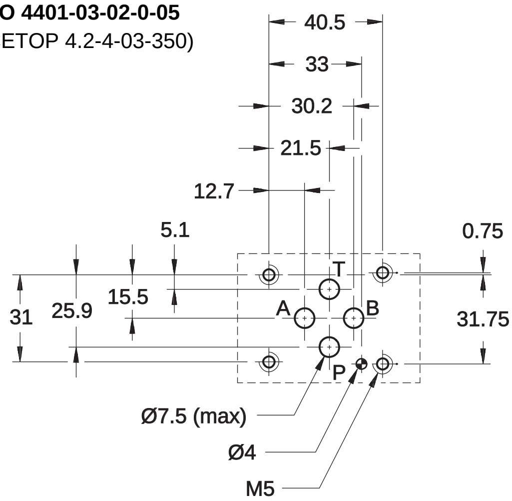
Side port type	Dimension A
S01	242.5
S04	243.5

dimensions in mm

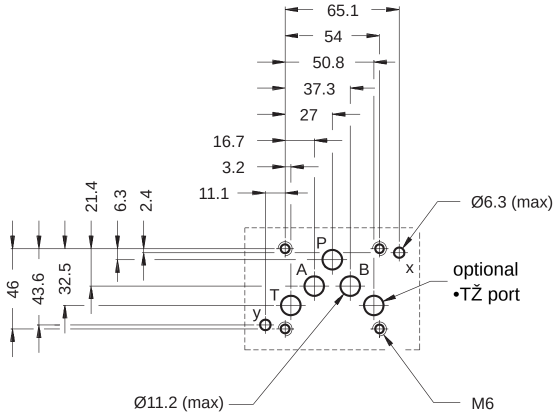
8	Side port for cable gland
9	Cable gland (side port shown). To be ordered separately, see par. 19

17 - MOUNTING SURFACES

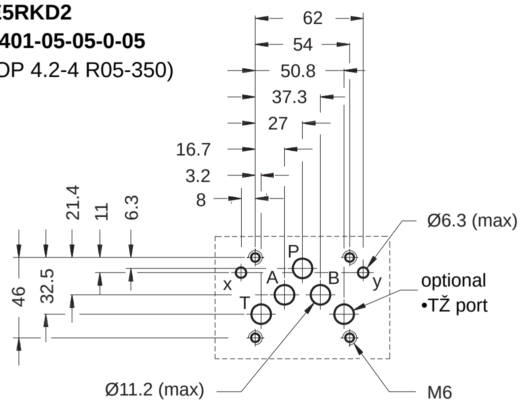
DSE3KD2
ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)



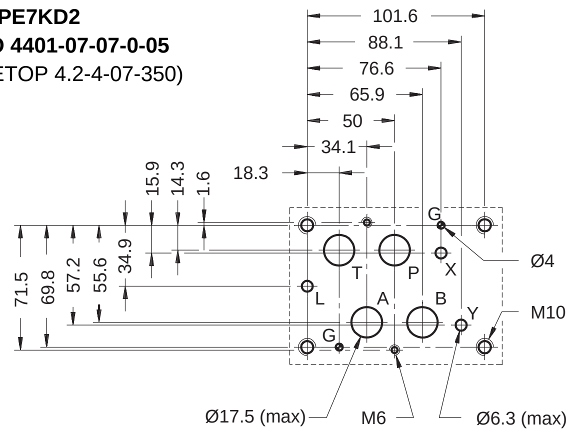
DSPE5KD2
CETOP 4.2-4 P05-350



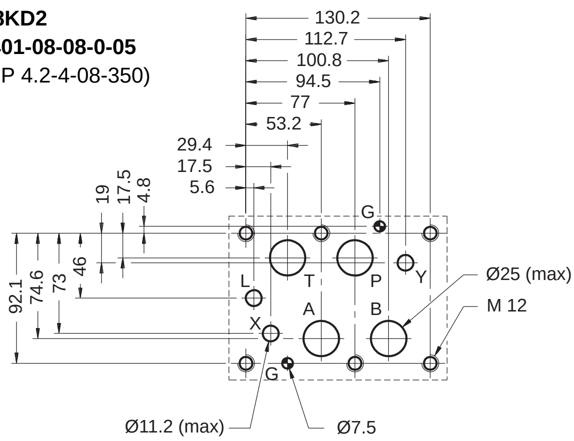
DSPE5RKD2
ISO 4401-05-05-0-05
(CETOP 4.2-4 R05-350)



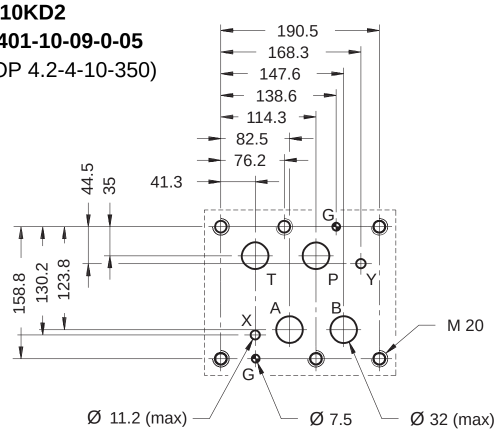
DSPE7KD2
ISO 4401-07-07-0-05
(CETOP 4.2-4-07-350)



DSPE8KD2
ISO 4401-08-08-0-05
(CETOP 4.2-4-08-350)

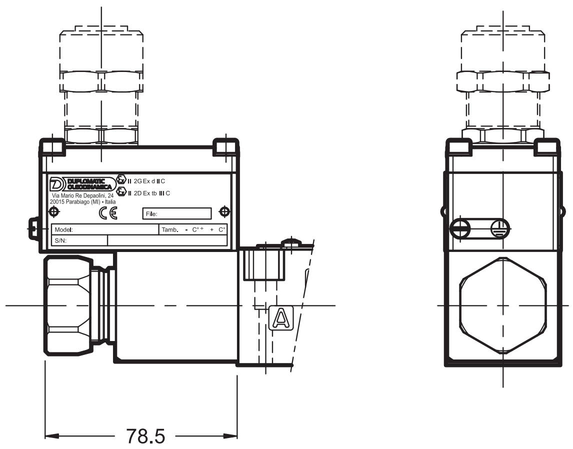


DSPE10KD2
ISO 4401-10-09-0-05
(CETOP 4.2-4-10-350)

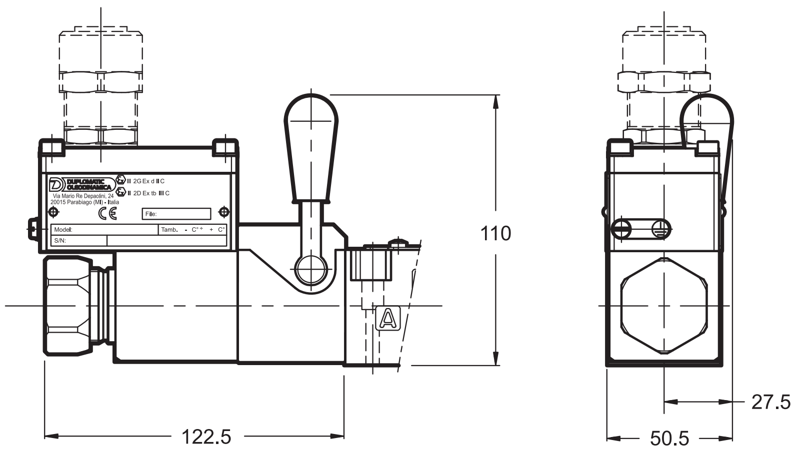


18 - MANUAL OVERRIDE

18.1 - CB - Blind ring nut



18.2 - CH - Lever manual override



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 Ø8÷10 mm cables);

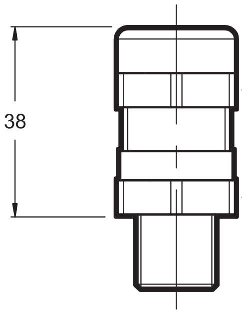
€ according to ATEX II 2GD directive certified

€ cable gland material: nickel brass

€ rubber tip material: silicone

€ ambient temperature range: -70ºC ÷ +220ºC

€ protection degree: IP66 / IP68



For the request of the version needed, indicate the description and the code mentioned here below:

Description: CGK2/NB-01/10
Code: 3908108001
Version with M20x1.5 - ISO 261 male thread, suitable for coils with T01 and S01 connection types; it is supplied equipped with silicone seal, that must be assembled between the cable gland and the coil cover, so as to ensure IP66 / IP68 protection degree.

Description: CGK2/NB-02/10
Code: 3908108002
Version with Gk 1/2 - UNI EN 10226-2 male thread, suitable for coils with T02 connection type; in order to ensure IP66 / IP68 protection degree, the customer must apply LOCTITE® 243' threadlocker or similar between the cable gland connection thread and the coil cover.

Description: CGK2/NB-03/10
Code: 3908108003
Version with 1/2Ž NPT - ANSI B1.20.1 (ex ANSI B2.1), suitable for coils with T03 connection type; in order to ensure IP66 / IP68 protection degree, the customer must apply LOCTITE® 243' threadlocker or similar between the cable gland connection thread and the coil cover.

Description: CGK2/NB-04/10
Code: 3908108004
Version with M16x1.5 - ISO 261 male thread, suitable for coils with S04 connection type; it is supplied equipped with silicone seal, that must be assembled between the cable gland and the coil cover, so as to ensure IP66 / IP68 protection degree.

20 - 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.

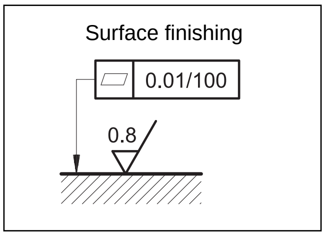
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

21 - INSTALLATION

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.



22 - SUBPLATES (see catalogue 51 000)

	DSE3KD2	DSPE5KD2	DSPE7KD2	DSPE8KD2
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	3/8Ž BSP	3/4Ž BSP	1Ž BSP	1 ½Ž BSP
X, Y ports dimensions	-	1/4Ž BSP	1/4Ž BSP	1/4Ž BSP

NOTE: Subplates (to be ordered separately) do not contain neither aluminium nor magnesium at a higher rate than the value allowed by norms according to ATEX directive for category 2GD.

The user must take care and make a complete assessment of the ignition risk, that can occur from the relative use in potentially explosive environments.

23 - ELECTRONIC CONTROL UNITS

DSE3KD2 - * * SA **DSE3KD2 - * * SB**

EDM-M112	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250
EDM-M142	for solenoid 12V DC		

DSPE*KD2 - * * SA **DSPE*KD2 - * * SB**

EDM-M111	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250
EDM-M141	for solenoid 12V DC		

DSE3KD2 - A* **DSE3KD2 - C***

EDM-M212	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250
EDM-M242	for solenoid 12V DC		

DSPE*KD2 - A* **DSPE*KD2 - C***

EDM-M211	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250
EDM-M241	for solenoid 12V DC		

NOTE: electronic control units offered are not certified according to ATEX 94/9/EC Directive; therefore, they must be installed outside the classified area.

DUPLOMATIC OLEODINAMICA

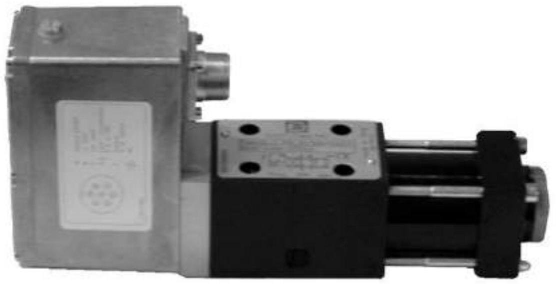
DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

83 510/313 ED

DXJ3

ELECTRO-HYDRAULIC SERVOVALVE WITH INTEGRATED ELECTRONICS

SERIES 10



SUBPLATE MOUNTING

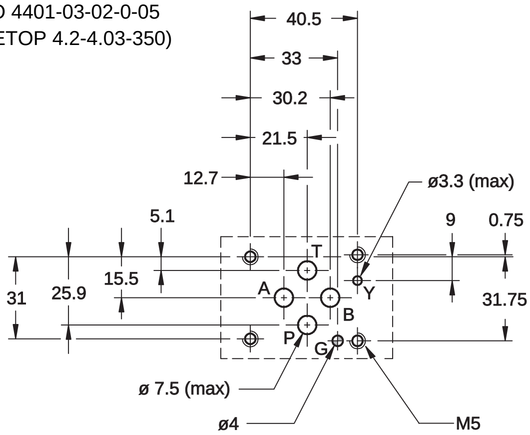
ISO 4401-03 (CETOP 03)

p max **350** bar

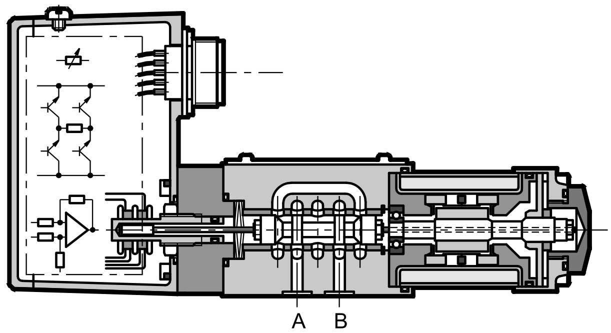
Q max (see performances table)

MOUNTING INTERFACE

ISO 4401-03-02-0-05
(CETOP 4.2-4.03-350)



OPERATING PRINCIPLE

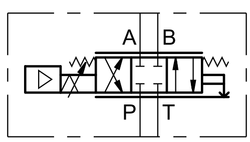


- The DXJ3 valve is a four-way servo-proportional valve where the spool moves inside a sleeve. This valve has a direct drive with a linear force motor resulting in high dynamic performances which are independent of system pressure. The spool position is controlled by a linear transducer (LVDT) with closed loop which ensures high precision and repeatability.
- It is available in four different flow rate control ranges up to 40 l/min, with spools with zero overlap and a mounting surface in compliance with ISO 4401 (CETOP RP 121H) standards.
- The valve is featured by integrated 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. With a loss of power or with a zero reference signal, the spool goes automatically at rest-position. In this position the valve has a minimum leakage, depending on the operating pressure (see the performances table).
- A version with external drain is available.

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

Maximum operating pressure Ports P - A - B Port T (standard) Port T with Y	bar	350 50 350
Rated flow Q nom (with p 70 bar P - T)	l/min	5 - 10 - 20 - 40
Null leakage flow (with p=140 bar)	l/min	3% of Q nom
Hysteresis	% In	< 0,2
Threshold	% In	< 0,1
Thermal drift (with T= 50°C)	% In	< 1,5
Response time	ms	12
Vibration on the three axes	g	30
Electric features	see paragraph 3	
Protection degree according CEI EN 60529	IP 65	
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	2,5

HYDRAULIC SYMBOL



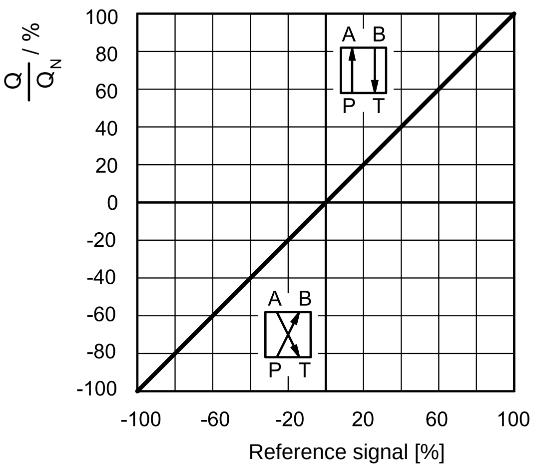
1 - IDENTIFICATION CODE

D	X	J	3	-	D	0	L		/	10		/	E0	K11	/	

- D X: Servo-proportional-valve with bushing spool
- J: Integrated electronics and position feedback
- 3: Rated size ISO 4401-03 (CETOP 03)
- D: Symmetric spool
- 0: Spool with zero overlap
- L: Spool with a linear flow rate curve
- Rated flow (with p = 70 bar P - T)
  05 = 5 l/min **20** = 20 l/min
  10 = 10 l/min **40** = 40 l/min
- 10: 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
- E0: Reference signal: ±10V (other signals available on request)
- K11: 6 + PE pole connector
- Option:
  Y= port for subplate external drain

2 - CHARACTERISTIC CURVES (measured with viscosity of 36 cSt at 50°C)

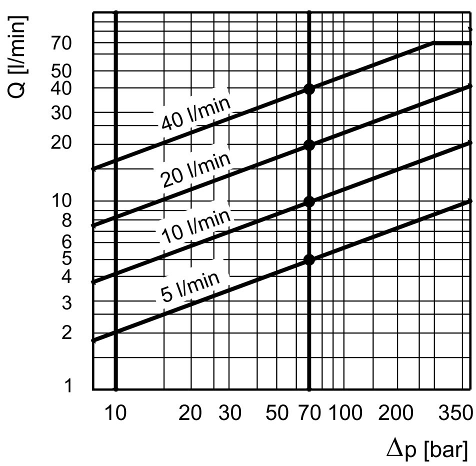
REFERENCE / FLOW RATE CURVE



Typical flow rate curves at constant p = 70 bar P-T according to the reference signal.

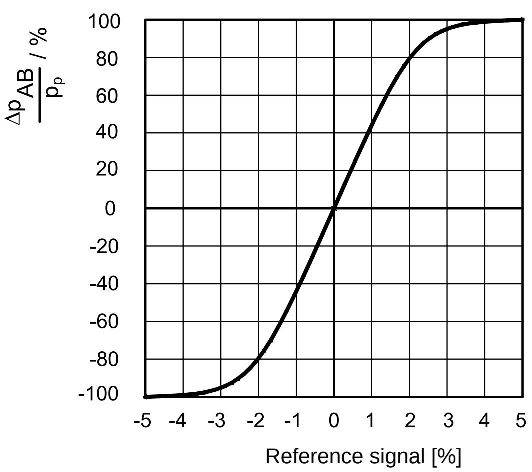
NOTE: with positive reference signal connected to pin D the valve regulates P - A / B - T.

FLOW RATE CURVE ACCORDING TO P



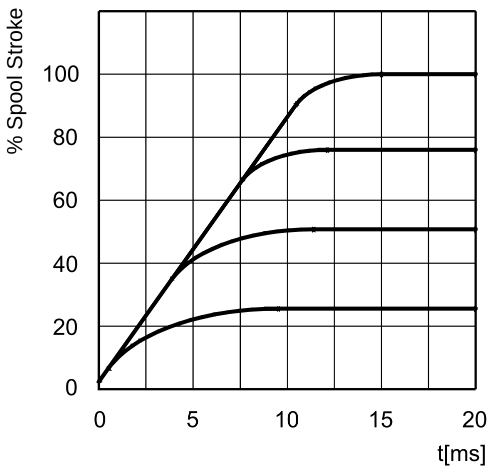
The diagram states the maximum valve controlled flow rate according to the pressure drop between the P and T ports.

PRESSURE GAIN

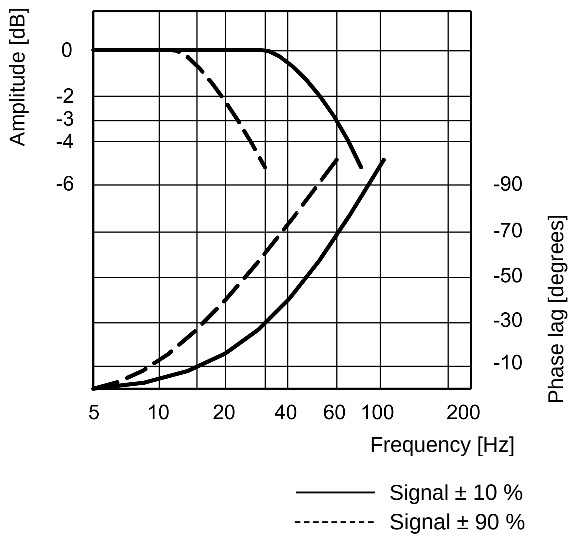


The diagram shows the valve pressure gain, expressed as % of the ratio between the port pressure variation in A or B (p AB) and the P system pressure, according to the reference signal. In practice, the pressure gain states the valve reaction towards external disturbances aimed at changing the actuator position.

RESPONSE TIME

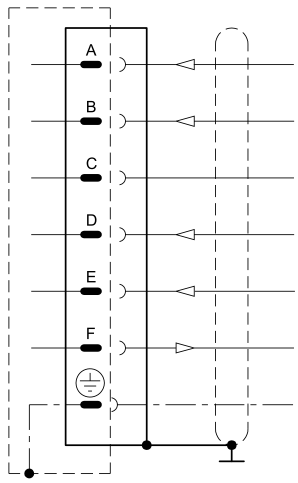


FREQUENCY RESPONSE



3 - ELECTRICAL FEATURES

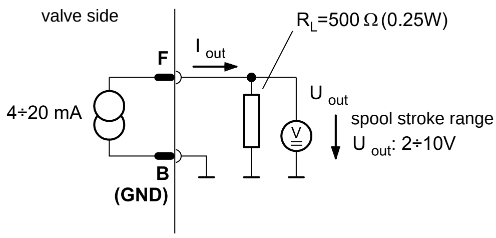
CONNECTION WIRING



Pin	Values	Function	NOTES
A	24 VDC	Supply	From 19 to 32 VDC $I_{A\ MAX}$ = 1,2 A
B	0 V	Signal ground	0 V
C	----	Not used	----
D	± 10 V	Input rated command	R_e = 10 k (see **NOTE 1**)
E	0 V	Input rated command	----
F	4 ÷ 20 mA	Spool position	R_L = from 300 to 500 (see **NOTE 2**)
PE	----	Protective earth	----

NOTE 1: The input stage is a differential amplifier. With positive reference signal connected to pin D, valve opening P - A e B - T is achieved. With a zero reference signal the spool is in centred position. The spool stroke is proportional to U_D - U_E. If only one command signal is available (single-end), pin E must be connected to pin B (0V ground).

NOTE 2: The spool position value can be measured at pin F (see diagram right). The position signal output goes from 4 to 20 mA. The centered position is at 12 mA, while 20 mA corresponds to 100% valve opening P - A and B - T. This monitoring allows to detect a cable break when I_F = 0V.



General requirements:

- External fuse = 1,6 A
- Minimum cross-section of all leads 0,75 mm ^{2}
- When making electric connections to the valve (shield, protective earth) appropriate measures must be taken to ensure that locally different earth potentials do not results in excessive ground currents.
- The differential and the spool position signal lines must be connected to the mating connector housing at valve side and to the 0V (signal ground) at cabinet side.
- **EMC**: meets the requirements of EN 55011:1998, class B, and the immunity regulation according to EN 61000-6-2:1998

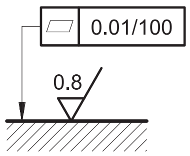
4 - HYDRAULIC FLUIDS

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 - INSTALLATION

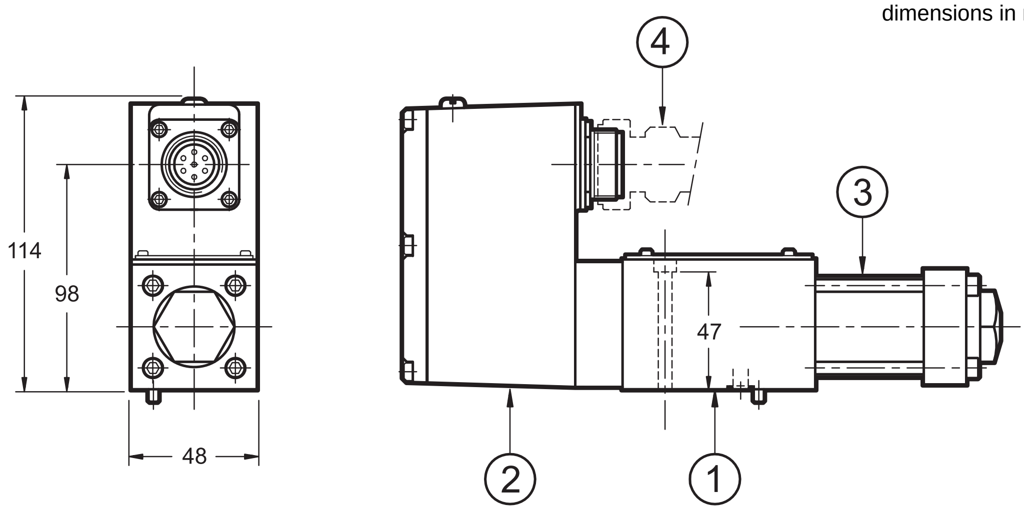
The DXJ3 valve can be installed in any position without impairing its correct operation.
The valve is “xed by means of screws on a ”at surface with planarity between 0,01 mm over 100 mm and roughness R_a <0,8 m. If the minimum values are not observed, the ”uid can easily leak between the valve and the mounting surface. While mounting pay attention to the environment and valve cleanliness.

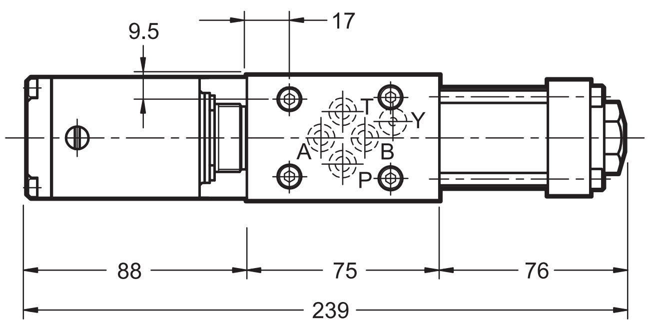
Surface finishing



6 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm





1	Mounting surface with sealing rings: N. 5 OR type 2037 (9.25x1.78) - 90 Shore N. 1 OR type 2021 (5.28x1.78) - 90 Shore (for Y port)
2	Integrated electronics
3	Linear force motor
4	Electric connector 7 pins DIN 43563 - IP67 PG11 EX7S/L/10 cod. 3890000003 (**to be ordered separately**)

Fastening bolts: 4 bolts SHC M5 x 55 - ISO 4762
Torque: 8,5 Nm

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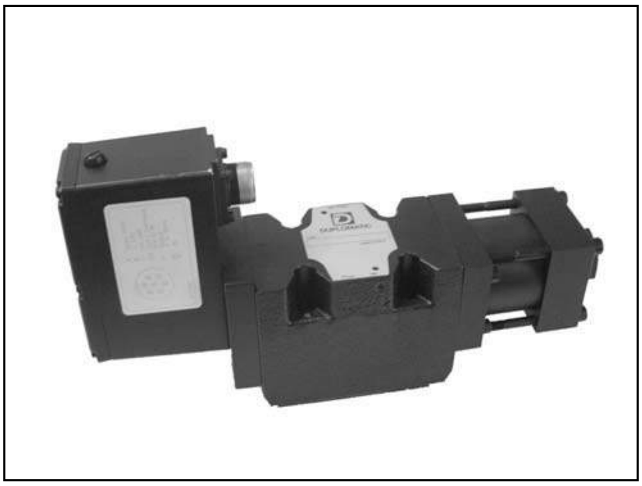
DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com



DXJ5

ELECTRO-HYDRAULIC SERVOVALVE WITH INTEGRATED ELECTRONICS

SERIES 10

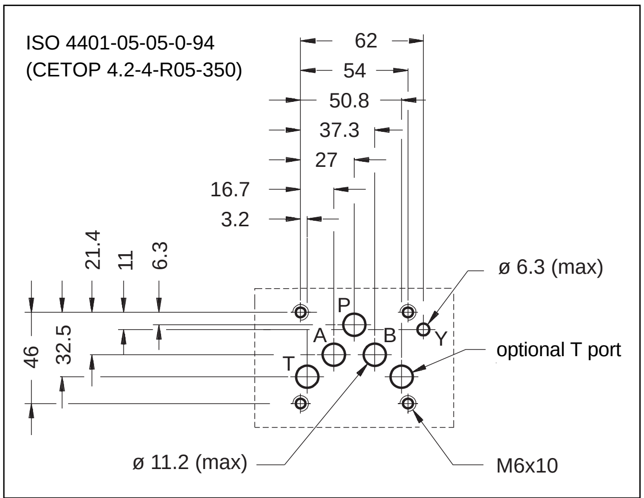
SUBPLATE MOUNTING

ISO 4401-05 (CETOP R05)

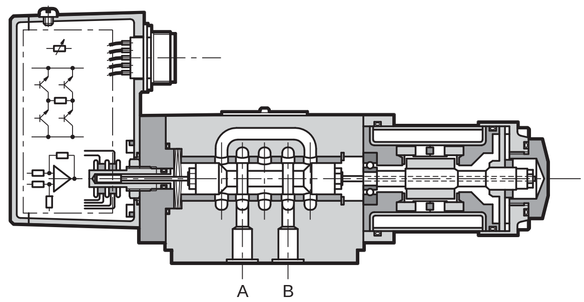
p max **350** bar

Q max (see performances table)

MOUNTING INTERFACE



OPERATING PRINCIPLE



„ The DXJ5 is a four-way servo-proportional valve where the spool moves inside a sleeve. This valve has a direct drive with a linear force motor resulting in high dynamic performances independent of system pressure. A linear transducer (LVDT) with closed loop controls the spool position, ensuring high precision and repeatability.

„ It is available in four different ”ow rate control ranges up to 100 l/min, with spools with zero overlap and a ISO 4401 (CETOP RP 121H) mounting surface.

„ The valve is featured by integrated electronic based on SMD technology which ensures standard regulations and simpli“es the electric wiring. The unit does not require any adjustment other than the possible electronic regulation of the zero.

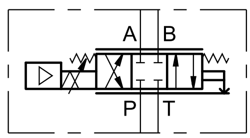
„ Suitable for control applications with closed loop of position, velocity and pressure. With a loss of power or with a zero reference signal, the spool goes automatically at rest-position. In this position the valve has a minimum leakage, depending on the operating pressure (see the performances table).

„ A version with external drain is available.

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

Maximum operating pressure Ports P - A - B Port T (standard) Port T with Y	bar	350 50 350
Rated flow Q nom (with p 70 bar P - T)	l/min	60 ÷ 100
Null leakage flow (with p=140 bar)	l/min	3% of Q nom
Hysteresis	% In	< 0,2
Threshold	% In	< 0,1
Thermal drift (with T= 50°C)	% In	< 1,5
Response time	ms	20
Vibration on the three axes	g	30
Electric features	see paragraph 3	
Protection degree according CEI EN 60529	IP 65	
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	6,3

HYDRAULIC SYMBOL



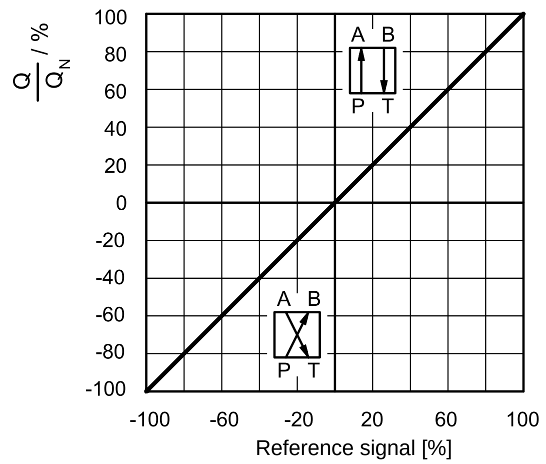
1 - IDENTIFICATION CODE

D	X	J	5	-	D	0	L		/	10		/	E0	K11	/	

- D X: Servo-proportional-valve with bushing spool
- J: Integrated electronics and position feedback
- 5: Rated size ISO 4401-05 (CETOP 05)
- D: Symmetric spool
- 0: Spool with zero overlap
- L: Spool with a linear characteristic of ”ow
- Rated ”ow (with p = 70 bar P - T)
  060 = 60 l/min **100** = 100 l/min
- 10: Series N. (from 10 to 19 sizes and mounting dimensions remain unchanged)
- Seals:
  N = NBR seals for mineral oil (**standard**)
  V = FPM seals for special fluids
- E0: Reference signal: ±10V (other signals available on request)
- K11: 6 + PE pole connector
- Options:
  Y = port for subplate external drain

2 - CHARACTERISTIC CURVES (measured with viscosity of 36 cSt at 50°C)

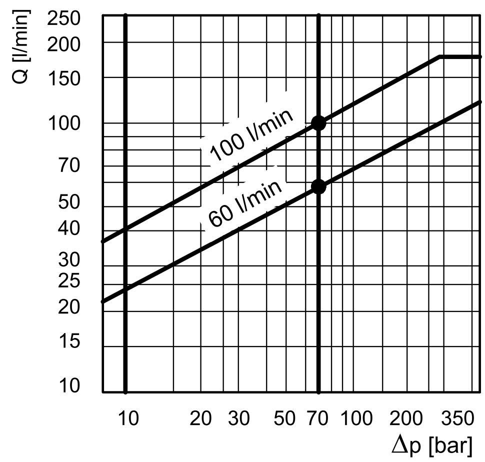
REFERENCE / FLOW RATE CURVE



Typical ”ow rate curves at constant p = 70 bar P-T according to the reference signal.

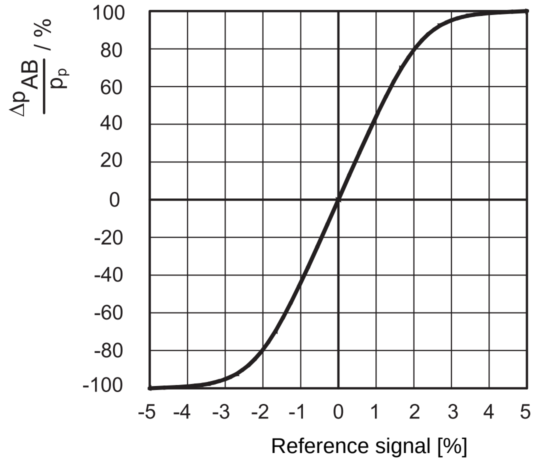
NOTE: with positive reference signal connected to pin D the valve regulates P - A / B - T.

FLOW RATE CURVE ACCORDING TO P



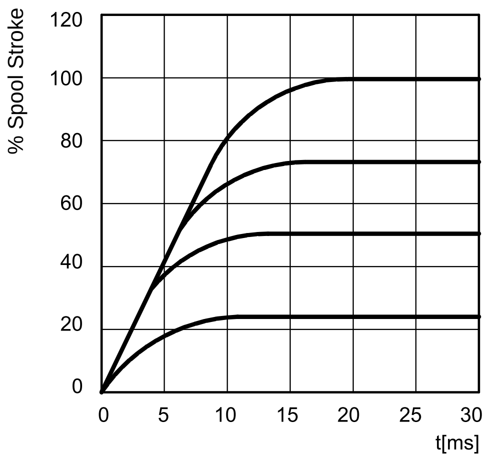
The diagram states the maximum valve controlled ”ow rate according to the pressure drop between the P and T ports.

PRESSURE GAIN

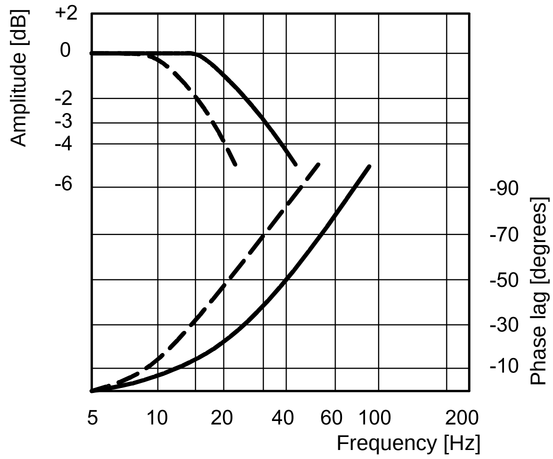


The diagram on the left shows the valve pressure gain, expressed as % of the ratio between the port pressure variation in A or B (p AB) and the P system pressure, according to the reference signal. Practically, the pressure gain states the valve reaction towards external disturbances aimed at changing the actuator position.

STEP RESPONSE

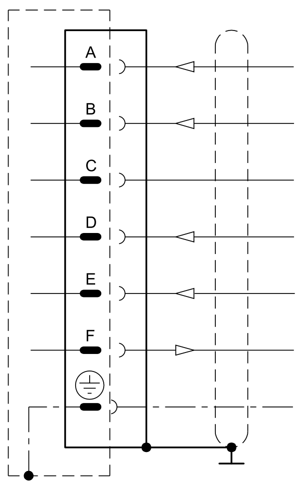


FREQUENCY RESPONSE



3 - ELECTRICAL FEATURES

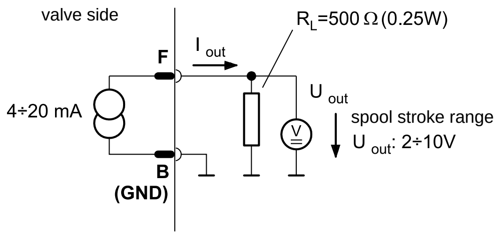
CONNECTION WIRING



Pin	Values	Function	NOTES
A	24 VDC	Supply	From 19 to 32 VDC $I_{A\ MAX.}$ = 2,2 A
B	0 V	Signal ground	0 V
C	----	Not used	----
D	± 10 V	Input rated command	R_e = 10 k (see **NOTE 1**)
E	0 V	Input rated command	----
F	4 ÷ 20 mA	Spool position	R_L = from 300 to 500 (see **NOTE 2**)
PE	----	Protective earth	----

NOTE 1: The input stage is a differential ampli“er. With positive reference signal connected to pin D, valve opening P - A e B - T is achieved. With a zero reference signal the spool is in centred position. The spool stroke is proportional to U_D - U_E. If only one command signal is available (single-end), pin E must be connected to pin B (0V ground).

NOTE 2: The spool position value can be measured at pin F (see diagram right). The position signal output goes from 4 to 20 mA. The centered position is at 12 mA, while 20 mA, corresponds to 100% valve opening P - A and B - T. This monitoring allows to detect a cable break when I_F = 0V.



General requirements:

External fuse = 2,5 A

Minimum cross-section of all leads 0,75 mm^2

When making electric connections to the valve (shield, protective earth) appropriate measures must be taken to ensure that loc ally different earth potentials do not results in excessive ground currents.

The differential and the spool position signal lines must be connected to the mating connector housing at valve side and to th e 0V (signal ground) at cabinet side.

EMC: meets the requirements of EN 55011:1998, class B, and the immunity regulation according to EN 61000-6-2:1998

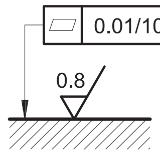
4 - HYDRAULIC FLUIDS

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 - INSTALLATION

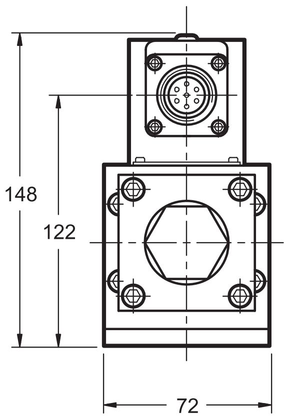
The DXJ5 valve can be installed in any position without impairing its correct operation.
The valve is “xed by means of screws on a ”at surface with planarity between 0,01 mm over 100 mm and roughness R_a < 0,8 m. If the minimum values are not observed, the ”uid can easily leak between the valve and the mounting surface. While mounting pay attention to the environment and valve cleanliness.

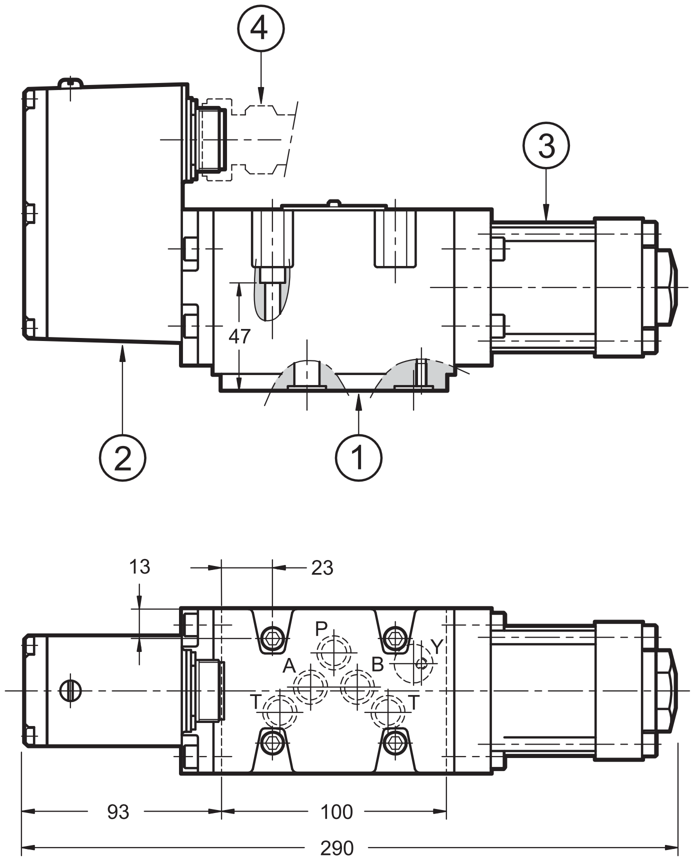
Surface “nishing



7 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm





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 (Y port)
2	Integrated electronics
3	Linear force motor
4	Electric connector 7 pins DIN 43563 - IP67 PG11 EX7S/L/10 cod. 3890000003 (**to be ordered separately**)

Fastening bolts: 4 bolts SHC M6 x 60 - ISO 4762
Torque: 13 Nm

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DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

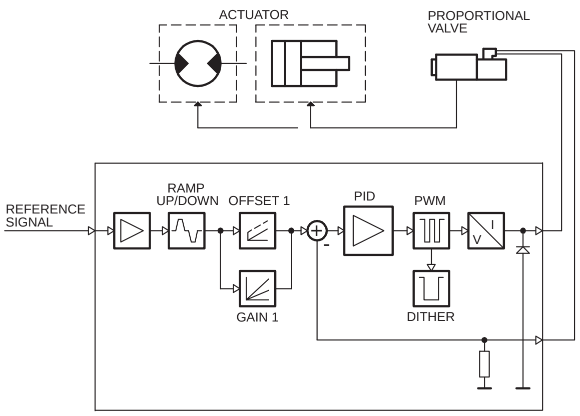
EDC-1

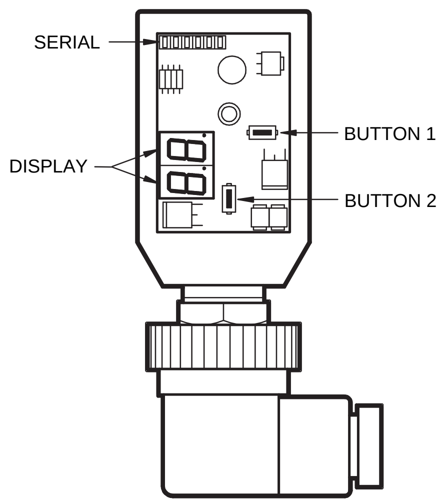
DIGITAL ELECTRONIC CONTROL UNIT FOR OPEN-LOOP SINGLE SOLENOID PROPORTIONAL VALVES

SERIES 10

PLUG VERSION

OPERATING PRINCIPLE

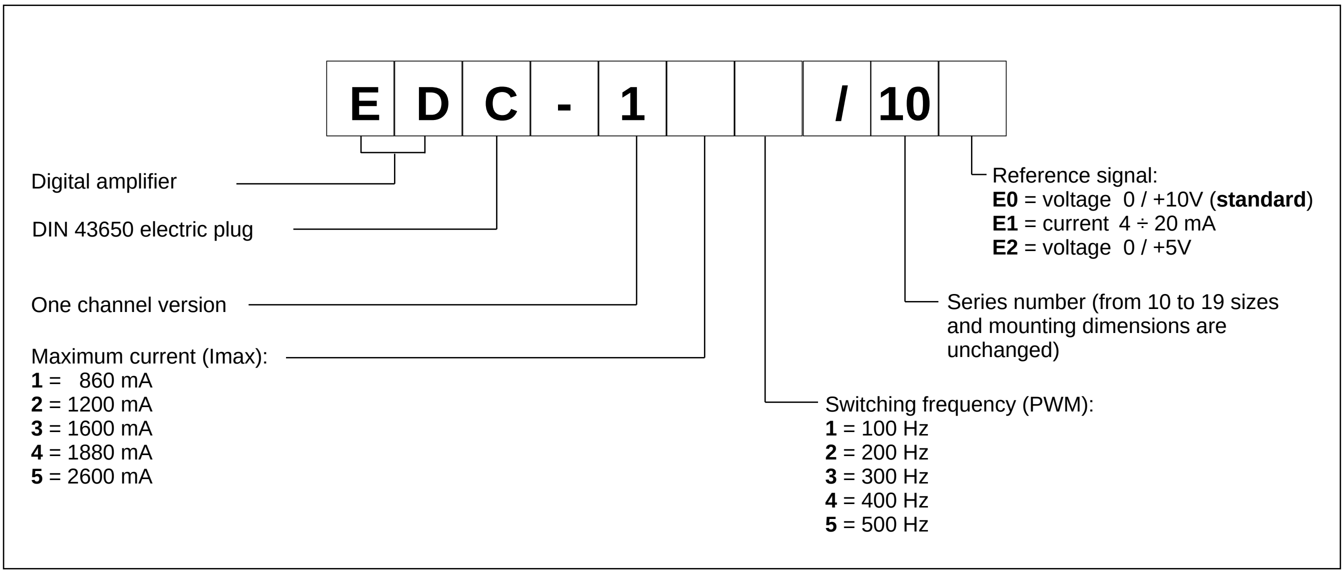




TECHNICAL CHARACTERISTICS

Power supply	V DC	10 ÷ 30 - ripple included
Required power	W	min 20 - max 40 (see paragraph 2.1)
Output current	mA	min 800 - max 2600 (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
Available reference signals (selectable from the jumper)	0 ÷ 10V 0 ÷ 5V 4 ÷ 20 mA	input impedance 100 k input impedance 100 k input impedance max 500
Connector type		DIN 43650
Electromagnetic compatibility (EMC): - EMISSIONS CEI EN 61000-6-4 - IMMUNITY CEI EN 61000-6-2		according to 2004/108/CEE standards (see paragraph 5 - **NOTE 1**)
Protection to atmospheric agents (CEI EN 60529)		IP 65 - 67
Operating temperature range	°C	-20 / +70
Mass	kg	0,10

1 - IDENTIFICATION CODE



The EDC-1 connector is a digital amplifier controlling open loop proportional valves. The unit supplies a variable current proportionally to the reference signal and independently of temperature variations or load impedance, with a resolution of 1% on 2600 mA (the full scale value).
The PWM stage on the solenoid power supply makes it possible to reduce the valve hysteresis thus optimising control precision. The connector is customizable with different maximum current sizes and switching frequencies (PWM), optimized according to the valve to be controlled.
Setting is possible by buttons and display inside the case, or with a notebook by RS232 with the software EDC-PC, (see par. 6.2)

2 - FUNCTIONAL SPECIFICATIONS

Electric power supply

The connector requires a power supply of 10 ÷ 30 V DC (terminals 1 and 2).

NOTE: 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 supply voltage must be rectified and filtered, with maximum admissible ripple within the above voltage range.

The power required by the connector depends on the power supply voltage and on the maximum value of the supplied current (it is determined by the card version). In general a conservative value of the required power can be considered as the product of V x I.

Example: a connector with a maximum current = 800 mA and a power supply voltage of 24 V DC requires a power of about 20W. In case of a card with a maximum current =1600 mA and a power supply voltage of 24 V DC the used power is equal to 38.5 W.

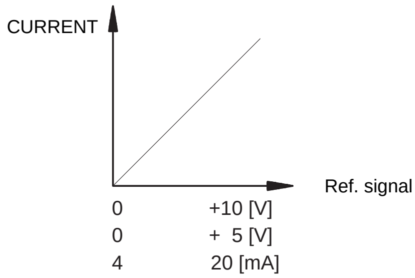
2.2 - Electrical protection

The connector is protected against overvoltage and polarity inversion.

On the output a protection against any short circuit is foreseen.

2.3 - Reference signal

The connector accepts voltage reference signals with 0 ÷ 10V and 0 ÷ 5V, in 4 ÷ 20 mA current, from an external generator (PLC, CNC) or external potentiometer.
See paragraph 7 for electric connections referring to the different connector versions.



3 - SIGNALS

3.1 - POWER ON (Power supply)

Display indicate the connector is ON and with +24V 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 U1 parameter (reference signal).
Pushing button (1) the current to solenoid is displayed. By means of (1) key, the different variables can be selected. Each time a variable is selected, its short name appears for approximately one second.
By briefly pressing the keys, the current variable name appears for approximately one second.

The variables that can be selected are:

U1: Reference signal:
0 + 10V
0 + 5V
4 ÷ 20mA (displayed as 2 ÷ 10)

C1: current required according to the applied reference signal, expressed in ampere, ranging between 0 and 2.6 A

All the mentioned parameters can be viewed on the two digits display, located on the connector front panel.
The selected value has to be read as follows (example for EDC-15*/10E* card):

REFERENCE (V)	(mA)	DISPLAY U1 (V)		DISPLAY C1 (Ampere)
0	4	0.0	2.0	40 (mA)
5	12	5.0	6.0	13 (A)
10	20	10.	10.	26 (A)

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 parameters, repeat the steps above-mentioned for the G1 parameter.

The parameters that can be selected are:

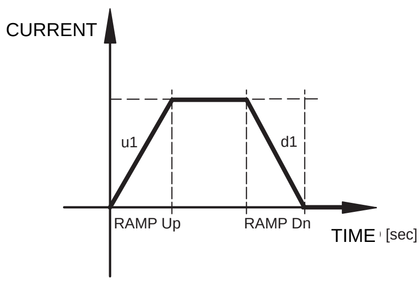
G1: •I MaxŽ current, expressed in milliampere.
It sets the maximum current to the solenoid, when the reference signal is at the maximum value of +10 V (or 20 mA). It is used to limit the maximum value of the hydraulic size controlled by the valve.
Default value = Imax
Range = 50 ÷ 100% of Imax

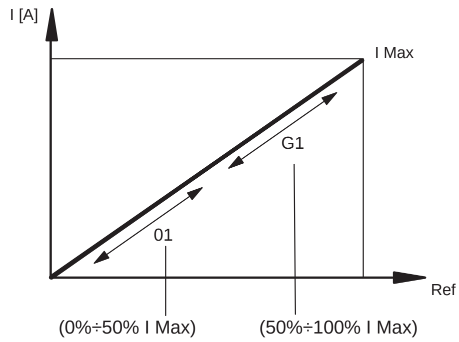
o1: •I MinŽ current, expressed in milliampere.
It sets the offset current to the solenoid, when the reference signal exceeds the limit of 0,1 V (or 0,1 mA). It is used to null the insensitiveness area of the valve (dead band).
Default value = 0%
Range = 0 ÷ 50% of Imax

u1: •Ramp UpŽ increasing ramp time, expressed in seconds.
It sets the current increasing time, for a variation from 0 to 100% of the input reference.
It is used to slow down the valve response time in the case of a sudden variation of the reference signal.
Default value = 00 sec.
Range = 00 ÷ 50 sec.

d1: •Ramp DnŽ decreasing ramp time, expressed in seconds.
It sets the current decreasing time, for a variation from 100% to 0 of the input reference. It is used to slow down the valve response time in the case of a sudden variation of the reference signal.
Default value = 00 sec.
Range = 00÷ 50 sec.

Fr: PWM frequency, in Hertz.
It sets the PWM frequency, which is the pulsating frequency of the control current. The PWM decrease improves the valve accuracy, decreasing the regulation stability. The PWM increase improves the regulation stability, causing a higher hysteresis.
Default value = PWM (according to version card)
Range = 50 ÷ 500Hz





4.3 - ERROR SIGNAL

EE: breakdown cable error on 4 ÷ 20 mA signal (threshold 3 mA).
Reset the alarm turning off the +24 V DC cable.

5 - INSTALLATION

The connector type electronic unit is suitable for direct assembly on the solenoid of the relative proportional valve. The 4-core connection cable (0,5 mm^2 individual wire section) is supplied pre-wired and in a standard length of 2.5 m (DIN 47100 standard).

NOTE 1
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 (e.g. 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 MEASUREMENT

6.1 - Set up

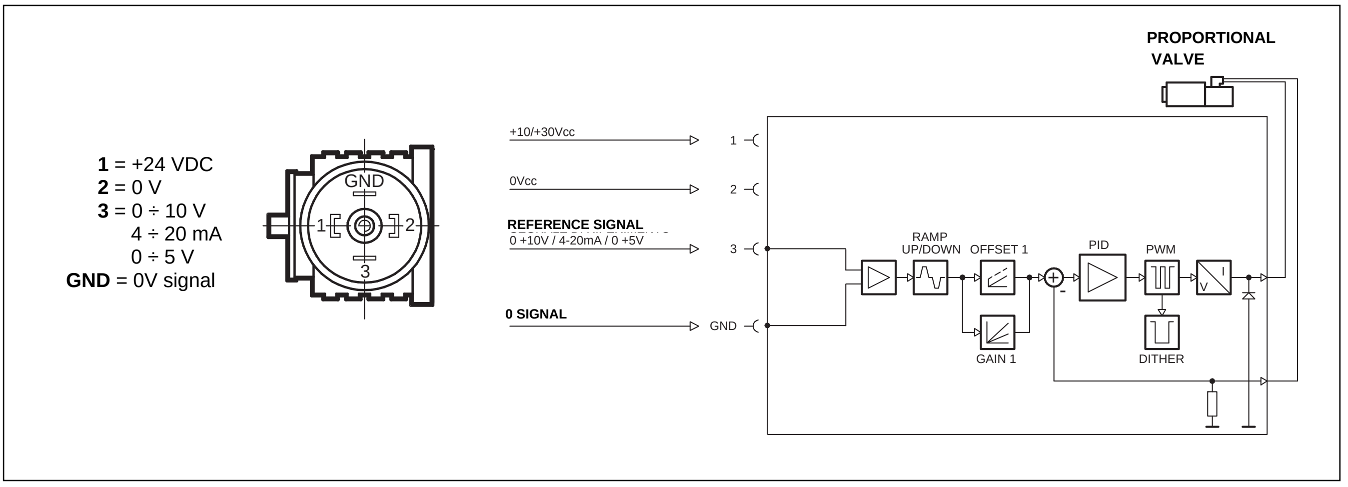
Settings can be changed by either acting on the (1) and (2) keys located on the card front panel, or using the EDC-PC hardware and software kit.

6.2 - EDC-PC Software

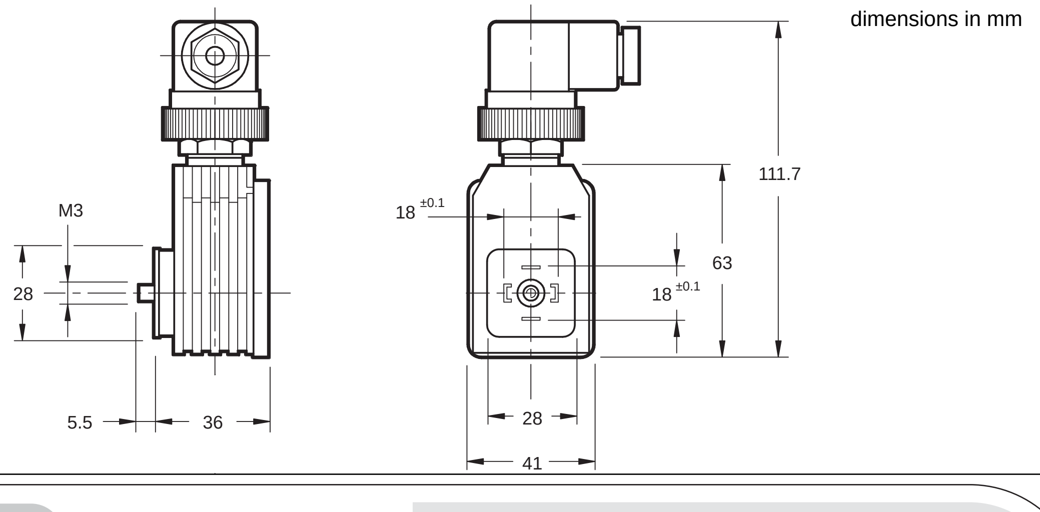
The relevant hardware and software kit (to be ordered separately) allows to read the values and to set the connector easily.

The software communicates, through a flat cable, to the relevant connector placed in the EDC-1 panel, behind the protecting gate. The EDC-PC software compatibility is guaranteed only on Windows 2000 and Windows XP operating systems.

7 - WIRING DIAGRAM



8 - OVERALL AND MOUNTING DIMENSIONS



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DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
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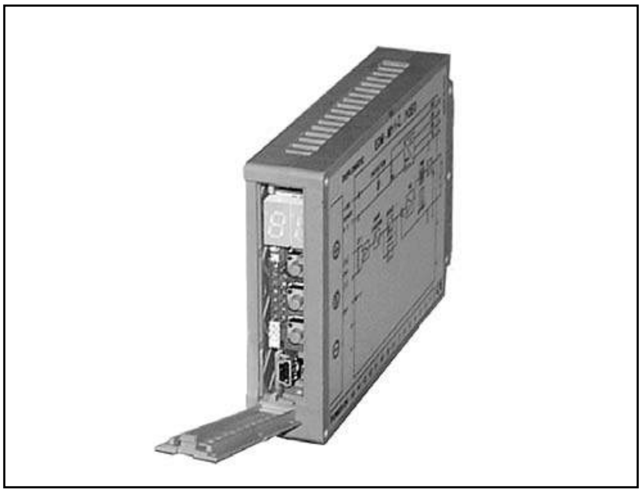


EDM-M*

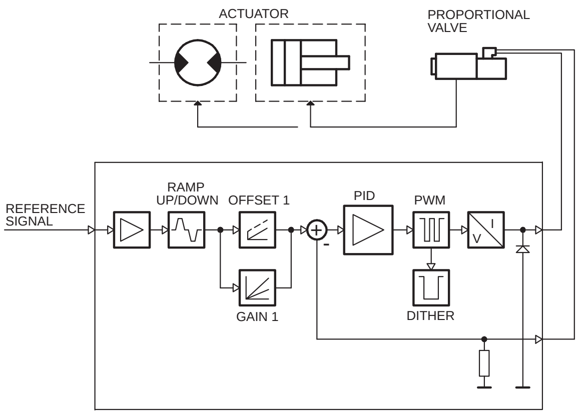
DIGITAL AMPLIFIER FOR OPEN LOOP PROPORTIONAL VALVES

SERIES 20

EDM-M1 single solenoid
EDM-M2 double solenoid
EDM-M3 two single solenoids independent channels

RAIL MOUNTING TYPE: DIN EN 50022

OPERATING PRINCIPLE



The EDM-M* card is a digital ampli“er for open loop proportional valves control. It is designed for rail mounting type: DIN EN 50022.

The unit supplies a variable current in proportion to the reference signal and independently of temperature variations or load impedance.

The PWM stage on the solenoid power supply allows the reduction of the valve hysteresis, thus optimising control precision. The unit is available in three main versions, to control single solenoid valves (M1), double solenoid valves (M2) and valves with two independent channels controlling two single solenoid valves (M3). Each version is available with different maximum current settings and switching frequencies (PWM), optimised according to the relevant valve.

The parameters adjustment is carried out either through keyboard and display, placed on the front panel, or with a notebook, via RS232 or via USB converter (EDMPC/20 software).

TECHNICAL CHARACTERISTICS

Power supply	V DC	10 ÷ 30 ripple included
Required power	W	min 20 - max 40 (see paragraph 3.1)
Output current	mA	min 800 - max 2600 (see paragraph 1)
Power supply electrical protections		over load over 33V polarity inversion
Output electrical protections		short-circuit
Analogue electrical protections		up to 30V DC due to incorrect power supply connection
Available reference signals	0 ÷ 10V ±10V 4 ÷ 20 mA	input impedance 10-100 k input impedance 10-100 k input impedance max 500
Additional output ports		±10V DC to supply 50 + 50 mA to external potentiometer
Electromagnetic compatibility (EMC)		according to 2004/108/CE standards (see paragraph 6 - **NOTE 1**)
Housing material		thermoplastic polyamide
Housing dimensions	mm	120 x 93 x 23
Connector		Plug-in terminal block with tightening screws: 15 poles
Operating temperature range	°C	-20 / +70
Mass	kg	0,15

1 - IDENTIFICATION CODE

E	D	M	-	M					/	20	

Digital ampli“er
for rail mounting DIN EN 50022

for open loop

Versions:
1 = for single solenoid proportional valves
2 = for double solenoid proportional valves
3 = 2 channels for an independent control of two single solenoid valves

Max current (I Max):
(“rst channel for EDM - M3 version)
1 = 860 mA **3** = 1600 mA **5** = 2600 mA
2 = 1200 mA **4** = 1880 mA

Only for EDM-M3 version, omit for other versions
Max current (I Max) second channel:
1 = 860 mA **3** = 1600 mA
2 = 1200 mA **4** = 1880 mA

Switching frequency (PWM):
1 = 100 Hz
2 = 200 Hz
3 = 300 Hz
4 = 400 Hz

Series N. (from 20 to 29 sizes and mounting dimensions remain unchanged)

Reference signal:
E0 = voltage 0 ÷ ±10V (standard)
E1 = current 4 ÷ 20 mA

2 - EDM-M, DUPLOMATIC VALVES AND DEFAULT SETTINGS

The card is preset at factory. The following table shows the default settings for the standard EDM versions and the Duplomatic valve to be coupled to. As shown at par. 1 different settings are possible. Apply for them at our Technical Dept.

CARDS FOR 24V VALVES

CARD					**COUPLING VALVES** (you can find the matches between valves names and catalogue numbers in the group 8 index)		
Name	**I Min** [mA]	**I Max** [mA]	**I Lim** [mA]	**PWM** [Hz]	**Name**	**single coil**	**double coil**
EDM-M111	200	860	1350	100	DSPE*, RPCED1, RPCED1-T3, RPCE2, RPCE3, BLS6, ZDE3, QDE3		
EDM-M112	200	860	1350	200	DSE3, CRE, PRE*, PRE3, PRED3, MZE, DZCE*		
EDM-M131	200	1600	2350	100	DSE5, QDE5		
EDM-M211	200	860	1350	100	DSPE*, ZDE3, BLS6		
EDM-M212	200	860	1350	200	DSE3		
EDM-M231	200	1600	2350	100	DSE5		
EDM-M3312	200 200	1600 860	2350 1350	200	VPPM-*PQCE regulator		

CARDS FOR 12V VALVES

CARD					**COUPLING VALVES** (you can find the matches between valves names and catalogue numbers in the group 8 index)		
Name	**I Min** [mA]	**I Max** [mA]	**I Lim (#)** [mA]	**PWM** [Hz]	**Name**	**single coil**	**double coil**
EDM-M141	300	1880	2700	100	DSPE*, BLS6		
EDM-M142	300	1880	2700	200	DSE3, CRE, PRE*, PRE3, PRED3, MZE, DZCE*, ZDE3, QDE3		
EDM-M151	500	2600	4000	100	DSE5, QDE5		
EDM-M241	300	1880	2700	100	DSPE*, BLS6		
EDM-M242	300	1880	2700	200	DSE3, ZDE3		
EDM-M251	500	2600	4000	100	DSE5		

I Lim: Max output current from the card.

3 - FUNCTIONAL SPECIFICATIONS

3.1 - Power supply

The card requires a power supply of between 10 and 30V DC ripple included (terminals 1 and 2).

NOTE: The value of the power supply voltage on the card must not be lower than the rated working voltage of the solenoid to be controlled.

The power supply voltage must be recti“ed and “ltered, with maximum admissible ripple within the above voltage range.
The power required by the card depends on the power supply voltage and on the maximum value of the supplied current (it is determined by the card version).
In general a conservative value of the required power can be considered as the product of V x I.
Example: a card with a maximum current = 860 mA and a power supply voltage of 24V DC requires a power of about 20W. With a card with a maximum current =1600 mA and a power supply voltage of 24V DC, the used power is equal to 38,5W.

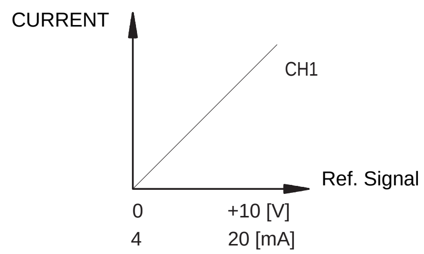
3.2 - Electrical protections

The card is protected against overvoltage and polarity inversion.
On the output a protection against any short circuit is foreseen.

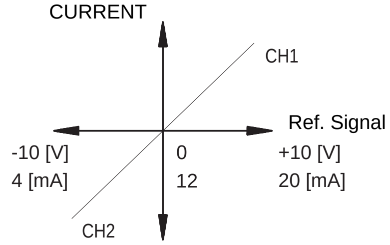
3.3 - Reference signal

The card accepts voltage reference signals 0 ÷ 10 V and ± 10 V, current reference signal 4 ÷ 20 mA, coming from an external generator (PLC, CNC) or from an external potentiometer powered by the card itself. The reference value depends on the card version as stated in the diagrams along side.
See paragraph 12 for the electric connections referring to the different card versions.

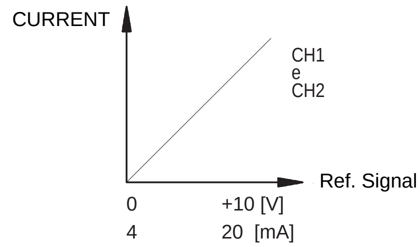
EDM-M1 VERSION



EDM-M2 VERSION



EDM-M3 VERSION



4 - SIGNALS

4.1 - Power ON (Power supply)

The two red displays indicates the card power supply:

ON - normal power supply

OFF - no power supply

FLASHING - see table at paragraph 12.

4.2 - Card ok output

The state of the card can be checked by means of the output •card ok OUTPUTŽ, located on pin 9 (referred to zero power supply, pin 15) with load resistance of 220 K and max current 100 mA . When the card works normally, on this pin there is the same voltage as the power supply; when there is an anomaly, the output voltage is zero.

The anomalies could be:

- low voltage (lower than 10V)
- short circuit
- unconnected coil

If the output pin 9 is low, the control logic forbids the power outputs towards the solenoids. When the anomaly is settled, the card resets automatically.

5 - ADJUSTMENTS

There are two adjustments modalities: variables view and parameters editing. The “rst one enables the real time monitoring of the control values, for both the required and the read current, on both channels. The second modality enables the operating parameters view and editing.

5.1 - Variables view

The card is switched on at the variables view modality, and it shows the “rst variable value, that is the reference signal to channel 1.
By means of (+) and (-) keys, the different variables can be selected. Each time a variable is selected, its short name appears for approximately one second.
By brie”y pressing the (E) key, the current variable name appears for approximately one second.

The variables that can be selected are:

U1: Reference signal to channel 1:

0 + 9,9 V 4 ÷ 20 mA	for single solenoid
- 9,9 / 0 / +9,9 V 4 / 12 / 20 mA	for double solenoid

C1: current required for channel 1, according to the applied reference signal, expressed in ampere, ranging between 0 and 3.0 A

E1: current actually supplied by channel 1, expressed in ampere, ranging between 0 and 3.0 A

U2: Reference signal to channel 2:

0 + 9,9 V 4 ÷ 20 mA	for single solenoid
- 9,9 / 0 / +9,9 V 4 / 12 / 20 mA	for double solenoid

C2: current required for channel 2, according to the applied reference signal, expressed in ampere, ranging between 0 and 3.0 A

E2: current actually supplied by channel 1, expressed in ampere, ranging between 0 and 3.0 A

Only the variables of channel 1 (U1, C1 ed E1) will be viewed, if the card is set for a single solenoid valve.

All the mentioned parameters can be viewed on the display located on the card front panel. It is a two digits display.

The selected value has to be read as follows (example for EDM-M15*/20E* card):

REFERENCE (V)	(mA)	VAR. U1 (V)	VAR. C1/E1	VAR. U2 (V)	VAR. C2/E2
+10	20	10.	18. (A)		
+5	16	5.0	1.0 (A)		
0	12	00	40.(mA)		
0	12			0.0	40.(mA)
-5	8			5.0	1.0 (A)
-10	4			10.	1.8 (A)

5.2 - Parameters editing

By pressing the (-) key for longer than 1,5 seconds, it is possible to switch from the variables view modality to the parameters editing modality, and vice versa.

In the parameters editing modality, the different parameters can be selected, as in the previous modality, by brie”y pressing (+) and (-) keys. Each time a parameter is selected, its short name appears for approximately one second.

By brie”y pressing the (E) key, the current parameter name appears for approximately one second.

By pressing the (E) key for longer than 1,5 seconds, the parameters name ”ashes for approximately one second: by means of (+) and (-) keys, the parameter value can be edited. Each time one of these keys is pressed, the value is either increased or decreased of one unit; by holding the key pressed, the value is continuously increased.

Once the desired value is edited, exit by pressing the (E) key. The value is recorded in the EEPROM, the (+) and (-) keys resume their parameters selection function.

Once the parametrization cycle is completed, by pressing the (+) key more than 2 seconds and until displays blinking, all parameters are saved in EEPROM and the visualization goes back to variables view modality.

The parameters that can be selected are:

G1: •I MaxŽ current, expressed in milliampere.
It sets the maximum current to the solenoid of channel 1, when the reference signal is at the maximum value of +10 V (or 20 mA). It is used to limit the maximum value of the hydraulic size controlled by the valve.
Default value = see paragraph 2

o1: •I MinŽ current, expressed in milliampere.
It sets the offset current to the solenoid of channel 1, when the reference signal exceeds the limit of 0,1 V (or 0,1 mA). It is used to null the insensitiveness area of the valve (dead band).
Default value = see paragraph 2
Range = 0 ÷ 50% of I Max

r1 •Max RampŽ - Ramp time, expressed in seconds.
It sets the time it takes to the current supplied by channel 1 to go from zero to the maximum value, in the case of a reference signal variation from zero to 100% and vice versa. It is used to slow down the valve response time in the case of a sudden variation of the reference signal.
Default value = see paragraph 2
Range = 00 ÷ 20 sec.

u1: •Ramp UpŽ increasing time, expressed in % of the r1 ramp time. It sets the current increasing time on channel 1, for a variation from 0 to 100% of the input reference.
Default value = 99%
Range = 00 ÷ 99%

d1: •Ramp DnŽ - decreasing time, expressed in % of the ramp time. It sets the current decreasing time on channel 1, for a variation from 100% to 0 of the input reference.
Default value = 99%
Range = 00 ÷ 99%

G2: •I MaxŽ - current, expressed in milliampere.
It sets the maximum current to the solenoid of channel 2, when the reference signal is at the maximum value.
Default time = see paragraph 2

o2: •I MinŽ - current, expressed in milliampere.
It sets the offset current to the solenoid of channel 2.
Default value = see paragraph 2
Range = 0 ÷ 50% of Imax

r2: •Max RampŽ - Ramp time, expressed in seconds.
It sets the time it takes to the current supplied by channel 1 to go from zero to the max value, in the case of a reference signal variation from zero to 100% and vice versa. It is used to slow down the valve response time in the case of a sudden variation of the reference signal.
Default value = see paragraph 2
Range = 00 ÷ 20 sec.

u2: •Ramp UpŽ increasing time, expressed in % of the r2 ramp time. It sets the current increasing time on channel 2, for a variation from 0 to 100% of the input reference.
Default value = 99%
Range = 00 ÷ 99%

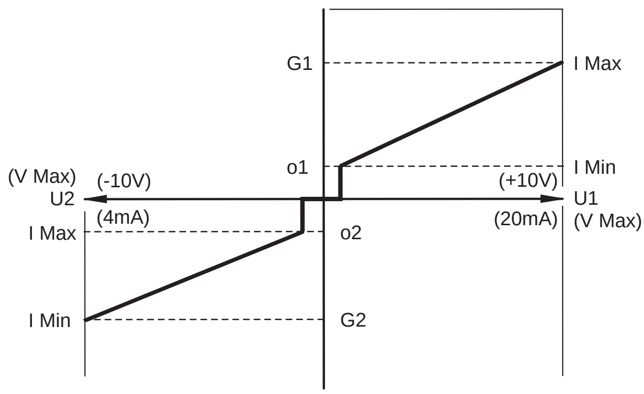
d2: •Ramp DnŽ decreasing time, expressed in % of the r2 ramp time. It sets the current decreasing time on channel 2, for a variation from 100% to 0 of the input reference.
Default value = 99%
Range = 00 ÷ 99%

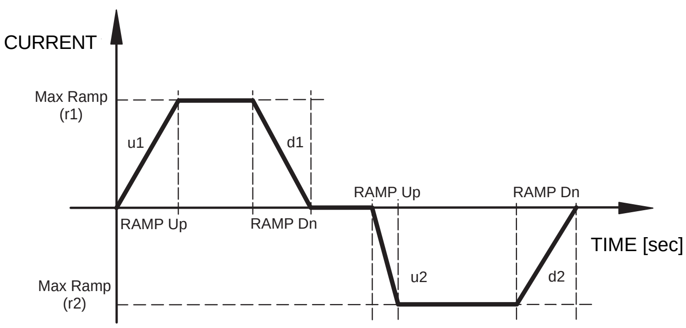
Fr: •PWM FreqŽ - PWM expressed in Hertz.
It sets the PWM frequency, which is the pulsating frequency of the control current. The PWM decrease improves the valve accuracy, decreasing the regulation stability. The PWM increase improves the regulation stability, causing a higher hysteresis.
Default value = PWM (according to card version)
Range = 50 ÷ 400Hz

U1 and **U2**: They represent the set point full scale.
By means of this parameter (that is modi“able only via software) it is possible to keep the same resolution, even if the set point is lower than 10V.
Example: with a card EDM-M121 with command 10V and with parameter set as standard, the output current charge is 1200 mA. If •UŽ is set with a value of 500, the output current charge will be 600 mA.

If the card is set for a single solenoid valve, only the channel 1 parameters will be viewed.

Parameters that can be modified in EDM-M2 version





6 - INSTALLATION

The card is designed for rail mounting type DIN EN 50022.
The wiring connections are on the terminal strip located on the bottom of the electronic control unit.
It is recommended to use cable sections of 0.75 mm^2, up to 20 m length and of 1.00 mm^2 up to 40m length, for power supply and solenoid connections. For other connections it is recommended to use cables with a screened sheath connected to earth only on the card side.

NOTE 1
To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the wiring diagram of paragraphs 8 - 9 - 10 and 11 of this catalogue.
As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electric motors, inverters and electrical switches).
In environments that are critical from the electromagnetic interference point of view, a complete protection of the connection wires can be requested.

7 - CONTROL SETTINGS AND SIGNAL MEASUREMENT

7.1 - Setting device

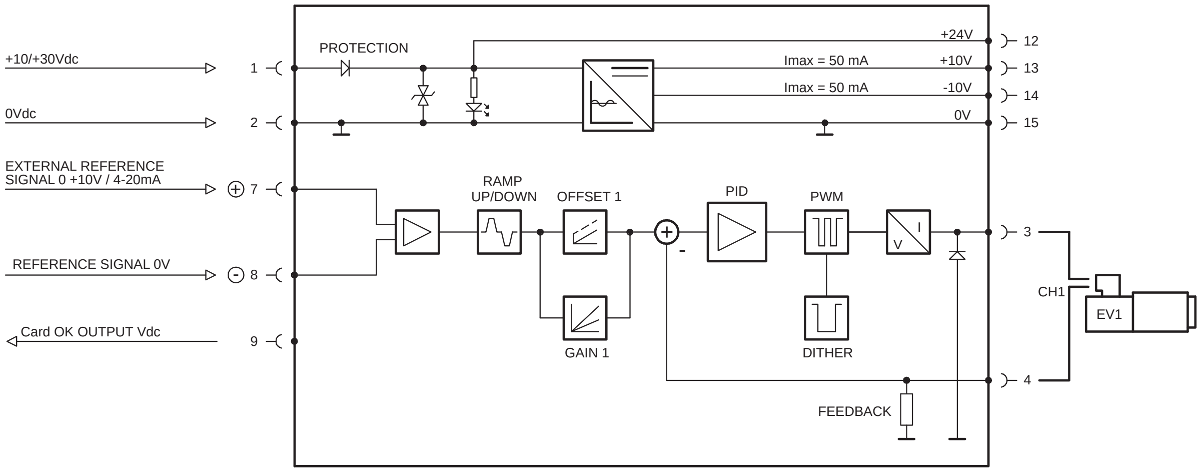
Settings can be changed by either acting on the (+) (E) (-) keys located on the card front panel, or by means of the EDMPC/20 hardware and software kit.

7.2 - EDMPC/20 hardware and software kit (code 3898201010)

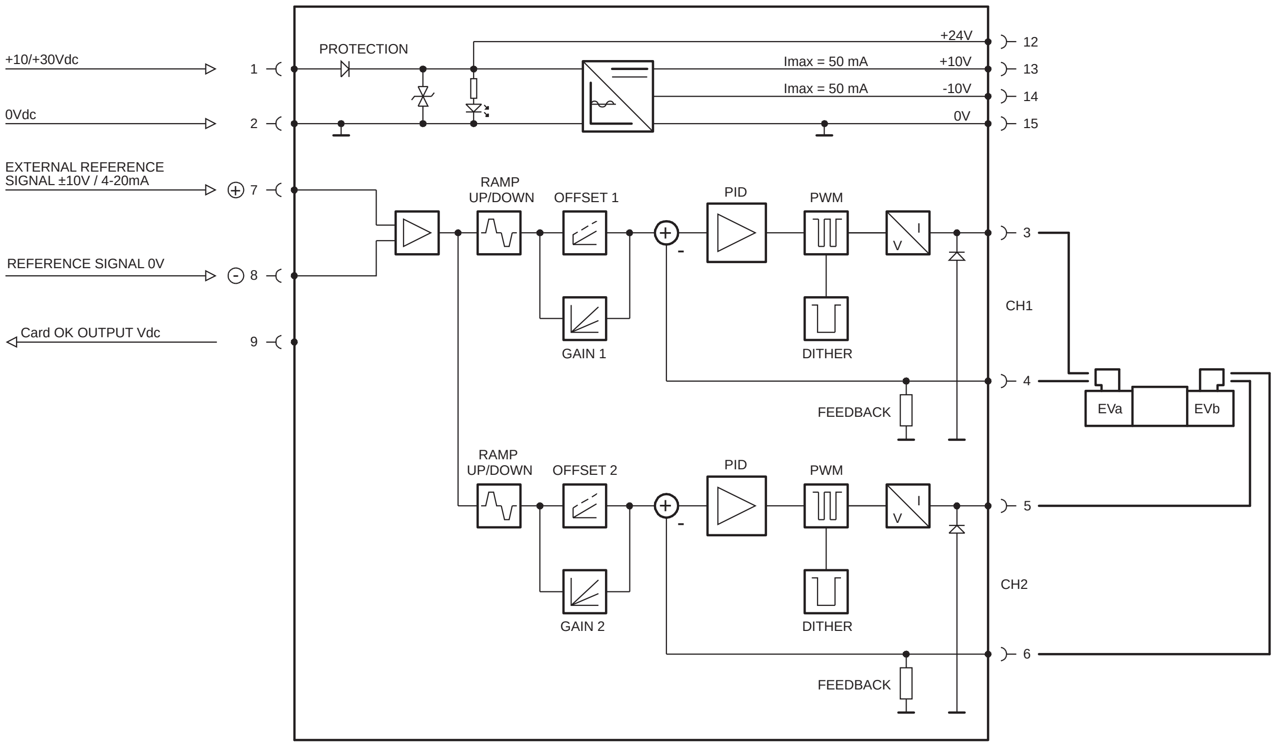
The relevant hardware and software kit (to be ordered separately) enables the signals measurement and the card operations.
The software communicates, through a ”at cable, to the relevant mini USB connector on the EDM card front panel, behind the protecting gate.
The supply includes:
- a communication cable (L=1 meter) for connecting the EDM card to the PC RS232 port;
- a converter from RS232 to USB.

The EDM-PC software compatibility is guaranteed only on Windows 2000 and Windows XP operating systems.

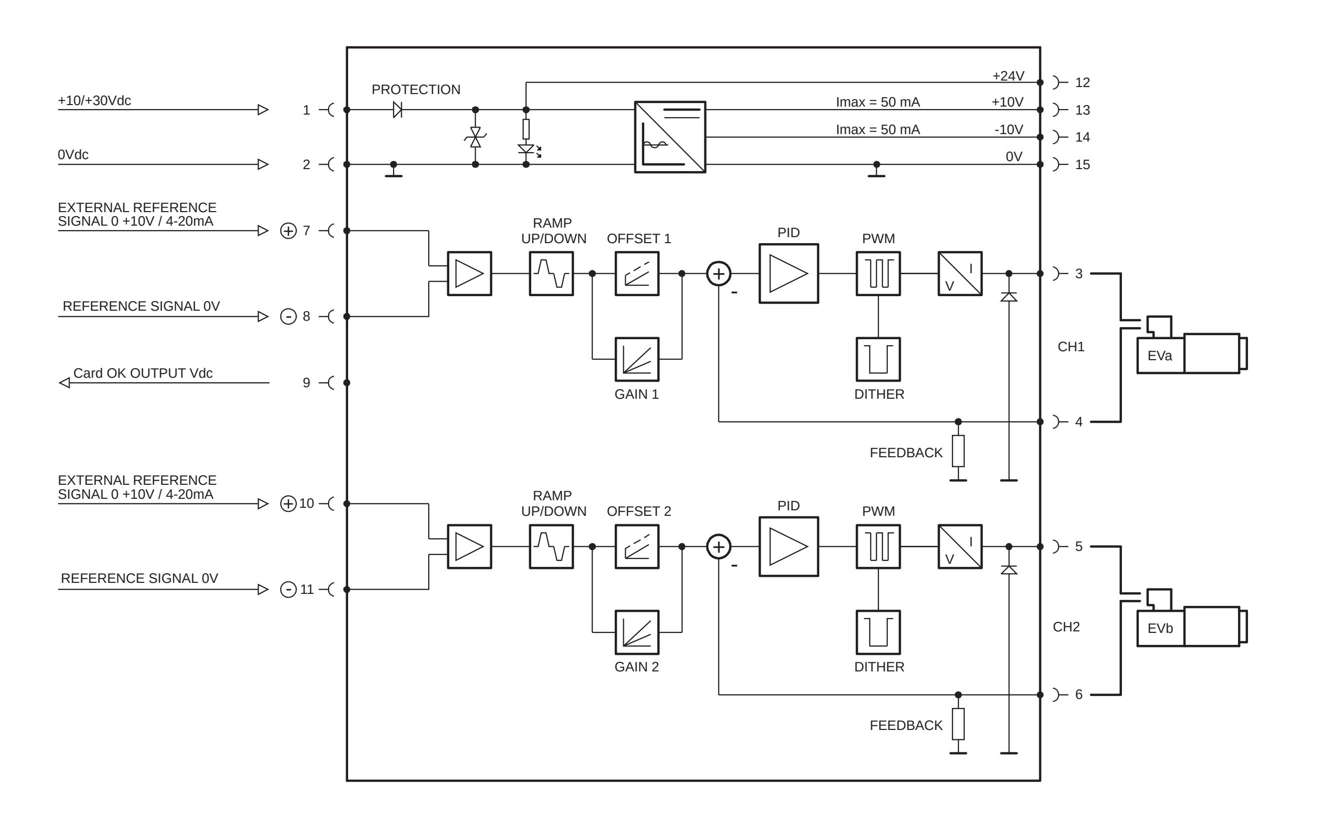
8 - EDM-M1 CARD CIRCUIT AND WIRING DIAGRAM



9 - EDM-M2 CARD CIRCUIT AND WIRING DIAGRAM

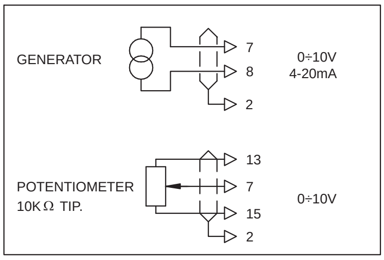


10 - EDM-M3 CARD CIRCUIT AND WIRING DIAGRAM

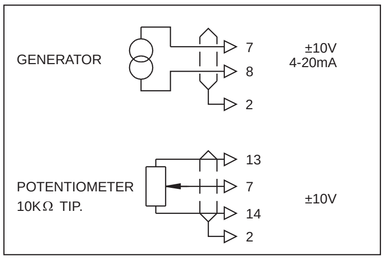


11 - WIRING DIAGRAM FOR REFERENCE SIGNAL

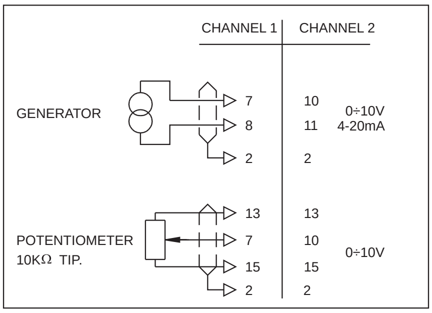
EDM-M1



EDM-M2



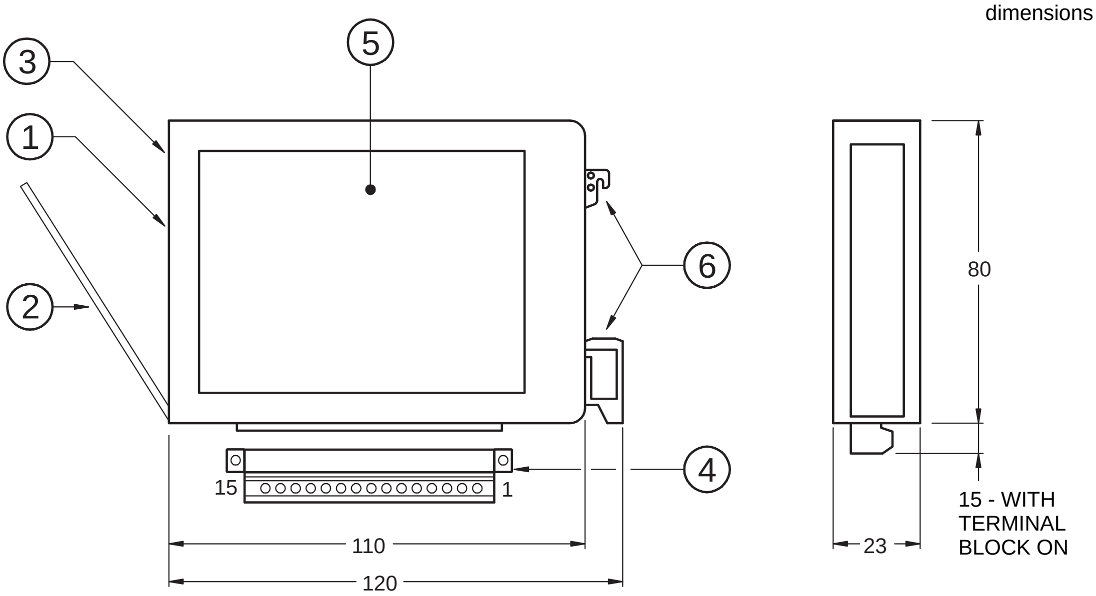
EDM-M3



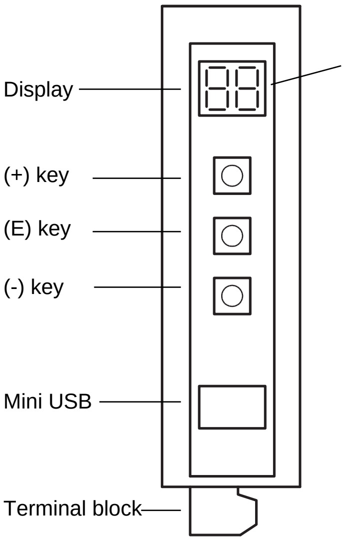
NOTE: the pin 8 (and 11 for EDM-M3 version) must be connected to pin 15 (0V), when the potentiometer is used as reference signal. This is recommended also when the generator has a pure differential output (not connected to ground).

12 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



FRONT PANEL



DISPLAYED CODE:

A1 current lower than 3,5 mA on input 1

A2 current lower than 3,5 mA on input 2

A3 output 1 in short circuit

A4 output 2 in short circuit

A5 output 1 solenoid disconnected

A6 output 2 solenoid disconnected

A7 power supply voltage lower than 10V

NOTE: the displayed code is eliminated removing the cause.

1	Display and mini USB side
2	Buttons protecting gate
3	Display - for card power supply and faults displaying
4	Plug-in 15-pole terminal strip with downwards cables output and fastening bolts
5	Screen printing with card circuit and wiring diagram
6	Connection for rails DIN EN 50022

DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

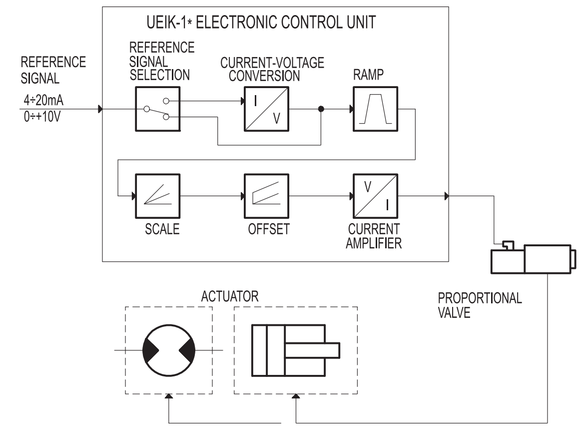
UEIK-1*

ELECTRONIC CONTROL UNIT FOR OPEN LOOP SINGLE SOLENOID PROPORTIONAL VALVE

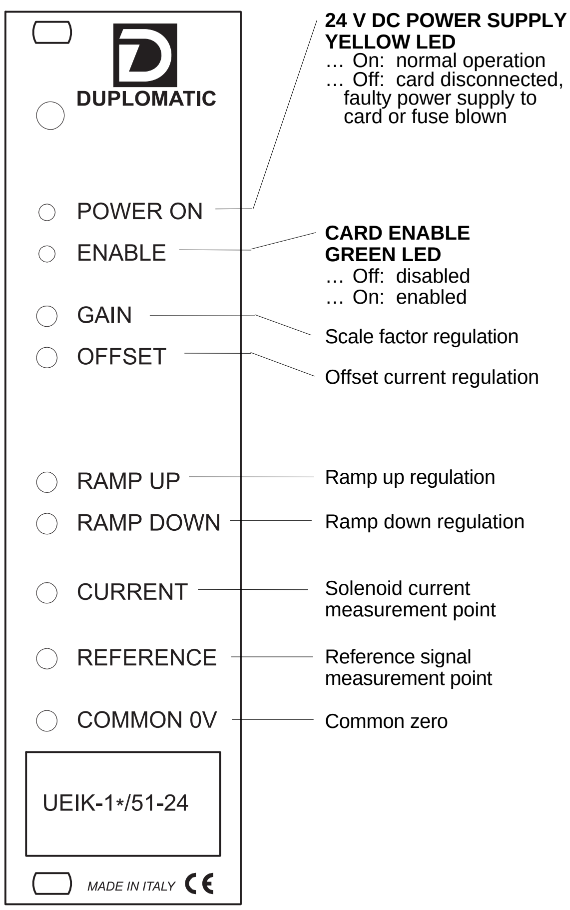
SERIES 51

EUROCARD TYPE

FUNCTIONAL BLOCK DIAGRAM



FRONT PANEL



TECHNICAL CHARACTERISTICS

Power supply	V DC	22 ÷ 30 Ripple included
Required power	See par. 2.1	
Output current	See par. 3.3	
Power supply electrical protection	… overload … polarity inversion	
Reference signal: … Voltage … Current	 V mA	 0 / +10 4 ÷ 20
Input reference signal impedance: … Voltage … Current	k	 10 250
Electromagnetic compatibility (EMC) (see par. 5 - **NOTE** 1)		in compliance with 2004/108/CE
Card size	Eurocard 100x160x35	
Connector interface	DIN 41612-D 32 Male	
Operating temperature range	°C	0 ÷ 50
Mass	kg	0,20

1 - IDENTIFICATION CODE

U	E	I	K	-	1		/	51	-	24

Eurocard type electronic control unit

For open loop single solenoid proportional valves

Maximum current: **1** = 800 mA **2** = 1.200 mA

Power supply voltage = 24 V DC

Series No. (from 50 to 59 sizes and mounting dimensions remain unchanged)

The UEIK-1* card is an electronic control unit Eurocard type for open loop single solenoid proportional valves.

The unit supplies a variable current in proportion to the reference signal and independently of temperature variations or load impedance.

The PWM stage on the solenoid power supply makes it possible to reduce valve hysteresis thus optimising control precision. The front panel is fitted with LEDs to indicate card functions and potentiometers to optimize control.

2 - FUNCTIONAL SPECIFICATIONS

2.1 - Electric power supply

The card requires a power supply of between 22 and 30 V DC (pin 2a/2c - 4a/4c) and a power of: 20W (UEIK-11) - 29W (UEIK-12). Power supply voltage must be rectified and filtered, with maximum admissible ripple within the above voltage range.

2.2 - Electrical protection

The card is protected against overvoltage and polarity inversion.
A 2A fast-acting fuse is fitted for power circuit protection.

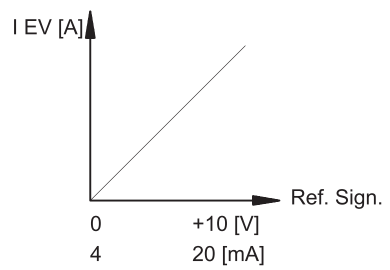
2.3 - Reference signal

The card accepts voltage reference signals (0 to +10V) or current reference signals (4÷20 mA).

N.B: If the signal is transmitted by potentiometer, please verify that this has a load of at least 200 Ω.

See para. 9 for electrical connections.

The diagram shows characteristics of current supplied according to the reference signal.



3 - SIGNALS AND ADJUSTMENT

3.1 - POWER ON

The green LED indicates card power supply:
ON - normal power supply
OFF - no power supply, faulty power supply or blown fuse

3.2 - ENABLE

A 22 to 30 V DC enable command on pin 24c is required for card operation.
The condition of the card enable is shown by both a visible LED on the front panel and as a contact available for the user on pins 6a and 6c.

The green LED indicates:
ON - card enabled
OFF - card disabled or failed

3.3 - GAIN (Scale factor regulation)

The •GAINŽ potentiometer enables regulation of the relation between the set reference value and maximum current supplied to the solenoid and therefore the hydraulic parameter controlled by the valve.

The maximum current of the card is limited to 1,0A (UEIK-11) - 1,2A (UEIK-12). See par. 6 for default values.

Rotate clockwise to increase current.

3.4 - OFFSET (Offset current regulation)

The •OFFSETŽ potentiometer enables regulation of the offset current of the valve. It is used to eliminate the insensitivity zone (dead zone) of the valve.
The regulation field is from 0 to 0,5A (UEIK-11) - from 0 to 0,65A (UEIK-12).

The offset current is activated when the reference signal exceeds the threshold of + 150 mV (or 4,25 mA).
The offset is not active and only the polarization current equal to 25 mA is present beneath this threshold.

NOTE: The variation of the set value of the offset current causes a corresponding variation of the scale factor value.

Rotate clockwise to increase current.

3.5 - RAMP UP / RAMP DOWN (Ramp regulation)

•RAMP UPŽ and •RAMP DOWNŽ potentiometers, in a range from 0,03 to 7 sec., regulates the time required to reach the supplied current according to a step change of the reference signal up or down.

It is possible, in this way, to control the valve response time, adjusting it to the requirements of the hydraulic circuit and the machine cycle.

Ramps can be inhibited by transmitting a 22 to 30 V DC exclusion command to pin 16a. In this case, the ramp residual time is 10 ms.

Rotate clockwise to increase ramp time.

4 - SIGNAL MEASUREMENT

4.1 - CURRENT (Solenoid current measurement point)

Enables voltage reading of current supplied to the solenoid.
Reading conversion: 1V DC = 1A (UEIK-11)
0,82V DC = 1A (UEIK-12).

4.2 - REFERENCE (Reference signal measurement point)

Enables reading in voltage of reference signal sent to the card. Reading is direct, but of opposite sign, with voltage reference while current conversion is: 4 mA = 0 V 20 mA = - 10V.

5 - INSTALLATION

The card is suitable for assembly on a rack or a card holder with interface for connector types DIN 41612 - size D - 32 pole.

It is recommended to use cable sections of 1 to 2,5 mm^2, depending on their length, for power supply and solenoid connections. For other connections it is recommended to use cables with a screened sheath connected to earth only on the card side.

NOTE 1: To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the wiring diagram of par. 9.
As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electric motors, inverters and electrical switches).

In environments that are critical from the electromagnetic interference point of view, a complete protection of the connection wires can be requested.

6 - DEFAULT CONDITIONS

The electronic unit is supplied factory set.
The setting conditions are:

… •GAINŽ regulation: +10V (or 20 mA) reference signal corresponding to a current supply of 0,7 A to the solenoid.
… •OFFSETŽ regulation: zero
… •RAMP UPŽ and •RAMP DOWNŽ regulation: minimum
… position SW1 on V
… position SW2 on S
… position SW3 on AA
… switching frequency (PWM) = 200Hz (UEIK-11)
100Hz (UEIK-12).

7 - START-UP AND CONTROL SETTINGS

If required, it is possible to change the settings as follows:

a) OFFSET CURRENT ADJUSTMENT

… Set •GAINŽ potentiometer to minimum.
… Enter reference signal at maximum value (+10V or 20 mA).
… Set the •OFFSETŽ potentiometer so that the valve is positioned at the start of the work zone.

b) SCALE FACTOR ADJUSTMENT

… Enter the reference signal at maximum value (+10V or 20 mA).
… Set •GAINŽ potentiometer so that the controlled hydraulic parameter reaches the maximum required value.

NOTE: The maximum current value must be compatible with the maximum current prescribed by the technical table of the connected proportional valve.

c) RAMP REGULATION

… Regulate the •RAMP UPŽ and •RAMP DOWNŽ potentiometers to obtain gradual valve operation required with a reference signal variation.

8 - CARD CIRCUIT SETTINGS

The overall and mounting dimensions diagram in par. 10 shows three switch banks: SW 1 - SW 2 - SW 3 which enable the card to be set up as required.

NOTE: Each modification to switch settings must be carried out with the card disconnected from the power supply. The individual switches inside each bank must all be set in the same position.

SELECTION OF VOLTAGE OR CURRENT REFERENCE SIGNAL (SW 1 bank comprising three individual switches)

… select V for voltage reference signal
… select I for current reference signal.

SELECTION OF SINGLE ENDED OR DIFFERENTIAL REFERENCE SIGNAL (SW 2 bank comprising one individual switch)

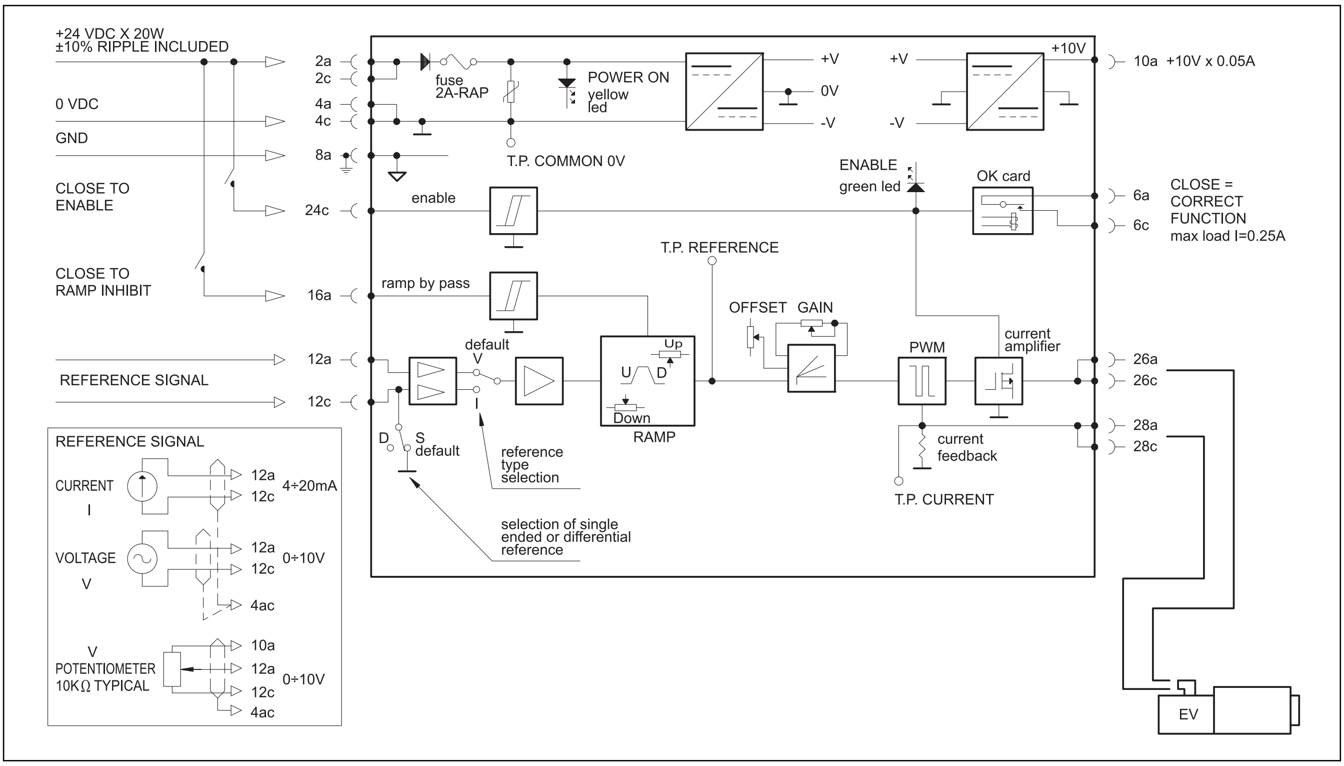
… select S for single ended reference signal. This condition is obligatory in the case where the reference signal is generated with an external potentiometer fed by the card itself.
… select D for differential reference signal. This condition is preferable in the case where the reference signal comes from a PLC or CNC analogic outlet.

NOTE: The SW 3 bank, comprising two individual switches, must always be set at AA as per standard default conditions.

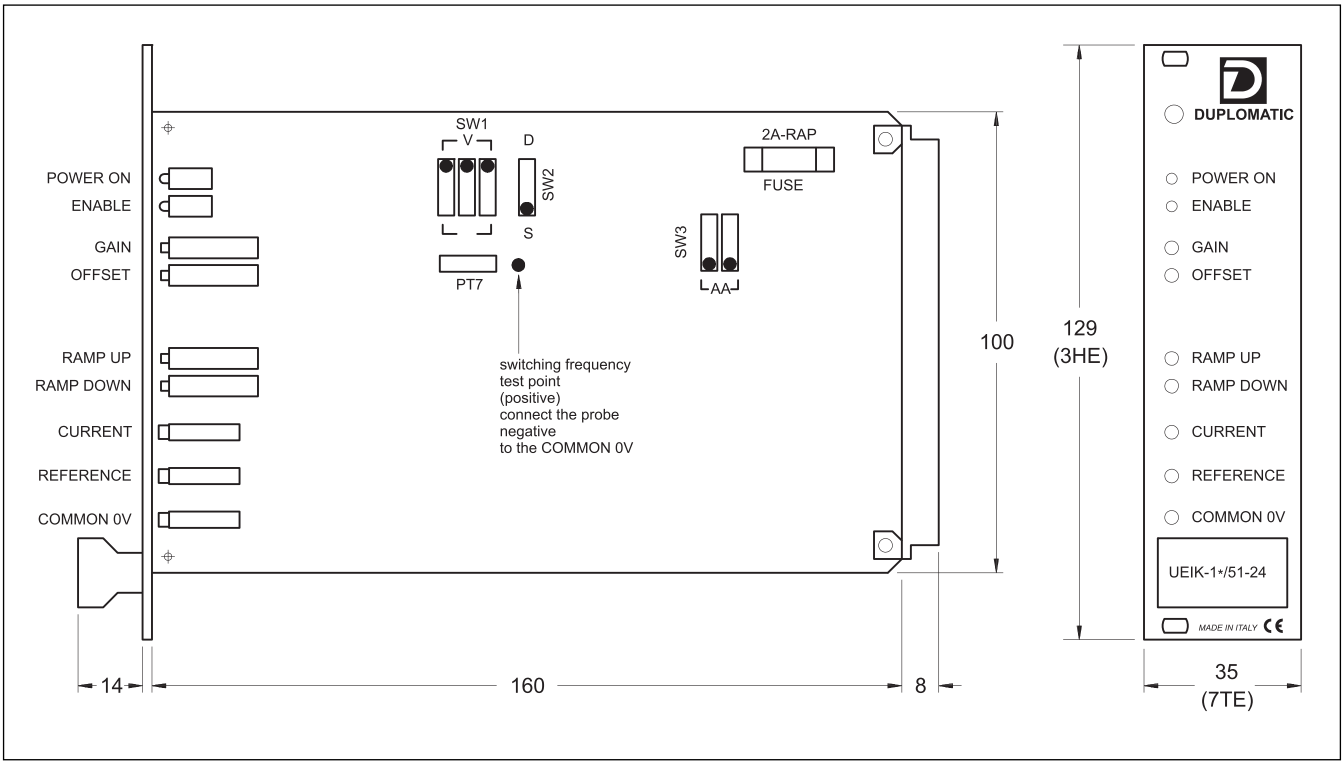
SWITCHING FREQUENCY ADJUSTMENT

It is possible to change the switching frequency (PWM) by acting on the trimmer PT7 (see par. 10).
The setting range is from 80 to 370 Hz.
An appropriate switching frequency adjustment allows reduction of the valve hysteresis value.
Clockwise rotation to increase the frequency.

9 - CARD CIRCUIT AND WIRING DIAGRAMS



10 - OVERALL AND MOUNTING DIMENSIONS



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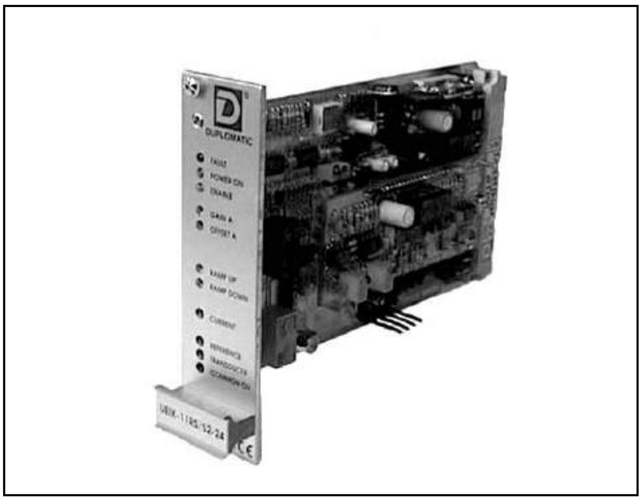
DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com



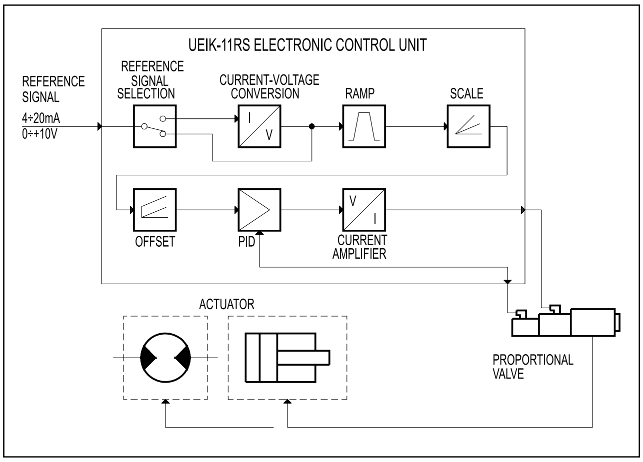
UEIK-11RS*

ELECTRONIC CONTROL UNIT FOR SINGLE SOLENOID PROPORTIONAL VALVE WITH POSITION FEEDBACK

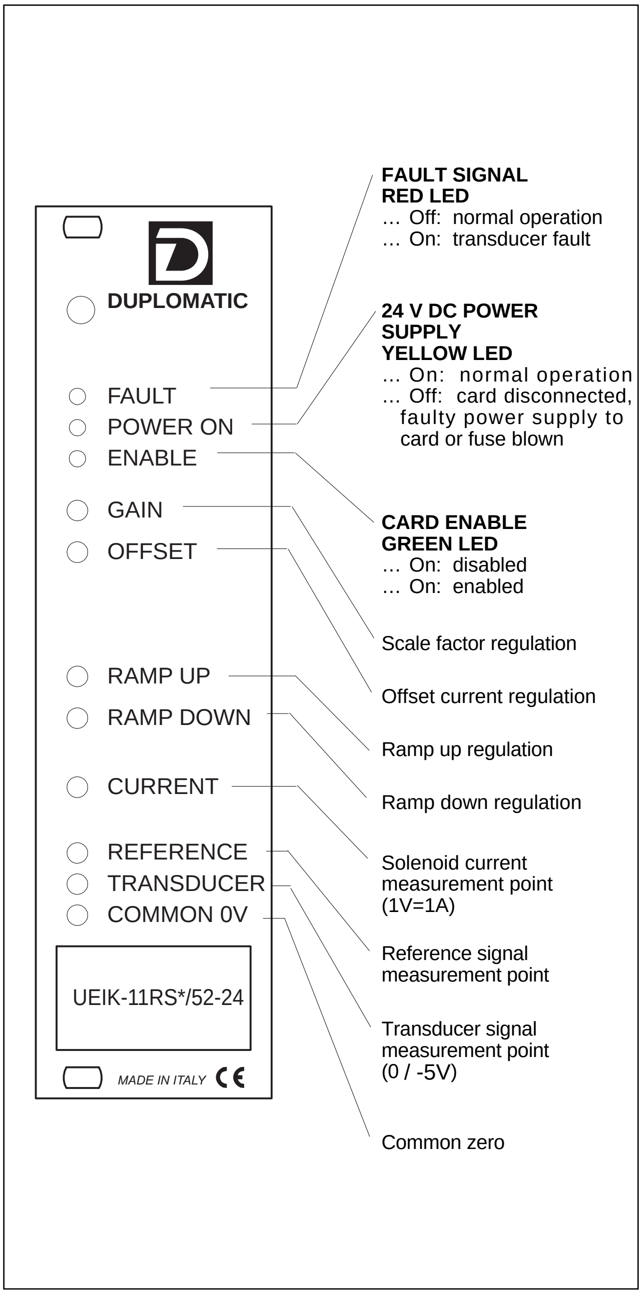
SERIES 52

EUROCARD TYPE

FUNCTIONAL BLOCK DIAGRAM



FRONT PANEL



TECHNICAL CHARACTERISTICS

Power supply	V DC	22 ÷ 30 Ripple included
Required power	W	20 ÷ 45
Output current	see par. 3.4	
Power supply electrical protections	… overload … polarity inversion	
Reference signal: … Voltage … Current	 V mA	 0 ÷ +10 4 ÷ 20
Input reference signal impedance: … Voltage … Current	K	 10 250
Electromagnetic compatibility (EMC) (see par. 5 - **NOTE 1**)		in compliance with 2004/108/CE
Card size	Eurocard 100x160x35	
Connector edge	DIN 41612-D 32 Male	
Operating temperature range	°C	0 ÷ 50
Mass	kg	0,20

1 - IDENTIFICATION CODE

U	E	I	K	-	11	R	S		/	52	-	24

UEIK: Eurocard type electronic control unit

11: For single solenoid proportional valves

RS: Position feedback control

Q: version for flow control valves type RPCER1/52
D: version for directional valves type DSE3F-S*

52: Series No. (from 50 to 59 sizes and mounting dimensions remain unchanged)

24: Power supply voltage = 24 V DC

The UEIK-11RS*/52 card is an electronic control unit Eurocard type for closed loop control of single solenoid proportional valves with positional feedback control.

The card controls the position of the valve spool according to the reference input signal enabling linear regulation and reduced hysteresis.

The front panel is fitted with LEDs to indicate card functions and potentiometers to optimise control.

2 - FUNCTIONAL SPECIFICATIONS

2.1 - Electric power supply

The card requires a power supply of 22-30 V DC and 20 ÷ 45 W (pin 2a/2c - 4a/4c).

Power supply voltage must be rectified and filtered, with maximum admissible ripple within the above voltage range.

2.2 - Electrical protection

The card is protected against overvoltage and polarity inversion.

A 3,15A fast-acting fuse is fitted for power circuit protection.

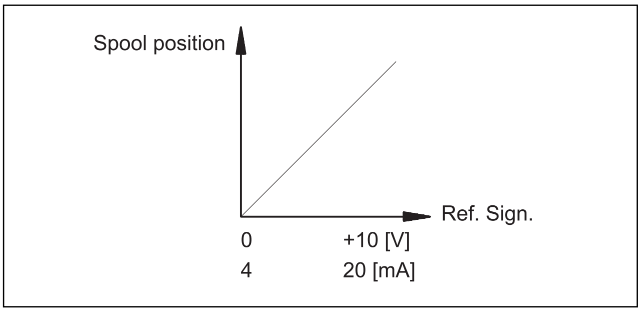
2.3 - Reference signal

The card accepts voltage reference signals (0 ÷ +10V) or current signals (4÷20 mA).

N.B: If the signal is transmitted by potentiometer, please verify that this has a load of at least 200 Ω.

See par. 9 for electrical connections.

The diagram shows characteristics of valve spool position according to the reference signal.



3 - SIGNALS AND ADJUSTMENT

3.1 - FAULT

The red LED indicates operation of the position transducer:
OFF - normal operation
ON - transducer fault or electrical connection failure. In this case the current supply to the solenoid is shut off and the valve is set at the rest position, the ENABLE LED switches off and the OK card relay contact opens (6a - 6c pin)

3.2 - POWER ON

The yellow LED indicates card power supply:
ON - normal power supply
OFF - no power supply, faulty power supply or blown fuse

3.3 - ENABLE

From 22 to 30 V DC (pin 24c) enable command is required for card operation.
The condition of the card enable is shown by both a visible LED on the front panel and as a contact available for the user on pins 6a and 6c.
The green LED indicates:
ON - card enabled
OFF - card disabled

3.4 - GAIN (Scale factor regulation)

The •GAINŽ potentiometer enables regulation of the relation between the set reference value and maximum current supplied to the solenoid and therefore the hydraulic parameter controlled by the valve.
The maximum current of the card is limited to 1A for RSQ version and to 1,8A for RSD version. See par. 6 for default values.
Rotate clockwise to increase current.

3.5 - OFFSET (Offset current regulation)

The •OFFSETŽ potentiometer enables regulation of the offset current of the valve. It is used to eliminate the insensitivity zone (dead zone) of the valve.
The regulation field is from 0 to 0,5A for RSQ version and from 0 to 0,9A for RSD version.

The offset current is activated when the reference signal exceeds the threshold of + 150 mV (or 4,25 mA).
The offset is not active and only the polarization current equal to 25 mA is present beneath this threshold.

NOTE: The variation of the set value of the offset current causes a corresponding variation of the scale factor value.

Rotate clockwise to increase current.

3.6 - RAMP UP / RAMP DOWN (Ramp regulation)

•RAMP UPŽ and •RAMP DOWNŽ potentiometers, in a range from 0,03 to 7 sec., regulates the time required to achieve the supplied current according to a step change of the reference signal up or down.
It is possible, in this way, to control the valve response time, adjusting it to the requirements of the hydraulic circuit and the machine cycle.
Ramps can be inhibited by transmitting a 22 to 30 V DC exclusion command to pin 16a. In this case, the ramp residual time is 10 ms.
Rotate clockwise to increase ramp time.

4 - SIGNAL MEASUREMENT

4.1 - CURRENT (Solenoid current measurement point)

Enables voltage reading of current supplied to the solenoid.
Reading conversion: 1V DC = 1A.

4.2 - REFERENCE (Reference signal measurement point)

Enables reading of reference signal sent to the card.
Reading is direct, but of opposite sign, with voltage reference while current conversion is: 4 mA = 0V 20 mA = -10V.

4.3 - TRANSDUCER (Transducer signal measurement point)

Enables voltage reading of the valve spool position (0 / -5V).

5 - INSTALLATION

The card is designed for assembly on a rack or a card holder with interface for connector types DIN 41612 - size D - 32 pole.
It is recommended to use cable sections of 1 to 2,5 mm^2, depending on their length, for power supply and solenoid connections. For other connections it is recommended to use cables with a screened sheath connected to earth only on the card side.

NOTE 1: To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the wiring diagram of par. 9.
As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electric motors, inverters and electrical switches).
In environments that are critical from the electromagnetic interference point of view, a complete protection of the connection wires can be requested.

6 - DEFAULT CONDITIONS

The electronic control unit is supplied factory-set. Standard settings are:

… •GAINŽ regulation: +10V (or 20 mA) reference signal corresponding to maximum valve opening (transducer = -5V). In open loop •GAINŽ regulation corresponds to a current supply of 1 A for RSQ version and 1,8 A for RSD version, to the solenoid with maximum reference signal.
… •OFFSETŽ regulation: zero
… •RAMP UPŽ and •RAMP DOWNŽ regulation: minimum
… position SW1 on V
… position SW2 on S
… position SW3 on AC
… position S1 on N
… switching frequency (PWM) = 230 Hz

7 - START-UP AND CONTROL SETTINGS

If required, settings can be adjusted as follows:

a) OFFSET CURRENT REGULATION

… Set •GAINŽ potentiometer to minimum.
… Enter reference signal at maximum value (+10V or 20 mA).
… Set the •OFFSETŽ potentiometer so that the valve is positioned at the start of the work zone.

b) SCALE FACTOR REGULATION

… Enter the reference signal at maximum value (+10V or 20 mA).
… Set •GAINŽ potentiometer so that the controlled hydraulic parameter reaches the maximum required value.

c) RAMP REGULATION

… Regulate the •RAMP UPŽ and •RAMP DOWNŽ potentiometers to obtain the gradual valve operation required with a reference signal variation.

8 - CARD CIRCUIT SETTINGS

The overall and mounting dimension diagram in par. 10 shows four switch banks: SW 1 - SW 2 - SW 3 and S1 which enable the card to be set up as required.

NB. Each modification to switch settings must be carried out with the card disconnected from the power supply. The individual switches inside each bank must all be set in the same position.

SELECTION OF VOLTAGE OR CURRENT REFERENCE SIGNAL
(SW 1 bank comprising three individual switches)

… select V for voltage signal
… select I for current signal.

SELECTION OF SINGLE ENDED OR DIFFERENTIAL REFERENCE SIGNAL
(SW 2 bank comprising one individual switch)

… select S for single ended reference signal. This condition is obligatory in the case where the reference signal is generated with an external potentiometer fed by the card itself.
… select D for differential reference signal. This condition is preferable in the case where the reference signal comes from a PLC or CNC analogic outlet.

OPEN OR CLOSED LOOP SELECTION
(SW 3 bank comprising two individual switches)

… select AC for closed loop
… select AA for open loop.

TRANSDUCER POLARITY SELECTION
(SW 1 bank comprising one individual switch)

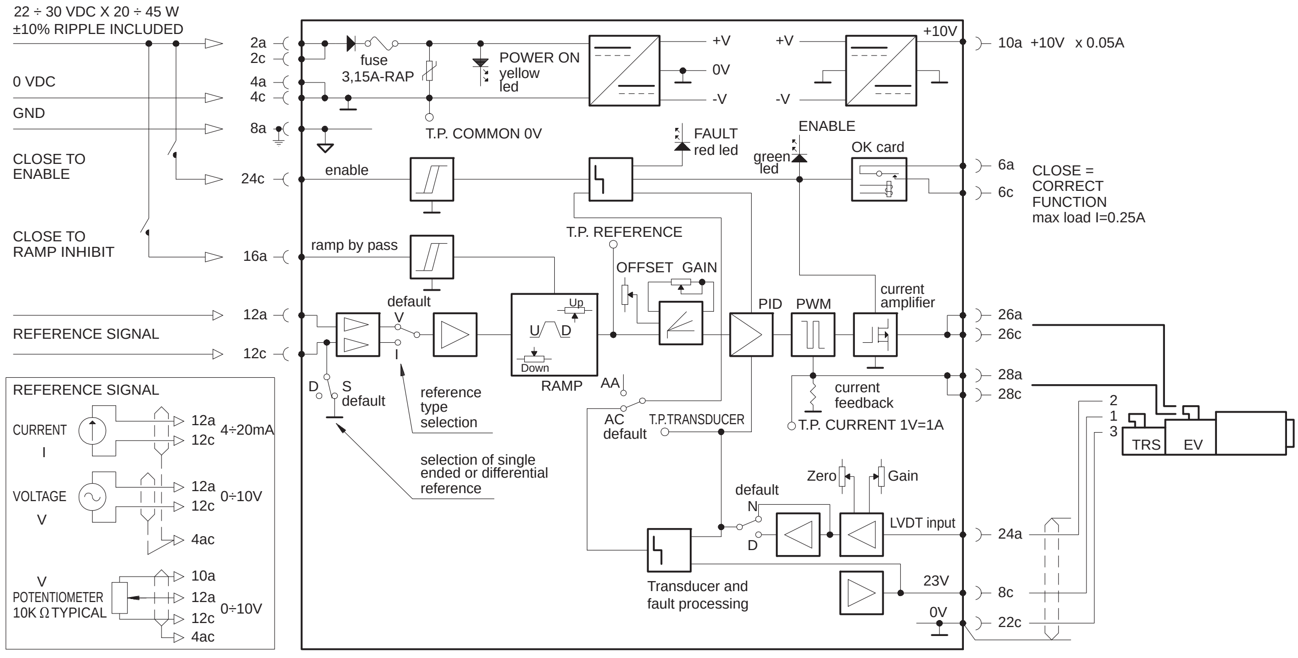
… select N for direct operated valve types DSE3F - RPCER1/52
… select D for piloted valves.

NB. In the event of transducer malfunction, AA can be selected to proceed with open loop operation. In this case, the ENABLE LED illuminates and the OK relay card contacts close and the FAULT LED remains lit to indicate alarm status.

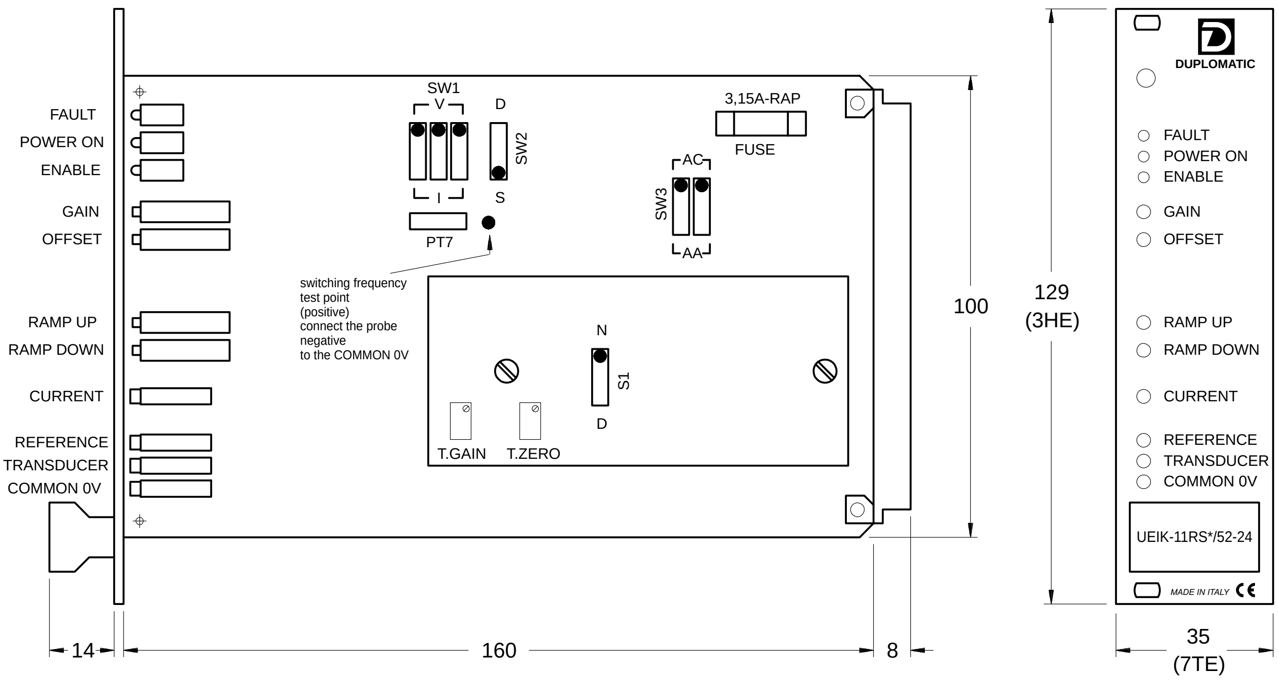
SWITCHING FREQUENCY ADJUSTMENT

It is possible to change the switching frequency (PWM) by acting on the trimmer PT7 (see par. 10).
The setting range is from 80 to 1600 Hz.
An appropriate switching frequency adjustment allows reduction of the valve hysteresis value.
Clockwise rotation to increase the frequency.

9 - CARD CIRCUIT AND WIRING DIAGRAMS



10 - OVERALL AND MOUNTING DIMENSIONS



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DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

DUPLOMATIC OLEODINAMICA

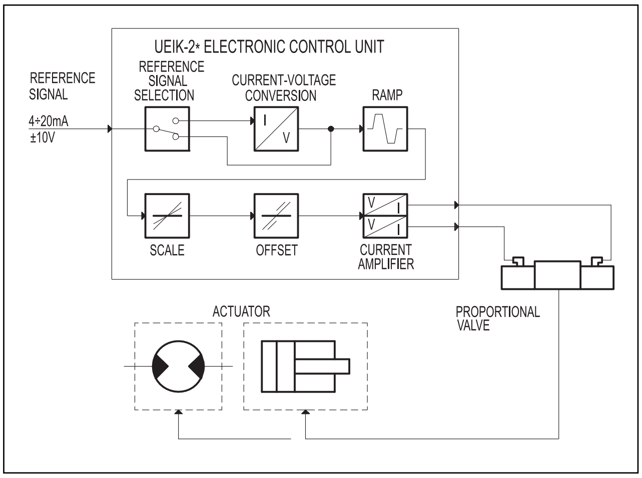
UEIK-2*

ELECTRONIC CONTROL UNIT FOR OPEN LOOP DOUBLE SOLENOID PROPORTIONAL VALVE

SERIES 51

EUROCARD TYPE

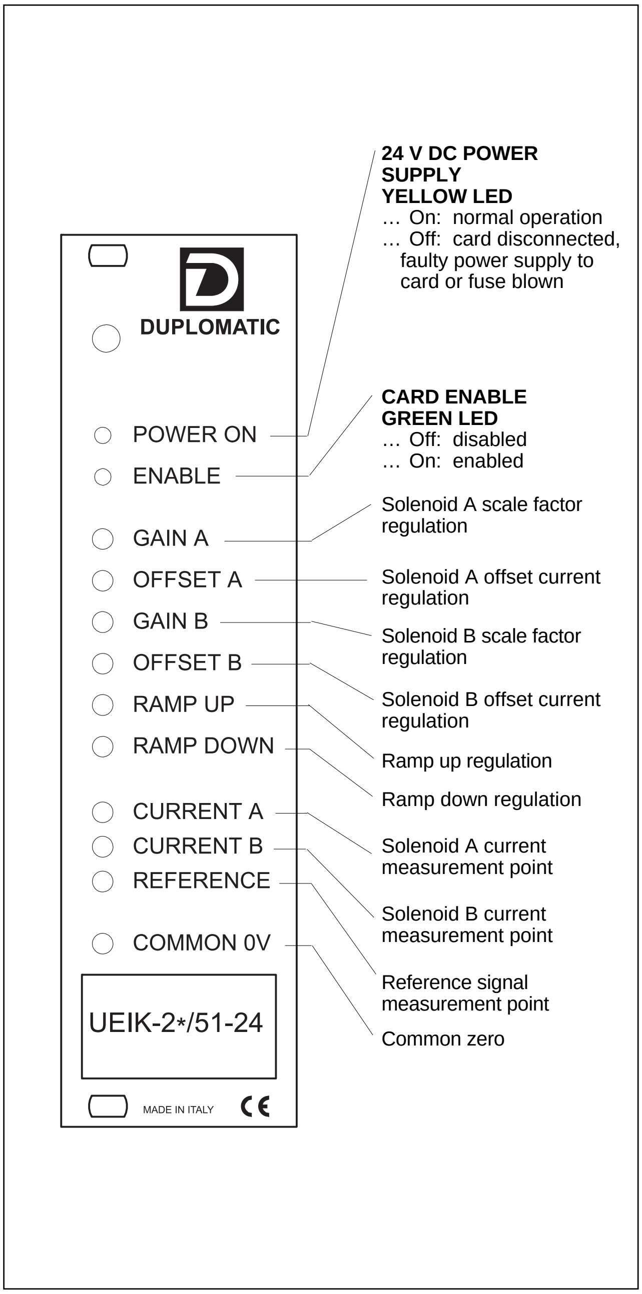
FUNCTIONAL BLOCK DIAGRAM



TECHNICAL CHARACTERISTICS

Power supply	V DC	22 ÷ 30 Ripple included
Required power		See par. 2.1
Output current		See par. 3.3
Power supply electrical protections		… overload … polarity inversion
Reference signal: … Voltage … Current	 V mA	 ± 10 4 ÷ 20
Input reference signal impedance: … Voltage … Current	k	 10 250
Electromagnetic compatibility (EMC) (see par. 5 - **NOTE 1**)		in compliance with 2004/108/CE
Card size		Eurocard 100x160x35
Connector interface		DIN 41612-D 32 Male
Operating temperature range	°C	0 ÷ 50
Mass	kg	0,27

FRONT PANEL



UEIK-2*
SERIES 51

1 - IDENTIFICATION CODE

U	E	I	K	-	2		/	51	-	24

Eurocard type electronic control unit

For open loop double solenoid proportional valves

Maximum current: **1** = 800 mA **2** = 1.200 mA

Power supply voltage = 24 V DC

Series No. (from 50 to 59 sizes and mounting dimensions remain unchanged)

The UEIK-2* card is an electronic control unit Eurocard type for open loop of double solenoid proportional valves.

The unit supplies a variable current in proportion to the input reference signal and independently of temperature variations or load impedence.

The PWM stage on the solenoid power supply makes it possible to reduce valve hysteresis thus optimising control precision. The front panel is fitted with LEDs to indicate card functions and potentiometers to optimize control.

2 - FUNCTIONAL SPECIFICATIONS

2.1 - Electric power supply

The card requires a power supply of between 22 and 30 V DC (pin 2a/2c - 4a/4c) and 20 W (UEIK-21) - 29 W (UEIK-22).

Power supply voltage must be rectified and filtered, with maximum admissible ripple within the above voltage range.

2.2 - Electrical protection

The card is protected against overvoltage and polarity inversion.

A 2A fast-acting fuse is fitted for power circuit protection.

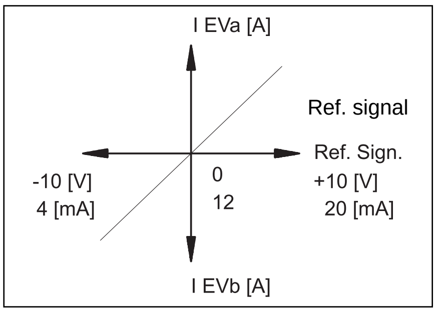
2.3 - Reference signal

The card accepts voltage reference signals (±10V) or current reference signals (4 ÷ 20 mA).

N.B: If the signal is transmitted by potentiometer, please verify that this has a load of at least 200 .

See paraagraph 9 for electrical connections.

The diagram shows characteristics of current supplied according to the reference signal.



3 - SIGNALS AND ADJUSTMENT

3.1 - POWER ON

The yellow LED indicates card power supply:
ON - normal power supply
OFF - no power supply, faulty power supply or blown fuse

3.2 - ENABLE

A 22 to 30 V DC on pin 24c enable command is required for card operation.
The condition of the enable card is shown by both a visible LED on the front panel and as a contact available for the user on pins 6a and 6c.

The green LED indicates:
ON - card enabled
OFF - card disabled or failed

3.3 - GAIN A / GAIN B
(Scale factor regulation of solenoids A and B)

•GAIN AŽ and •GAIN BŽ potentiometers enable regulation of the ratio between the set reference value and current supplied to solenoids A and B respectively. This enables independent regulation of the controlled parameter in the two valve hydraulic configurations.

The maximum current of the card is limited to 1,0A (UEIK-21) - 1,2A (UEIK-22). See par. 6 for default values.

Rotate clockwise to increase current.

3.4 - OFFSET A / OFFSET B
(Polarization current regulation of solenoids A and B)

•OFFSET AŽ and •OFFSET BŽ potentiometers enable regulation of the offset current of the valve solenoids A and B respectively.
They are used to eliminate the valve insensitivity zone (dead zone) in the two valve hydraulic figures.

The regulation range is from 0 to 0,5A (UEIK-21) - from 0 to 0,65A (UEIK-22).

The offset current is activated when the reference signal exceeds the threshold of ±150 mV.
The offset is not active and only the polarization current equal to 25 mA is present beneath this threshold.

NOTE: The variation of the set value of the offset current causes a corresponding variation of the scale factor value.

Rotate clockwise to increase current.

3.5 - RAMP UP / RAMP DOWN (Ramp regulation)

•RAMP UPŽ and •RAMP DOWNŽ potentiometers, in a range from 0,03 to 7 sec., regulate the time taken to achieve the current for a step change of the reference signal up or down. They are independently adjusted and serve both solenoids.

This makes it possible to smooth valve response and adapt it to the requirements of the hydraulic system and the machine cycle.

Rotate clockwise to increase ramp time.

Ramps can be inhibited by transmitting a 22 to 30 V DC command to pin 16a. In this case, the ramp residual time is 10 ms.

4 - SIGNAL MEASUREMENT

4.1 - CURRENT A / CURRENT B
(Current measurement points of solenoids A and B)

Measurement points for voltage readings of current supplied to solenoids A and B. Reading conversion is 1V DC = 1A (UEIK-21) and 0,82V DC = 1A (UEIK-22).

4.2 - REFERENCE (Reference signal measurement point)

Enables reading in voltage of reference signal sent to the card.

Reading is direct, but of opposite sign, with voltage reference while current conversion is: 4 mA = +10V   20 mA = -10V.

5 - INSTALLATION

The card is suitable for assembly on a rack or a card holder with interface for connector types DIN 41612 - size D - 32 pole.

It is recommended to use cable sections of 1 to 2,5 mm^2, in function with their length, for power supply and solenoid connections. For other connections, it is recommended to use cables with a screened sheath connected to earth only on the card side.

NOTE 1
To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the wiring diagram of para.6.
As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electric motors, inverters and electrical switches).

In environments that are critical from the electromagnetic interference point of view, a complete protection of the connection wires can be requested.

6 - DEFAULT CONDITIONS

The electronic control unit is supplied factory-set.

Standard settings are:

… •GAIN AŽ regulation: +10V (or 20 mA) reference signal corresponding to a current supply of 0,82 A to solenoid A.
… •GAIN BŽ regulation: -10V (or 4 mA) reference signal corresponding to a current supply of 0,82 A to solenoid B.
… •OFFSET AŽ or •OFFSET BŽ regulation: zero
… •RAMP UPŽ and •RAMP DOWNŽ regulation: minimum
… position SW1 on V
… position SW2 on S
… position SW3 on AA
… switching frequency (PWM) = 200Hz (UEIK-21)
100Hz (UEIK-22)

7 - START-UP AND FRONTAL SETTINGS

If required, settings can be adjusted as follows:

a) OFFSET CURRENT REGULATION
(Note: the same procedure applies to channels A and B on the card)

… Set •GAIN AŽ or •GAIN BŽ potentiometer to minimum.
… Enter reference signal at maximum value:
+10V (or 20 mA) for solenoid A
- 10V (or 4 mA) for solenoid B.
… Regulate •OFFSET AŽ or •OFFSET BŽ potentiometer so that the valve is positioned at the start of the relative hydraulic configuration work zone.

b) SCALE FACTOR REGULATION
(**NOTE**: the same procedure applies to channels A and B on the card)

… Enter the reference signal at maximum value
+10V (or 20 mA) for solenoid A
- 10V (or 4 mA) for solenoid B.
… Adjust •GAIN AŽ and •GAIN BŽ potentiometers until the size controlled in the relative hydraulic configuration reaches the maximum required value.

NOTE: The maximum current value must be compatible with the maximum current prescribed by the technical table of the connected proportional valve.

c) RAMP REGULATION
… Regulate the •RAMP UPŽ and •RAMP DOWNŽ potentiometers to obtain the required valve smoothness of movement with a reference variation.

8 - CARD CIRCUIT SETTINGS

The overall dimension diagram in par. 10 shows three switch banks: SW 1 - SW 2 - SW 3 which enable card set up as required.

NB. Each modification to switch settings must be carried out with the card disconnected from the power supply. The individual switches inside each bank must all be set in the same position.

SELECTION OF VOLTAGE OR CURRENT REFERENCE SIGNAL (SW 1 bank comprising three individual switches)

… select V for voltage reference signal
… select I for current reference signal.

SELECTION OF SINGLE ENDED OR DIFFERENTIAL REFERENCE SIGNAL (SW 2 bank comprising one individual switch)

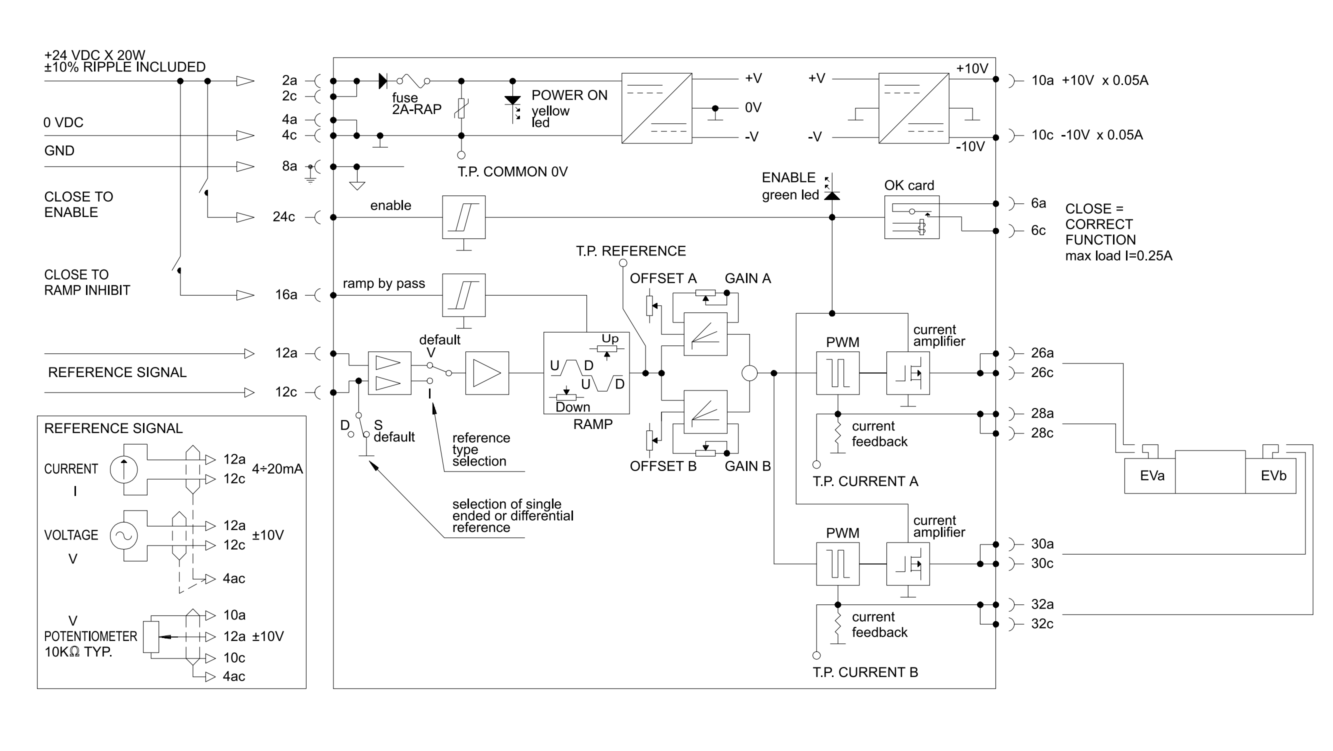
… select S for single ended reference signal. This condition is obligatory in the case that the reference signal is generated with an external potentiometer fed by the card itself.
… select D for differential reference signal. This signal is preferable in the case that the reference signal comes from a PLC or CNC analogic outlet.

NOTE: The SW 3 bank, comprising two individual switches, must always be set at AA as per standard supply conditions.

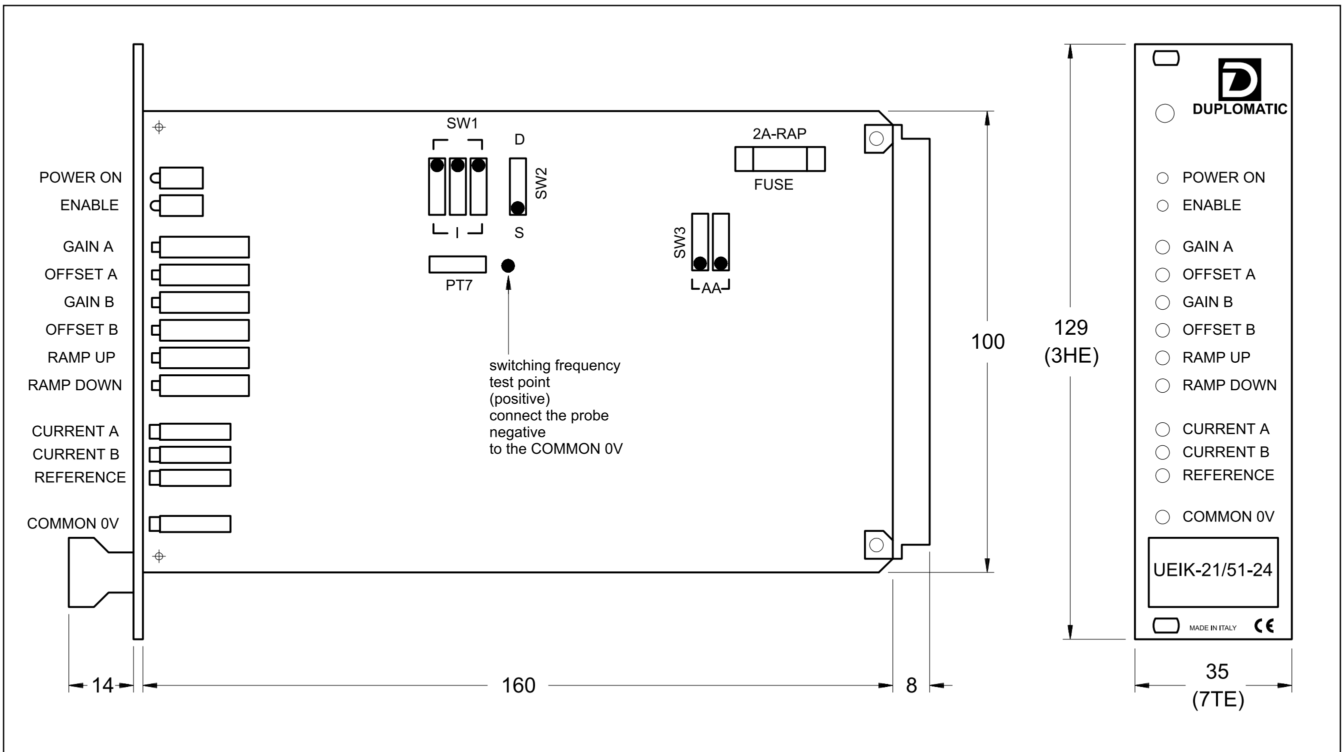
SWITCHING FREQUENCY ADJUSTMENT

It is possible to change the switching frequency (PWM) by acting on the trimmer PT7 (see par. 10).
The setting range is from 80 to 370 Hz.
An appropriate switching frequency adjustment allows reduction of the valve hysterisis value.
Clockwise rotation to increase thefrequency.

9 - CARD CIRCUIT AND WIRING DIAGRAMS



10 - OVERALL AND MOUNTING DIMENSIONS



DUPLOMATIC OLEODINAMICA
DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

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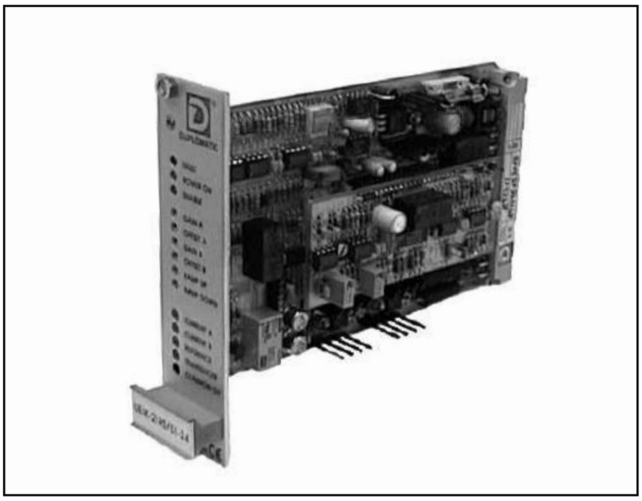


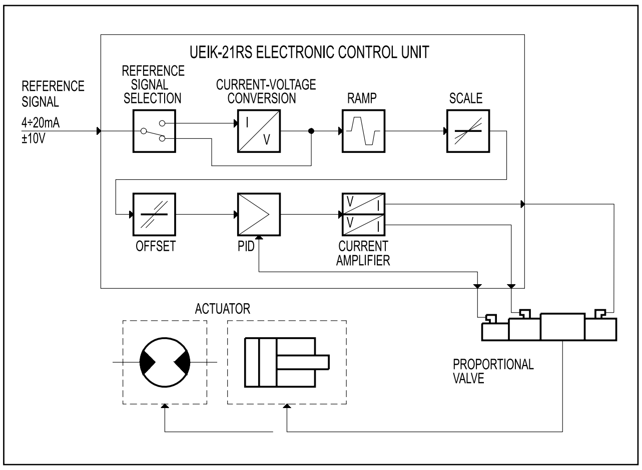
UEIK-21RSD

ELECTRONIC CONTROL UNIT FOR DOUBLE SOLENOID PROPORTIONAL VALVES WITH POSITION FEEDBACK

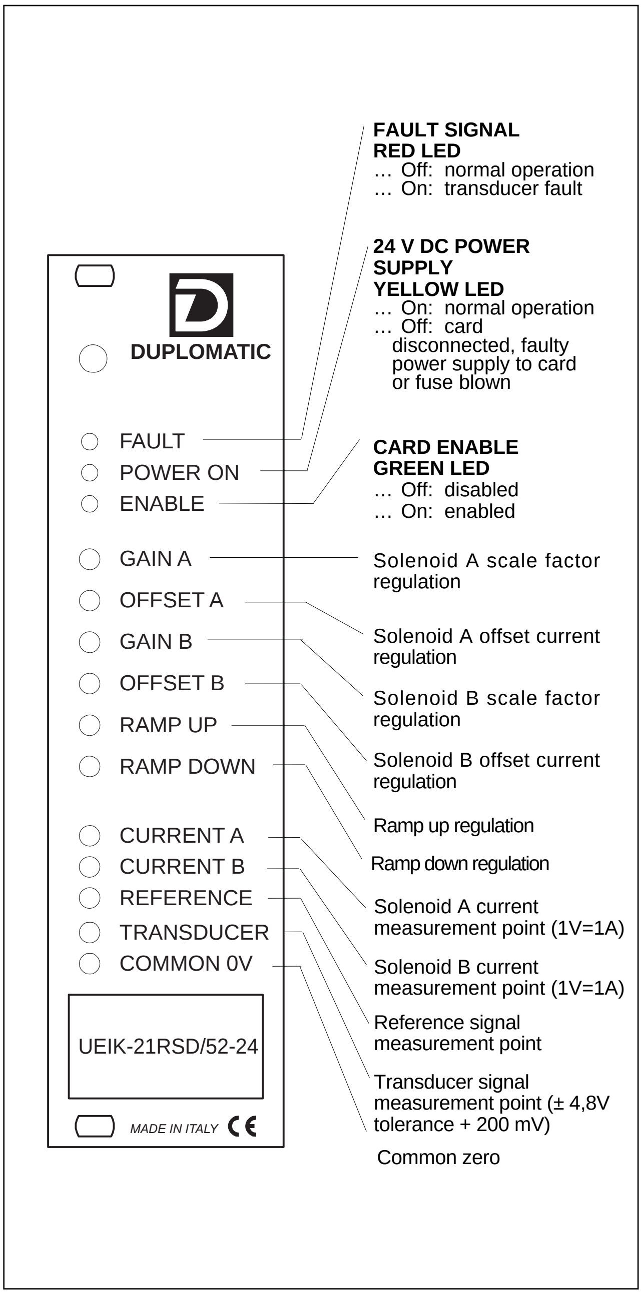
SERIES 52

EUROCARD TYPE

FUNCTIONAL BLOCK DIAGRAM



FRONT PANEL



TECHNICAL CHARACTERISTICS

Power supply	V DC	22 ÷ 30 Ripple included
Required power	W	45
Output current	see par. 3.4	
Power supply electrical protections	… overload … polarity inversion	
Reference signal: … Voltage … Current	 V mA	 ±10 4 ÷ 20
Input reference signal impedance: … Voltage … Current	 kΩ Ω	 10 250
Electromagnetic compatibility (EMC) (see par. 5 - **NOTE 1**)		in compliance with 2004/108/CE
Card size	Eurocard 100x160x35	
Connector interface	DIN 41612-D 32 Male	
Operating temperature range	°C	0 ÷ 50
Mass	kg	0,27

1 - IDENTIFICATION CODE

U	E	I	K	-	21	R	S	D	/	52	-	24

- UEIK: Eurocard type electronic control unit
- 21: For double solenoid proportional valves
- RS: Positional feedback control
- D: for directional valves type DSE3F
- 52: Series No. (from 50 to 59 sizes and mounting dimensions remain unchanged)
- 24: Power supply voltage = 24 VDC

The UEIK-21RS card is an electronic control unit Eurocard type for closed loop control of double solenoid proportional valves with positional feedback control.

The unit controls the position of the valve spool according to the reference input signal ensuring linear regulation with minimum hysteresis.

The front panel is fitted with LEDs to indicate card functions and potentiometers to optimise performance.

2 - FUNCTIONAL SPECIFICATIONS

2.1 - Electric power supply

The card requires a power supply of 22 - 30 V DC and 45 W (pin 2a/2c - 4a/4c).

Power supply voltage must be rectified and filtered, with maximum admissible ripple within the above voltage range.

2.2 - Electrical protection

The card is protected against overvoltage and polarity inversion.
A 3,15A fast-acting fuse is fitted for power circuit protection.

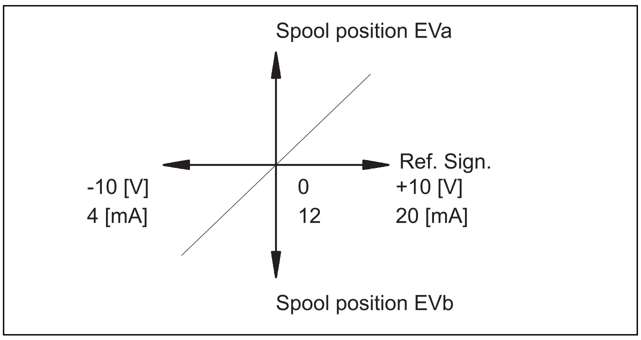
2.3 - Reference signal

The card accepts voltage reference signals (±10V) or current reference signals (4-20 mA).

N.B: If the signal is transmitted by potentiometer, please verify that this has a load of at least 200 Ω.

See par. 9 for electrical connections.

The diagram shows valve spool position characteristics according to the reference signal.



3 - SIGNALS AND ADJUSTMENT

3.1 - FAULT (Fault signal)

The red LED indicates operation of the positional transducer:
OFF - normal operation
ON - transducer fault or power supply failure. In the event of a FAULT, current to the solenoid is shut off and the valve is set at the hydraulic rest configuration, the ENABLE LED switches off and the OK card relay contact opens (6a and 6c pins).

3.2 - POWER ON

The yellow LED indicates card power supply:
ON - normal power supply
OFF - no power supply, faulty power supply or blown fuse

3.3 - ENABLE

A 22 to 30 V DC on pin 24c enable command is required for card operation.
The condition of the enable card is shown by both a visible LED on the front panel and as a contact available for the user on pins 6a and 6c.

The green LED indicates:
ON - card enabled
OFF - card disabled or failed

3.4 - GAIN A / GAIN B
(Scale factor regulation of solenoids A and B)

•GAIN AŽ and •GAIN BŽ potentiometers enable regulation of the ratio between the set reference value and the valve spool position in the two hydraulic configurations controlled by solenoids A and B.
The maximum current of the card is limited to 1,8A.
See par. 6 for default values.
Rotate clockwise to increase current.

3.5 - OFFSET A / OFFSET B
(Offset current regulation of solenoids A and B)

•OFFSET AŽ and •OFFSET BŽ potentiometers enable regulation of the offset current of the solenoids A and B respectively with reference signal set at zero. They are used to eliminate the valve insensitivity zone (dead zone).

The regulation range is from 0 to 0,9A.

The offset current is activated when the reference signal exceeds the threshold of ±150 mV.
The offset is not active and only the polarization current equal to 25 mA is present beneath this threshold.

NOTE: The variation of the set value of the offset current causes a corresponding variation of the scale factor value.

Rotate clockwise to increase current.

3.6 - RAMP UP / RAMP DOWN (Ramp regulation)

•RAMP UPŽ and •RAMP DOWNŽ potentiometers, in a range from 0,03 to 7 sec., regulate the time taken to achieve the current for a step change of the reference signal up or down. They are independently adjusted and serve both solenoids.
This makes it possible to smooth valve response and adapt it to the requirements of the hydraulic system and the machine cycle.

Rotate clockwise to increase ramp time.

Ramps can be inhibited by transmitting a 22 to 30 V DC command to pin 16a. In this case, the ramp residual time is 10 ms.

4 - SIGNAL MEASUREMENT

4.1 - CURRENT A / CURRENT B (Current measurement points of solenoids A and B)

Measurement points for voltage readings of current supplied to solenoids A and B. Reading conversion is 1V DC = 1A.

4.2 - REFERENCE (Reference signal measurement point)

Enables reading in voltage of reference signal sent to the card. Reading is direct, but of opposite sign, with voltage reference while current conversion is: 4 mA = +10V 20 mA = -10V.

4.3 - TRANSDUCER (Transducer signal measurement point)

Enables voltage reading of the valve spool position (± 4,8V - tolerance +200 mV).

5 - INSTALLATION

The card is suitable for assembly on a rack or a card holder with interface for connector types DIN 41612 - size D - 32 pole.
It is recommended to use cable sections of 1 to 2,5 mm^2, in function with their length, for power supply and solenoid connections. For other connections, it is recommended to use cables with a screened sheath connected to earth only on the card side.

NOTE 1: To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the connection scheme of par. 9.
As a general rule, the valve and the electronic unit connection wires must be keeped as far as possible from interference sources (e.g. power wires, electric motors, inverters and electrical switches).
In environments that are critical from the electromagnetic interference point of view, a complete protection of the connection wires can be requested.

6 - DEFAULT CONDITIONS

The electronic control unit is supplied factory-set. Standard settings are:

… •GAIN AŽ regulation: +10V (or 20 mA) reference signal corresponding to maximum valve opening in the hydraulic configuration controlled by solenoid A (transducer = -5V) .
… •GAIN BŽ regulation: -10V (or 4 mA) reference signal corresponding to maximum valve opening in the hydraulic configuration controlled by solenoid B (transducer = +5V).
In open loop •GAIN AŽ and •GAIN BŽ regulations correspond to a current supply of 1,8 A to the solenoids A and B with maximum reference signal.
… •OFFSET AŽ or •OFFSET BŽ regulation: zero
… •RAMP UPŽ and •RAMP DOWNŽ regulation: minimum
… position SW1 on V
… position SW2 on S
… position SW3 on AC
… position S1 on N
… switching frequency (PWM) = 300 Hz

7 - START-UP AND CONTROL SETTINGS

a) OFFSET CURRENT REGULATION
(Note: the same procedure applies to channels A and B on the card)

… Set •GAIN AŽ and •GAIN BŽ potentiometers to minimum.
… Enter reference signal at maximum value:
+10V (or 20 mA) for solenoid A
- 10V (or 4 mA) for solenoid B.
… Regulate •OFFSET AŽ and •OFFSET BŽ potentiometers so that the valve is positioned at the start of the corresponding hydraulic configuration work zone.

b) SCALE FACTOR REGULATION
(Note: the same procedure applies to channels A and B on the card)

… Enter the reference signal at maximum value
+10V (or 20 mA) for solenoid A
- 10V (or 4 mA) for solenoid B.
… Set •GAIN AŽ and •GAIN BŽ potentiometers so that the controlled parameter in the relative hydraulic configuration reaches the maximum required value.

c) RAMP REGULATION

… Regulate the •RAMP UPŽ and •RAMP DOWNŽ potentiometers to obtain the required valve smoothness od movement with a reference position.

8 - CARD CIRCUIT SETTINGS

The overall dimension diagram in par. 10 shows four switch banks: SW 1 - SW 2 - SW 3 and S1 which enable card set up as required.

NB. Each modification to switch settings must be carried out with the card disconnected from the power supply. The individual switches inside each bank must all be set in the same direction.

SELECTION OF VOLTAGE OR CURRENT REFERENCE SIGNAL
(SW 1 bank comprising three individual switches)

… select V for voltage signal
… select I for current signal.

SELECTION OF SINGLE ENDED OR DIFFERENTIAL REFERENCE SIGNAL (SW 2 bank comprising one individual switch)

… select S for single ended reference signal. This condition is obligatory in the case that the reference signal is generated with an external potentiometer fed by the card itself.
… select D for differential reference signal. This signal is preferable in the case that the reference signal comes from a PLC or CNC analogic outlet.

OPEN OR CLOSED LOOP SELECTION
(SW 3 bank comprising two individual switches)

… select AC for closed loop
… select AA for open loop.

TRANSDUCER POLARITY SELECTION
(SW 1 bank comprising one individual switch)

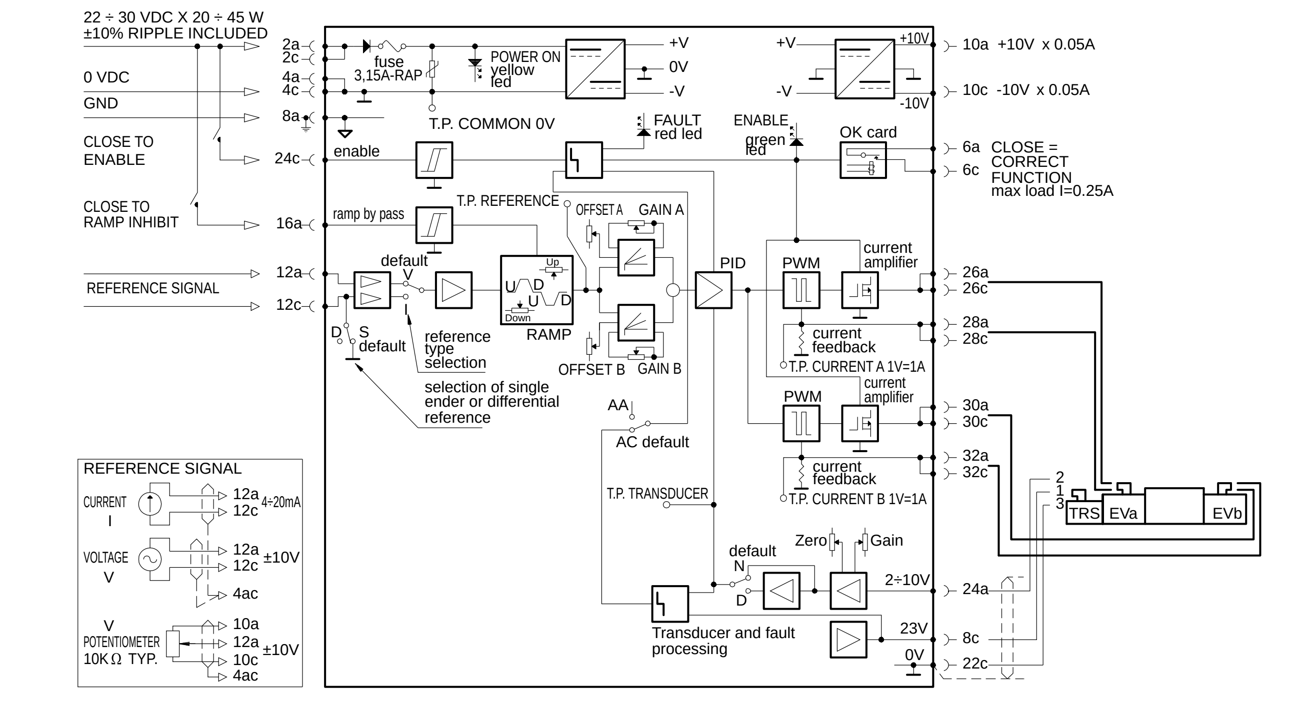
… select N for direct operated valve types DSE3F
… select D for piloted valves.

NB. In the event of transducer malfunction, AA can be selected to proceed with open loop operation. In this case, the ENABLE LED illuminates and the OK relay card contacts close and the FAULT LED remains lit to indicate alarm status.

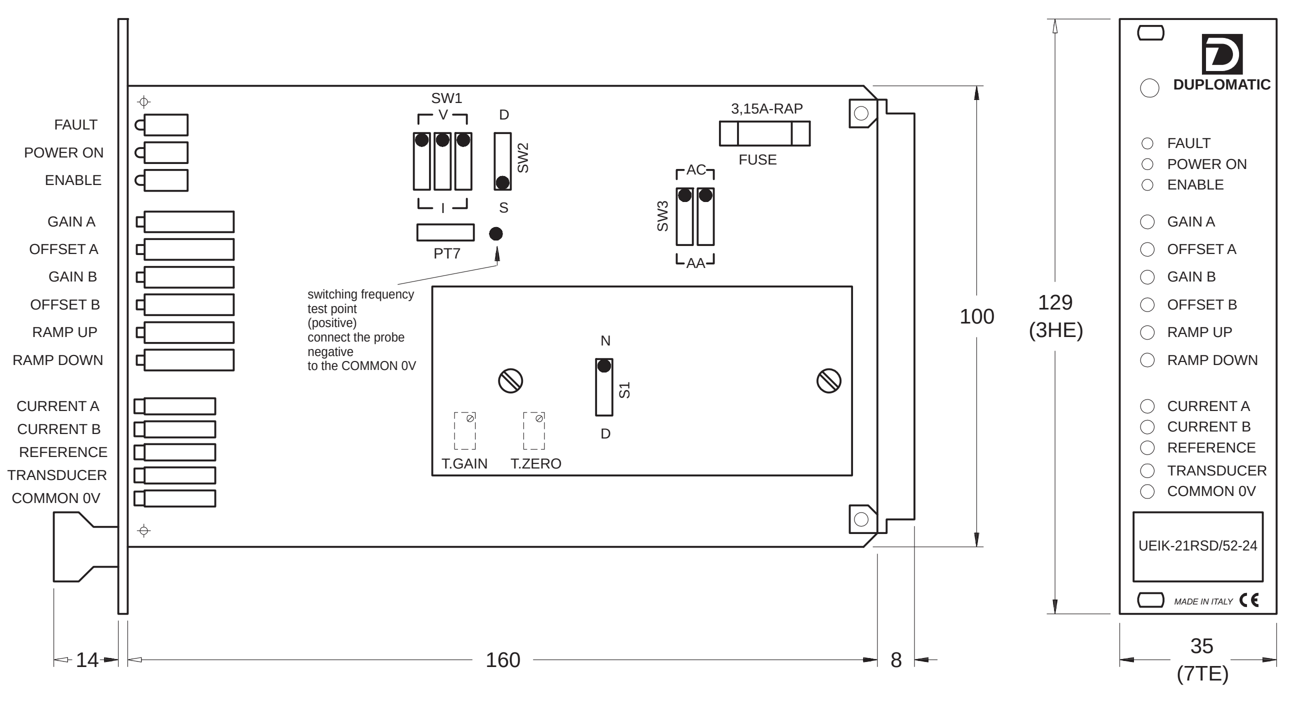
SWITCHING FREQUENCY ADJUSTMENT

It is possible to change the switching frequency (PWM) by acting on the trimmer PT7 (see par. 10). The setting range is from 80 to 1600 Hz.
An appropriate switching frequency adjustment allows reduction of the valve hysterisis value. Clockwise rotation to increase the frequency.

9 - CARD CIRCUIT AND WIRING DIAGRAMS



10 - OVERALL AND MOUNTING DIMENSIONS



DUPLOMATIC OLEODINAMICA

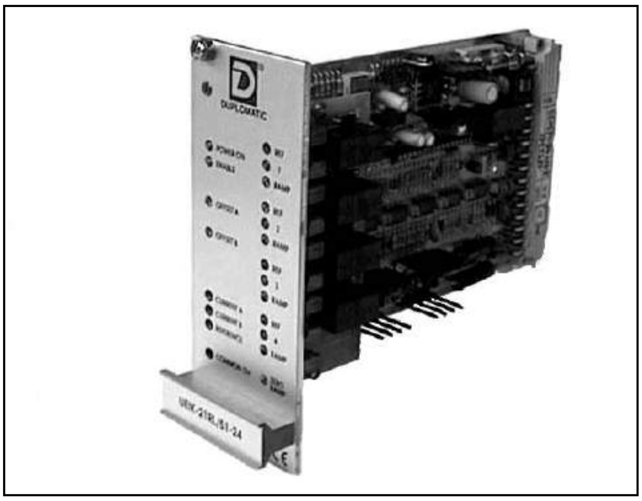
DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

UEIK-2*RL

ELECTRONIC CONTROL UNIT FOR OPEN LOOP DOUBLE SOLENOID PROPORTIONAL VALVE

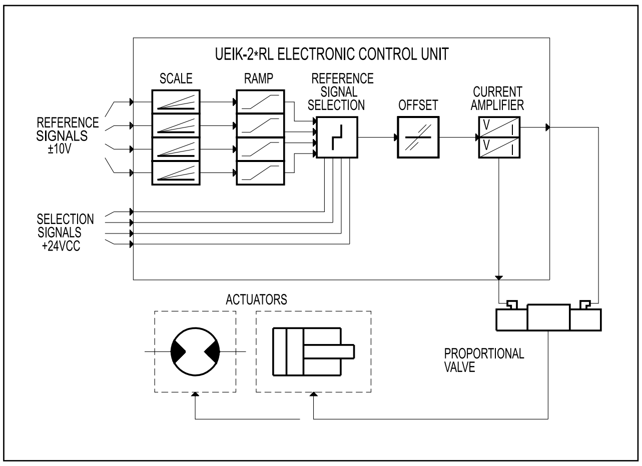
SERIES 51

WITH REFERENCE SIGNAL AND RAMP SELECTION



EUROCARD TYPE

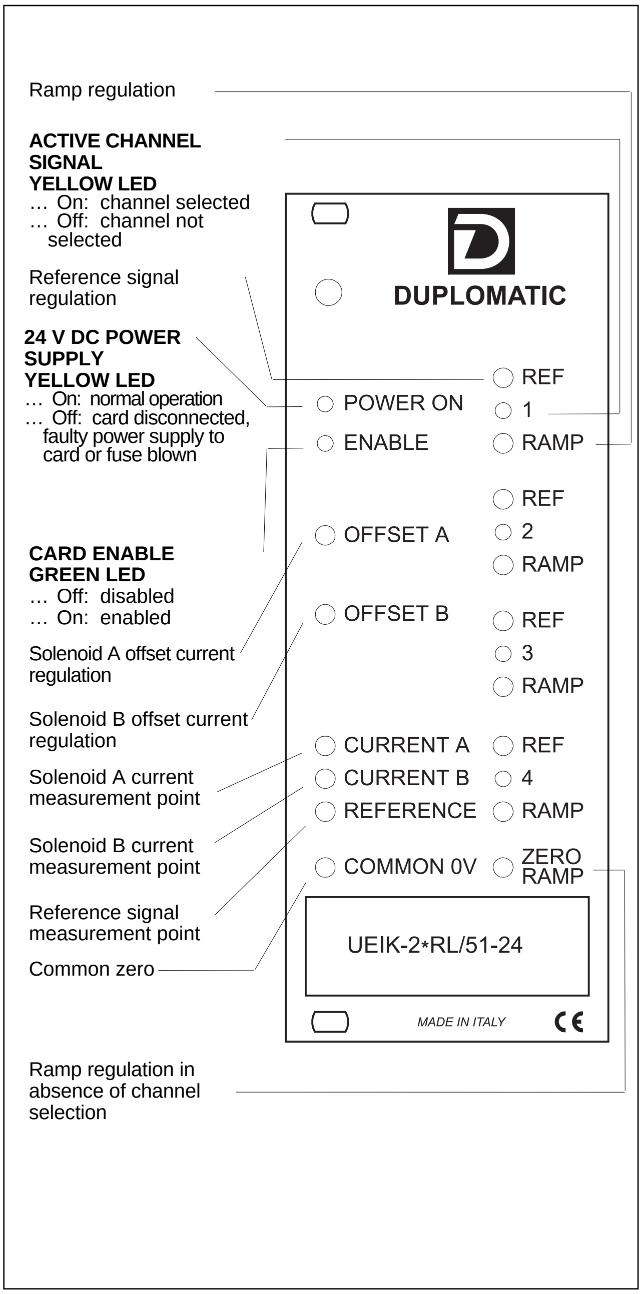
FUNCTIONAL BLOCK DIAGRAM



TECHNICAL CHARACTERISTICS

Power supply	V DC	22 ÷ 30 Ripple included
Required power		see par. 2.1
Output current		see par. 3.4
Power supply electrical protections		… overload … polarity inversion
No. of selectable channels		4
Reference signal	V	± 10 adjustable for each channel
Electromagnetic compatibility (EMC) (see par. 5 - **NOTE 1**)		in compliance with 2004/108/CE
Card size		Eurocard 100x160x50
Connector interface		DIN 41612-D 32 Male
Operating temperature range	°C	0 ÷ 50
Mass	kg	0,3

FRONT PANEL



1 - IDENTIFICATION CODE

U	E	I	K	-	2		R	L	/	51	-	24

Eurocard type electronic control unit

For double solenoid proportional valves

Maximum current: **1** = 800 mA **2** = 1.200 mA

Ramp and reference signal selection

Series No. (from 50 to 59 sizes and mounting dimensions remain unchanged)

Power supply voltage = 24 V DC

The UEIK-2*RL card is an electronic control unit in Eurocard format for open loop control of double solenoid proportional valves, with selection in sequence of four different reference and ramp time regulation signals.

The unit is suitable for management of •fast-slowŽ work cycles.

The front panel is fitted with LEDs to indicate card functions and potentiometers to optimise performance.

2 - FUNCTIONAL SPECIFICATIONS

2.1 - Electric power supply

The card requires a power supply of between 22 and 30 V DC (pin 2a/2c - 4a/4c) and 20 W (UEIK21-RL) - 29 W (UEIK-22-RL).

Power supply voltage must be rectified and filtered, with maximum admissible ripple within the above voltage range.

2.2 - Electrical protection

The card is protected against overvoltage and polarity inversion.

A 2A fast-acting fuse is fitted for power circuit protection.

3 - SIGNALS AND ADJUSTMENT

3.1 - POWER ON

The yellow LED indicates card power supply:
ON - normal power supply
OFF - no power supply, faulty power supply or blown fuse

3.2 - ENABLE

A 22 to 30 V DC on pin 24c enable command is required for card operation.
The condition of the enable card is shown by both a visible LED on the front panel and as a contact available for the user on pins 6a and 6c.

The green LED indicates:
ON - card enabled
OFF - card disabled or failed

3.3 - OFFSET A / OFFSET B
(Polarization current regulation of solenoids A and B)

•OFFSET AŽ and •OFFSET BŽ potentiometers enable regulation of thepolarization current of the solenoids A and B respectively. They are used to eliminate the valve insensitivity zone (dead zone) in the two valve hydraulic configurations.

The regulation field is up between 0 and 0,5 A (UEIK-21-RL) and between 0 and 0,65 A (UEIK-22-RL).
The default value is zero.

The offset current is activated when the reference signal exceeds the threshold of ± 150 mV.
The offset is not active and only the polarization current equal to 25 mA is present beneath this threshold.

NOTE: The variation of the set value of the offset current causes a corresponding variation of the scale factor value.

Rotate clockwise to increase current.

3.4 - REF (Reference signal regulation)

The card enables settings by means of multi-turn potentiometers on the front panel (indicated by •REFŽ) of four different reference signal values (one per channel).

Solenoid A is controlled with positive reference of 0÷+10V, and solenoid B is controlled with negative reference signal of 0÷-10V.

Maximum output current, corresponding to the maximum potentiometers regulation, is limited to 1 A. See par. 6 for default settings.

Rotate clockwise to increase the reference signal by absolute values. See par. 9 for electrical connections.

One of the four channels can be selected automatically by transmitting a +24 V DC command to pin 18c (channel 1) - 18a (channel 2) - 20c (channel 3) - 20a (channel 4).

To obtain correct signal switching and continuous regulation with the selection of channels from 1 to 4, select the new channel before deactivating the previous one. A yellow LED illuminates on the front panel in correspondence to the channel selected.

NB. The system manages reference signals and ramp values of the channel with the highest selected number. To enable channel selection in reverse order (4 to 1) all previous channels must be deactivated.

3.5 - RAMP (Ramp regulation)

A •RAMPŽ potentiometer is associated with each of the channels to enable regulation of the time required to reach the current supplied according to the selected reference signal.
The regulation range is from 0,03 to 7 sec.
This makes it possible to smooth valve response and adapt it to the requirements of the hydraulic system and the machine cycle.
The •ZERO RAMPŽ potentiometer enables regulation of the valve deactivation time (current=0) when all channels are switched off.
Rotate clockwise to increase ramp time.

Ramps can be inhibited by transmitting a 22 to 30 V DC exclusion command to pin 16a. In this case, the ramp residual time is 10 ms.

4 - SIGNAL MEASUREMENT

4.1 - CURRENT A / CURRENT B (Current measurement points of solenoids A and B)

Measurement points for voltage readings of current supplied to solenoids A and B.
Reading conversion is 1V DC = 1A (UEIK-21-RL) and
0,82 V DC = 1A (UEIK-22-RL).

4.2 - REFERENCE (Reference signal measurement point)

Enables reading of reference signal related to the selected channel, in voltage, but of the opposite sign.

5 - INSTALLATION

The card is suitable for assembly on a rack or a card holder with interface for connector types DIN 41612 - size D - 32 pole.

It is recommended to use cable sections of 1 to 2,5 mm^2, in function with their length, for power supply and solenoid connections. For other connections, it is advisable to use cables with a screened sheath connected to earth only on the card side.

NOTE 1
To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the wiring diagram of par. 9.
As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electricmotors, inverters and electrical switches).

In environments that are critical from the electromagnetic interference point of view, a complete protection of the connection wires can be requested.

6 - DEFAULT CONDITIONS

The electronic control unit is supplied factory-set.

Standard settings are:

… •OFFSETŽ regulation: zero
… •REFŽ regulation:corresponding to 0,82A to A and B solenoids
… •RAMPŽ regulation: minimum
… position SW1 on V
… position SW2 on S
… position SW3 on AA
… switching frequency (PWM) = 200Hz (UEIK-21-RL) - 100Hz (UEIK-22-RL)

7 - START-UP AND FRONTAL SETTINGS

Settings can be modified and references can be regulated according to specific work cycles as follows:

a) OFFSET CURRENT REGULATION

… Select one of the channels connected to positive reference +10V (pin 10a).
… Regulate the relative potentiometer •REFŽ at a value between 200 and 300 mV (for reference signal see par. 4.2)
… Regulate the •OFFSET AŽ potentiometer so that the valve is positioned at the start of the work zone controlled by solenoid •AŽ.

Repeat the procedure by selecting a channel connected to the negative reference -10V (pin 10c) and regulate the •OFFSET BŽ potentiometer.

b) REFERENCE REGULATION

… Select a channel and regulate the relative •REFŽ potentiometer to obtain the required actuator speed.
… Repeat the procedure for all four channels to obtain the required speed cycle.

c) RAMP REGULATION

… Regulate the four •RAMPŽ potentiometers to obtain the required regulation smoothness during passage from one channel to another.
… Regulate the •ZERO RAMPŽ potentiometer to obtain regulation smoothness when all four channels are deactivated.

8 - CARD CIRCUIT SETTINGS

The overall dimension diagram in par. 10 shows three switch banks: SW 1 - SW 2 - SW 3 which enable card set mup as required.

NB. Each modification to switch settings must be carried out with the card disconnected from the power supply. The individual switches inside each bank must all be set in the same position.

SELECTION OF SINGLE ENDED OR DIFFERENTIAL REFERENCE SIGNAL (SW 2 bank comprising one individual switch)

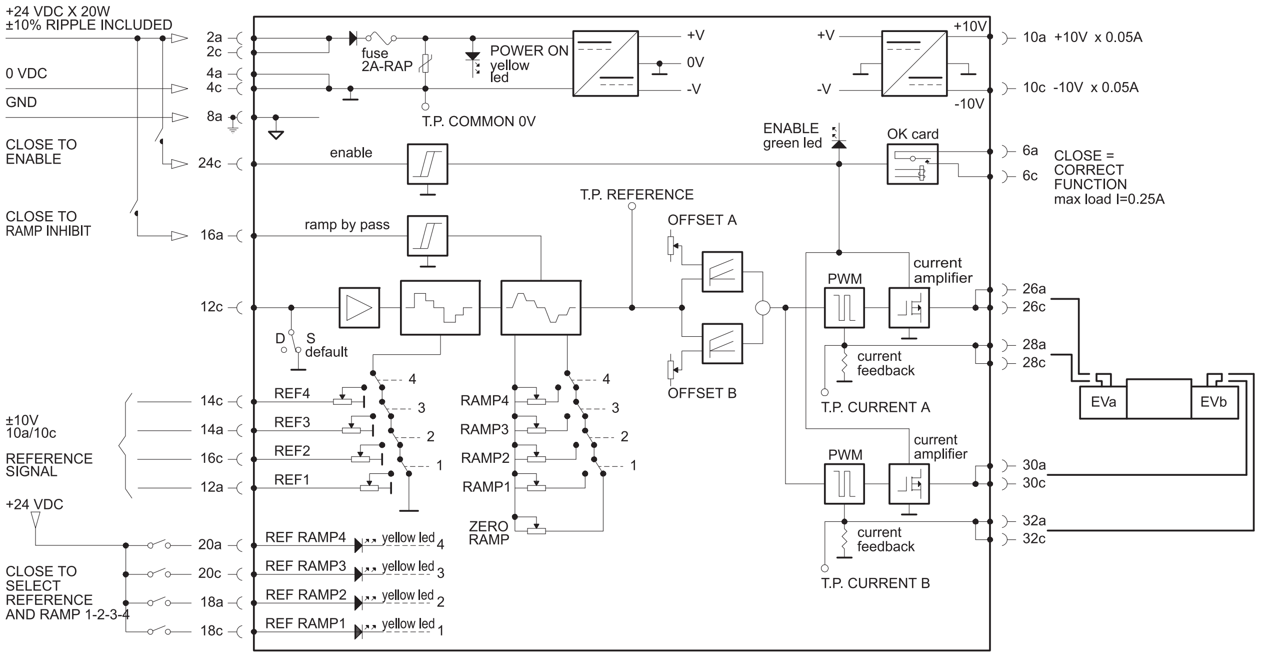
… select S for single ended. This condition is obligatory in the case that the reference signal is generated with the four potentiometers inside the card.
… by selecting D (differential), it is possible to add an external reference signal that can control the valve during the manual cycle.

- SW 1 bank (comprising three individual switches) must always be set on V, as per standard supply conditions.
- SW 3 bank (comprising two individual switches) must always be set on AA, as per standard supply conditions.

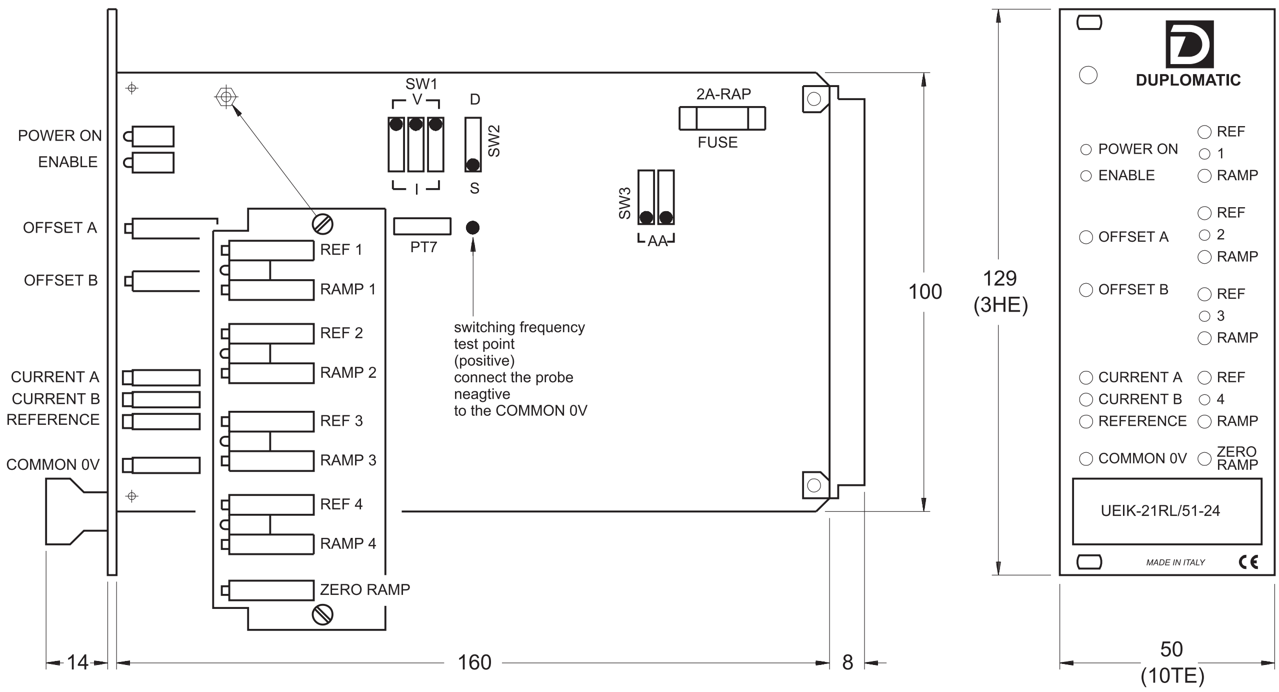
SWITCHING FREQUENCY ADJUSTMENT

It is possible to change the switching frequency (PWM) by acting on the trimmer PT7 (see par. 10).
The setting range is from 80 to 370 Hz.
An appropriate switching frequency adjustment allows reduction of the valve hysterisis value.
Clockwise rotation to increase the frequency.

9 - CARD CIRCUIT AND WIRING DIAGRAM



10 - OVERALL AND MOUNTING DIMENSIONS



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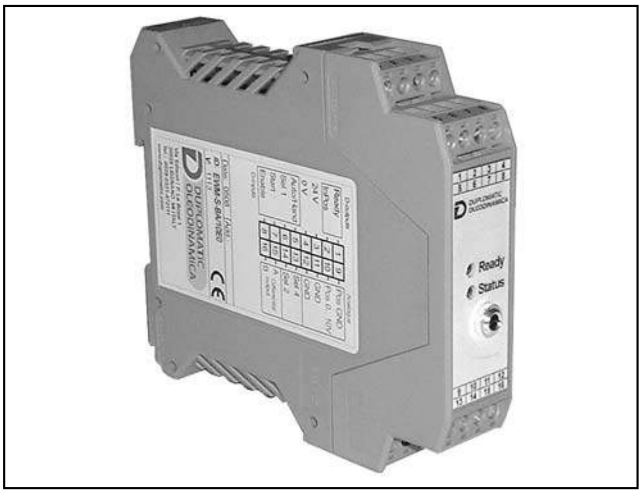
DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com



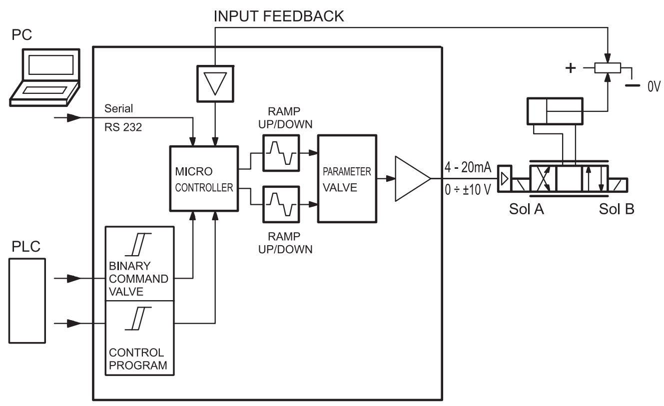
EWM-S-B*

DIGITAL CARD FOR STROKE CONTROL IN CLOSED LOOP SYSTEMS

SERIES 10

RAIL MOUNTING TYPE:
DIN EN 50022

OPERATING PRINCIPLE

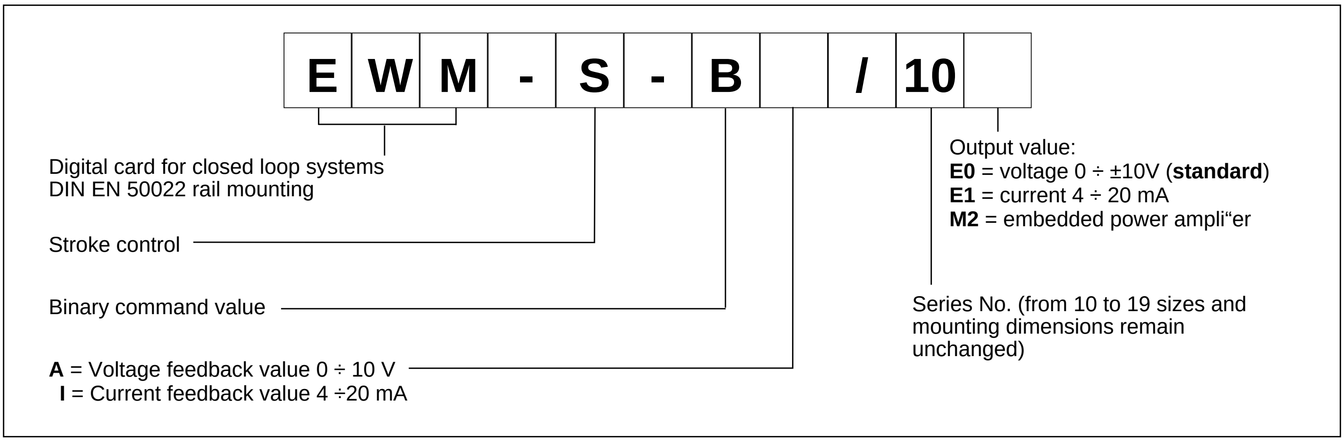


- The EWM-S-B* cards are designed for an easy stroke control of hydraulic actuators connected to a simple PLC with only I/O functions. The target position can be selected by a binary input up to 8 different position.
- Typical applications are positioning drives, handling axis and fast transportable drives (adaptation of non-linear valve characteristics).The card controls a directional proportional valve with integrated electronics. As option, an integrated power amplifier is available.
- This card allows an optimal use of overlapped and zero overlapped proportional valves.
- Internal function and failure are monitored with two digital output easy to read.
- The card use the RS232C interface, and is settable via notebook, using the kit (EWMPC).

TECHNICAL CHARACTERISTICS

Power supply		V DC	12 ÷ 30 ripple included external fuse 1,0 A (5 A for M2 version)
Current consumption:	- E0 and E1 version - M2 version	mA A	100 + sensor power consumption depending from solenoid current. max 5A
Command value			binary command with 3 bit
Feedback value:	- BA version - BI version	V mA	0 ÷ 10 (R_I = 90 k) 4 ÷ 20 (R_I = 250 k)
Output values:	- E0 version - E1 version - M2 version	V mA A	±10 (max load 5 mA) 4 ÷ 20 (max load 390) 1,0 - 1,6 - 2,6
Position accuracy		%	0,01
Interface			RS 232 C
Electromagnetic compatibility (EMC) according to 2004/108/CE			Emissions EN 61000-6-3 Immunity EN 61000-6-2
Housing material			thermoplastic polyamide PA6.6 -combustibility class V0 (UL94)
Housing dimensions		mm	120(d) x 99(h) x 23(w) or 46 on M2 version
Connector			4x4 poles screw terminals - PE direct via DIN rail
Operating temperature range		°C	-20 / +60
Protection degree			IP 20

1 - IDENTIFICATION CODE



This module supports the simple point-to-point positioning with hydraulic drives. Up to eight target positions (with related velocities) can be selected. The deceleration characteristics can be defined with the command CTRL, choosing between linear (LIN) or nearly square root (SQRT1) parameters. See at par.4, Adjustments.

The sampling time of the control loop is 1 ms.

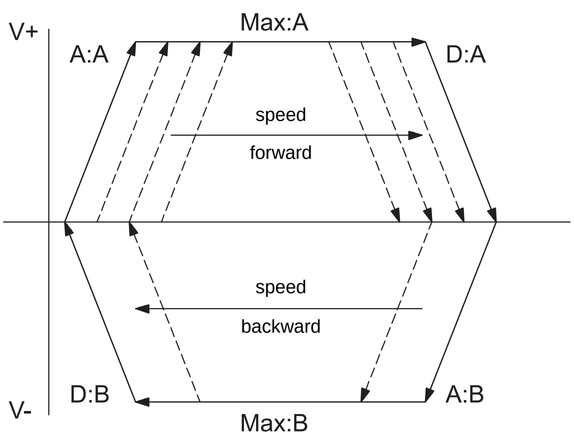
Two operating modes can be selected:

A - stroke depending deceleration, that means the control gain will be adjusted with the parameters D:A and D:B This is a time-optimal positioning structure with vey high stability.

B - NC mode, where the position value is generated from the following error.

The positioning accuracy will almost be limited by the resolution of the transducer, and by the right size of the hydraulic valve. Therefore, the correct valve selection is the most important point. Additionally, two contradictory requirements (short positioning time and high accuracy) have to be considered in the system design.

flow (volume) P A and B T



Sequence of the positioning with 3 target position achievable with the EWM-S-B* cards :

S:0 and V:0 - Switching on and placement to parking position.
S:1 and V:1 - Initial positioning in the work cycle
S:2 and V:2 - Second target position
S:3 and V:3 - Return to the first position;
To begin, the external input START (RUN) must be enabled.

2 - FUNCTIONAL SPECIFICATIONS

2.1 - Power supply

This card is designed for 12 to 30 VDC (typical 24 V) of a power supply. This power supply must correspond to the actual EMC standards.
All inductivity at the same power supply (relays, valves) must be provided with an over voltage protection (varistors, free-wheel diodes).
It is recommended to use a regulated power supply (linear or switching mode) for the card supply and the sensors.

NOTE: in the type M2 the value of the power supply voltage on the card must not be lower than the rated working voltage of the solenoid to be controlled.

2.2 - Electrical protections

All inputs and outputs are protected with suppressor diodes and RC-filters against transient overshoots.

2.3 - Digital Input

The card accepts digital input. The digital input must have a voltage from 12 to 24 V , Low level: <4V, high level >12V with current <0,1A. See the block diagram at paragraph 8 for the electric connections.

2.4 - Feedback input values

The card accepts analogue feedback input. The feedback value must be 0 ÷ 10 V for EWM-S-BA*, and 4 ÷ 20 mA for EWM-S-BI* version.

2.5 - Output values

E0 version: output voltage 0 ±10 V
E1 version: output current 4 ÷ 20 mA
M2 version: Embedded power stage configurable via software with a value of 1, 1.6 or 2.6 A.

2.6 - Digital Output

Two digital output are available, INPOS and READY, that are displayed via LEDs on the front panel
Low level <4V High Level > 10 V Max 50 mA with load 200

3 - LED FUNCTIONS

There are two leds on the card: GREEN and YELLOW.

GREEN: Shows if the card is ready (READY output).

ON - The card is supplied
OFF - No power supply
FLASHING - Failure detected (internal or 4 20 mA).
Only if SENS = ON

YELLOW: Signal of the control error monitoring. (STATUS output)

ON - No control error
OFF - Error detected, depending of a parameter error.

4 - ADJUSTMENTS

On the EWM cards, the adjustment setting is possible only via software. Connecting the card to the PC, the software automatically recognises the card model and shows a table with all the available commands, with their parameters, the default setting, the measuring unit and an explanation of the command and its uses. The parameters changes depending on the card model.

STANDARD PARAMETERS TABLE

Commands	Parameter	Defaults	Units	Description
s:i x	i= 0..7 x= 0..10000	- :0	- 0,01%	Definition of the target positions. The value **i** is related to the input selection (SEL1, SEL2 and SEL4; binary coded).
vc:i x	i= 0..7 x= 0..10000	- :5000	- 0,01%	Definition of the target speeds. The value i is related to the input selection (SEL1, SEL2 and SEL4; binary coded).
dsel x	x= on|off	off	-	Mode of the digital selection inputs. OFF: activation of the target position by a signal change (low to high) of the START input. ON: direct activation by the SELx inputs.
a:i x	i= A|B x= 1… 2000	:A 100 :B 100	ms ms	Acceleration time depending on direction. **A** indicates analogue output 15 and **B** indicates analogue output 16. Normally **A** = flow p-A, B-T and **B** = flow P-B, A-T.
d:i x	i= A|B x= 10… 10000	:A 2500 :B 2500	0,01% 0,01%	Deceleration stroke depending on direction. The loop gain is calculated by the deceleration stroke. The shorter the higher. In case of instabilities longer deceleration stroke will be sufficient.
ctrl x	x= lin|sqrt1 |sqrt2	sqrt1	-	Selection of the control function: **lin** = standard linear P-control, (**NOTE**) **sqrt1** = progressive time optimized deceleration curve **sqrt2** = sqrt1 with a higher gain in position
vramp x	x= 1… 2000	50	ms	Ramp time for velocity input.
vmode x	x= on|off	off	-	Activation of the NC-generator. The command position is generated by a velocity profile (internal or external preset of v). The axis drives more or less speed controlled.
th x	x= 100… 60000	5000	ms	Stroke time for 100% velocity and 100% nominal sensor stroke.
hand:i x	i= A|B x= -10000… 10000	:A 3300 :B -3300	0,01% 0,01%	Degree of output signal in manual mode
min:i x	i= A|B x= 0… 5000	:A 0 :B 0	0,01% 0,01%	Deadband compensation of positive overlapped proportional valves. Good adjustment will increase positioning accuracy.
max:i x	i= A|B x= 5000… 10000	:A 10000 :B 10000	0,01% 0,01%	Maximum output range for adapting control range to maximum flow range.
trigger x	x= 0… 2000	200	0,01%	Point to activate the deadband compensation (**min**). Also useful for reduced sensitivity in position with control valves.
inpos x	x= 2… 2000	200	0,01%	Range for the InPos signal (status output). (**NOTE**)
offset x	x= -2000… 2000	0	0,01%	The offset will be added to the command value.
pol x	x= +|-	+	-	For changing the output polarity. All **A** and **B** adjustments depend on the output polarity. The right polarity should be defined first.
save	-	-	-	Storing the programmed parameter in E²PROM.
loadback	-	-	-	Reloading the parameter from E²PROM in working RAM

help	-	-	-	Help to the commands, for terminal programs only
para	-	-	-	Parameter list with programmed data, for terminal programs only
din	-	-	-	Status of the digital inputs.
w, x, xw, u ,v	-	-	-	Actual signals: command value, actual value, process data, control divergence and reference value.
default	-	-	-	Preset values will be set.

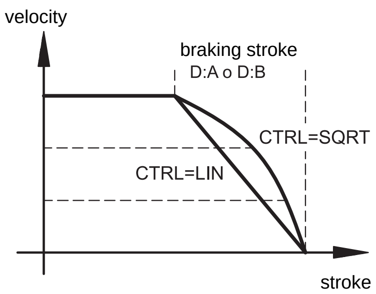
NOTE about the INPOS command: The INPOS command defines the window in relation to the stroke where the INPOS message is indicated. The monitored area is derived from the setpoint value minus the half •InposŽ value until setpoint value plus the haf •InposŽ value. The positioning process is not influenced by this message. The controller remains active. In NC-mode this message has to be interpreted alternatively as following error.

NOTE about the CTRL command:: This command controls the braking characteristic of the hydraulic axis. With positive overlapped proportional valves one of both SQRT braking characteristics should be used because of the linearization of the non-linear flow curve typical of these valves If zero overlapped proportional valves (control valves) are used, you can choose between LIN and SQRT1 according to the application. The progressive gain characteristic of SQRT1 has the better positioning accuracy.

According to the application there is maybe a longer braking distance, so that the total stroke time will be longer.

LIN: Linear braking characteristics (control gain corresponds to: 10000 / d:i).

SQRT*: Root function for the calculation for the braking curve. SQRT1: with small control error. control gain corresponds to 30000 / d:i ; SQRT2: control gain corresponds to 50000 / d:i



ADDITIONAL PARAMETERS ON VERSION BI*

Commands	Parameters	Defaults	Unit	Description
ain:i **a, b, c, x**	i= X a= 0… 10000 b= 0… 10000 c= -10000… 10000 x= V|C	 : 1000 : 1000 : 0 : V	 - - 0,01% -	Analogue output selection. **W** and **X** for the inputs and **V** = voltage, **C** = current. With the parameters **a**, **b** and **c** the inputs can be scaled (output = a / b * (input - c)). Because of the programming of the **x**-value (x = C) the corresponding input will be switched over to current automatically.

ADDITIONAL PARAMETERS ON VERSION *M2

Command	Parameter	Defaults	Unit	Description
current x	x=0… 2	0	-	Selection of the output current range: **0** = 1,0 A **1** = 1,6 A **2** = 2,6 A
dfreq x	x= 60… 400	120	Hz	Dither frequency
dampl x	x= 0… 3000	500	0,01%	Dither amplitude. Typical values between 500 and 1200 (good experience were made with 700).
pwm x	x= 100… 7700	2600	Hz	PWM Frequency. PWM Frequencies of 2000 Hz improve the current loop dynamics. PWM Frequencies in the range of 100 500 Hz will be used for low dynamic valves with high hysteresis. In this case, DAMPL must be zero.
ppwm x **ipwm x**	x= 0… 30 x= 1… 500	3 40	- -	PI-compensator for the current controller. Changes should be only done with good experience in optimizing of current loops. In some cases a PWM Frequency of >2500 Hz; PPWM can be increased to 7 15. ATTENTION: The dither amplitude must be optimized after that.

5 - INSTALLATION

The card is designed for rail mounting type DIN EN 50022.

It is recommended to use cable sections of 0.75 mm^2, up to 20 m length and of 1.00 mm^2 up to 40m length, for power supply and solenoid connections on version M2. For other connections it is recommended to use cables with a screened sheath connected to earth only on the card side.

NOTE 1

To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the wiring diagram.

As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electric motors, inverters and electrical switches).

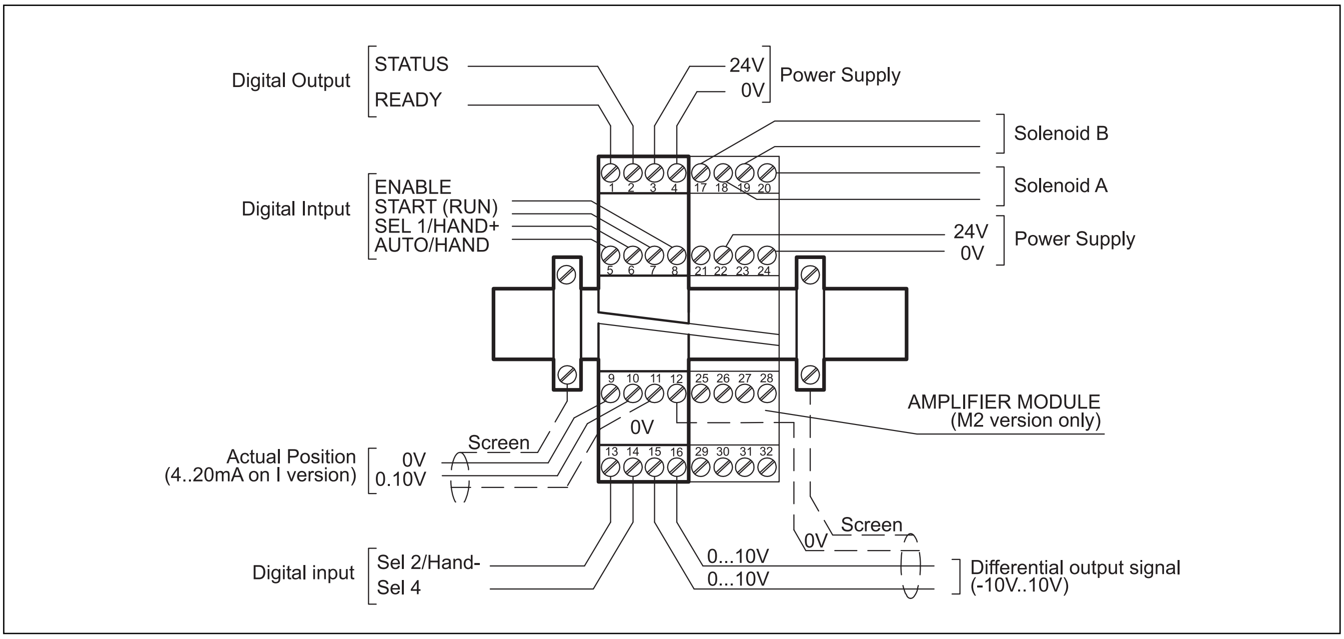
In environments that are critical from the electromagnetic interference point of view, a complete protection of the connection wires can be requested.

6 - SOFTWARE KIT EWMPC/10 (code 3898401001)

The software kit includes a USB cable (2.70 mt length) to connect the card to a PC or notebook and the software. During the identification all information are read out of the module and the table input will be automatically generated. Some functions like baud rate setting, remote control mode, saving of process data for later evaluation are used to speed up the installation procedure.

The software is compliant with Microsoft XP® operating systems.

7 - WIRING DIAGRAM OF EWM-S-B*



DIGITAL INPUT AND OUTPUT

PIN 1 — READY output.
This output is high when ENABLE is active and there is no sensor error. This output corresponds with the green led.

PIN 2 — STATUS output.
Monitoring of the control error (INPOS). Depending on the INPOS command, the status output will be deactivated, if the position difference is greater then the adjusted window.
The output is only active if START = ON.

PIN 5 — AUTO/HAND input
ACTIVATED = automatic mode
DEACTIVATED = hand mode.

PIN 6 — SEL 1/HAND+ input:
SEL 1 = Selection input 1
HAND+ = Hand mode (START = OFF), the axis drives with the programmed speed (parameter HAND:A). After the deactivation the command position is set to the actual position.

PIN 7 — START (RUN) input:
The positioning controller is active; the external analogue command position is taken over as command value. If the input is switched off during movement, the command position is set to the actual position plus a defined emergency deceleration stroke

PIN 8 — ENABLE input:
This digital input signal initializes the application. The analogue output is active and the READY signal indicates that all components are working correctly. Target position is set to actual position and the drive is closed loop controlled.

PIN 13 — SEL 2 / HAND- input:
SEL 2 = Selection input 2
HAND- = (START = OFF), the axis drives with the programmed speed (parameter HAND:B). After the deactivation the command position is set to the actual position.

PIN 14 — SEL 4- input:
Selection input 4 - See schemes in the BINARY TABLE below

Address	0	1	2	3	4	5	6	7
SEL 1	0	1	0	1	0	1	0	1
SEL 2	0	0	1	1	0	0	1	1
SEL 4	0	0	0	0	1	1	1	1

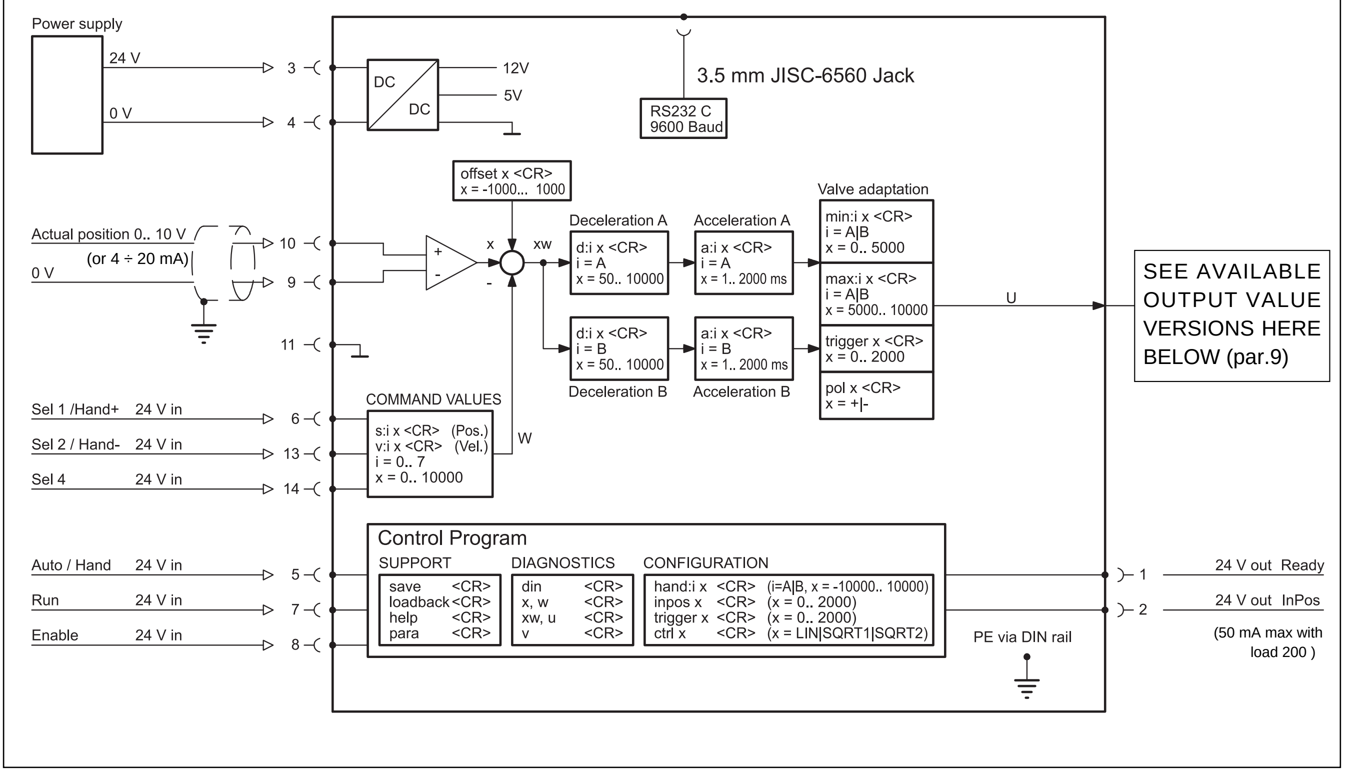
ANALOGUE INPUT

PIN 9/10 — Actual position (feedback) value (X)
range 0 ÷ 100% corresponds to 0 ÷ 10V (or 4 ÷ 20 mA)

ANALOGUE OUTPUT

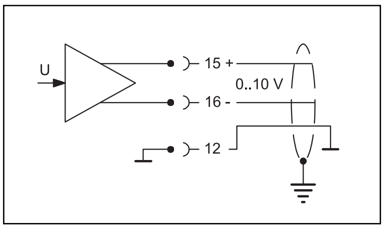
PIN 15/16 — Differential output signal (U)
± 100% corresponds to ± 10V differential voltage, optionally (I-version) current output ±100% corresponds to 4 ÷ 20 mA (PIN 15 to PIN 12)

8 - CARD BLOCK DIAGRAM

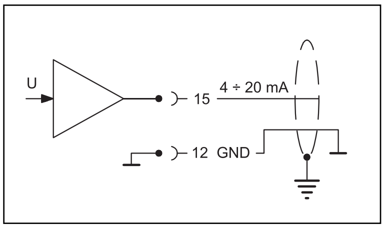


9 - AVAILABLE OUTPUT VALUE VERSIONS

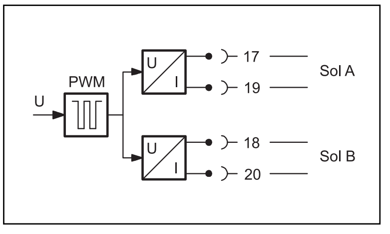
E0 VERSION



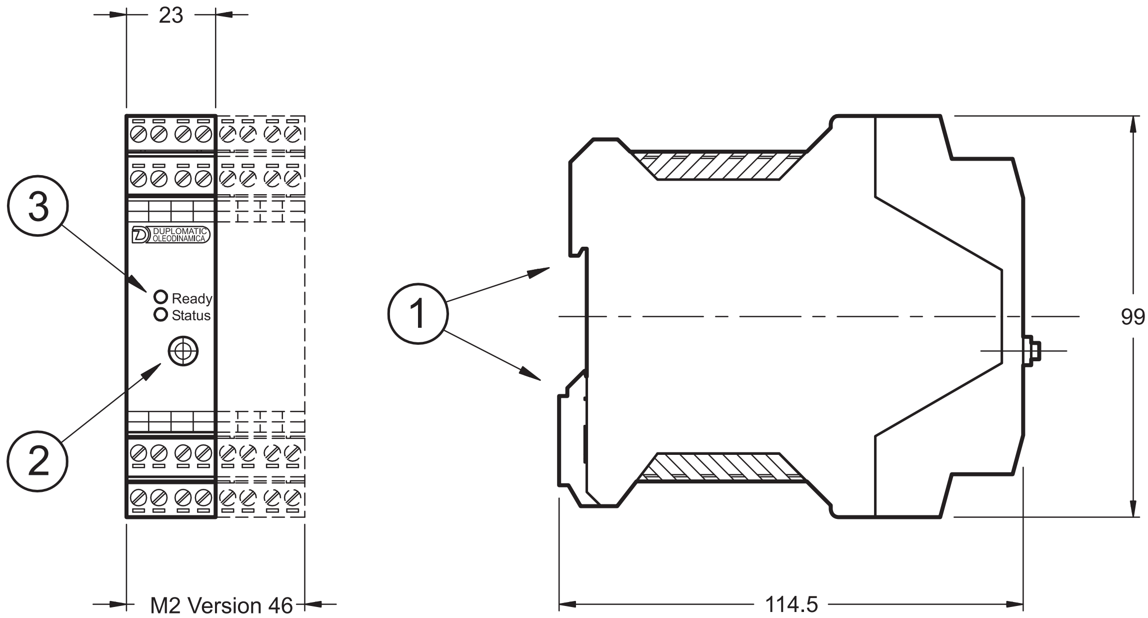
E1 VERSION



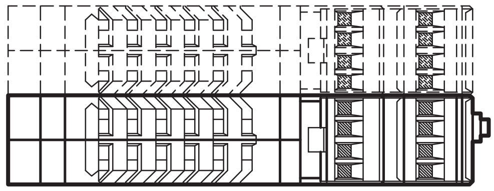
M2 VERSION



10 - OVERALL AND MOUNTING DIMENSIONS



power stage module -
present on M2 version only .



1	DIN EN 50022 rail type fastening
2	Plug for PC cable connection
3	LED for output signals

DUPLOMATIC OLEODINAMICA

DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

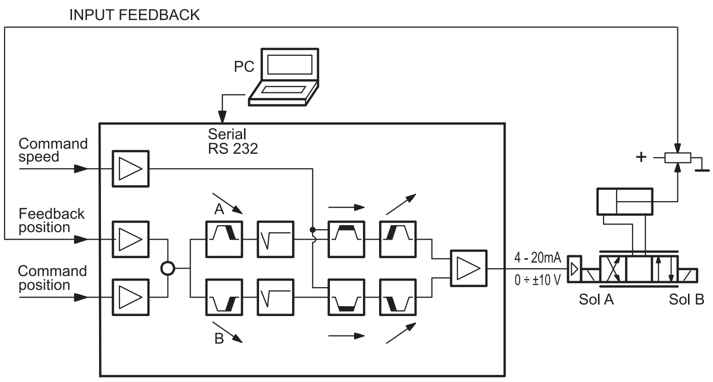
EWM-S-AA

ANALOGUE POSITIONING CARD FOR STROKE CONTROL IN CLOSED LOOP SYSTEMS WITH ANALOG FEEDBACK

SERIES 10

RAIL MOUNTING TYPE:
DIN EN 50022

OPERATING PRINCIPLE

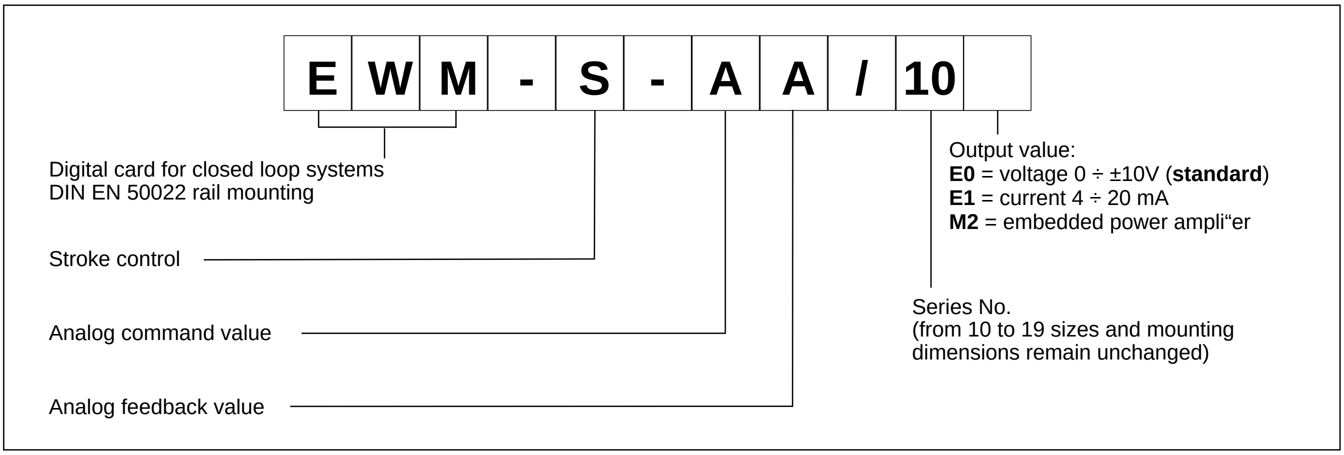


- The EWM-S-AA card is designed for an easy stroke positioning control of hydraulic actuators in closed loop systems. Target positions are defined by the external command input, and an accuracy of approx. 0,01% of the sensor stroke can be achieved.
- Typical applications are positioning drives.
- The card controls a directional proportional valve with integrated electronics and allows an optimal use of overlapped and zero-overlapped proportional valves.
- Velocities can be defined also by an external speed command. Versions with output value in voltage, in current. or with an integrated power amplifier are available.
- Internal function and failure are monitored with two digital output easy to read.
- The card use the RS232C interface, and is settable via notebook, using the kit (EWMPC).

TECHNICAL CHARACTERISTICS

Power supply	V DC	12 ÷ 30 ripple included - external fuse 1,0 A (5A for M2 version)
Current consumption: - E0 and E1 version - M2 version	mA	100 + sensor power consumption depending from solenoid current max 5A
Command position value	V mA	0 ÷ 10 (R_I = 25 k) 4 ÷ 20 (R_I = 250)
Position accuracy	%	0,01
Command speed	V	0 ÷ 10 (R_I = 90 k)
Feedback value:	V mA	0 ÷ 10 (R_I = 25 k) 4 ÷ 20 (R_I = 250)
Output value: - E0 version - E1 version - M2 version	V mA A	±10 (max load 5 mA 2 k) 4 ÷ 20 (max load 390) 1,0 - 1,6 - 2,6
Interface		RS 232 C
Electromagnetic compatibility (EMC): according to 2004/108/CE		Emissions EN 61000-6-3 Immunity EN 61000-6-2
Housing material		thermoplastic polyamide PA6.6 -combustibility class V0 (UL94)
Housing dimensions	mm	120(d) x 99(h) x 23(w)
Connector		4x4 poles screw terminals - PE direct via DIN rail
Operating temperature range	°C	-20 / +60
Protection degree		IP 20

1 - IDENTIFICATION CODE



This module supports the simple point-to-point positioning with hydraulic drives. The deceleration characteristics can be defined with the command CTRL, choosing between linear (LIN) or nearly square root (SQRT1) parameters. See at par. 4, adjustments.

The sampling time of the control loop is 1 ms.

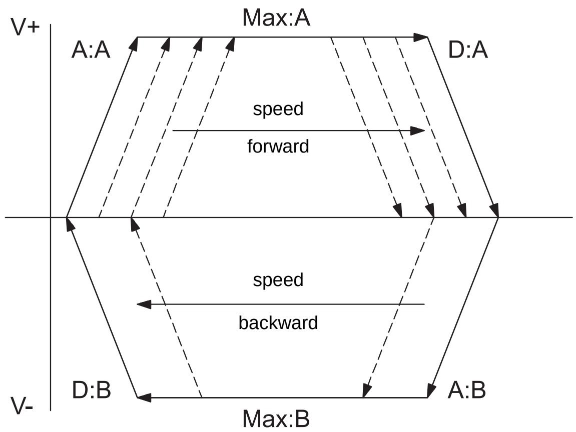
Two operating modes can be selected:

A - stroke depending deceleration, that means the control gain will be adjusted with the parameters D:A and D:B This is a time-optimal positioning structure with vey high stability.

B - NC mode, where the position value is generated from the following error.

The positioning accuracy will almost be limited by the resolution of the transducer, and by the right size of the hydraulic valve. Therefore, the correct valve selection is the most important point. Additionally, two contradictory requirements (short positioning time and high accuracy) have to be considered in the system design.

flow (volume) P A and B T



The actuator position is measured by an analog transducer and compared with a specified target position. The target position is adjusted with an external potentiometer or preset by an analog input from an external controller (PLC). It•s possible to define the axis speed also by an external command speed.

2 - FUNCTIONAL SPECIFICATIONS

2.1 - Power supply
This card is designed for 12 to 30 VDC (typical 24 V) of a power supply. This power supply must correspond to the actual EMC standards.

All inductivities at the same power supply (relays, valves) must be provided with an over voltage protection (varistors, free-wheel diodes).

It is recommended to use a regulated power supply (linear or switching mode) for the card supply and for the sensors.

NOTE: in the type M2 the value of the power supply voltage on the card must not be lower than the rated working voltage of the solenoid to be controlled.

2.2 - Electrical protections
All inputs and outputs are protected with suppressor diodes and RC-filters against transient overshoots.

2.3 - Digital Input
The card accepts digital input. The digital input must have a voltage from 12 to 24 V; Low level: <2V, high level >10V with current <50mA. See the block diagram at paragraph 8 for the electric connections.

2.4 - Command value
The card accepts an analogue input signal. The command value can be 0 ÷ 10 V (R_I = 25 k) or 4 ÷ 20 mA (R_I = 250).

2.5 - Command speed
The card accepts an analogue input signal. The command speed must be 0 ÷ 10 V (R_I = 90 k)

2.6 - Feedback input value
The card accepts analogue feedback input. The feedback value can be 0 ÷ 10 V (R_I = 25 K) or 4 ÷ 20 mA (R_I = 250).

2.7 - Analog output values
E0 version: output voltage 0 ±10 V.
E1 version: output current 4 ÷ 20 mA.
M2 version: embedded power stage configurable via software
with a value of 1, 1.6 or 2.6 A.

All analogue output have to be wired with screened cables.

2.8 - Digital Output
Two digital output are available, INPOS and READY, that are displayed via LEDs on the front panel
Low level <2V High Level > 10 V Max 50 mA with load 200

3 - LED FUNCTIONS

There are two LED on the card: GREEN and YELLOW.

GREEN: Shows if the card is ready.

ON - System in process
OFF - No power supply or ENABLE is inactive
FLASHING - Failure detected (internal or 4 20 mA).
Only if SENS = ON

YELLOW: Is the signal of the control error monitoring.

ON - No control error
OFF - Error detected, depending of a parameter error.

4 - ADJUSTMENTS

On the EWM cards, the adjustment setting is possible only via software. Connecting the card to the PC, the software automatically recognises the card model and shows a table with all the available commands, with their parameters, the default setting, the measuring unit and an explanation of the commands and its uses. The parameters change depending on the card model.

PARAMETERS TABLE

Command	Parameters	Defaults	Units	Group	Description
LG x	x= DE|GB	GB	-	STD	Changing language help texts.
MODE x	x=STD|EXP	STD	-	STD	Mode parameter.
TS x	x= 5..30	10	0,1 ms	EXP	Changing the controller sample time.
STROKE x	x= 10..10000	100	mm	STD	Working stroke or the sensor.
VS x	x= EXT|INT	INT	-	STD	Switch over between internal and external velocity preset.
VELO x	x= 1..10000	10000	0,01%	STD	Here the max velocity can be limited internally. The limitation function corresponds to the external velocity preset if VS was parameterized with EXT
VRAMP x	x= 10..5000	200	ms	VS=EXT	Ramp time for velocity input.
VMODE x	x= SDD|NC	SDD	-	EXP	Control structure for positioning process. SDD: stroke-dependent deceleration is activated. From the set deceleration point the drive then switches to control mode and moves accurately to the desired position. NC: In this mode a position pro“le is generated internally. The system always works under control and uses the following error to follow the position pro“le.
VMAX x	x= 1..3000	50	mm/s	VMODE=NC	Max velocity in NC mode.
EOUT x	x= -10000..10000	0	0,01%	EXP	When an input error occurs the adjusted value of •EOUT• will be displayed at the output pin 15/16. A value less than 100 deactivates this function.
POL x	x= -|+	+	-	STD	For changing the output polarity. All **A** and **B** adjustments depend on the output polarity. The right polarity should be de“ned “rst.
SENS x	x= ON|OFF|AUTO	AUTO	-	STD	Activation of the sensor and internal failure monitoring.
AIN:W **AIN:X**	A= -10000..10000 B= -10000..10000 C= -500..10000 X= V|C	A: 1000 B: 1000 C: 0 X: V	-	STD	Analogue output selection. **W** and **X** for the inputs and **V** = voltage, **C** = current. With the parameters **a**, **b** and **c** the inputs can be scaled (output = a / b * (input - c)). Because of the programming of the **x**-value (**x** = **C**) the corresponding input will be switched over to current automatically.
A:A x **A:B x**	x= 1..5000 x= 1..5000	100 100	ms ms	STD	Acceleration time depending on direction. **A** indicates analogue output 15 and **B** indicates analogue output 16. Normally **A** = ”ow P-A, B-T and **B** = ”ow P-B, A-T.
D:A x **D:B x** **D:S x**	x= 1..10000 x= 1..10000 x= 1..10000	25 25 10	mm mm mm	VMODE=SDD	Deceleration stroke dependent from direction. The loop gain is calculated by the deceleration stroke. The shorter the higher. In case of instabilities longer deceleration stroke should be set Loop Gain = STROKE / D:A o STROKE / D:B.
V0:A x **V0:B x**	x= 1..200 x= 1..200	10 10	1/s 1/s	VMODE=NC	Loop Gain for NC mode: D:A = VMAX / V0:A e D:B = VMAX / V0:B Loop Gain = STROKE / D:A o STROKE / D:B.
CTRL x	x= lin|sqrt1|sqrt2	sqrt1	-	STD	Selection of the control function: (see **NOTE)** **lin** = standard linear P-control, **sqrt1** = progressive time optimized deceleration curve. **sqrt2** = sqrt1 with a higher gain in position.
HAND:A x **HAND:B x**	x= -10000..10000 x= -10000..10000	3330 -3330	0,01% 0,01%	STD	Hand speed (in manual mode) For the corresponding switch input the direction can be de“ned by the sign.

MIN:A x **MIN:B x**	x= 0..6000 x= 0..6000	0 0	0,01% 0,01%	STD	Zero point setting /following error compensation.
MAX:A x **MAX:B x**	x= 3000..10000 x= 3000..10000	10000 10000	0,01% 0,01%	STD	Maximum output signal limitation.
TRIGGER x	x= 0..4000	200	0,01%	STD	Trigger threshold for activating the following error compensation (MIN).
OFFSET x	x= -4000..4000	0	0,01%	STD	Offset value added to the output signal. (setpoint - actual value + offset).
INPOS x	x= 2..200000	200	µm	STD	Range for InPos signal. (See **NOTE**)

NOTE about the INPOS command: The INPOS command defines the window in relation to the stroke where the INPOS message is indicated. The monitored area is derived from the setpoint value minus the half •InposŽ value until setpoint value plus the haf •InposŽ value. The positioning process is not influenced by this message. The controller remains active. In NC-mode this message has to be interpreted alternatively as following error.

NOTE about the CTRL command:: This command controls the braking characteristic of the hydraulic axis. With positive overlapped proportional valves one of both SQRT braking characteristics should be used because of the linearization of the non-linear flow curve typical of these valves If zero overlapped proportional valves (control valves) are used, you can choose between LIN and SQRT1 according to the application. The progressive gain characteristic of SQRT1 has the better positioning accuracy.

According to the application there is maybe a longer braking distance, so that the total stroke time will be longer.

LIN: Linear braking characteristics (control gain corresponds to: 10000 / d:i).

SQRT*: Root function for the calculation for the braking curve.
SQRT1: with small control error. control gain corresponds to 30000 / d:i ;
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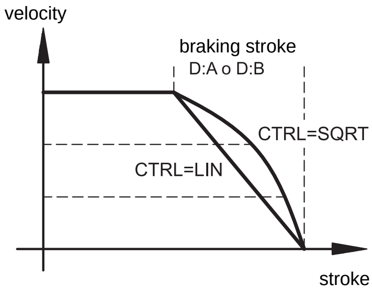

PARAMETER FOR *M2 VERSION

Command	Parameters	Default	Units	Group	Description
CURRENT x	x=0… 2	0	-	STD	Switching over the output current: 0 = 1,0 A 1 = 1,6 A 2 = 2,6 A
DFREQ x	x= 60… 400	120	Hz	STD	Dither frequency.
DAMPL x	x= 0… 3000	600	0,01%	STD	Dither amplitude. Different amplitudes or frequencies may be required depending on the valve.
PWM x	x= 100… 7700	2600	Hz	STD	PWM frequency. PWM frequency 2000 Hz improves current loop dynamic. For valves with low dynamic and high hysteresis it is necessary to use PWM frequency between 100 to 500 Hz. In this case, DAMPL must be zero.
PPWM x **IPWM x**	x= 0… 30 x= 1… 500	7 40	- -	EXP	Current control loop PI control dynamic. If the PWM frequency is > 2500 Hz, the dynamic response of the current controller can be increased..Typical values are: PPWM = 7 15 and IPWM = 20 40. If the PWM frequency is < 250 Hz, the dynamic response of the current controller must be reduced.Typical values are: PPWM = 1 3 and IPWM = 40 80. ATTENTION: Dither and PWM must be optimized after this regolation.

5 - INSTALLATION

The card is designed for rail mounting type DIN EN 50022. It is recommended to use cable sections of 0.75 mm^2, up to 20 m length and of 1.00 mm^2 up to 40m length, for power supply and solenoid connections on version M2. For other connections it is recommended to use cables with a screened sheath connected to earth only on the card side.

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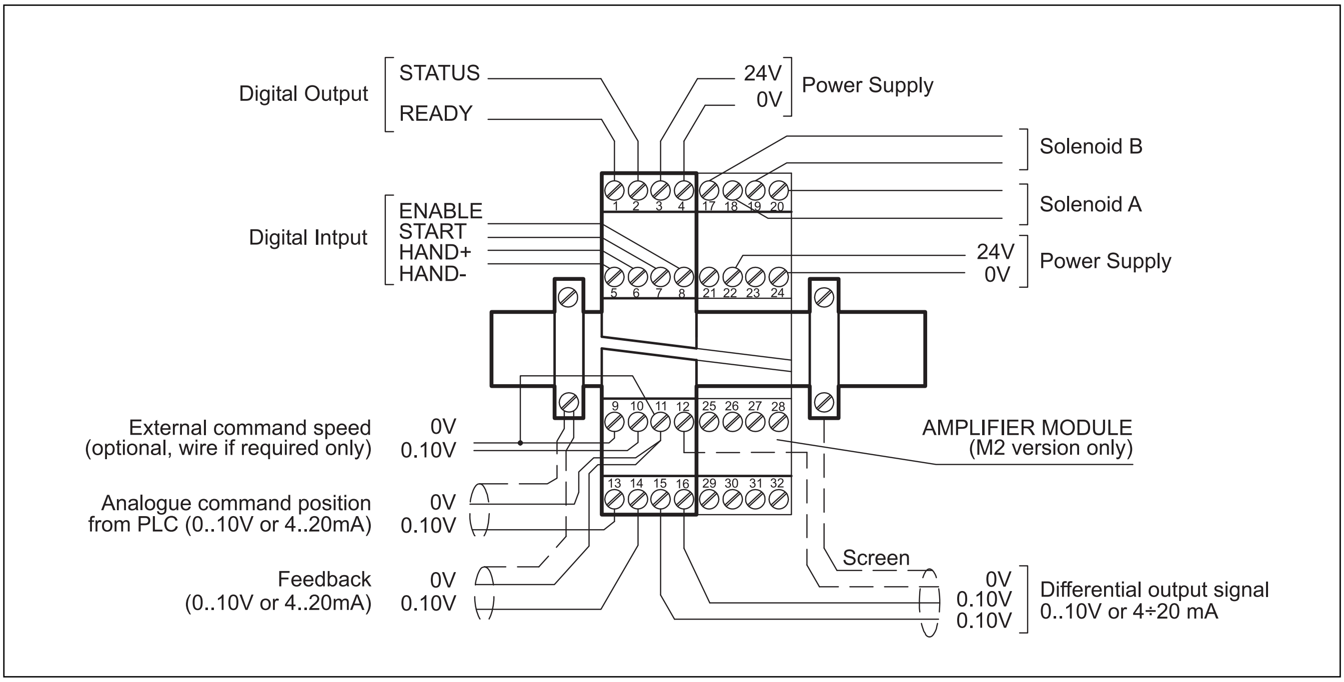
The software kit includes a USB cable (2.70 mt lenght) to connect the card to a PC or notebook and the software. During the identification all information are read out of the module and the table input will be automatically generated. Some functions like baud rate setting, remote control mode, saving of process data for later evaluation are used to speed up the installation procedure.

The software is compliant with Microsoft XP® operating systems.

7 - WIRING DIAGRAM



DIGITAL INPUT AND OUTPUT

PIN 1 READY output.
General operationality, ENABLE is active and there is no sensor error (by use of 4÷20 mA sensors). This output corresponds with the green LED.

PIN 2 STATUS output.
Monitoring of the control error (INPOS). Depending on the INPOS command, the status output will be deactivated, if the position difference is greater than the adjusted window.
The output is only active if START = ON.

PIN 5 HAND- input
Hand mode (START = OFF), driving with the programmed velocity. After deactivation the actual value is taken over as command position.

PIN 6 HAND+ input:
Hand mode (START = OFF), driving with the programmed velocity. After deactivation the actual value is taken over as command position.

PIN 7 START (RUN) input:
The positioning controller is active; the external analogue command position is taken over as command value. If the input is switched off during movement, the command position is set to the actual position plus a defined emergency deceleration stroke.

PIN 8 ENABLE input:
This digital input signal initializes the application. The analogue output is active and the READY signal indicates that all components are working correctly. Target position is set to actual position and the drive is closed loop controlled.

ANALOGUE INPUT

PIN 9/10 External command speed (V),
range 0 ÷ 100 % corresponds to 0 ÷ 10 V

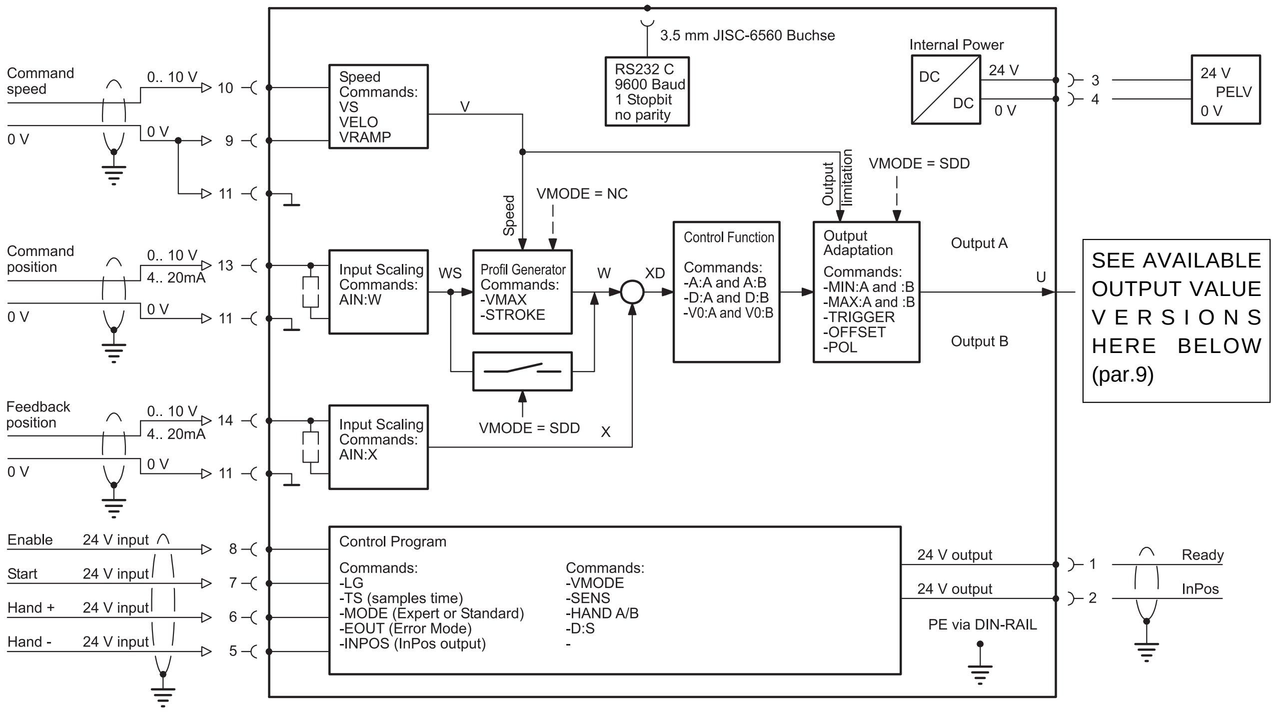
PIN 13 Command position (W),
range 0 ÷ 100% corresponds to 0 ÷ 10V or 4 ÷ 20 mA

PIN 14 Actual (feedback) value (X),
range 0 ÷ 100% corresponds to 0 ÷ 10V or 4 ÷ 20 mA

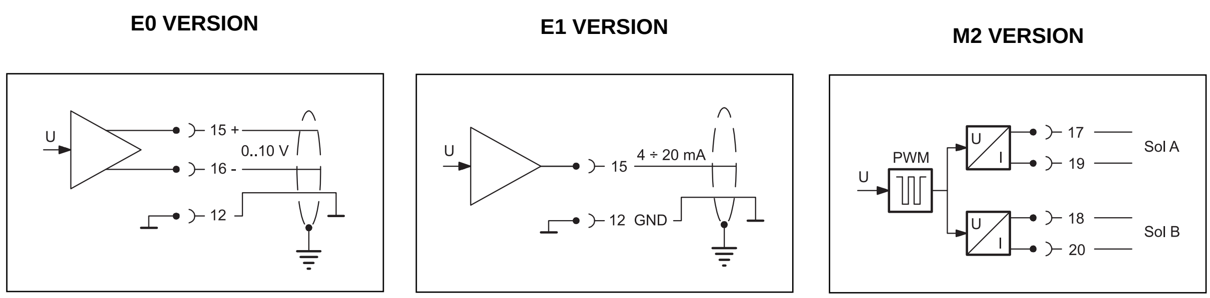
ANALOGUE OUTPUT

PIN 15/16 Differential output (U)
± 100% corresponds to ± 10V differential voltage, optionally (E1 version) current output ±100% corresponds to 4 ÷ 20 mA (PIN 15 to PIN 12)

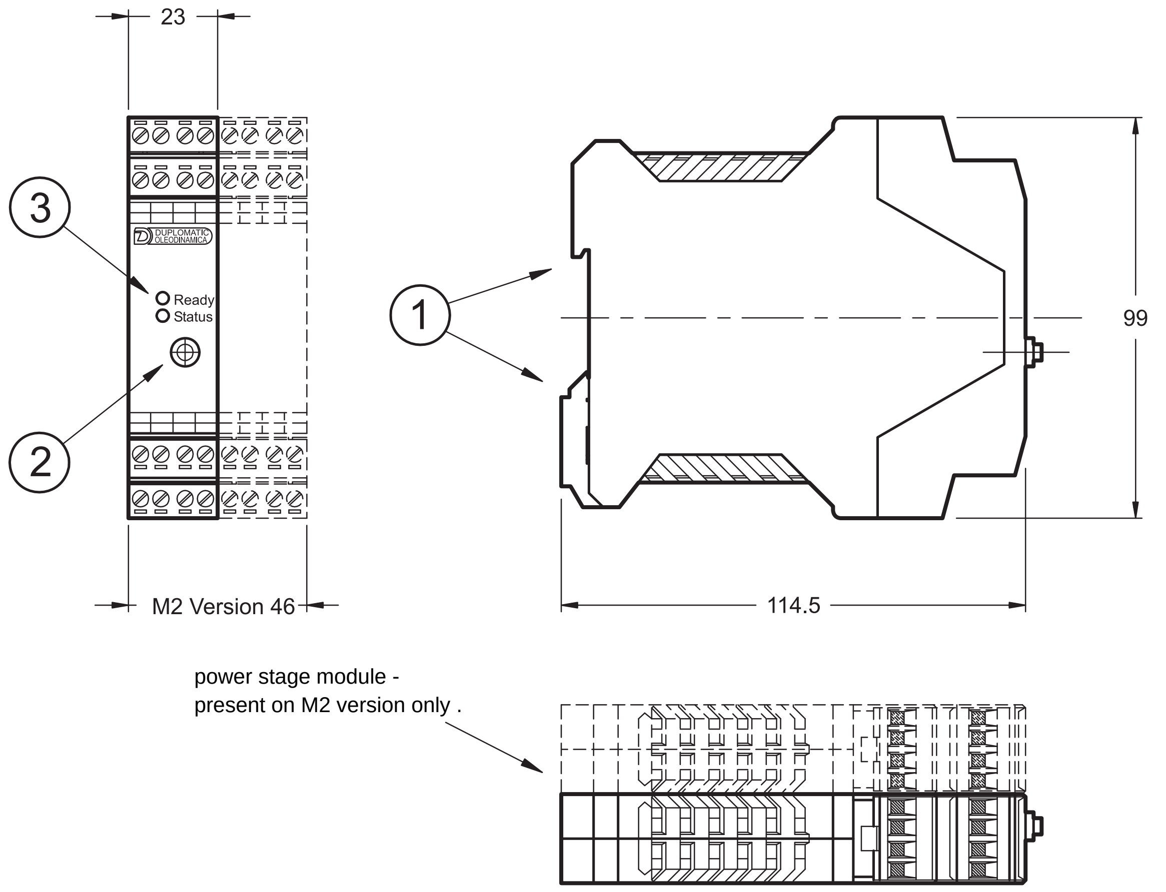
8 - CARD BLOCK DIAGRAM



9 - AVAILABLE OUTPUT VALUE VERSIONS



10 - OVERALL AND MOUNTING DIMENSIONS



1	DIN EN 50022 rail type fastening
2	Plug for PC cable connection
3	LED for output signals

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DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

DUPLOMATIC OLEODINAMICA

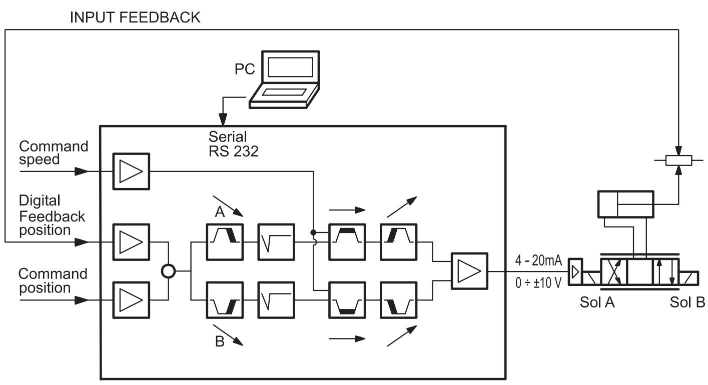
EWM-S-AD

ANALOGUE POSITIONING CARD FOR STROKE CONTROL IN CLOSED LOOP SYSTEMS WITH DIGITAL FEEDBACK

SERIES 10

RAIL MOUNTING TYPE: DIN EN 50022

OPERATING PRINCIPLE

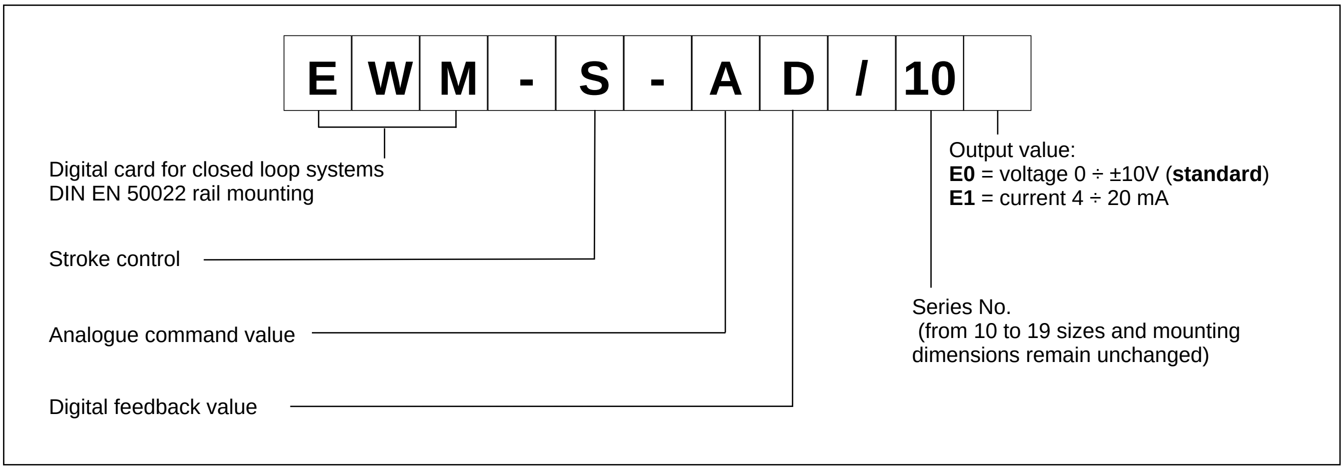


- This card has been developed for closed loop positioning of hydraulics actuators where an high accuracy is needed, using a digital sensor with SSI interface to measure the position.
- The card controls a directional proportional valve with integrated electronics and allows an optimal use of overlapped and zero-overlapped proportional valves. Internal function and failure are monitored with two digital output easy to read.
- Velocities can be defined also by an external speed command. Two versions are available, with output value in voltage or in current.
- The positioning control loop can be made in two ways: stroke depending deceleration or NC mode.
- The card use the RS232C interface, and is settable via notebook, using the kit (EWMPC).

TECHNICAL CHARACTERISTICS

Power supply	V DC	12 ÷ 30 ripple included - external fuse 1,0 A
Current consumption	mA	100 + sensor power consumption
Command value	V mA	0 ÷ 10 (R_I = 25 k) 4 ÷ 20 (R_I = 250)
Command speed	V	0 ÷ 10 (R_I = 25 k)
Feedback value	SSI	digital sensor with any SSI interface
Output value: - E0 version - E1 version	V mA	±10 (max load 5 mA) 4 ÷ 20 (max load 390)
Position accuracy	%	± 2 bits of sensor resolution
Interface		RS 232 C
Electromagnetic compatibility (EMC): according to 2004/108/CE standards		Emissions EN 61000-6-3 Immunity EN 61000-6-2
Housing material		thermoplastic polyamide PA6.6 -combustibility class V0 (UL94)
Housing dimensions	mm	120(d) x 99(h) x 46(w)
Connector		4x4 poles screw terminals - PE direct via DIN rail
Operating temperature range	°C	-20 / +60
Protection degree		IP 20

1 - IDENTIFICATION CODE



This module supports the simple point-to-point positioning with hydraulic drives. The deceleration characteristics can be defined with the command CTRL, choosing between linear (LIN) or nearly square root (SQRT1) parameters. See at par. 4, adjustments.

The sampling time of the control loop is 1 ms.

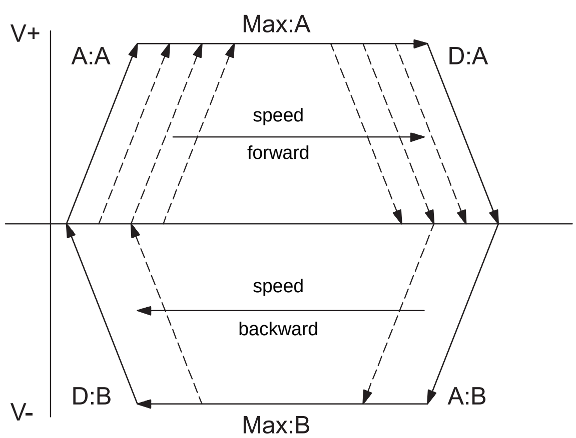
Two operating modes can be selected:

A - stroke depending deceleration, that means the control gain will be adjusted with the parameters D:A and D:B This is a time-optimal positioning structure with very high stability.

B - NC mode, where the position value is generated from the following error.

The positioning accuracy will almost be limited by the resolution of the transducer, and by the right size of the hydraulic valve. Therefore, the correct valve selection is the most important point. Additionally, two contradictory requirements (short positioning time and high accuracy) have to be considered in the system design.

flow (volume) P A and B T



The actuator position is detected by a digital transducer and compared with a specified target position. The target position is adjusted with an external potentiometer or preset by an analogue input from an external controller (PLC). It•s possible to define the axis speed by an external speed input command.

2 - FUNCTIONAL SPECIFICATIONS

2.1 - Power supply
This card is designed for 12 to 30 VDC (typical 24 V) of a power supply. This power supply must correspond to the actual EMC standards.

All inductivity at the same power supply (relays, valves) must be provided with an over voltage protection (varistors, free-wheel diodes). It is recommended to use a regulated power supply (linear or switching mode) for the card supply and the sensors.

2.2 - Electrical protections
All inputs and outputs are protected with suppressor diodes and RC-filters against transient overshoots.

2.3 - Digital Input
The card accepts digital input. The digital input must have a voltage from 12 to 24 V; Low level: <2V, high level >10V with current <50mA. See the block diagram at paragraph 8 for the electric connections.

2.4 - Command value
The card accepts an analogue input signal. The command value can be 0 ÷ 10 V (R_I = 25 k) or 4 ÷ 20 mA (R_I = 250).

2.5 - Command speed
The card accepts an analogue input signal. The command speed must be 0 ÷ 10 V (RI = 90 k).

2.6 - Input feedback values
The card accepts a digital feedback input from a sensor with any SSI interface with RS422 specifications. Bit, code and resolution are settable via software (see parameters table). The max sensor resolution is 0,001mm.

2.7 - Analogue output values
E0 version: output voltage 0 ±10 V.
E1 version: output current 4 ÷ 20 mA.

A feedback monitor signal is available as 0 ÷ 10V output on PIN 17 and 18.

2.8 - Digital Output
Two digital output are available, INPOS and READY, that are displayed via LEDs on the front panel.
Low level <2V High Level > 10 V Max 50 mA with load 200 .

3 - LED FUNCTIONS

There are two LED on the card: GREEN and YELLOW.

GREEN: Shows if the card is ready.

ON - The card is supplied
OFF - No power supply
FLASHING - Failure detected (internal or 4 20 mA).
Only if SENS = ON

YELLOW: Is the signal of the control error monitoring.

ON - No control error
OFF - Error detected, depending of a parameter error.

4 - ADJUSTMENTS

On the EWM cards, the adjustment setting is possible only via software.

Connecting the card to the PC, the software automatically recognises the card model and shows a table with all the available commands, with their parameters, the default setting, the measuring unit and an explanation of the commands and its uses. The parameters change depending on the card model.

EXAMPLE OF PARAMETERS TABLE

Command	Parameters	Defaults	Units	Group	Description
LG x	x= DE|GB	GB	-	STD	Changing language help texts.
MODE x	x=STD|EXP	STD	-	STD	Mode parameter.
TS x	x= 5..30	10	0,1 ms	EXP	Changing the controller sample time.
STROKE x	x= 10..10000	100	mm	STD	Working stroke or the sensor.
VS x	x= EXT|INT	INT	-	STD	Switch over between internal and external velocity preset.
VELO x	x= 1..10000	10000	0,01%	STD	Here the max velocity can be limited internally. The limitation function corresponds to the external velocity preset if VS was parameterized with EXT
VRAMP x	x= 10..5000	200	ms	VS=EXT	Ramp time for velocity input.
VMODE x	x= SDD|NC	SDD	-	EXP	Control structure for positioning process. SDD: stroke-dependent deceleration is activated. From the set deceleration point the drive then switches to control mode and moves accurately to the desired position. NC: In this mode a position pro“le is generated internally. The system always works under control and uses the following error to follow the position pro“le.
VMAX x	x= 1..3000	50	mm/s	VMODE=NC	Max velocity in NC mode.
EOUT x	x= -10000..10000	0	0,01%	EXP	When an input error occurs the adjusted value of •EOUT• will be displayed at the output pin 15/16. A value less than 100 deactivates this function.
POL x	x= -|+	+	-	STD	For changing the output polarity. All **A** and **B** adjustments depend on the output polarity. The right polarity should be de“ned “rst.
SENS x	x= ON|OFF|AUTO	AUTO	-	STD	Activation of the sensor and internal failure monitoring.
AIN:W **AIN:X**	A= -10000..10000 B= -10000..10000 C= -500..10000 X= V|C	A: 1000 B: 1000 C: 0 X: V	-	STD	Analogue output selection. **W** and **X** for the inputs and **V** = voltage, **C** = current. With the parameters **a**, **b** and **c** the inputs can be scaled (output = a / b * (input - c)). Because of the programming of the **x**-value (**x** = **C**) the corresponding input will be switched over to current automatically.
A:A x **A:B x**	x= 1..5000 x= 1..5000	100 100	ms ms	STD	Acceleration time depending on direction. **A** indicates analogue output 15 and **B** indicates analogue output 16. Normally **A** = ”ow P-A, B-T and **B** = ”ow P-B, A-T.
D:A x **D:B x** **D:S x**	x= 1..10000 x= 1..10000 x= 1..10000	25 25 10	mm mm mm	VMODE=SDD	Deceleration stroke dependent from direction. The loop gain is calculated by the deceleration stroke. The shorter the higher. In case of instabilities longer deceleration stroke should be set Loop Gain = STROKE / D:A o STROKE / D:B.
V0:A x **V0:B x**	x= 1..200 x= 1..200	10 10	1/s 1/s	VMODE=NC	Loop Gain for NC mode: D:A = VMAX / V0:A e D:B = VMAX / V0:B Loop Gain = STROKE / D:A o STROKE / D:B.
CTRL x	x= lin|sqrt1|sqrt2	sqrt1	-	STD	Selection of the control function: (see **NOTE)** **lin** = standard linear P-control, **sqrt1** = progressive time optimized deceleration curve. **sqrt2** = sqrt1 with a higher gain in position.
HAND:A x **HAND:B x**	x= -10000..10000 x= -10000..10000	3330 -3330	0,01% 0,01%	STD	Hand speed (in manual mode) For the corresponding switch input the direction can be de“ned by the sign.

MIN:A x **MIN:B x**	x= 0..6000 x= 0..6000	0 0	0,01% 0,01%	STD	Zero point setting /following error compensation.
MAX:A x **MAX:B x**	x= 3000..10000 x= 3000..10000	10000 10000	0,01% 0,01%	STD	Maximum output signal limitation.
TRIGGER x	x= 0..4000	200	0,01%	STD	Trigger threshold for activating the following error compensation (MIN).
OFFSET x	x= -4000..4000	0	0,01%	STD	Offset value added to the output signal. (setpoint - actual value + offset).
INPOS x	x= 2..200000	200	µm	STD	Range for InPos signal. (See **NOTE**)

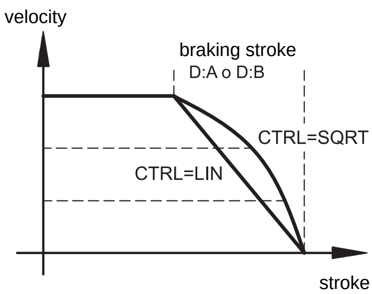
NOTE about the INPOS command: The INPOS command defines the window in relation to the stroke where the INPOS message is indicated. The monitored area is derived from the setpoint value minus the half •InposŽ value until setpoint value plus the haf •InposŽ value. The positioning process is not influenced by this message. The controller remains active. In NC-mode this message has to be interpreted alternatively as following error.

NOTE about the CTRL command:: This command controls the braking characteristic of the hydraulic axis. With positive overlapped proportional valves one of both SQRT braking characteristics should be used because of the linearization of the non-linear flow curve typical of these valves If zero overlapped proportional valves (control valves) are used, you can choose between LIN and SQRT1 according to the application. The progressive gain characteristic of SQRT1 has the better positioning accuracy.

According to the application there is maybe a longer braking distance, so that the total stroke time will be longer.

LIN: Linear braking characteristics (control gain corresponds to: 10000 / d:i).

SQRT*: Root function for the calculation for the braking curve.
SQRT1: with small control error. control gain corresponds to 30000 / d:i ;
SQRT2: control gain corresponds to 50000 / d:i



PARAMETER FOR SSI SENSOR

Command	Parameters	Defaul	Units	Group	Description
INPX x	x= ANA|SSI	ANA	-	STD	Sensor input changeover.
SSI:OFFSET x	x= -1000000… 1000000	0	µm	INPX=SSI	Position Offset.
SSI:POL x	x= +|-	+	-	INPX=SSI	Sensor polarity. To reverse the sensor working direction its polarity can be changed with this command.
SSI:RES x	x= 100… 10000	500	10 nm	INPX=SSI	Sensor resolution. The sensor signal resolution is defined with this parameter. Data is entered with the resolution of 10 nm (nanometer or 0.01µm). This means that if the sensor has 1 µm resolution the value 100 must be specified.
SSI:BITS x	x= 8… 31	24	bits	INPX=SSI	Number of bits trasmitted.
SSI:CODE x	x= GREY|BIN	GREY	-	INPX=SSI	Transmission coding.

5 - INSTALLATION

The card is designed for rail mounting type DIN EN 50022. It is recommended to use cable sections of 0.75 mm^2, up to 20 m length and of 1.00 mm^2 up to 40m length, for power supply. For other connections it is recommended to use cables with a screened sheath connected to earth only on the card side.

NOTE 1

To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the wiring diagram.

As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electric motors, inverters and electrical switches).

In environments that are critical from the electromagnetic interference point of view, a complete protection of the connection wires can be requested.

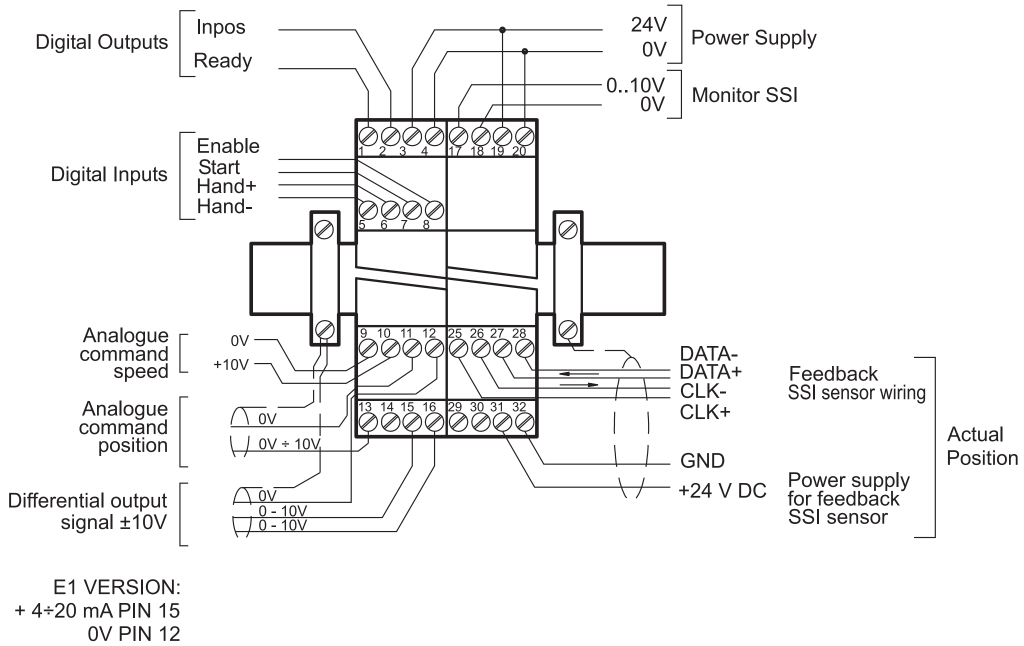
6 - SOFTWARE KIT EWMPC/10 (code 3898401001)

The software kit includes a USB cable (2.70 mt length) to connect the card to a PC or notebook and the software.

During the identification all information are read out of the module and the table input will be automatically generated. Some functions like baud rate setting, remote control mode, saving of process data for later evaluation are used to speed up the installation procedure.

The software is compliant with Microsoft XP® operating systems.

7 - WIRING DIAGRAM



DIGITAL INPUT AND OUTPUT

PIN 1 — READY output.
General operationality, ENABLE is active and there is no sensor error. This output corresponds with the green led.

PIN 2 — STATUS output.
Monitoring of the control error (INPOS). Depending on the INPOS command, the status output will be deactivated, if the position difference is greater than the adjusted window.
The output is only active if START = ON.

PIN 5 — HAND- input
Hand mode (START = OFF), driving with the programmed velocity. After deactivation the actual value is taken over as command position.

PIN 6 — HAND+ input:
Hand mode (START = OFF), driving with the programmed velocity. After deactivation the actual value is taken over as command position.

PIN 7 — START input:
The positioning controller is active; the external analogue command position is taken over as command value. If the input is switched off during movement, the command position is set to the actual position plus a defined emergency deceleration stroke.

PIN 8 — Enable input:
This digital input signal initializes the application. The analogue output is active and the READY signal indicates that all components are working correctly. Target position is set to actual position and the drive is closed loop controlled.

ANALOGUE INPUT

PIN 9/10 — External command speed (V)
range 0 ÷ 100 %
corresponds to 0 ÷ 10 V

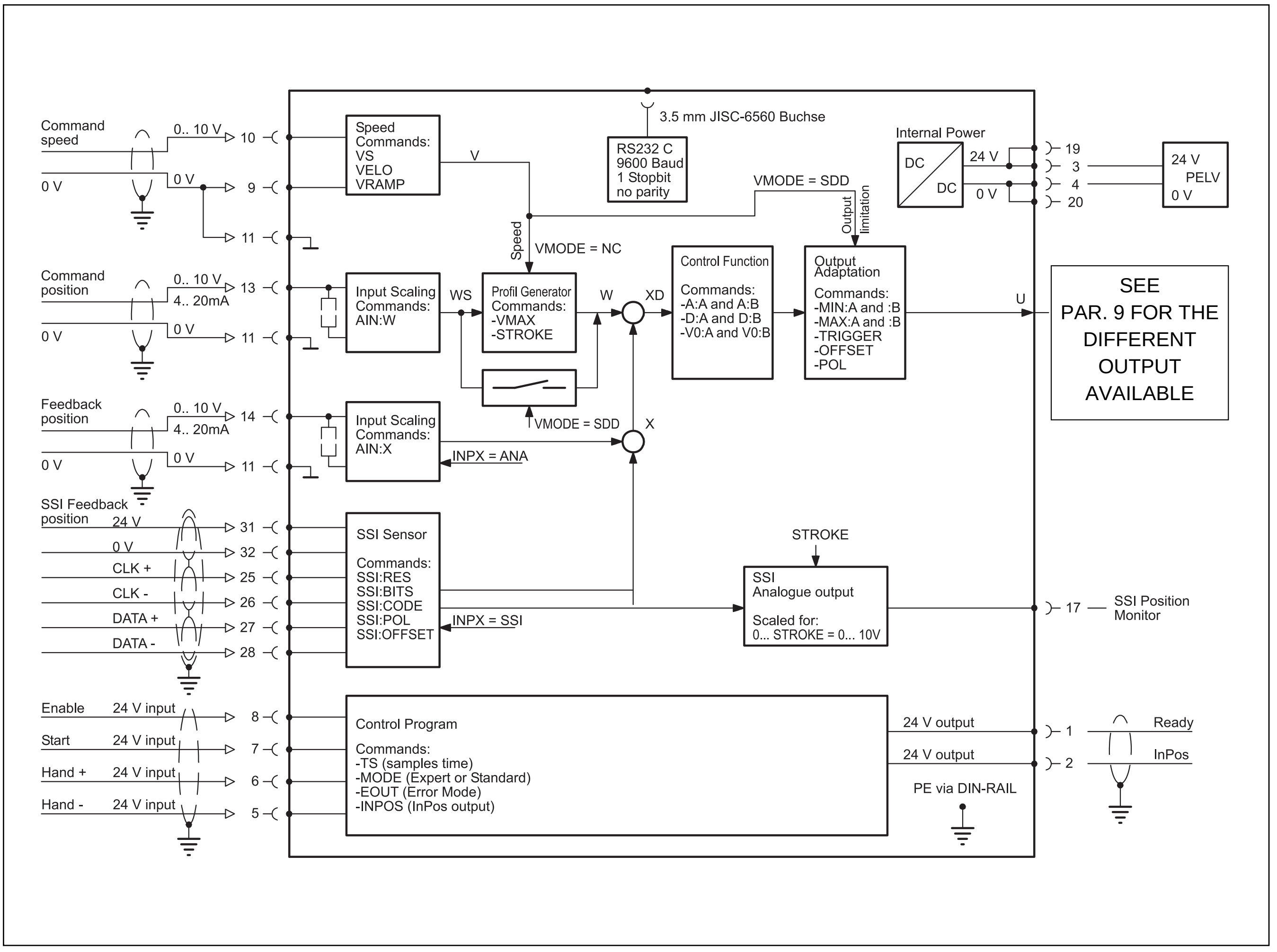
PIN 13/11 — Command position (WL)
range 0 ÷ 100%
corresponds to 0 ÷ 10V or 4 ÷ 20 mA

ANALOGUE OUTPUT

PIN 15/16 — Differential output (U)
± 100% corresponds to ± 10V differential voltage.
On E1 version the output is in current, ±100% corresponds to 4 ÷ 20 mA (PIN 15 to PIN 12)

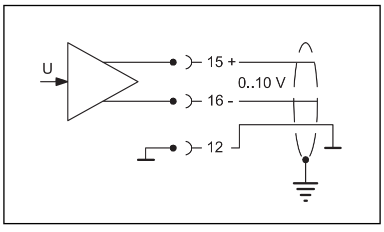
PIN 17/18 — Monitor of the SSI sensor position, 0 ÷ 10V

8 - STANDARD CARD BLOCK DIAGRAM

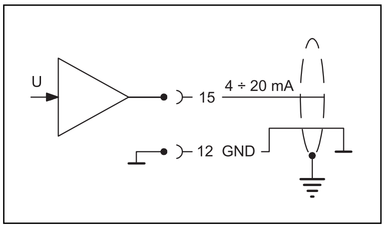


9 - OUTPUT SIGNALS AVAILABLE FOR DIFFERENT VERSIONS

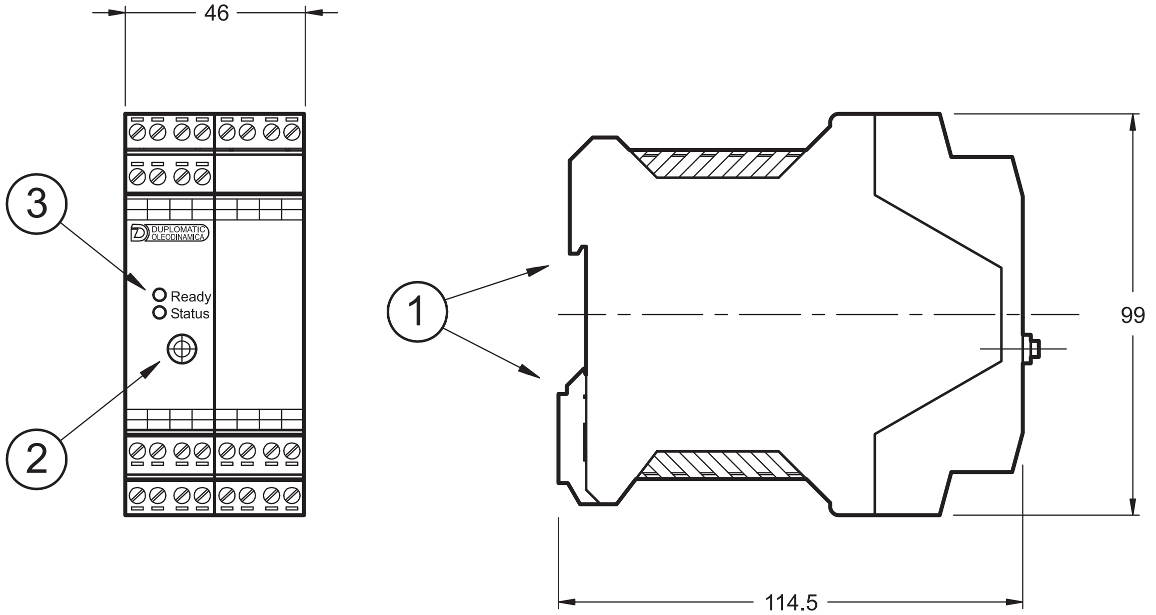
E0 VERSION

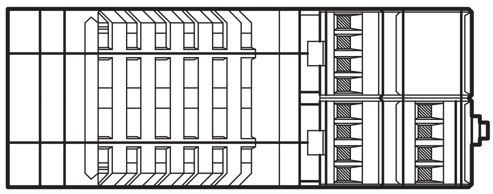


E1 VERSION



9 - OVERALL AND MOUNTING DIMENSIONS





1	DIN EN 50022 rail type fastening
2	plug for connection PC cable
3	LED for Output signals

DUPLOMATIC OLEODINAMICA
DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

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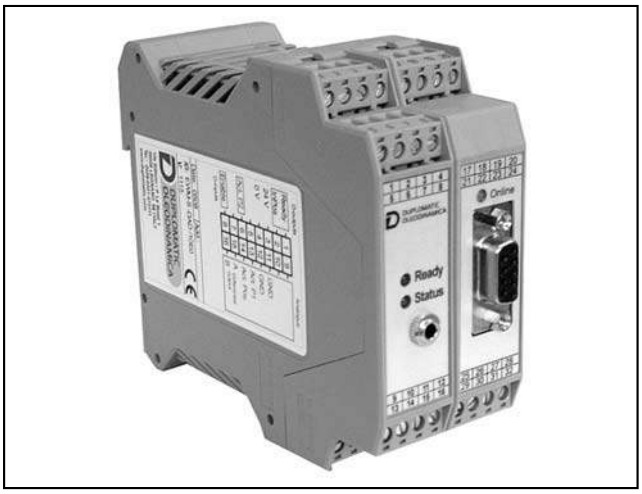


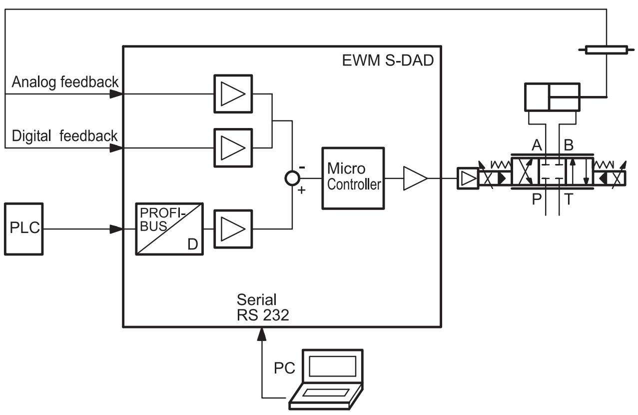
EWM-S-DAD

CARD FOR POSITIONING AND VELOCITY STROKE CONTROL WITH PROFIBUS COMMUNICATION INTERFACE

SERIES 10

RAIL MOUNTING TYPE:
DIN EN 50022

OPERATING PRINCIPLE



„ This card has been developed to drive the positioning of the hydraulics actuators where an high accuracy is needed, using a digital sensor with SSI interface to measure the positions, or an analog sensor with an accuracy of up to 0,01%

„ The card works as an axis controller and communicates with the PLC via the integrated Profibus interface.

„ The card works in two ways: stroke depending deceleration or NC mode.

„ The card allows an optimal use of overlapped and zero overlapped proportional valves.

„ The card use the RS232C interface, and is settable via notebook, using the software kit (EWMPC).

TECHNICAL CHARACTERISTICS

Power supply	V DC	12 ÷ 30 ripple included - external fuse 1,0 A
Current consumption	mA	100+ sensor power consumption
Command value		via Pro“bus DP - ID number 1810h
Feedback value: - digital - analogue	SSI V mA	digital sensor with any interface SSI 0 ÷ 10 (R_I = 25 k) 4 ÷ 20 (R_I = 250)
Position accuracy: - digital - analogue	%	± 2 bits of sensor resolution 0.01
Output value: - E0 version - E1 version	V mA	±10 (max load 5 mA) 4 ÷ 20 (max load 390)
Interface		RS 232 C
Electromagnetic compatibility (EMC): according to 2004/108/CE standards		Emissions EN 61000-6-3 Immunity EN 61000-6-2
Housing material		thermoplastic polyamide PA6.6 combustibility class V0 (UL94)
Housing dimensions	mm	120 (d) x 99(h) x 46(w)
Connector		4x4 poles screw terminals - PE direct via DIN rail
Operating temperature range	°C	-20 / +60
Protection degree		IP 20

1 - IDENTIFICATION CODE

E	W	M	-	S	-	D	AD	/	10	

Digital card for closed loop systems
DIN EN 50022 rail mounting

Stroke control

Digital command value

Analog and digital feedback values

Output value:
E0 = voltage ±10V (**standard**)
E1 = current 4 ÷ 20 mA

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

The card EWM-S-DAD is an evolution of an analog model (EWM-S-AD). The customer can choose between two sensor types: analog or digital and the communication with the PLC is via Profibus DP.

With only a few parameters the controller can be optimized and the movement profile is preset via Profibus (position and velocity).

Sample time is 1 ms.

Here below an example of profile with a switch speed:

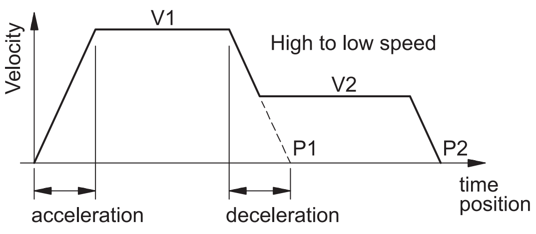
- the target position is command value 2 (P2) combined with velocity 2 (V2).

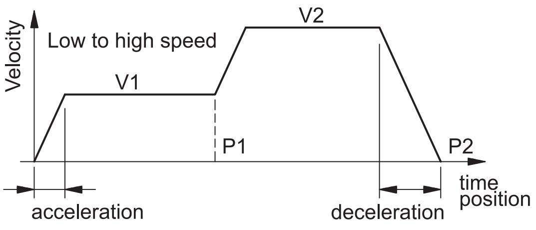
- the switch over position is command value 1 (P1), combined with velocity 1 (V1).

Switching over position from a high to a lower speed is calculated by the deceleration function and V2.

Switching over from a low to a high velocity is carried out at the position (P1) via the acceleration ramp; see below.

- If the positioning command value 2 (P2) is between the actual and the position command value 1 (P1), to position 2 (P2) can only be driven with speed 1 (V1).





2 - FUNCTIONAL SPECIFICATIONS

2.1 - Power supply
This card is designed for 12 to 30 VDC (typical 24 V) of a power supply. This power supply must correspond to the actual EMC standards. All inductivities at the same power supply (relays, valves) must be provided with an over voltage protection (varistors, free-wheel diodes). It is recommended to use a regulated power supply (linear or switching mode) for the card supply and the sensors.

2.2 - Electrical protections
All inputs and outputs are protected with suppressor diodes and RC-filters against transient overshoots.

2.3 - Digital Input (ENABLE)
The card accepts digital input. The digital input must have a voltage from 12 to 24 V; Low level: <2V, high level >10V with current <50mA. See the block diagram at paragraph 8 for the electric connections.

2.4 - Command value
The card accepts the input via Profibus, ID number 1810h (see paragraph 4).

2.5 - Input feedback values
The card accepts analogue or digital feedback input. The digital sensor parameters are settable via software (see parameters table). with analogue feedback the signal must can be 0 ÷ 10 V (R_I = 25 k) or 4 ÷ 20 mA (R_I = 250) Analogue sensor max resolution is 0.001 mm.

2.6 - Output values
E0 version: output voltage 0 ±10 V (standard).
E1 version: output current 4 ÷ 20 mA with max load 390 .

2.7 - Digital Output
Two digital output are available, INPOS and READY, that are displayed via LEDs on the front panel.
Low level <2V High Level > 10 V Max 50 mA with load 200 .

3 - LED FUNCTIONS

There are three leds on the card: one on the profibus module, that shows the online status of Profibus connection, and two on the other module:

GREEN: Shows if the card is ready.

ON - The card is supplied
OFF - No power supply
FLASHING - Failure detected (internal or 4 20 mA).
Only if SENS = ON

YELLOW: Is the signal of the control error monitoring.

ON - No control error

4 - ADJUSTMENTS

On the EWM cards, the adjustment setting is possible only via software.

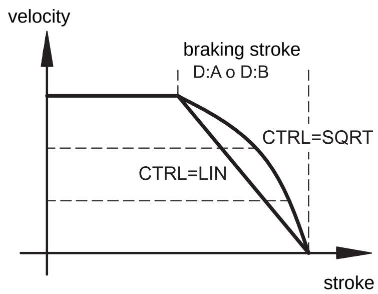
Connecting the card to the PC, the software automatically recognises the card model and shows a table with all the available commands, with their parameters, the default settings, the measuring unit and an explanation of the commands and its uses. The parameters change depending on the card model.

EXAMPLE OF PARAMETERS TABLE

Command	Parameters	Defaults	Units	Group	Description
LG x	x= DE|GB	GB	-	STD	Changing language help texts.
MODE x	x=STD|EXP	STD	-	STD	Mode parameter.
TS x	x= 5..30	10	0,1 ms	EXP	Changing the controller sample time.
STROKE x	x= 10..10000	100	mm	STD	Working stroke or the sensor.
VS x	x= EXT|INT	INT	-	STD	Switch over between internal and external velocity preset.
VELO x	x= 1..10000	10000	0,01%	STD	Here the max velocity can be limited internally. The limitation function corresponds to the external velocity preset if VS was parameterized with EXT
VRAMP x	x= 10..5000	200	ms	VS=EXT	Ramp time for velocity input.
VMODE x	x= SDD|NC	SDD	-	EXP	Control structure for positioning process. SDD: stroke-dependent deceleration is activated. From the set deceleration point the drive then switches to control mode and moves accurately to the desired position. NC: In this mode a position pro“le is generated internally. The system always works under control and uses the following error to follow the position pro“le.
VMAX x	x= 1..3000	50	mm/s	VMODE=NC	Max velocity in NC mode.
EOUT x	x= -10000..10000	0	0,01%	EXP	When an input error occurs the adjusted value of •EOUT• will be displayed at the output pin 15/16. A value less than 100 deactivates this function.
POL x	x= -|+	+	-	STD	For changing the output polarity. All **A** and **B** adjustments depend on the output polarity. The right polarity should be de“ned “rst.
SENS x	x= ON|OFF|AUTO	AUTO	-	STD	Activation of the sensor and internal failure monitoring.
AIN:W **AIN:X**	A= -10000..10000 B= -10000..10000 C= -500..10000 X= V|C	A: 1000 B: 1000 C: 0 X: V	-	STD	Analogue output selection. **W** and **X** for the inputs and **V** = voltage, **C** = current. With the parameters **a**, **b** and **c** the inputs can be scaled (output = a / b * (input - c)). Because of the programming of the **x**-value (**x** = **C**) the corresponding input will be switched over to current automatically.
A:A x **A:B x**	x= 1..5000 x= 1..5000	100 100	ms ms	STD	Acceleration time depending on direction. **A** indicates analogue output 15 and **B** indicates analogue output 16. Normally **A** = ”ow P-A, B-T and **B** = ”ow P-B, A-T.
D:A x **D:B x** **D:S x**	x= 1..10000 x= 1..10000 x= 1..10000	25 25 10	mm mm mm	VMODE=SDD	Deceleration stroke dependent from direction. The loop gain is calculated by the deceleration stroke. The shorter the higher. In case of instabilities longer deceleration stroke should be set Loop Gain = STROKE / D:A o STROKE / D:B.
V0:A x **V0:B x**	x= 1..200 x= 1..200	10 10	1/s 1/s	VMODE=NC	Loop Gain for NC mode: D:A = VMAX / V0:A e D:B = VMAX / V0:B Loop Gain = STROKE / D:A o STROKE / D:B.
CTRL x	x= lin|sqrt1|sqrt2	sqrt1	-	STD	Selection of the control function: (see **NOTE**) **lin** = standard linear P-control, **sqrt1** = progressive time optimized deceleration curve. **sqrt2** = sqrt1 with a higher gain in position.
HAND:A x **HAND:B x**	x= -10000..10000 x= -10000..10000	3330 -3330	0,01% 0,01%	STD	Hand speed (in manual mode) For the corresponding switch input the direction can be de“ned by the sign.
MIN:A x **MIN:B x**	x= 0..6000 x= 0..6000	0 0	0,01% 0,01%	STD	Zero point setting /following error compensation.
MAX:A x **MAX:B x**	x= 3000..10000 x= 3000..10000	10000 10000	0,01% 0,01%	STD	Maximum output signal limitation.
TRIGGER x	x= 0..4000	200	0,01%	STD	Trigger threshold for activating the following error compensation (MIN).
OFFSET x	x= -4000..4000	0	0,01%	STD	Offset value added to the output signal. (setpoint - actual value + offset).
INPOS x	x= 2..200000	200	µm	STD	Range for InPos signal. (See **NOTE**)

INPX x	x= ANA|SSI	ANA	-	STD	Sensor input changeover.
SSI:OFFSET x	x= -1000000… 1000000	0	µm	INPX=SSI	Position Offset.
SSI:POL x	x= +|-	+	-	INPX=SSI	Sensor polarity. To reverse the sensor working direction its polarity can be changed with this command.
SSI:RES x	x= 100… 10000	500	10 nm	INPX=SSI	Resolution of the sensor. The highest resolution (1000) corresponds to 1 µm. This sensor resolution is always used for the input data via Profibus and is needed for the internal calculations. (see **NOTE**)
SSI:BITS x	x= 8… 31	24	bits	INPX=SSI	Number of bits transmitted.
SSI:CODE x	x= GREY|BIN	GREY	-	INPX=SSI	Transmission coding.

NOTE about the CTRL command:: This command controls the braking characteristic of the hydraulic axis. With positive overlapped proportional valves one of both SQRT braking characteristics should be used because of the linearization of the non-linear flow curve typical of these valves If zero overlapped proportional valves (control valves) are used, you can choose between LIN and SQRT1 according to the application. The progressive gain characteristic of SQRT1 has the better positioning accuracy.



According to the application there is maybe a longer braking distance, so that the total stroke time will be longer.

LIN: Linear braking characteristics (control gain corresponds to: 10000 / d:i).

SQRT*: Root function for the calculation for the braking curve.
 SQRT1: with small control error. Control gain corresponds to 30000 / d:i ;
 SQRT2: control gain corresponds to 50000 / d:i

NOTE about the INPOS command: The INPOS command defines the window in relation to the stroke where the INPOS message is indicated. The monitored area is derived from the setpoint value minus the half •InposŽ value until setpoint value plus the haf •InposŽ value. The positioning process is not influenced by this message. The controller remains active. In NC-mode this message has to be interpreted alternatively as following error.

NOTE about the SSIRES command: the standard of measurement is defined as increment/mm (inkr/mm). The maximum available resolution is equal to 1 m that corresponds to a value 1000.

Example: A sensor with resolution 5 m has a resolution (0.005 mm) 5 times lower than the maximum set.
The SSIRES value is calculated as follows: *1000* (full scale ink) */ n* (sensor resolution in m) = *1000 / 5 = 200*

5 - PROFIBUS COMMUNICATION

The module supports all baud rates from 9,6 kbit/s up to 12000 kbit/s with auto detection of the baud rate. The functionality is defined in IEC 61158. The Profibus address can be programmed with the EWMPC/10 software or online via the Profibus. A diagnostic LED indicates the online status.

5.1 - Data Sent

The card is set as follows:

Byte	Function	Comment
0	control word Hi	
1	control word Lo	actual not used
2	command position 1 Hi	
3	command position 1	
4	command position 1	
5	command position 1 Lo	
6	velocity 1 Hi	
7	velocity 1 Lo	
8	command position 2 Hi	active, if a second velocity is programmed (Bytes 13 and 14)
9	command position 2	
10	command position 2	
11	command position 2 Lo	
12	velocity 2 Hi	
13	velocity 2 Lo	
14	-	reserved
15	-	reserved

5.1.2 - Control words

The control words contain the following informations:

ENABLE: Must be activated in addition to the hardware signal.

START: In case of increasing edge the current command position is taken over, in case of deactivated START the system about a brake ramp is stopped.

HAND-: Hand mode (START = OFF), driving with the velocity programmed with the HAND:B parameter according to the hydraulic symbol of the valve. After deactivation the actual value is taken over as command position.

HAND+: Hand mode (START = OFF), driving with the velocity programmed with the HAND:A parameter according to the hydraulic symbol of the valve. After deactivation the actual value is taken over as command position.

Byte 0 - control word Hi		
bit	**Function**	
0		
1		
2		
3		
4	Hand-	1 = active
5	Hand+	1 = active
6	Start	1 = active
7	Enable (with hardware enable)	

The ENABLE bit is combined with the external enable input; that means that both signals must exist, in order to enable the axes..

5.1.3 - Position setpoint description

Command position: according to the sensor resolution.

Byte 2 to 5 - command position 1		
bit	**Function** defined by the sensor resolution	
from 0 to 7	Command position Lo byte	Byte 5
from 8 to 15	Command position	Byte 4
from 16 to 23	Command position	Byte 3
from 24 to 31	Command position Hi byte	Byte 2

Byte 8 to 11 - command position 2		
bit	**Function** defined by the sensor resolution	
from 0 to 7	Command position Lo byte	Byte 11
from 8 to 15	Command position	Byte 10
from 16 to 23	Command position	Byte 9
from 24 to 31	Command position Hi byte	Byte 8

Example of calculation of position control for SSI sensor resolution = 5 µm and 100% stroke = 300 mm.

Position setpoint = 150 mm (= 50% stroke)

STROKE €SSIRES = 100% stroke (dec)

300 € 200 = 60.000 (dec) EA60 (hex)
50% di 60.000 = 30.000 (dec) 7530 (hex)

Example of calculation of position control for ANA sensor with 100% stroke = 300 mm. With analog sensors SSIRES value is preset and unchangeable.

Position setpoint = 150 mm (= 50% stroke)

STROKE €SSIRES = 100% stroke (dec)

300 € 1000 = 300.000 (dec) 493E0 (hex)
50% di 300.000 = 150.000 (dec) 249F0 (hex)

Position setpoint to be sent
with decimal value 150,000 :

hex **00 02 49 F0**

Byte 5
Byte 2
Byte 4
Byte 3

10.1.4 - Speed setpoint description

Command velocity: 0x3fff corresponds to 100 %.

Byte 6 and 7 - command velocity 1		
bit	**Function** max value 0x3FFF	
from 0 to 7	velocity Lo byte	Byte 7
from 8 to 15	velocity Hi byte	Byte 6

Byte 12 and 13 - command velocity 2		
bit	**Function** max value 0x3FFF	
from 0 to 7	velocity Lo byte	Byte 13
from 8 to 15	velocity Hi byte	Byte 12

5.2 - Updating data

The card send back to the bus-card a totally of 24 bytes of data.

Byte	Function	Comment
0	status word Hi	
1	status word Lo	not used
2	actual position Hi	
3	actual position	
4	actual position	
5	actual position Lo	
6	internal command position Hi	
7	internal command position	
8	internal command position	
9	internal command position Hi	
10	Control deviation Hi	in resolution of the positioning sensor
11	Control deviation	
12	Control deviation	
13	Control deviation Lo	
14		
15		

5.2.1 - Status word description

The status words are:

READY: System is ready.

INPOS: Depending on the mode set, can transmit a target reached information or, in NC mode, the following error control information.

Byte 1 - status word Hi		
bit	**Function**	
0		
1		
2		
3		
4		
5		
6	INPOS	1 = actual value in position window
7	READY	1 = ready to operate

5.2.2 - Positioning description

Bytes 2 to 5 - Actual position		
byte	**Function** defined by the sensor resolution	
from 0 to 7	Actual position Lo-Byte	Byte 5
from 8 to 15	Actual position	Byte 4
from 16 to 23	Actual position	Byte 3
from 24 to 31	Actual position Hi-Byte	Byte 2

Current command position: is interpreted according to mode differently.

SDD mode : target command position

NC-mode : (V_{MODE} = ON) calculated command position of the generator.

Actual position: according to the sensor resolution.

The stroke of the cylinder is obtained by applying the following formula:

received data / SSIRES = stroke

hex **00 04 90 F3** = dec **299251**

Byte 2 Byte 3 Byte 4 Byte 5

so, with SSIRES = 1000

299251 / 1000 = 299,251 (millimetres)

Bytes 6 to 9 - Internal command position		
byte	**Function** defined by the sensor resolution	
from 0 to 7	Command position Lo-Byte	Byte 9
from 8 to 15	Command position	Byte 8
from 16 to 23	Command position	Byte 7
from 24 to 31	Command position Hi-Byte	Byte 6

Bytes 10 to 13 - Control deviation		
byte	**Function** defined by the sensor resolution	
from 0 to 7	Control deviation Lo-Byte	Byte 13
from 8 to 15	Control deviation	Byte 12
from 16 to 23	Control deviation	Byte 11
from 24 to 31	Control deviation Hi-Byte	Byte 10

6 - INSTALLATION

The card is designed for rail mounting type DIN EN 50022.

The wiring connections are on the terminal strip located on the bottom of the electronic control unit. It is recommended to use cable sections of 0.75 mm^2, up to 20 m length and of 1.00 mm^2 up to 40m length, for power supply and solenoid connections. For other connections it is recommended to use cables with a screened sheath connected to earth only on the card side.

NOTE: To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the wiring diagram. As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electric motors, inverters and electrical switches).

In environments that are critical from the electromagnetic interference point of view, a complete protection of the connection wires can be requested.

A typical screened Profibus plug (D-Sub 9pol with switchable termination) is mandatory. Also the Profibus cable must be screened.

Every Profibus segment must be provided with an active bus termination at the beginning and at the end. The termination is already integrated in all common Profibus plugs and can be activated by DIL switches.

In environments that are critical from the electromagnetic interference point of view, a complete protection of the connection wires can be requested.

7 - SOFTWARE KIT EWMPC/10 (code 3898401001)

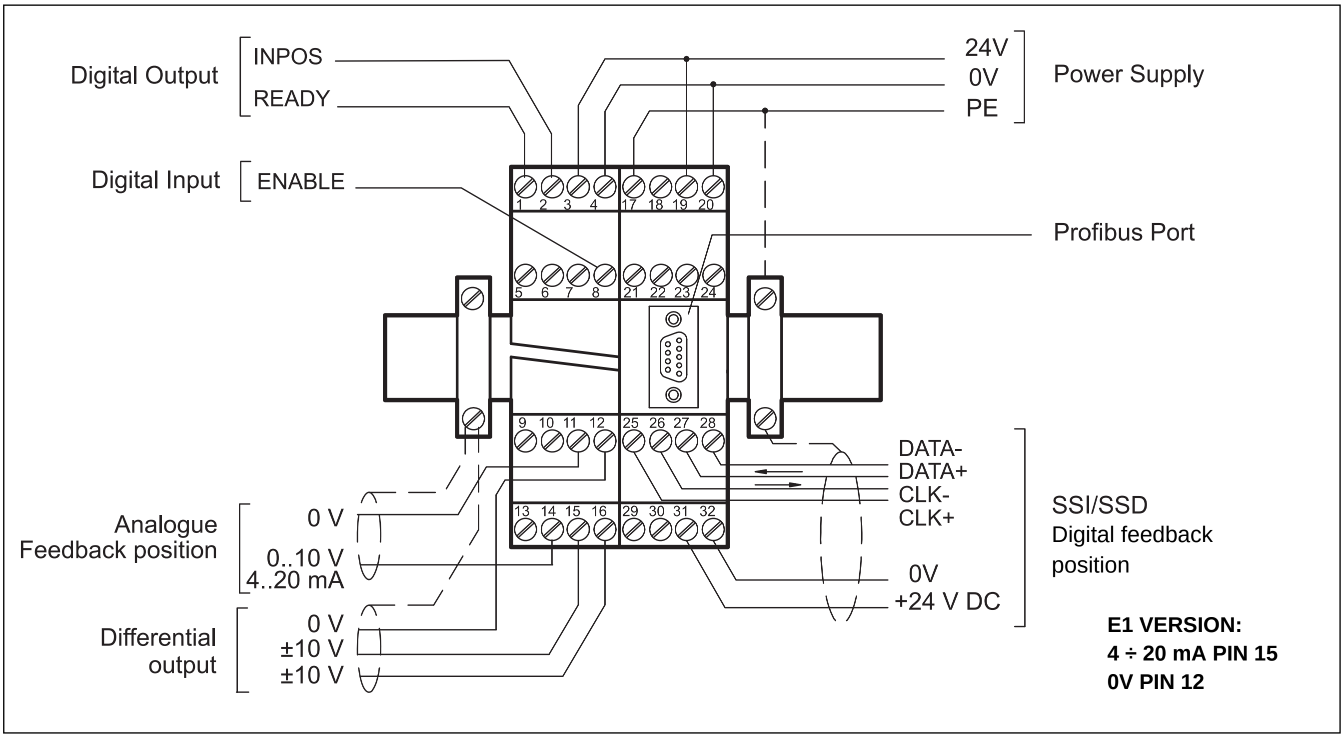
The software kit comprising a USB cable (1.8 mt length) to connect the card to a PC or notebook and the software.

During the identification all information are read out of the module and the table input will be automatically generated.

Some functions like baud rate setting, remote control mode, saving of process data for later evaluation are used to speed up the installation procedure.

The software is compliant with Microsoft XP® and Windows7 operating systems.

8 - WIRING DIAGRAM



DIGITAL INPUT AND OUTPUT

PIN 1 READY output.
General operationality, ENABLE is active and there is no sensor error (by use of 4÷20 mA sensors). This output corresponds with the green LED.

PIN 2 INPOS output.
Monitoring of the control error (INPOS). Depending on the INPOS command, the status output will be deactivated, if the position difference is greater then the adjusted window.
The output is only active if START = ON.

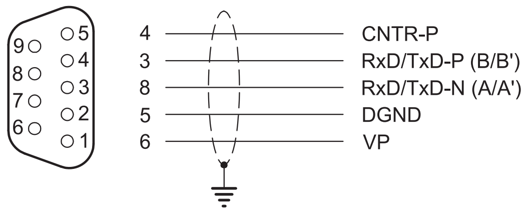
PIN 8 ENABLE input:
This digital input signal initializes the application.
The analogue output is active and the READY signal indicates that all components are working correctly.
Target position is set to actual position and the drive is closed loop controlled.

ANALOGUE INPUT AND OUTPUT

PIN 14 Analogue feedback value (XL),
range 0 ÷ 100% corresponds to 0 ÷ 10V or 4 ÷ 20 mA

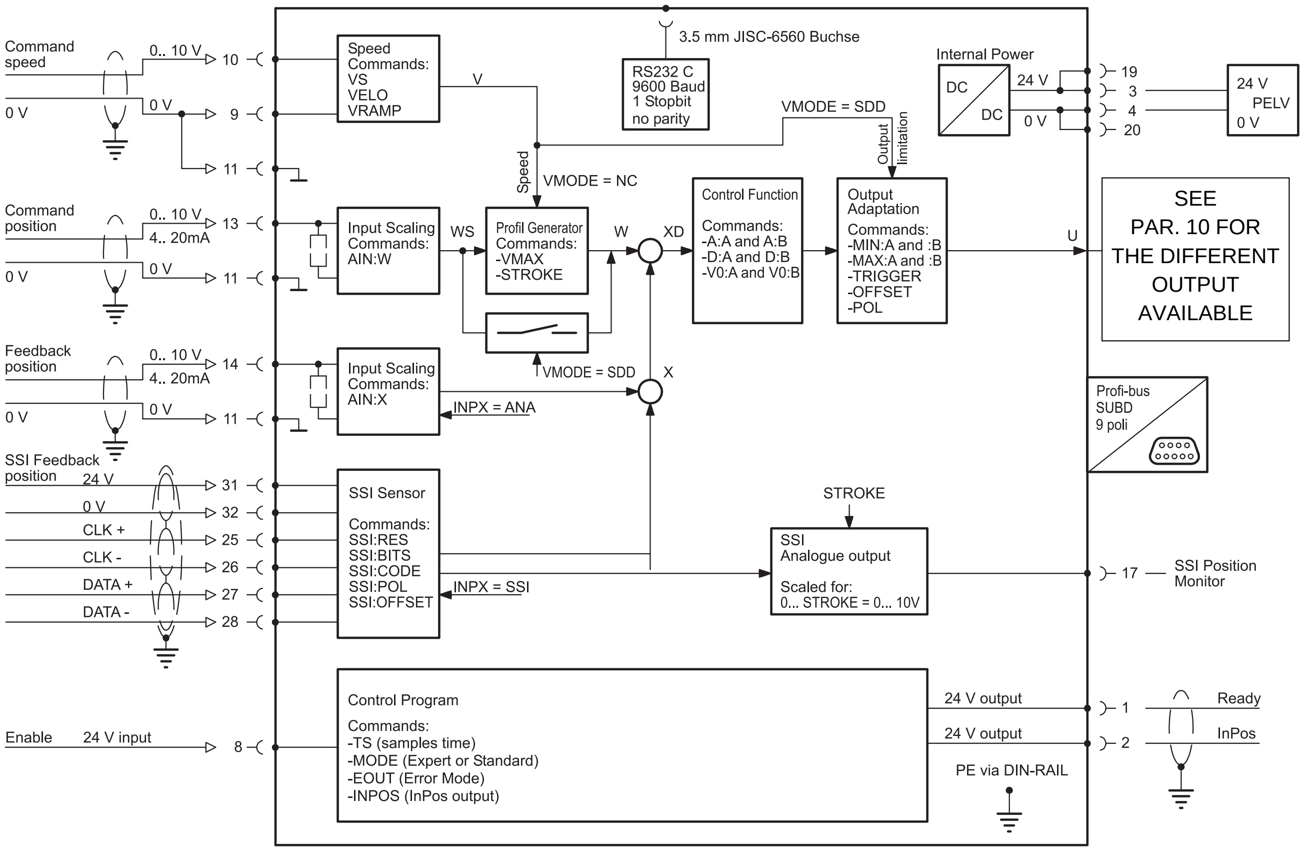
PIN 15/16 Differential output (U)
±100% corresponds to ± 10V differential voltage,
optionally (E1 version) current output ±100% corresponds to 4 ÷ 20 mA (PIN 15 to PIN 12)

PROFIBUS PORT WIRING AND LINKING CONFIGURATION



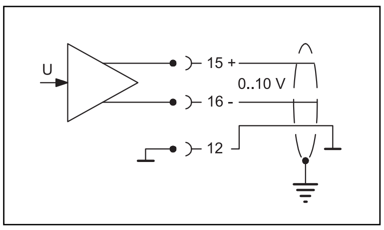
pin	Signal name	Function
1-2-7-9	not used	-
3	RxD/TxD-P (B-Line)	Receive/Send P data
4	CNTR-P/RTS	Request to Send
5	DGND	Data ground
6	VP	+5 V DC for external bus termination
8	RxD/TxD-N (A-Line)	Receive/Send N data

9 - CARD BLOCK DIAGRAM

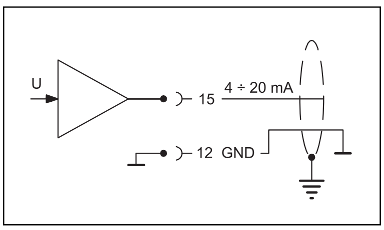


10 - OUTPUT SIGNALS AVAILABLE FOT DIFFERENT VERSIONS

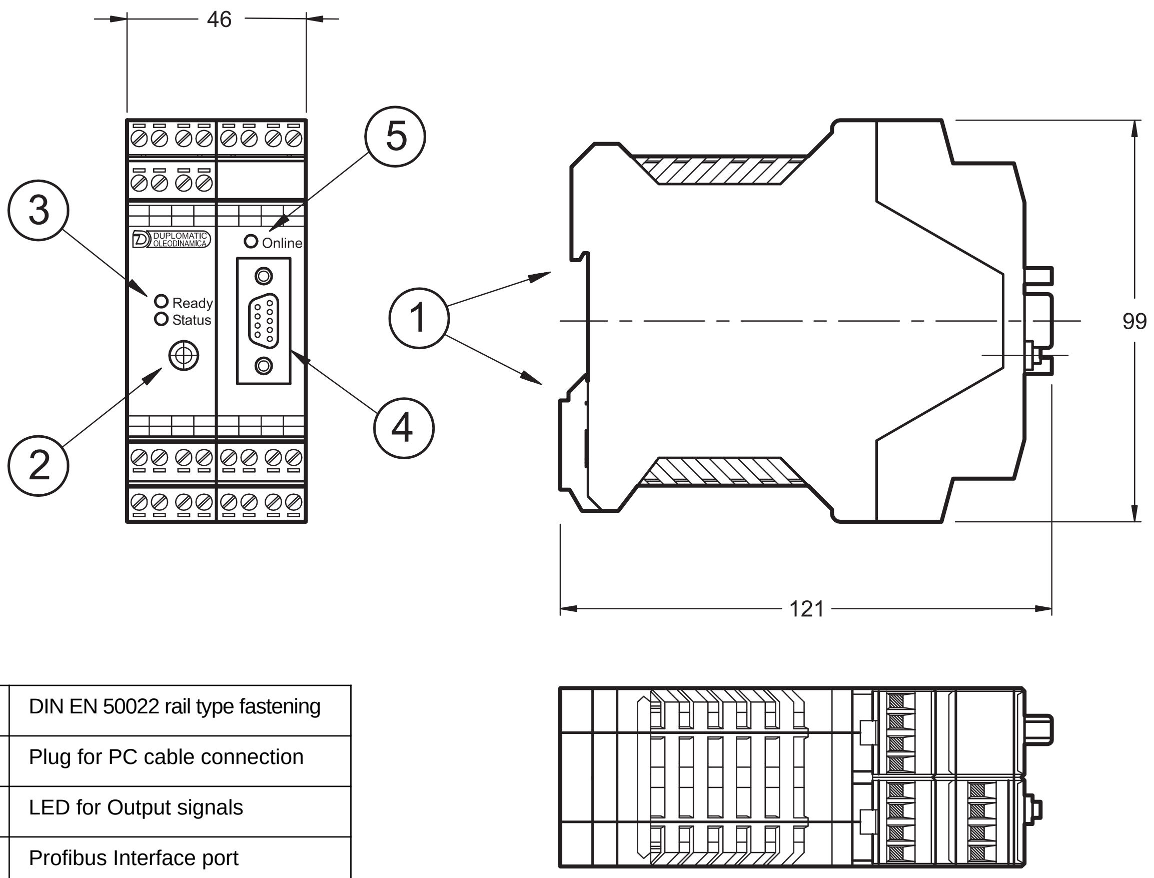
E0 VERSION



E1 VERSION



10 - OVERALL AND MOUNTING DIMENSIONS



1	DIN EN 50022 rail type fastening
2	Plug for PC cable connection
3	LED for Output signals
4	Profibus Interface port
5	Profibus LED

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DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

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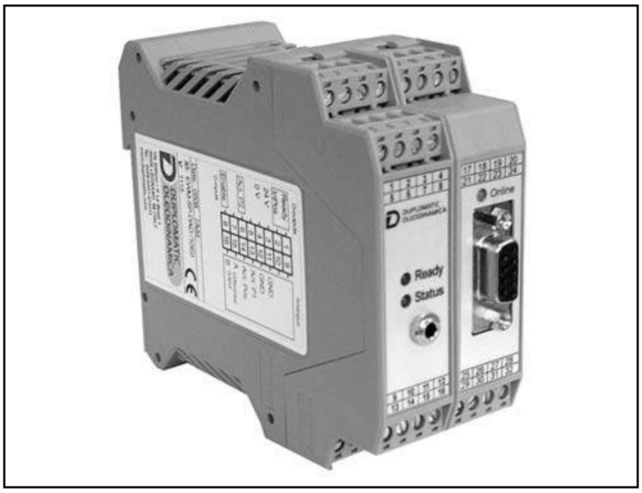


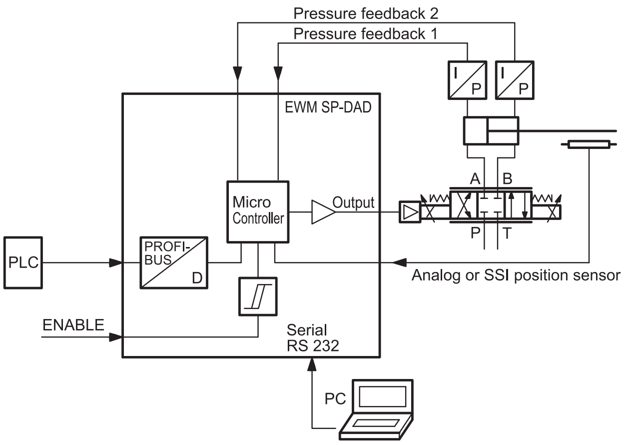
EWM-SP-DAD

CARD FOR AXIS CONTROL (STROKE AND PRESSURE) WITH PROFIBUS COMMUNICATION INTERFACE

SERIES 10

RAIL MOUNTING TYPE: DIN EN 50022

OPERATING PRINCIPLE



„ This card has been developed to drive the positioning of the hydraulics actuators where an high accuracy is needed, using a digital sensor with SSI interface to measure the positions, or an analog sensor with an accuracy of up to 0,01%

„ Additionally an integrated control for pressure limitation, for one or two sensors (differential pressure), is implemented.

„ The card works as an axis controller and communicates with the PLC via the integrated Profibus interface and vice versa.

„ The card works in three ways: stroke depending deceleration, NC mode and force control mode.

„ Tipically used for general positioning control with integrated closed loop pressure control.

„ The card use the RS232C interface, and is settable via PC, using the software kit (EWMPC).

TECHNICAL CHARACTERISTICS

Power supply	V DC	12 ÷ 30 ripple included - external fuse 1,0 A
Current consumption	mA	400 + sensor power consumption
Command value		via Pro“bus DP - ID number 1810h
Position feedback value	SSI V mA	digital sensor with any interface SSI 0 ÷ 10 (R_I = 33 k) 4 ÷ 20 (R_I = 250)
Pressure feedback value	V mA	0 ÷ 10 (R_I = 33 k) 4 ÷ 20 (R_I = 250)
Output value: - E0 version - E1 version	V mA	±10 (max load 5 mA) 4 ÷ 20 (max load 390)
Position accuracy	%	± 2 bits of sensor resolution
Interface		RS 232 C
Electromagnetic compatibility (EMC): according to 2004/108/CE standards		Emissions EN 61000-6-3 Immunity EN 61000-6-2
Housing material		thermoplastic polyammide PA6.6 combustibility class V0 (UL94)
Housing dimensions	mm	120 (d) x 99(h) x 46(w)
Connector		4x4 poles screw terminals - PE direct via DIN rail
Operating temperature range	°C	-20 / +60
Protection degree		IP 20

1 - IDENTIFICATION CODE

E	W	M	-	SP	-	D	AD	/	10	

- E W M: Digital card for closed loop systems DIN EN 50022 rail mounting
- SP: Stroke and pressure control
- D: Digital command value
- AD: Analog and digital feedback values
- 10: Series No. (from 10 to 19 sizes and mounting dimensions remain unchanged)
- Output value:
  E0 = voltage ±10V (**standard**)
  E1 = current 4 ÷ 20 mA

The EWM-SP-DAD is card for positioning and force control loop, which can be combined or single position or force.

The card is designed both for digital or analogue position feedback; the communication with the PLC is via Profibus DP.

the card can be used as point to point controller (stroke depended deceleration) as well as in NC mode.

With only few parameters the controller can be optimized and the movement profile is preset via Profibus (position and velocity).

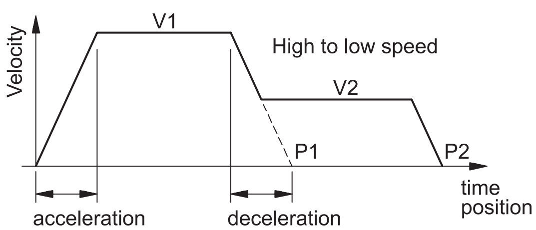
Here below an example of profile with a switch speed:

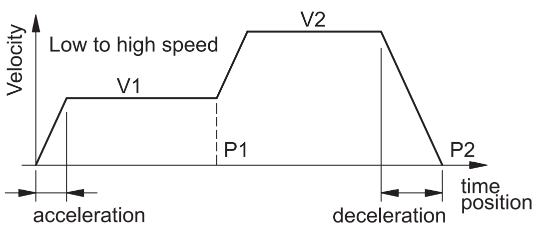
- the target position is command value 2 (P2) combined with velocity 2 (V2).
- the switch over position is command value 1 (P1), combined with velocity 1 (V1).

The switchpoint from high to low velocity is calculated depending on the speed V2 and the braking.

The switchpoint from low to high speed is made in the P1 position with the ramp acceleration, as shown below.

If the command position P2 is between the current position and the position value of P1, the positioning in P2 can only be driven with V1 velocity.





Pressure limitation control function:
For p/Q control a dynamic zero-overlapped control valve is necessary.

The pressure loop is managed according to the value of pressure measured in both chambers of the cylinder. The control value for the force loop is maintained via profibus (see par. 9.1.2). If the pressure (or force) exceeds the controller reduces the output signal to the valve (only in a negative scale) until it reaches the preset pressure value.

The switch from 'positioning mode' to 'pressure limitation' is handled automatically.

The sampe time of the card is 1 millisecond.

2 - FUNCTIONAL SPECIFICATIONS

2.1 - Power supply
This card is designed for 12 to 30 VDC (typical 24 V) of a power supply. This power supply must correspond to the actual EMC standards.

All inductivities at the same power supply (relays, valves) must be provided with an over voltage protection (varistors, free-wheel diodes).

It is recommended to use a regulated power supply (linear or switching mode) for the card supply and for the sensors.

2.2 - Electrical protections
All inputs and outputs are protected with suppressor diodes and RC-filters against transient overshoots.

2.3 - Digital Input (ENABLE)
The digital input must have a voltage from 12 to 24 V; Low level: <4V, high level >12V with current <0,1A. See the block diagram at paragraph 8 for the electric connections.

2.4 - Reference signal
The reference signal is run through the card-bus and addressed to the individual modules via Profibus, ID number 1810h (see par. 10).

2.5 - Position feedback values
The card works both with digital (SSI) or analog sensors.

SSI: parameters are settable via software (see SSI parameters in the table on next page).

ANA: The analogue signal must be voltage 0 ÷ 10V with RI = 33 k or current 4 ÷ 20 mA (250), with RI = 250 k
The analogue resolution is of 0,01% of the sensor stroke.

⚠ Using analog sensors, the SSI parameters in the software assume default preset values that the user must not change.

2.6 - Pressure feedback values
The analogue signal must be voltage 0 ÷ 10V with RI = 33 k or current 4 ÷ 20 mA (250), with RI = 250 k .

When a sensor failure occurs, (READY signal) the hardware-enable-signal has to be deactivated.

2.7 - Output values
E0 version: output voltage 0 ±10 V (standard).
E1 version: output current 4 ÷ 20 mA. (max load 390)

2.8 - Digital Output
Two digital output are available, INPOS and READY, that are displayed via LEDs on the front panel.

Low level <4V; High level >10V (I_{max} 50 mA with load of 200)

3 - LED FUNCTIONS

There are three leds on the card: one on the profibus interface, that indicates the online status of Profibus connection, and two on the other module:

GREEN: Shows if the card is ready.

ON - The card is supplied
OFF - No power supply or ENABLE is inactive.
FLASHING - Failure detected (internal or 4 ÷ 20 mA) only if SENS = ON

YELLOW: Is the signal of the control error monitoring.

ON - No control error
OFF - Error detected, depending of a parameter error.

4 - ADJUSTMENTS

On the EWM cards the adjustment setting is possible only via software. Connecting the card to the PC, the software automatically recognises the card model and shows a table with all the available commands, with their parameters, the default setting, the measuring unit and an explanation of the commands and its uses.

The parameters changes depending on the card mode.

5 - SOFTWARE KIT EWMPC/10 (code 3898401001)

The software kit comprising a USB cable (2 mt lenght) to connect the card to a PC or notebook and the software.

During the identification all information are read out of the module and the table input will be automatically generated.

Some functions like baud rate setting, remote control mode, saving of process data for later evaluation are used to speed up the installation procedure.

The software is compliant with Microsoft XP® operating systems.

EXAMPLE OF PARAMETERS TABLE

Commands	Parameter	Defaults	Units	Description
inpx	X= SSI|ANA	SSI	-	Selection of the sensor input channel. The standard is a digital sensor with SSI specification at the corresponding connections (clamps 25 to 28 and 31, 32). Alternatively an analogue input which is indicated in the command as parameters •ANAŽ can be used. The command AIN is used for input scaling of the analogue input.
vmode x	x= on|off	off	-	Activation of the NC-generator. In **OFF** state the stroke depended deceleration is active; the velocity preset limits the output signal. In **ON** state a profile generator generates the positioning demand value and the axis drives to the target position with the defined velocity. The stroke time is defined by the parameter **VMAX**.
pdpadr x	X= 1… 126	5		Profibus address
sens x	x= on|off	on	-	Activation of the sensor and internal failure monitoring.
stroke x	X= 2… 3000	500	mm	Length of the sensor. The length of the stroke sensor is needed for the scaling of the analogue input and for the calculation of the braking stroke.
ssioffset x	X= -30000… 30000	0	0,01 mm	Zero point adjustment of the sensor.
ssires x	X= 10… 1000	1000	inkr/mm	Resolution of the digital sensor. This sensor resolution is always used for the input data via Profibus and is needed for the internal calculations. (see **NOTE**)
ssibits x	X= 8… 31	24	-	Data protocol length in bits
ssicode x	X= GRAY|BIN	GRAY	-	Transmitting code of the sensor.
ssipol x	X= +|-	+	-	Sensor polarity. In order to reverse the working direction of the sensor, the polarity can be changed via this command. In any case also the SSIOFFSET has to be adjusted. Ex: Sensor length = 200 mm opposite working direction. SSIPOL is set on •-• and SSIOFFSET on 20000.
ain:i a b c x	i= XL|XP1|XP2 a= -10000… 10000 b= -10000… 10000 c= -10000… 10000 x= V|C	 : 10000 : 10000 : 0 : V	 - - 0,01% -	Analogue input scaling. **XL** for position, **XP1** or **XP2** for pressure. (**NOTE**) Input signal: **V** = voltage and **C** = current. With the parameters **a**, **b** and **c** the input can be scaled (output = a / b * (input - c)). Because of the programming of the **x**-value (x = **C**) the corresponding input will be switched over to current automatically.

vramp x	x= 1… 2000	200	ms	Ramp time for the external velocity. Operating shocks can be reduced when changing the external velocity.
vmax x	X= 1… 20000	50	mm/s	Parameter is active in vmode = ON only. **vmax** defines the maximum speed. Via the external command speed an actual speed between 0,5 100 % can be selected.
a:i x	i= A|B x= 1… 2000	:A 200 :B 200	ms ms	Acceleration time depending on direction. **A** indicates analogue output 15 and **B** indicates analogue output 16. Normally **A** = flow P-A, B-T and **B** = flow P-B, A-T.
d:i x	i= A|B|S X= 50… 10000	:A 2500 :B 2500 :S 1000	0,01% 0,01%	Deceleration stroke depending on direction. This parameter is set in 0,01% units of the maximum length of the sensor. The braking distance is set dependent from the direction. The controller gain will be calculated by means of the braking distance. The shorter the braking distance the higher the gain (see command CTRL). In case of instabilities a longer braking distance should be set. The parameter **D** indicates the ratio between the maximum sensor length and and a indicated stopping point;will become active after the removal of the •START• signal only .
ctrl x	x= lin|sqrt1|sqrt2	sqrt1	-	Selection of the control function: (see **NOTE**) **lin** = standard linear P-control, **sqrt1** = progressive time optimized deceleration curve, **sqrt2** = sqrt1 with a higher gain in position
inpos x	i= S|D X= 0… 5000	32	0,01%	Range for the InPos signal (status output) **S** is used for the static INPOS window. **D** is used for the dynamic (following error) monitoring in NC mode.
hand:i x	i= A|B x= -10000… 10000	:A 3300 :B -3300	0,01% 0,01%	Velocity command in manual mode, in both A and B directions
ap:i x	i= UP|DOWN x= 0… 60000	:A 100 :B 100	ms ms	Ramp time for pressure UP and DOWN.
poffset x	x= -2000… 2000	0	0,01%	Pressure offset.
c:i x	i= P|I|D|T1|IC :P x= 0… 10000 :I x= 0… 2050 :D x= 0… 120 :T1 x= 0… 100 :IC x= 0… 10000	:P 50 :I 400 :D 0 :T1 1 :IC 5000	0,01 ms ms ms 0,01%	PID-compensator used for pressure control. P-Gain, 50 = nominal gain of 0,5. I-Gain, in ms, can be deactivated by values > 2010. D-Gain, in ms. T1 in ms; damping of the D-Gain. IC-Factor; activation point of the integrator.
perror x	x= 0..2000	100	0,01%	The command 'ERROR' defines the window within which the error message is displayed on the led. But the controller is always active.
pol x	x= +|-	+	-	Output polarity. All **A** and **B** adjustments depend on the output polarity. The right polarity should be defined first. Output polarity. All **A** and **B** adjustments depend on the output polarity. The right polarity should be defined first.
save	-	-	-	Storing the programmed parameter in E²PROM.
loadback	-	-	-	Reloading the parameter from E²PROM in working RAM
default	-	-	-	Preset values will be set.

wl **xl** **v** **xw** **wp** **xp** **xp1** **xp2,** **xwp** **up** **u**	Command signal Actual signal Speed limitation Position error (wl-xl) Pressure command XP1-XP2 (differential) Sensor pressure 1 Sensor pressure 2 Pressure error Output of the pressure control function Controller output	-	-	Data monitoring process. The data can be read and show the real-time command and actual values
st	-	-	-	Monitoring the status words. You can use this command from the tool 'terminal' of the software to read the values of the status word in binary format.

NOTE about the SSIRES command: the standard of measurement for this parameter is defined as increment/mm (inkr/mm). The maximum settable value is 1000 and corresponds to 1 m (0,001 mm), that is the highest resolution available.

Example: A sensor with resolution 5 m (0.005 mm) has a resolution 5 times lower than the maximum set.
The SSIRES value is calculated as follows: *1000* (full scale ink) */ n* (sensor resolution in m) = *1000 / 5 = 200*

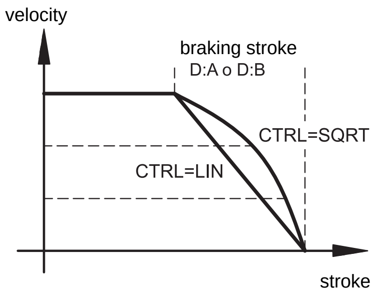
NOTE about the AIN command: This command is for analogue sensor only. With this command each input can be scaled individually. For the scaling function the following linear equation is taken: output signal = *a / b * (input signal - c)*.

At first the offset (c) will be subtracted (in 0,01% units) from the input signal, then the signal will be multiplied with factor **a** / **b**. **a** and **b** should always be positive. With these both factors every floating-point value can be simulated (for example: 1.345 = 1345 / 1000).

With the x parameter value the internal measuring resistance for the current measuring (4 20 mA) will be activated (V for volt ages input and C for current input). ATTENTION: This resistor is never activated at the k input.

	AIN:X	a	b	c	x
i with voltage:	AIN:i	1000	1000	0	V
i with current:	AIN:i	1250	1000	2000	C

NOTE about the CTRL command:: This command controls the braking characteristic of the hydraulic axis. With positive overlapped proportional valves one of both SQRT braking characteristics should be used because of the linearization of the non-linear flow curve typical of these valves If zero overlapped proportional valves (control valves) are used, you can choose between LIN and SQRT1 according to the application. The progressive gain characteristic of SQRT1 has the better positioning accuracy.



According to the application there is maybe a longer braking distance, so that the total stroke time will be longer.

LIN: Linear braking characteristics (control gain corresponds to: 10000 / d:i).

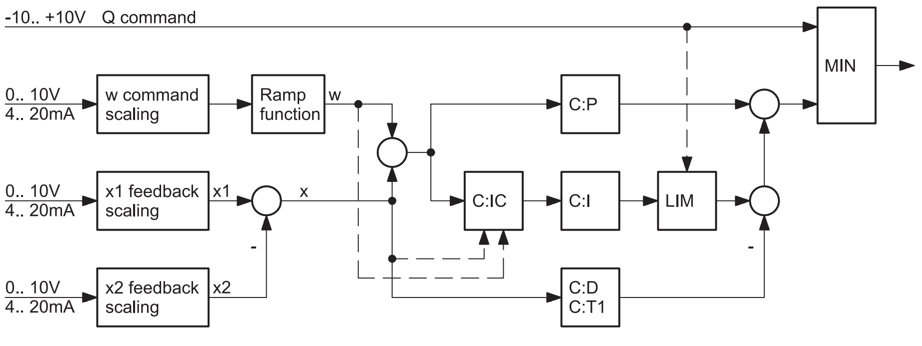
SQRT*: Root function for the calculation for the braking curve.
SQRT1: with small control error. control gain corresponds to 30000 / d:i ;
SQRT2: control gain corresponds to 50000 / d:i

NOTE about the C command (pressure limitation function): The control function will be parameterized via this command. The P, I and D gain are similar to a standard PID controller. The T1 factor is a filter for the D-gain in order to suppress high-frequency noise.

To reduce pressure overshoots, an activation point for the integrator can be programmed via the IC-value. The integrator is activated if the actual pressure is higher than the programmed threshold:

$$I\ on = x > \frac{w \cdot \mathrm{c:ic}}{100\%}$$

At *c:ic = 0* the integrator is always active. By high IC-values and a small P-gain the velocity of the drive is limited. The IC-value activates the integrator in % of the current command value.



Pressure limitation function

C:P	P-gain
C:I	I-gain
C:D	D-gain
C:T1	filter for D-gain
C:IC	integrator activation

6 - INSTALLATION

The card is designed for rail mounting type DIN EN 50022.

The wiring connections are on the terminal strip located on the bottom of the electronic control unit. It is recommended to use cable sections of 0.75 mm^2, up to 20 m length and of 1.00 mm^2 up to 40m length, for power supply and solenoid connections. For other connections it is recommended to use cables with a screened sheath connected to earth only on the card side.

NOTE 1

To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the wiring diagram.

As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electric motors, inverters and electrical switches).

In environments that are critical from the electromagnetic interference point of view, a complete protection of the connection wires can be requested.

6.1 - Profibus functions

The module supports all baud rates from 9,6 kbit/s up to 12000 kbit/s with auto detection of the baud rate. The functionality is defined in IEC 61158. The Profibus address can be programmed by a terminal program, EWMPC/10 or online via the Profibus. A diagnostic LED indicates the online status.

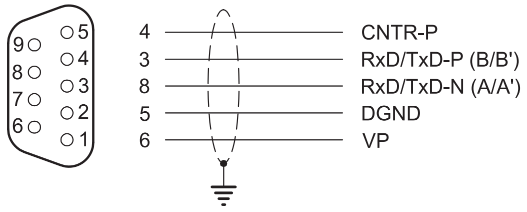
Upon request Duplomatic supplies the .GSD file for the configuration of the Profibus communication between PLC and EWM.

The communication parameter are 16 bytes (8 words) for IN and OUTPUT variables.

6.2 - Profibus port

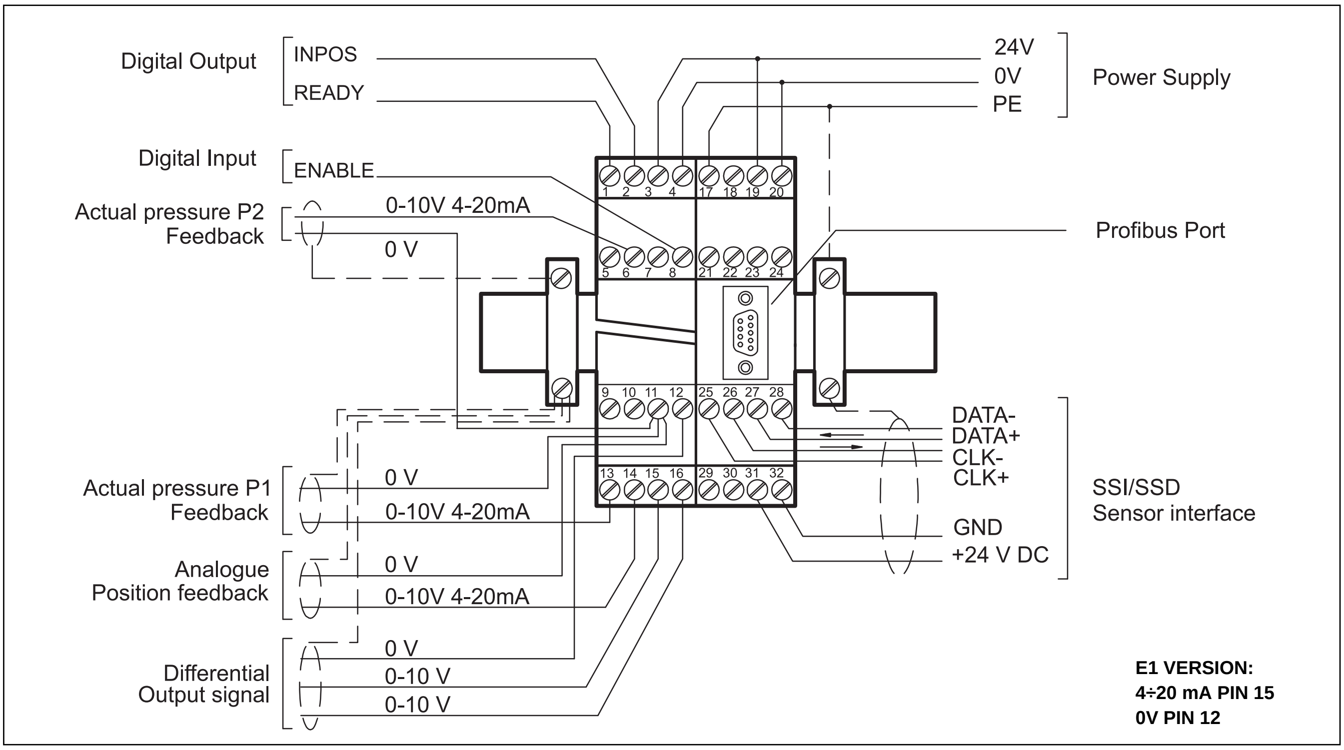
A typical screened Profibus plug (D-Sub 9pol with switchable termination) is mandatory. The address is preset and can be modified just via Profibus (default = 3). Wire not included.

PROFIBUS PORT WIRING AND LINKING CONFIGURATION



pin	Signal name	Function
1-2-7-9	not used	-
3	RxD/TxD-P (B-Line)	Receive/Send P data
4	CNTR-P/RTS	Request to Send
5	DGND	Data ground
6	VP	+5 V DC for external bus termination
8	RxD/TxD-N (A-Line)	Receive/Send N data

7 - WIRING DIAGRAM



ANALOGUE INPUT AND OUTPUT

PIN 6	Analogue pressure feedback value (XP2), range 0 ÷ 100% corresponds to 0 ÷ 10V or 4 ÷ 20 mA
PIN 13	Analogue pressure feedback value (XP1), range 0 ÷ 100% corresponds to 0 ÷ 10V or 4 ÷ 20 mA
PIN 14	Analogue position feedback value (XL), range 0 ÷ 100% corresponds to 0 ÷ 10V or 4 ÷ 20 mA
PIN 15/16	Differential output (U) ±100% corresponds to ± 10V differential voltage, optionally (E1 version) current output ±100% corresponds to 4 ÷ 20 mA (PIN 15 to PIN 12)

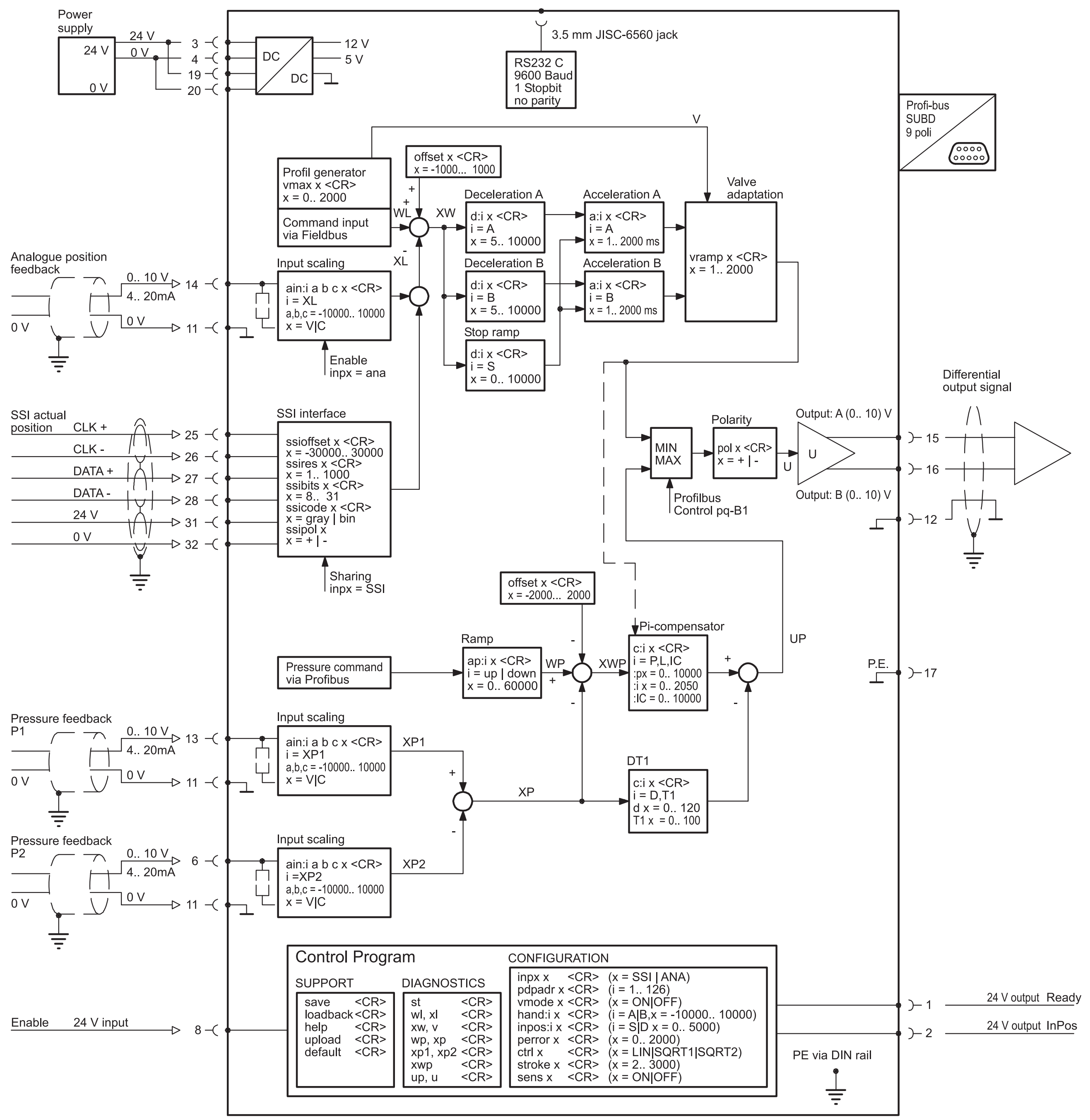
DIGITAL INPUT AND OUTPUT

PIN 8	ENABLE input: This digital input signal initializes the application. The analogue output is active and the READY signal indicates that all components are working correctly. Target position is set to actual position and the drive is closed loop controlled.

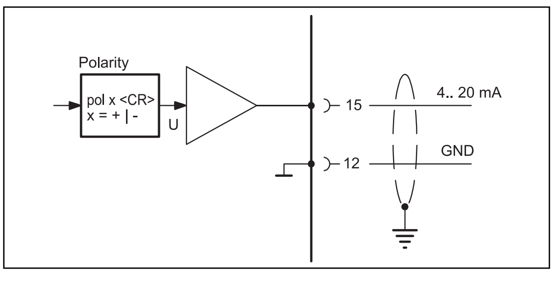
SSI SENSOR INTERFACE

PIN 25	CLK+ output
PIN 26	CLK- output
PIN 27	DATA+ input
PIN 28	DATA- input
PIN 31	24V Power supply of the SSI sensor
PIN 32	0V Power supply of the SSI sensor

8 - CARD BLOCK DIAGRAM



OUTPUT SIGNAL - E1 VERSION



9 - PROFIBUS COMMUNICATION

The PROFIBUS interface always works at the highest resolution possible, which corresponds to the full resolution of the sensors used.

The module receives from the PLC via profibus 8 bytes of data, which contain information relating to the control words, the two command position, the two command velocity, and the pressure value.

The card send informations about the status word, the pressure and position values detected by the sensors, and the differential pressure, for a total of 16 bytes of data.

Using ST command in EWMPC, those data can be read out and they appearing in this way:

(high byte / low byte)
control word : 0000 0000 / 0000 0000

Enable: ENABLE (card enabled; Profibus & Hardware enabled)

9.1 - Data sent to the axes:

The Profibus interface is set as follows:
(Hi = High byte; Lo = low byte)

Byte	Function	Comment
0	control word Hi	
1	control word Lo	not used
2	command position 1 Hi	
3	command position 1	
4	command position 1	
5	command position 1 Lo	
6	velocity 1 Hi	
7	velocity 1 Lo	
8	command position 2 Hi	active, if a second velocity is programmed (Bytes 13 and 14)
9	command position 2	
10	command position 2	
11	command position 2 Lo	
12	velocity 2 Hi	set to zero for deactivate.
13	velocity 2 Lo	
14	demand pressure Hi	
15	demand pressure Lo	

9.1.1 - Control words

The control words contain the following informations:

ENABLE: Must be activated in addition to the hardware signal.

START: The new command position is taken over by a signal change from low to high (from 0 to 1). By deactivation of this bit, the system stops via a programmed deceleration ramp.

HAND+: HAND- manual mode .

PQ: activation of the pressure limitation mode

PI changing of the direction of the pressure limitation.
0 = pressure limitation at extending
1= pressure limitation at retracting
In both directions positive pressure demand values are used. The polarity is changed by this BIT.

The definition of the control word are:

Byte 0 - control word Hi		
bit	**Function**	
0		
1		
2	PI inverse	1 = active
3	PQ active	1 = active
4	Hand+	1 = active
5	Hand-	1 = active
6	Start	1 = active
7	Enable (with hardware enable)	1 = ready

9.1.2 - Position setpoint description

Command position: according to the sensor resolution.

Byte 2, 3, 4 and 5 - command position 1		
bit	**Function** defined by the sensor resolution	
from 0 to 7	Command position Lo byte	Byte 5
from 8 to 15	Command position	Byte 4
from 16 to 23	Command position	Byte 3
from 24 to 31	Command position Hi byte	Byte 2

Byte 8 to 11 - command position 2		
bit	**Function** defined by the sensor resolution	
from 0 to 7	Command position Lo byte	Byte 11
from 8 to 15	Command position	Byte 10
from 16 to 23	Command position	Byte 9
from 24 to 31	Command position Hi byte	Byte 8

Example of calculation of position control for SSI sensor resolution = 5 µm and 100% stroke = 300 mm.

Position setpoint = 150 mm (= 50% stroke)

STROKE €SSIRES = 100% stroke (dec)

300 € 200 = 60.000 (dec) EA60 (hex)
50% di 60.000 = 30.000 (dec) 7530 (hex)

Example of calculation of position control for ANA sensor with 100% stroke = 300 mm. With analog sensors SSIRES value is preset and unchangeable.

Position setpoint = 150 mm (= 50% stroke)

STROKE €SSIRES = 100% stroke (dec)

300 € 1000 = 300.000 (dec) 493E0 (hex)
50% di 300.000 = 150.000 (dec) 249F0 (hex)

Example: command position to send, for decimal value 150000:

hex **2** **49** **F0**

Byte 4 Byte 5 Byte 6 (Lo)

9.1.3 - Speed setpoint description

Command velocity: 0x3fff corresponds to 100 %.

Byte 6 and 7 - command velocity 1		
bit	**Function max value 0x3FFF**	
from 0 to 7	velocity Lo byte	Byte 7
from 8 to 15	velocity Hi byte	Byte 6

Byte 12 and 13 - command velocity 2		
bit	**Function**	
from 0 to 7	velocity Lo byte	Byte13
from 8 to 15	velocity Hi byte	Byte 12

9.1.4 - Demanded pressure description

0x3fff corresponds to 100 %.

Byte 14 and 15 - demanded pressure		
bit	**Funzion max value 0x3FFF**	
from 0 to 7	demanded pressure Lo	Byte 15
from 8 to 15	demanded pressure Hi	Byte 14

9.2 - Data sent to the profibus

Data sent to the profibus interface are: two status words, the commands sent (position, velocity and pressure) and the current actual values, totally of 16 bytes of data.

(Hi = High byte; Lo = low byte)

Byte	Function	Comment
0	status word Hi	
1	status word Lo	not used
2	actual position Hi	
3	actual position	
4	actual position	
5	actual position Lo	
6	internal command position Hi	
7	internal command position	
8	internal command position	
9	internal command position Hi	
10	Pressure difference *xp* Hi	
11	Pressure difference *xp* Lo	
12	Pressure feedback *xp1* Hi	
13	Pressure feedback *xp1* Lo	
14	Pressure feedback *xp2* Hi	
15	Pressure feedback *xp2* Lo	

9.2.1 - Status word descriptions

READY: System is ready for positioning.

INPOS: In position signal.

PERROR: Pressure failure is higher than the programmed PERORR value.

SENSOR ERROR: if the sensor control is activated and if there exists a sensor failure, the READY signal will be deactivated.

COMMAND POSITION: Can be interpreted variously according to the mode.
Normal = preset command position
NC-mode = calculated command position of the generator,

ACTUAL POSITION: corresponding to the sensor solution.

CONTROL DEVIATION (X-W): according to the sensor resolution. In the NC-mode shows the profile error (difference in the value of the nominal value generator to the actual value).

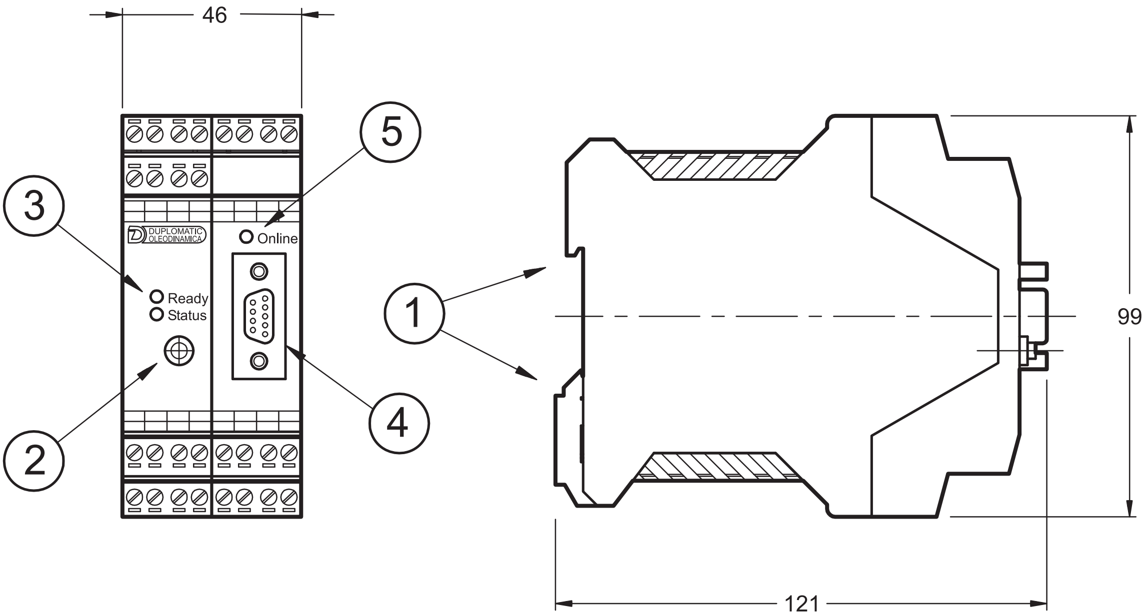
the status word is encoded as follow:

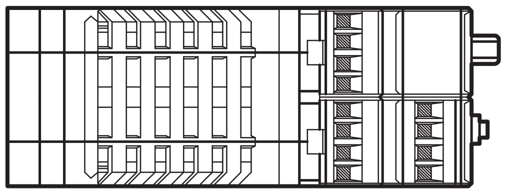
Byte 0 - status word Hi		
bit	**Function**	
0		
1		
2		
3	PERROR	1 = value in error window
4		
5		
6	INPOS	1 = value in pos-window
7	READY	1 = ready to operate

Byte 2, 3, 4 and 5 - Actual position		
byte	**Function** defined by the sensor resolution	
from 0 to 7	Actual positionn Lo-Byte	Byte 5
from 8 to 15	Actual position	Byte 4
from 16 to 23	Actual position	Byte 3
from 24 to 31	Actual position Hi-Byte	Byte 2

Byte 6 to 9 - internal command position		
byte	**Function** defined by the sensor resolution	
from 0 to 7	Command position Lo-Byte	Byte 9
from 8 to 15	Command position	Byte 8
from 16 to 23	Command position	Byte 7
from 24 to 31	Command position Hi-Byte	Byte 6

10 - OVERALL AND MOUNTING DIMENSIONS





1	DIN EN 50022 rail type fastening
2	Plug for PC cable connection
3	LED for Output signals
4	Profibus Interface port
5	Profibus LED

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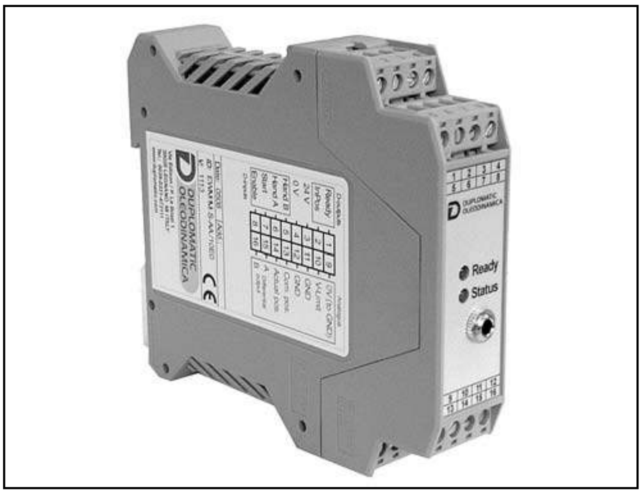
DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com



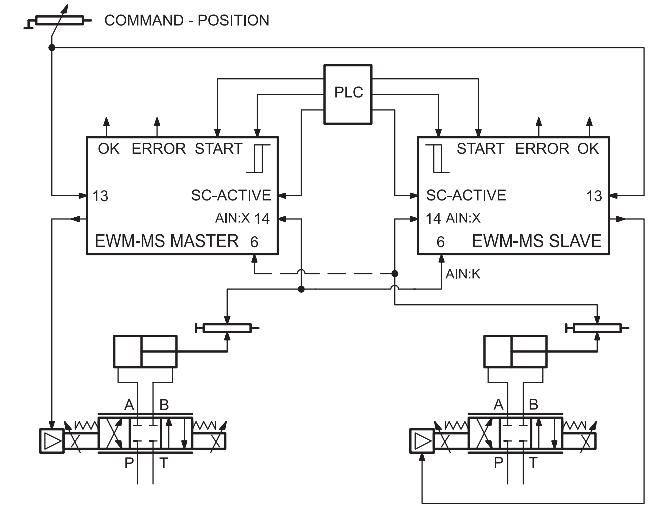
EWM-MS-AA

CARD FOR SYNCHRONIZATION CONTROL WITH ANALOGUE SIGNALS

SERIES 10

RAIL MOUNTING TYPE:
DIN EN 50022

OPERATING PRINCIPLE



„ This card has been developed for an easy synchronization of two actuators with an overriding synchronization controller.

„ The card can drive only an axis; to get the complete master and slave synchronization two cards are necessary.

„ Proportional valves with integrated electronics can be driven by the differential output. As option, an integrated amplifier is available.

„ The synchronization controller correct the speed of the axis (slave axis). Positioning failures during the movement will increase or reduce the slave axis velocity, so the synchronization failure will be compensated.

„ The axes speed can be limited by an external analogue speed input.

„ The card use the RS232C interface, and is settable via notebook, using the software kit (EWMPC).

TECHNICAL CHARACTERISTICS

Power supply	V DC	12 ÷ 30 ripple included external fuse 1,0 A (5 A for M2 version)
Current consumption: - E0 and E1 version - M2 version	mA A	100 + sensor power consumption depending from solenoid current
Command value	V mA	0 ÷ 10 (R_I = 33 k) 4 ÷ 20 (R_I = 250)
Command value resolution	%	0,01 (internally 0,0031)
Speed input value	V	0 ÷ 10 (R = 90 k)
Speed input value resolution	%	0,024
Feedback value	V mA	0 ÷ 10 (R_I = 33 k) 4 ÷ 20 (R_I = 250)
Output value: - E0 version - E1 version - M2 version	V mA A	±10 (max load 5 mA) 4 ÷ 20 (max load 390) 1,0 - 1,6 - 2,6
Interface		RS 232 C
Electromagnetic compatibility (EMC): 2004/108/CE std		Emissions EN 61000-6-3 Immunity EN 61000-6-2
Housing material		thermoplastic polyammide PA6.6 - combustibility class V0 (UL94)
Housing dimensions	mm	120(d) x 99(h) x 23(w) (M2 version: w = 46)
Connector		4x4 poles screw terminals - PE direct via DIN rail
Operating temperature range	°C	-20 / +60
Protection degree		IP 20

1 - IDENTIFICATION CODE

E	W	M	-	MS	-	A	A	/	10	

Digital card for closed loop systems
DIN EN 50022 rail mounting

Master and slave control

Analog command value

Analog feedback value

Output value:
E0 = voltage 0 ÷ ±10V (**standard**)
E1 = current 4 ÷ 20 mA
M2 = embedded power ampli“er

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

NOTE: one card per axis is needed. To synchronize 2 axes, 2 cards are needed.

The structure of the synchronisation controller was deduced from our positioning modules. The positioning function is controlled by target position of the axis (input PIN 13) and by the actual position of the axis (PIN 14). With input PIN 6 (normally the sensor of the master axis) the actual position of the other axes is given to the module. In case of two axes, the position information can be linked crosswise from PIN 14 to PIN 6.

If the synchronisation controller is active, it overrides the position control process. When the actual position of the master axis is given to the slave axis (SC = active), all slave axes will follow the master axis.

The ways are: master/master (both SC inputs are active), master/slave with selectable master function by deactivating of the SC input or independent positioning by deactivation of both SC inputs and separate command positions at PIN 13. The function of the STATUS output is - depending on SC input - in position signal (failure between PIN 13 and 14) or synchronisation error signal (failure between PIN 6 and PIN 14).

For a reliable function of the synchronisation control the speed should be limited to app. 70/80% of maximum speed. The slave axis must be able to increase the speed against the master axis to compensate position failures.

The card sample time is 1 ms.

NOTE: By using positioning sensors with current input (4 20 mA) PIN 6 of the slave and with PIN 14 of the master are connected parallel. DIL switches are removed; the right current input is set automatically.

2 - FUNCTIONAL SPECIFICATIONS

2.1 - Power supply

This card is designed for 12 to 30 VDC (typical 24 V) of a power supply. This power supply must correspond to the actual EMC standards.

All inductivities at the same power supply (relays, valves) must be provided with an over voltage protection (varistors, free-wheel diodes).

It is recommended to use a regulated power supply (linear or switching mode) for the card supply and the sensors.

NOTE: in the type M2 the value of the power supply voltage on the card must not be lower than the rated working voltage of the solenoid to be controlled.

2.2 - Electrical protections

All inputs and outputs are protected with suppressor diodes and RC-filters against transient overshoots.

2.3 - Digital Input

The card accepts digital input. The digital input must have a voltage from 12 to 24 V; Low level: <4V, high level >12V with current <0,1A. See the block diagram at paragraph 7 for the electric connections.

2.4 - Command value

The card accepts analogue input signals. The command value can be 0 ÷ 10 V (RI = 25k) or 4 ÷ 20 mA (RI = 250).

2.5 - Feedback input values

The card accepts analogue feedback input. The feedback value can be 0 ÷ 10 V (RI = 33 k) or 4 ÷ 20 mA (RI = 250). The sensors parameters are settable via software (see parameters table).

2.6 - Command speed input

The card accepts the command speed input with value 0 ÷ 10 V (R = 90 k)

2.7 - Analog output values

E0 version: output voltage 0 ±10 V.
E1 version: output current 4 ÷ 20 mA.
M2 version: embedded power stage configurable via software with a value of 1, 1.6 or 2.6 A.

All analogue output have to be wired with screened cables.

2.8 - Digital Output

Two digital output are available, INPOS and READY, that are displayed via LEDs on the front panel As common potential 0V used (PIN 4). Low level <4V High Level > 10 V Max 50 mA with load 200

3 - LED FUNCTIONS

There are two LED on the card: GREEN and YELLOW.

GREEN: Shows if the card is ready.

- ON - System in process
- OFF - No power supply or the ENABLE parameter is inactive
- FLASHING - Failure detected (internal or 4 ÷ 20 mA). Only if the parameter SENS is ON

YELLOW: Is the signal of the control error monitoring.

- ON - No control error
- OFF - Error detected, depending of a parameter error.

4 - ADJUSTMENTS

On the EWM cards, the adjustment setting is possible only via software. Connecting the card to the PC, the software automatically recognises the card model and shows a table with all the available commands, with their parameters, the default setting, the measuring unit and an explanation of the commands and its uses. The parameters change depending on the card model.

EXAMPLE OF PARAMETERS TABLE

Commands	Parameter	Defaults	Units	Description
ain:i a b c x	i= W|X|K a= 0… 10000 b= 0… 10000 c= 0… 10000 x= V|C	 : 1000 : 1000 : 0 : V	 - - 0,01% -	Analogue output selection. **(NOTE)** **W, X** and **K** for the input and **V** = voltage, **C** = current. With the parameters **a**, **b** and **c** the inputs can be scaled. Because of the programming of the **x**-value (**x** = **C**) the corresponding input will be switched over to current automatically.
a:i x	i= A|B x= 1… 2500	:A 100 :B 100	ms ms	Acceleration time depending on direction. **A** indicates analogue output 15 and **B** indicates analogue output 16. Normally **A** = flow P-A, B-T and **B** = flow P-B, A-T.
d:i x	i= A|B x= 50… 10000	:A 2500 :B 2500	0,01% 0,01%	Deceleration stroke depending on direction. The loop gain is calculated by the deceleration stroke. The shorter the higher. In case of instabilities longer deceleration stroke will be sufficient.
ctrl x	x= lin|sqrt1|sqrt2	sqrt1	-	Selection of the control function: (**NOTE**) **lin** = standard linear P-control, **sqrt1** = progressive time optimized deceleration curve, **sqrt2** = sqrt1 with a higher gain in position
glp x **t1 x**	X= -10000… +10000 X= 0… 100	500 10	0,01 ms	Synchronisation control gain and damping of the synchronisation control function. Used to optimize the synchronization controller. The SYNC-controller works as a compensator for optimized controlling of hydraulic drives. Both controller (sync and positioning) are working parallel. The higher the sync-gain the lower must be the gain of the positioning controller. A time constant value (T1) can be used to damp the sync-controller for better stability.
velo x	x= 1000… 10000	10000	0,01%	Internal limitation of maximum velocity. The limitation function corresponds to the external velocity preset if VS was parameterized with EXT.
vs x	x= ext|int	int	-	Switch over between internal and external velocity preset
vramp x	x= 1… 2000	50	ms	Ramp time for velocity input.
vmode x	x= on|off	off	-	Activation of the NC-generator. The command position is generated by a velocity profile (internal or external preset of v). The axis drives more or less speed controlled.
th x	x= 100… 60000	5000	ms	Stroke time for 100% velocity and 100% nominal sensor stroke.
min:i x	i= A|B x= 0… 5000	:A 0 :B 0	0,01% 0,01%	Deadband compensation of positive overlapped proportional valves. Good adjustment will increase positioning accuracy.
max:i x	i= A|B x= 5000… 10000	:A 10000 :B 10000	0,01% 0,01%	Maximum output range for adapting control range to maximum flow range.
trigger x	x= 0… 2000	200	0,01%	Point to activate the deadband compensation (**min**). Also useful for reduced sensitivity in position with control valves.
inpos x	x= 0… 2000	200	0,01%	Range for the InPos signal (status output). The INPOS command defines the window where the INPOS message is indicated. The positioning process is not influenced by this message. The controller remains active. In NC-mode this message has to be interpreted alternatively as following error. SC-activ = OFF INPOS output SC-activ = ON synchronisation error
offset x	x= -2000… 2000	0	0,01%	The corresponding OFFSET will be added to the control error (demand value - actual value + offset). With this parameter the zero point failure can be compensated
pol x	x= +|-	+	-	For changing the output polarity. All **A** and **B** adjustments depend on the output polarity. The right polarity should be defined first.
sens x	x= on|off	on	-	The sensor monitoring can be activated (with 4 20 mA sensors).
save	-	-	-	Storing the programmed parameter in E²PROM.
loadback	-	-	-	Reloading the parameter from E²PROM in working RAM
din	-	-	-	Status of the digital inputs.
w **x** **k** **xw** **xk** **u** **v**	Demand value Actual value Master synch value Control deviation Synchronization error Velocity Actuator signal	-	0,01%	
default	-	-	-	Preset values will be set.

ADDITIONAL PARAMETERS ON VERSION *M2

Command	Parameter	Defaults	Unit	Description
current x	x=0… 2	0	-	Selection of the output current range: **0** = 1,0 A **1** = 1,6 A **2** = 2,6 A
dfreq x	x= 60… 400	120	Hz	Dither frequency
dampl x	x= 0… 3000	500	0,01%	Dither amplitude. Typical values between 500 and 1200 (good experience were made with 700).
pwm x	x= 100… 7700	2600	Hz	PWM Frequency. PWM Frequencies of 2000 Hz improve the current loop dynamics. PWM Frequencies in the range of 100 500 Hz will be used for low dynamic valves with high hysteresis. In this case, DAMPL must be zero.
ppwm x **ipwm x**	x= 0… 30 x= 1… 500	3 40	- -	PI-compensator for the current controller. Changes should be only done with good experience in optimizing of current loops. In some cases a PWM Frequency of >2500 Hz; PPWM can be increased to 7 15. ATTENTION: The dither amplitude must be optimized after that.

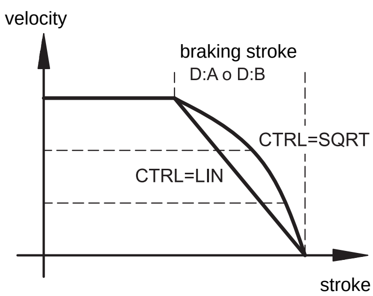
NOTE about the AIN command: With this command each input can be scaled individually. For the scaling function the following linear equation is taken: output signal = a / b * (input signal - c).

At first the offset (c) will be subtracted (in 0,01% units) from the input signal, then the signal will be multiplied with factor **a** / **b**. **a** and **b** should always be positive. With these both factors every floating-point value can be simulated (for example: 1.345 = 1345 / 1000).

With the x parameter value the internal measuring resistance for the current measuring (4 20 mA) will be activated (V for volt ages input and C for current input). ATTENTION: This resistor is never activated at the k input.

	AIN:X	a	b	c	x
i with voltage:	AIN:i	1000	1000	0	V
i with current:	AIN:i	1250	1000	2000	C

NOTE about the CTRL command:: This command controls the braking characteristic of the hydraulic axis. With positive overlapped proportional valves one of both SQRT braking characteristics should be used because of the linearization of the non-linear flow curve typical of these valves If zero overlapped proportional valves (control valves) are used, you can choose between LIN and SQRT1 according to the application. The progressive gain characteristic of SQRT1 has the better positioning accuracy.



According to the application there is maybe a longer braking distance, so that the total stroke time will be longer.

LIN: Linear braking characteristics (control gain corresponds to: 10000 / d:i).

SQRT*: Root function for the calculation for the braking curve.
SQRT1: with small control error. control gain corresponds to 30000 / d:i ;
SQRT2: control gain corresponds to 50000 / d:i

5 - INSTALLATION

The card is designed for rail mounting type DIN EN 50022. It is recommended to use cable sections of 0.75 mm^2, up to 20 m length and of 1.00 mm^2 up to 40m length, for power supply and solenoid connections on version M2. For other connections it is recommended to use cables with a screened sheath connected to earth only on the card side.

NOTE 1

To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the wiring diagram.

As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electric motors, inverters and electrical switches).

In environments that are critical from the electromagnetic interference point of view, a complete protection of the connection wires can be requested.

5.1 Start-up

… Control of correct wiring with the circuit diagrams.

… Switch-on the power supply and measure the supply current. If the supply current is higher than the nominal current, this indicates an electrical failure.

… Measure the analogue command and actual signals whether they are in the specified area.

… Measure the feedback values and then adjust the analogue input values for scaling with AIN:X and AIN:K

… If use the synchronization control set the AIN values as AIN:K = AIN:X

… Activate ENABLE input, the drive is in closed loop position control mode (command position = actual position). If the system drives immediately after enabling to one of the mechanical end stops, probably the polarity of the loop must be inverse (command POL for the output polarity or change both terminal pins 15 and 16).

… Activate START (RUN), the external Command position (0.. 10 V or 4.. 20 mA at Pin 13) is used. The system is driving to the new target position. With the actual pre-adjustment (uncritical control gain and no deadband compensation) higher position errors are possible.

… Optimising of the controller by setting the parameters. A:A, A:B, D:A and D:B for acceleration and deceleration. Deceleration parameters (D:A and D:B) are used for the calculation of the control gain. Be careful with short deceleration strokes. In case of positive overlapped proportional valves the MIN:A and MIN:B parameters should be used to compensate the deadband.

For applications with zero overlapped valves a TRIGGER value of five can improve positioning.

… When the setup has finished, the command SAVE will store all parameters in the E²PROM. If there are, made some other adjustments, the latest saved parameter set can be called back using the LOADBACK command.

… PARA shows the complete parameter setup.

5.2 Synchronisation control:

The speed of the master axis should be limited at app. 70 % of maximum speed (command velo or external analogue input).

… Command VS ON will activate the external analogue speed input (0 10 V).

… The synchronisation control is activated with the digital input SC-active and the gain of the synch. control can be optimized with the command GLP.

… The maximum error bandwidth can be defined with the INPOS command.

6 - SOFTWARE KIT EWMPC/10 (code 3898401001)

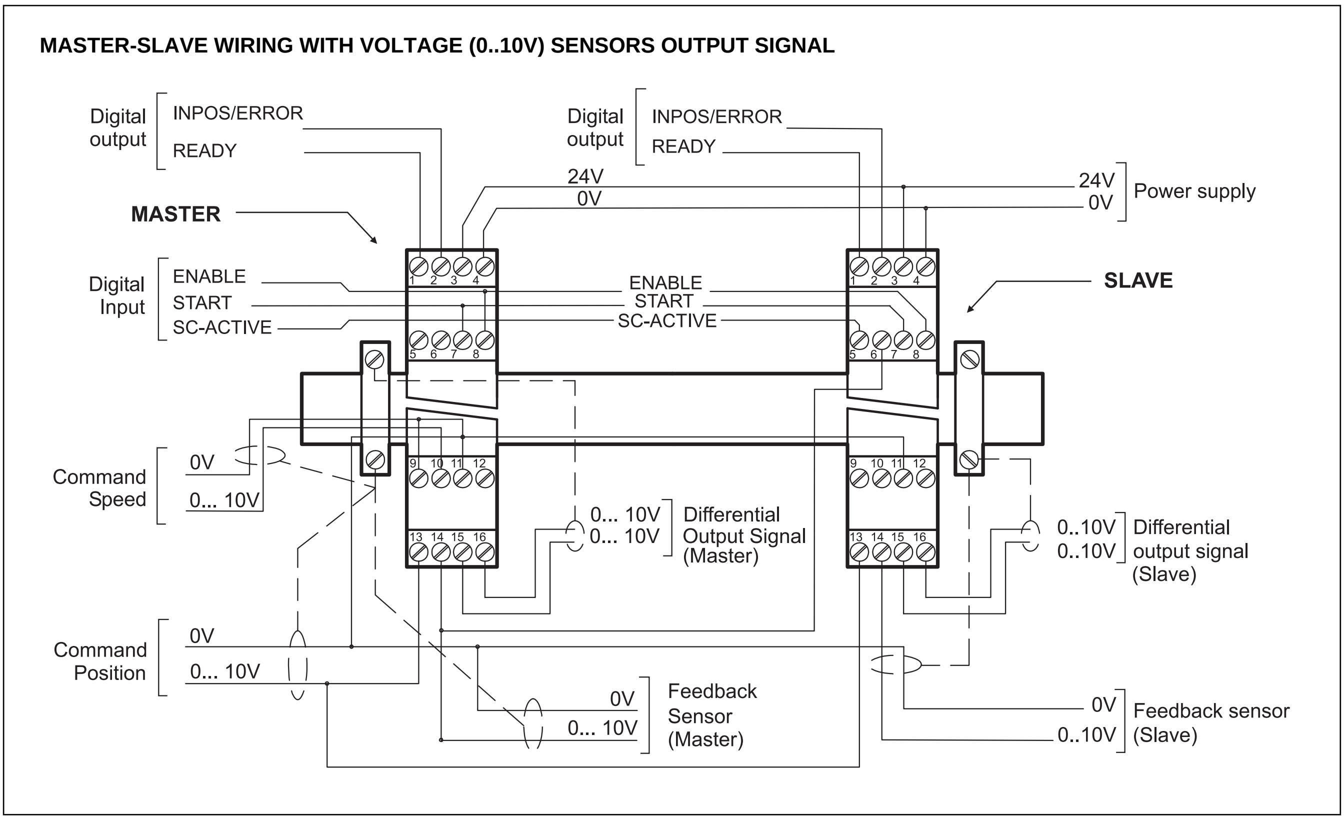
The software kit comprising a USB cable (2.70 mt length) to connect the card to a PC or notebook and the software.

During the identification all information are read out of the module and the table input will be automatically generated.

Some functions like baud rate setting, remote control mode, saving of process data for later evaluation are used to speed up the installation procedure.

The software is compliant with Microsoft XP® operating systems.

7 - WIRING DIAGRAM



DIGITAL INPUT AND OUTPUT

PIN 1 — READY output.
General operationality, ENABLE is active and there is no sensor error (by use of 4÷20 mA sensors). This output corresponds with the green LED.

PIN 2 — STATUS output.
Monitoring of the control error (INPOS). Depending on the INPOS command, the status output will be deactivated, if the position difference is greater then the adjusted window. If SC-ACTIVE (pin 5) is on, this output is used to monitor the synchronization error.
The output is only active if START = ON.

PIN 5 — SC-ACTIVE:
The synchronisation controller is activated. If this input is not activated, the system works as a normal positioning controller.

PIN 7 — START input:
The positioning controller is active; the external analogue command position is taken over as command value.
If the input is switched off during movement, the command position is set to the actual position plus a defined emergency deceleration stroke

PIN 8 — ENABLE input:
This digital input signal initializes the application. The analogue output is active and the READY signal indicates that all components are working correctly. Target position is set to actual position and the drive is closed loop controlled.

ANALOGUE INPUT

PIN 6 — Actual (feedback) value (K) of the master axis
range 0÷100% corresponds to 0 ÷ 10V or 4 ÷20 mA

PIN 9/10 — External command speed (V),
range 0 ÷ 100 % corresponds to 0 ÷ 10 V

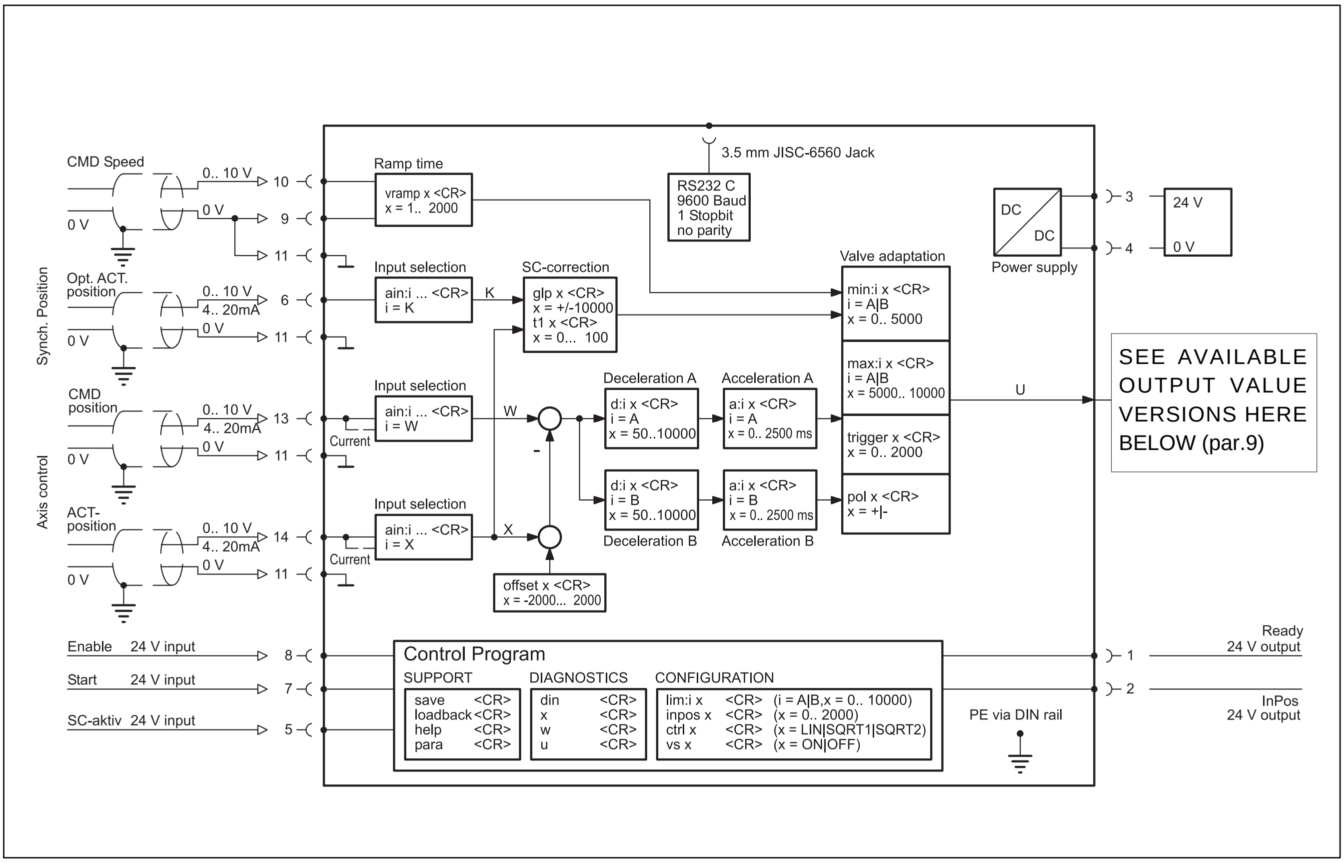
PIN 13 — Command position (W),
range 0 ÷ 100% corresponds to 0 ÷ 10V or 4 ÷ 20 mA

PIN 14 — Actual (feedback) value (X),
range 0 ÷ 100% corresponds to 0 ÷ 10V or 4 ÷ 20 mA

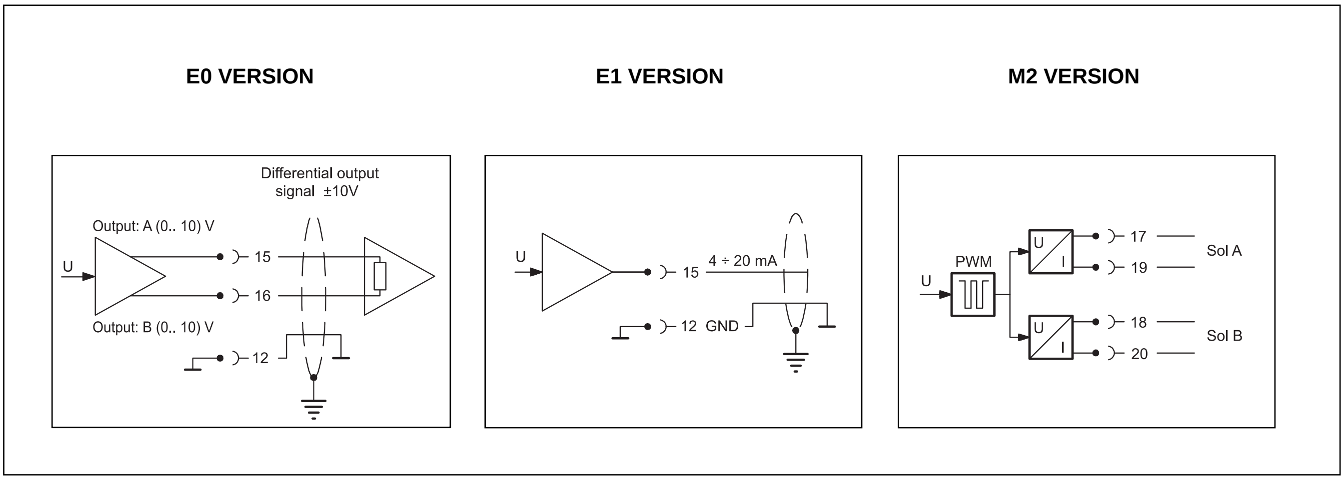
ANALOGUE OUTPUT

PIN 15/16 — Differential output (U)
± 100% corresponds to ± 10V differential voltage, optionally (E1 version) current output ±100% corresponds to 4 ÷ 20 mA (PIN 15 to PIN 12)

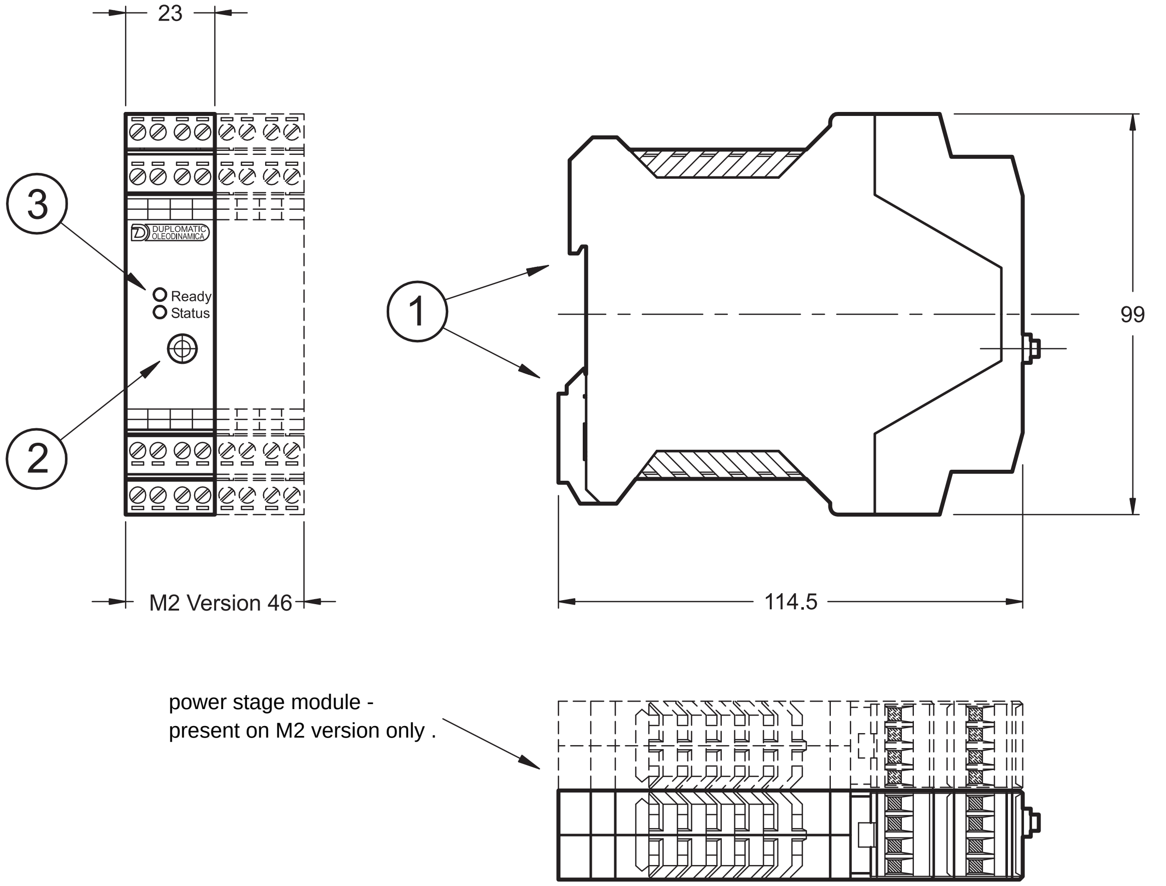
8 - CARD BLOCK DIAGRAM



9 - AVAILABLE OUTPUT VALUE VERSIONS



10 - OVERALL AND MOUNTING DIMENSIONS

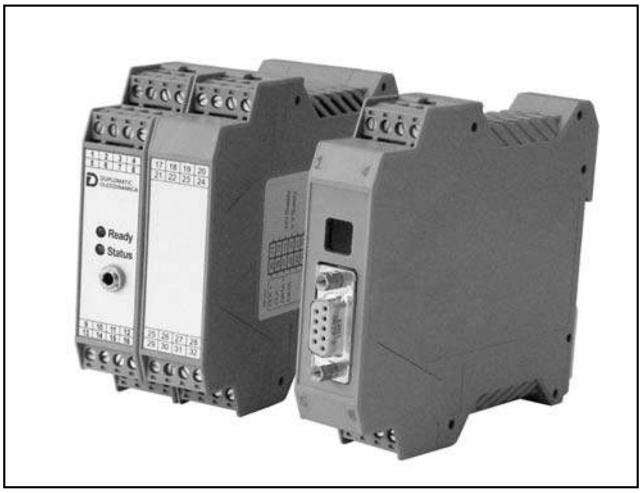


1	DIN EN 50022 rail type fastening
2	Plug for PC cable connection
3	LED for Output signals

DUPLOMATIC OLEODINAMICA

DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

DUPLOMATIC OLEODINAMICA



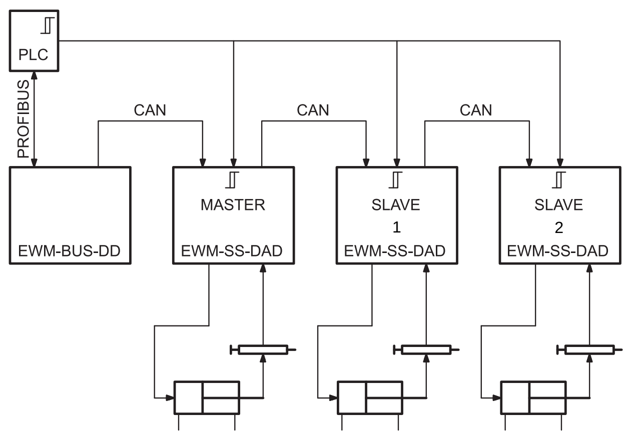
EWM-SS-DAD

CARD FOR AXIS SYNCHRONIZATION CONTROL FOR SYSTEMS FROM 2 TO 24 AXES WITH PROFIBUS/CAN COMMUNICATION INTERFACE

SERIES 10

RAIL MOUNTING TYPE:
DIN EN 50022

OPERATING PRINCIPLE



„ This card has been developed as axes controller and it is connected to the other cards via Canbus. This bus line has to be coupled with a PLC interface Profibus DP, the EWM-BUS-DD/10 (to be ordered separately).

„ The EWM-SS-DAD synchronizes the axes with a high accuracy. The position accuracy is reached using a digital sensor with SSI interface to measure the position. The card can drive only an hydraulic axis per card, so a EWM-SS-DAD per axis is needed.

„ The synchronization controller correct the speed of the slave axis. Positioning failures during the movement will increase or reduce the slave axis velocity, so the synchronization failure will be compensated.

„ The card use the RS232C interface, and is easily settable via notebook, using the software kit (EWMPC).

TECHNICAL CHARACTERISTICS

Power supply	V DC	12 ÷ 30 ripple included - external fuse 1,0 A
Current consumption	mA	< 200 + sensor power consumption
Command value		via Pro“bus DP - ID number 1810h
Speed input value		via Pro“bus DP - ID number 1810h
Feedback value	V mA SSI	0 ÷ 10 (R_I = 33 k) 4 ÷ 20 (R_I = 250) digital sensor with any SSI interface
Output value: - E0 version - E1 version	V mA	±10 (max load 5 mA) 4 ÷ 20 (max load 390)
Position accuracy		± 2 bits of digital sensor resolution
Interface		RS 232 C
Electromagnetic compatibility (EMC): according to 2004/108/CE standards		Emissions EN 61000-6-3 Immunity EN 61000-6-2
Housing material		thermoplastic polyamide PA6.6 combustibility class V0 (UL94)
Housing dimensions - EWM-SS-DAD - EWM-BUS-DD	mm	120 x 99(h) x 46(w) 120 x 99(h) x 23(w)
Connector		4x4 poles screw terminals - PE direct via DIN rail
Operating temperature range	°C	-20 / +60
Protection degree		IP 20

1 - IDENTIFICATION CODES

1.1 - Profibus / CAN coupler code

E	W	M	-	BUS	-	DD	/	10

Digital card for closed loop systems
DIN EN 50022 rail mounting

Profibus / CAN coupler

Digital command and output value

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

NOTE: Just one coupler per system is needed.

1.2 - Code of the axis drive card

E	W	M	-	SS	-	D	AD	/	10	

Digital card for closed loop systems
DIN EN 50022 rail mounting

Synchro Stroke control

Digital command value

Analog and digital feedback values

Output value:
E0 = voltage ±10V (**standard**)
E1 = current 4 ÷ 20 mA

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

NOTE: One card per axis is needed.

This electronic module is developed for controlling of hydraulic drives in synchronization. The communication with the PLC is solved by a standard Profibus DP interface.

A typical repeatable positioning accuracy of up to 0,01% with analogue sensors or up to 0,001 mm with digital SSI sensors can be achieved. Proportional valves with integrated electronics (typically with control valves) can be driven by the analogue differential output.

Internal profile generation (acceleration time, max. velocity and stroke depended deceleration) provides fast and excellent positioning. The drive works in open loop mode and is switched over in closed loop during deceleration. This is a time-optimal positioning structure with very high stability. An extra Numeric Control mode can be used for a speed controlled profile generation (VMODE = ON).

The synchronization control works as a second overriding velocity/position controller. Failure between the axes will be compensated by adjusting the speed of the slave axis.

The card sample time is 2 ms, up to 5 ms with 24 axes to drive.

2 - EWM-SS-DAD FUNCTIONAL SPECIFICATIONS

2.1 - Power supply

This card is designed for 12 to 30 VDC (typical 24 V) of a power supply. This power supply must correspond to the actual EMC standards.

All inductivity at the same power supply (relays, valves) must be provided with an over voltage protection (varistors, free-wheel diodes).

It is recommended to use a regulated power supply (linear or switching mode) for the card supply and for the sensors.

2.2 - Electrical protections

All inputs and outputs are protected with suppressor diodes and RC-filters against transient overshoots.

2.3 - Digital Input (ENABLE)

The digital input must have a voltage from 12 to 24 V; Low level: <4V, high level >12V with current <0,1A. See the block diagram at paragraph 8 for the electric connections. Apply to PIN 8 the 24V to enable hardware.

2.4 - Reference signal

The reference signal is run through the card-bus and addressed to the individual modules via Profibus, ID number 1810h (see par. 10).

2.5 - Input feedback values

The card works both with digital (SSI) or analog sensors.

SSI: parameters are settable via software (see SSI parameters in the table on next page).

ANA: The analogue signal must be voltage 0 ÷ 10V with RI = 33 k or current 4 ÷ 20 mA (250), with RI = 250 k
The analogue resolution is of 0,01% of the sensor stroke.

⚠ Using analog sensors, the SSI parameters in the software assume default preset values that the user must not change.

2.6 - Output values

E0 version: output voltage 0 ±10 V (standard).
E1 version: output current 4 ÷ 20 mA. (max load 390)

2.7 - Digital Output

Two digital output are available, INPOS and READY, that are displayed via LEDs on the front panel. .

Low level <4V; High level >10V (I_{max} 50 mA with load of 200)

3 - LED FUNCTIONS

There are two leds on the EWM-SS-DAD card:

GREEN: Shows if the card is ready.

ON - The card is supplied and ENABLE hardware e software ON
OFF - No power supply or the ENABLE HW/SW is inactive
FLASHING - Failure detected (internal or 4 ÷ 20 mA).
Only if the parameter SENS is ON

YELLOW: Is the signal of the control error monitoring.

ON - No control error, system in closed loop control.
OFF - Error detected or START signal not active.

4 - ADJUSTMENTS

On the EWM cards the adjustment setting is possible only via software. Connecting the card to the PC, the software automatically recognises the card model and shows a table with all the available commands, with their parameters, the default setting, the measuring unit and an explanation of the commands and its uses.

The parameters changes depending on the card model.

PARAMETERS TABLE

Commands	Parameter	Defaults	Units	Description
inpx	X= SSI|ANA	SSI	-	Selection of the sensor input channel. The standard is a digital sensor with SSI specification at the corresponding connections (clamps 25 to 28 and 31, 32). Alternatively an analogue input which is indicated in the command as parameters •ANAŽ can be used. The command AIN is used for input scaling of the analogue input.
ain:i a b c x	i= XL a= -10000… 10000 b= -10000… 10000 c= -10000… 10000 x= V|C	 : 1000 : 1000 : 0 : V	 - - 0,01% -	Analogue input scaling (only). **XL** for the input signal. **V** = voltage input and **C** = current input. With the parameters **a**, **b** and **c** the inputs can be scaled (output = a / b * (input - c)). Because of the programming of the **x**-value (x = **C**) the corresponding input will be switched over to current automatically. (see **NOTE**)
num	X= 0… 24	2	-	Number of modules used in synchronization system.
stroke x	X= 2… 5000	500	mm	Length of the sensor. The length of the stroke sensor is needed for the scaling of the analogue input and for the calculation of the braking stroke.
ssioffset x	X= -30000… 30000	0	0,01 mm	Zero point adjustment of the sensor.
ssires x	X= 10… 1000	1000	0,001 mm	Resolution of the sensor. The highest resolution (1000) corresponds to 1 µm. This sensor resolution is always used for the input data via Profibus and is needed for the internal calculations. (see **NOTE**)
ssibits x	X= 8… 32	24	-	Data protocol length in bits
ssicode x	X= GRAY|BIN	GRAY	-	Transmitting code of the sensor.
ssipol x	X= +|-	+	-	Sensor polarity. In order to reverse the working direction of the sensor, the polarity can be changed via this command. In any case also the SSIOFFSET has to be adjusted. Ex: Sensor length = 200 mm opposite working direction. SSIPOL is set on •-• and SSIOFFSET on 20000.
a:i x	i= A|B x= 1… 2000	:A 100 :B 100	ms ms	Acceleration time depending on direction. The ramp time is separately set for driving out (**A**) and for driving in (**B**). Normally **A** = flow P-A, B-T and **B** = flow P-B, A-T.
d:i x	i= A|B|S X= 50… 10000	:A 2500 :B 2500 :S 1000	0,01% 0,01% 0,01%	Deceleration stroke depending on direction. This parameter is set in 0,01% units of the maximum length of the sensor. The braking distance is set dependent from the direction. The controller gain will be calculated by means of the braking distance. The shorter the braking distance the higher the gain (see command CTRL). In case of instabilities a longer braking distance should be set. The parameter **D** indicates the ratio between the maximum sensor length and and a indicated stopping point;will become active after the removal of the •START• signal only .
ctrl x	x= lin|sqrt1 |sqrt2	sqrt1	-	Selection of the control function: (see **NOTE**) **lin** = standard linear P-control, **sqrt1** = progressive time optimized deceleration curve **sqrt2** = sqrt1 with a higher gain in position
syncmode x	X= MS|AV	MS		Synchronization mode. **MS** - Master/Slave:all axes are following the master axis (axis number 1) **AV** - Averages calculation: the command position will be calculated by the averages of all axes.
glp x **t1 x**	X= -10000… 10000 X= 0… 100	500 10	0,01 ms	Parameter of the synchronisation control function. (see **NOTE**) The SYNC-controller works as a PT1 compensator for optimized controlling of hydraulic drives. Critical drives can be stabilized with the T1 factor.
vramp x	x= 1… 2000	200	ms	Ramp time for the external velocity. Operating shocks can be reduced when changing the external velocity.

vmode x	x= on|off	off	-	Activation of the NC-generator. In OFF state the stroke depended deceleration is active; the velocity preset limits the output signal. In ON state a profile generator generates the positioning demand value and the axis drives to the target position with the defined velocity. The stroke time is defined by the parameter VEL.
vel x	X= 1… 20000	50	mm/s	Internal maximum velocity preset. This parameter is only active in case of VMODE = ON.
min:i x	i= A|B x= 0… 5000	:A 0 :B 0	0,01% 0,01%	Deadband compensation of positive overlapped proportional valves. Good adjustment will increase positioning accuracy
max:i x	i= A|B X= 5000… 10000	:A 10000 :B 10000	0,01% 0,01%	Maximum output signal. Adapt the control range to maximum flow range.
trigger x	X= 0… 2000	200	0,01%	Point to activate the deadband compensation (**min**). (see **NOTE**) Also useful for reduced sensitivity in position with control valves.
inpos x **glerror x**	X= 0… 5000 x= 0… 5000	200 200	0,01mm 0,01mm	Synchronization error. This parameter is entered in 0,01 mm units. The INPOS command defines the window when the INPOS message is indicated. The positioning process is not influenced by this message. The controller remains active. In NC-mode (VMODE = ON) this message has to be interpreted as following error control. With the GLERROR value the synchronization error window is defined.
offset x	x= -2000… 2000	0	0,01%	Zero point adjustment. The corresponding OFFSET will be added to the control error (demand value - actual value + offset). With this parameter the zero point failure can be compensated.
pol x	x= +|-	+	-	Output polarity. All **A** and **B** adjustments depend on the output polarity. The right polarity should be defined first.
sens x	x= on|off	on	-	The sensor monitoring can be activated (with 4 20 mA sensors).
save	-	-	-	Storing the programmed parameter in E²PROM.
loadback	-	-	-	Reloading the parameter from E²PROM in working RAM
help	-	-	-	Listing of all available commands.
para	-	-	-	Actual parameter list with all programmed values.
copy	-	-	-	Transfer of the parameters into all other modules at the node CAN. The parameters are stored in the EEPROM. **Caution**: All up to now adjusted values are overwritten in all modules. This command is carried out usually during the first basic installation.
st	-	-	-	Internal status. Monitoring of the control and status word (see par. 10). Command available via software only.
wl **xl** **xw** **kx** **kxw** **v** **u** **x:i**	Demand value Actual value Control deviation Sync position Sync error Velocity Actuator signal Indexed axes process	-	0,01 mm	The process data can be read out via software. They show the actual and command values
default	-	-	-	Preset values will be set.

NOTE about the AIN command: This command is for analogue sensor only.

With this command each input can be scaled individually. For the scaling function the following linear equation is taken: output signal = *a / b * (input signal - c)*.

At first the offset (c) will be subtracted (in 0,01% units) from the input signal, then the signal will be multiplied with factor **a** / **b**. **a** and **b** should always be positive. With these both factors every floating-point value can be simulated (for example: 1.345 = 1345 / 1000).

With the x parameter value the internal measuring resistance for the current measuring (4 20 mA) will be activated (V for volt ages input and C for current input). ATTENTION: This resistor is never activated at the k input.

	AIN:X	**a**	**b**	**c**	**x**
i with voltage:	AIN:i	1000	1000	0	V
i with current:	AIN:i	1250	1000	2000	C

NOTE about the SSIRES command: the standard of measurement is defined as increment/mm (inkr/mm). The maximum available resolution is equal to 1 m that corresponds to a value 1000.

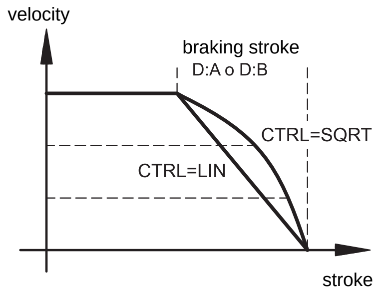
Example: A sensor with resolution 5 m has a resolution (0.005 mm) 5 times lower than the maximum set.
The SSIRES value is calculated as follows: *1000* (full scale ink) */ n* (sensor resolution in m) = *1000 / 5 = 200*

NOTE about the CTRL command: This command controls the braking characteristic of the hydraulic axis. With positive overlapped proportional valves one of both SQRT braking characteristics should be used because of the linearization of the non-linear flow curve typical of these valves If zero overlapped proportional valves (control valves) are used, you can choose between LIN and SQRT1 according to the application. The progressive gain characteristic of SQRT1 has the better positioning accuracy.

According to the application there is maybe a longer braking distance, so that the total stroke time will be longer.

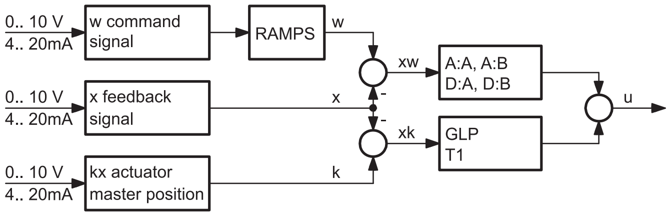
LIN: Linear braking characteristics (control gain corresponds to: 10000 / d:i).

SQRT*: Root function for the calculation for the braking curve.
SQRT1: with small control error. control gain corresponds to 30000 / d:i ;
SQRT2: control gain corresponds to 50000 / d:i



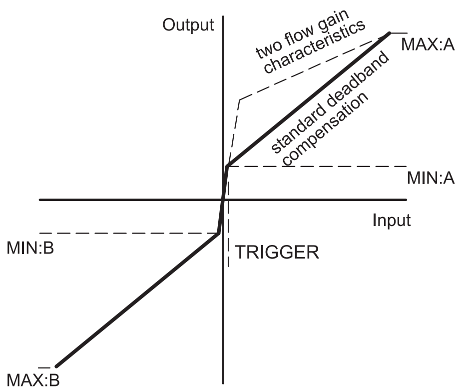
NOTE about the GLP and T1 command: Both controllers (sync and positioning) are working parallel. The higher the sync-gain the lower must be the gain of the positioning controller. A time constant value (T1) can be used to damp the sync-controller for better stability.

Simplified control structure:



NOTE about the TRIGGER command: With this command, the output signal is adjusted to the valve characteristics. The positioning controllers have a double-gain characteristic curve instead of a typical overlapped jump. The advantage is a better and more stabile positioning behaviour. With this compensation, non-linear volume flow characteristic curves can be adjusted too.

If there exist also possibilities for adjustments at the valve or at the valve electronics, it has to be guaranteed, that the adjustment has to be carried out at the power amplifier or at the positioning module. If the MIN value is set too high, it influences the minimal velocity, which cannot be adjusted any longer. In extreme case this causes to an oscillating around the closed loop controlled position.



5 - INSTALLATION

The card is designed for rail mounting type DIN EN 50022.

The wiring connections are on the terminal strip located on the bottom of the electronic control unit. It is recommended to use cable sections of 0.75 mm^2, up to 20 m length and of 1.00 mm^2 up to 40m length, for power supply and solenoid connections. For other connections it is recommended to use cables with a screened sheath connected to earth only on the card side.

NOTE: To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the wiring diagram. As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electric motors, inverters and electrical switches).

In environments that are critical from the electromagnetic interference point of view, a complete protection of the connection wires can be requested.

A typical screened Profibus plug (D-Sub 9pol with switchable termination) is mandatory. Also the Profibus cable must be screened.

Every Profibus segment must be provided with an active bus termination at the beginning and at the end. The termination is already integrated in all common Profibus plugs and can be activated by DIL switches.

For the installation of the EWM-BUS-DD only a few steps are necessary (CAN-side).

Electric connection: the CAN Bus of the modules is wired with the CAN Bus of the coupler.

EWM-SS-DAD: PIN 23 at PIN EWM-BUS-DD 1
EWM-SS-DAD: PIN 22 at PIN EWM-BUS-DD 4
EWM-SS-DAD: PIN 21 at PIN EWM-BUS-DD 3

Power supply: PIN 5 and PIN 6 = 24 V
PIN 7 and PIN 8 = 0 V

5.1 - CAN interface

The CAN interface is wired on all modules in parallel. The terminating resistors have to be activated in the EWM-SS-DAD at the first and last module.

The addressing of the EWM-SS-DAD about the DIL switches must begin with one. The first module has a master functionality and takes over the communication with the interface converter EWM-BUS-DD. The DIL-switch is inside the unit on the interface board opposite of the main board. Position and switch position are marked.

DIL switches (the DIL switch is on the interface board):

1 to 5: Binary coding of the postal address of the node. At the most 24 addresses are managed.

8: Terminal resistance: only at the first and last module the terminal resistance is activate.

Example: EWM-SS-DAD configuration node address 1.

1	2	3	4	5	6	7	8	
								ON
								OFF

For all the cards the default adress is type •MasterŽ; so it is necessary for each card to select the correct adress in according to the number of axis (see example paragraph 8.1).

ADRESSES TABLE FOR EWM-SS-DAD NODE

DIL ->	1	2	3	4	5
NODE					
1	ON	OFF	OFF	OFF	OFF
2	OFF	ON	OFF	OFF	OFF
3	ON	ON	OFF	OFF	OFF
4	OFF	OFF	ON	OFF	OFF
5	ON	OFF	ON	OFF	OFF
6	OFF	ON	ON	OFF	OFF
7	ON	ON	ON	OFF	OFF
8	OFF	OFF	OFF	ON	OFF
9	ON	OFF	OFF	ON	OFF
10	OFF	ON	OFF	ON	OFF
11	ON	ON	OFF	ON	OFF
12	OFF	OFF	ON	ON	OFF
13	ON	OFF	ON	ON	OFF
14	OFF	ON	ON	ON	OFF
15	ON	ON	ON	ON	OFF
16	OFF	OFF	OFF	OFF	ON
17	ON	OFF	OFF	OFF	ON
18	OFF	ON	OFF	OFF	ON
19	ON	ON	OFF	OFF	ON
20	OFF	OFF	ON	OFF	ON
21	ON	OFF	ON	OFF	ON
22	OFF	ON	ON	OFF	ON
23	ON	ON	ON	OFF	ON
24	OFF	OFF	OFF	ON	ON

6 - PROFIBUS/CANbus card EWM-BUS-DD

The module supports all baud rates from 9,6 kbit/s up to 12000 kbit/s with auto detection of the baud rate. The functionality is defined in IEC 61158. The Profibus address can be programmed by a terminal program, EWMPC/10 or online via the Profibus.

The reference values are preset over the digital Profibus / CAN-Bus that worked with full internal resolution. The position resolution corresponds to the sensor resolution.

TIn the EWM-BUS-DD the presetting is to be maintained for the CAN-Bus (address 2 and 1 MBd).

DIL Switches configuration for module EWM-BUS-DD:

1	2	3	4	5	6	7

ON
OFF

DIL Switches is inside the module and it gives the possibility to set address and data transmission speed.

tables below show the meaning of DIL Switches:

DIP-SWITCH						
1	2	3	4	5	6	7
CANBUS ADDRESS NODE					**TRANSMISSION SPEED**	

TRANSMISSION SPEED	DIP-SWITCH	
	6	**7**
125 Kbaud	OFF	OFF
250 Kbaud	ON	OFF
500 Kbaud	OFF	ON
1 Mbaud	ON	ON

6.1 - Display

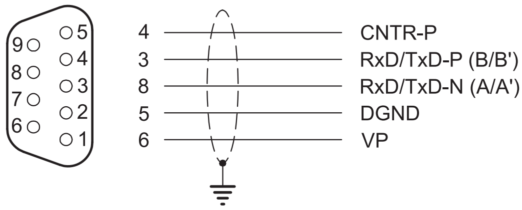
The EWM-BUS-DD has a display that shows the module status:

- everything OK, Profibus and CAN Bus in data exchange
1 Error, CAN Bus no data exchange
2 Error, Profibus no communication
3 Error, Profibus no communication, CAN Bus no data exchange
4 Error, Profibus OK, not connected CAN Bus
5 Error, Profibus no communication, not connected CAN Bus
6 Error, hardware fault

6.2 - ProfiBUS port

A shielded typical Profibus connector (9-polig), possibly with internal terminal resistors, must be used .The pre addressing of the module can be changed only by Profibus (DEFAULT is 3). The cable is not included.

PROFIBUS PORT WIRING AND LINKING CONFIGURATION



pin	Signal name	Function
1-2-7-9	not used	-
3	RxD/TxD-P (B-Line)	Receive/Send P data
4	CNTR-P/RTS	Request to Send
5	DGND	Data ground
6	VP	+5 V DC for external bus termination
8	RxD/TxD-N (A-Line)	Receive/Send N data

7 - SOFTWARE KIT EWMPC/10 (code 3898401001)

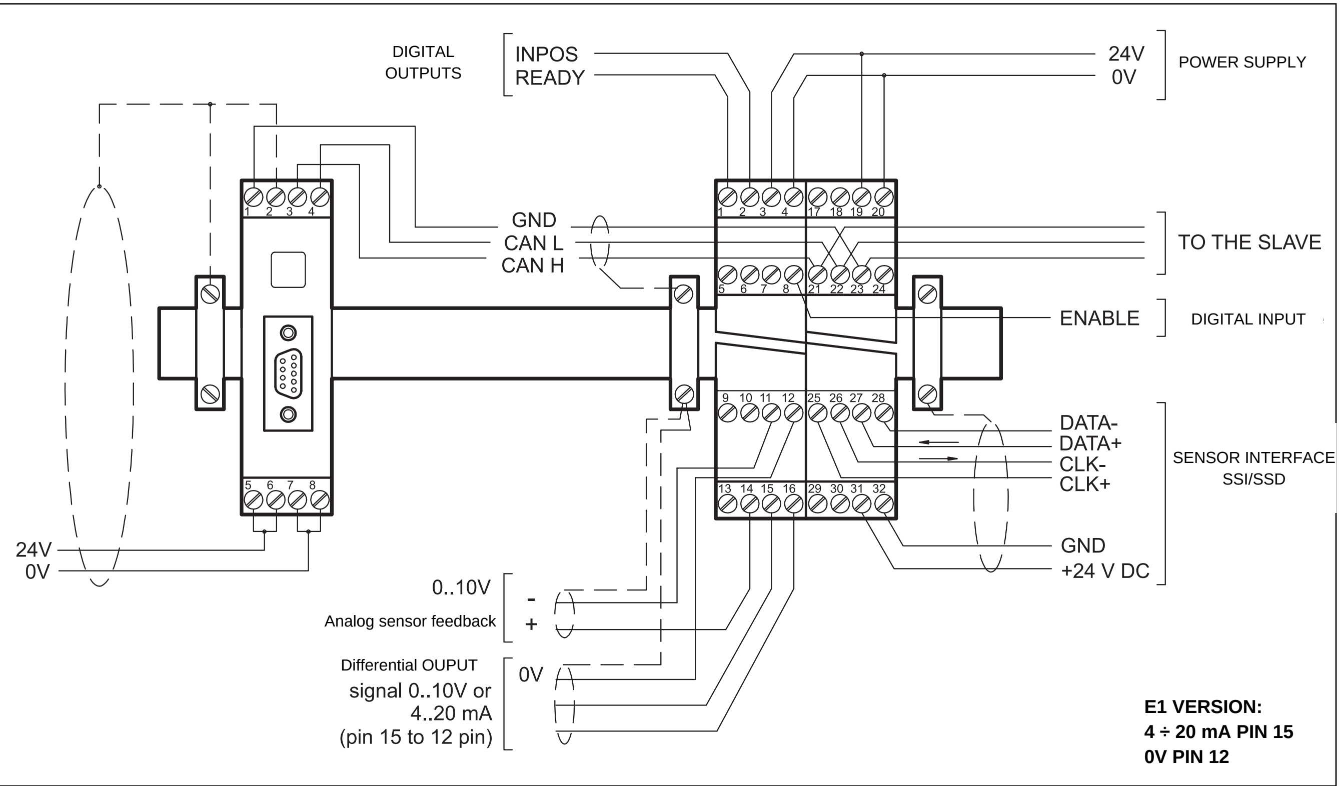
The software kit comprising a USB cable (2 mt length) to connect the card to a PC or notebook and the software.

During the identification all information are read out of the module and the table input will be automatically generated.

Some functions like baud rate setting, remote control mode, saving of process data for later evaluation are used to speed up the installation procedure.

The software is compliant with Microsoft XP® operating systems.

8 - WIRING DIAGRAMS FOR EWM-SS-DAD*E0 AND EWM-BUS-DD



DIGITAL INPUT AND OUTPUT

PIN 1 READY output:
General operationally, ENABLE is active and there is no sensor error (by use of 4 ÷ 20 mA sensors). This output corresponds with the green LED.

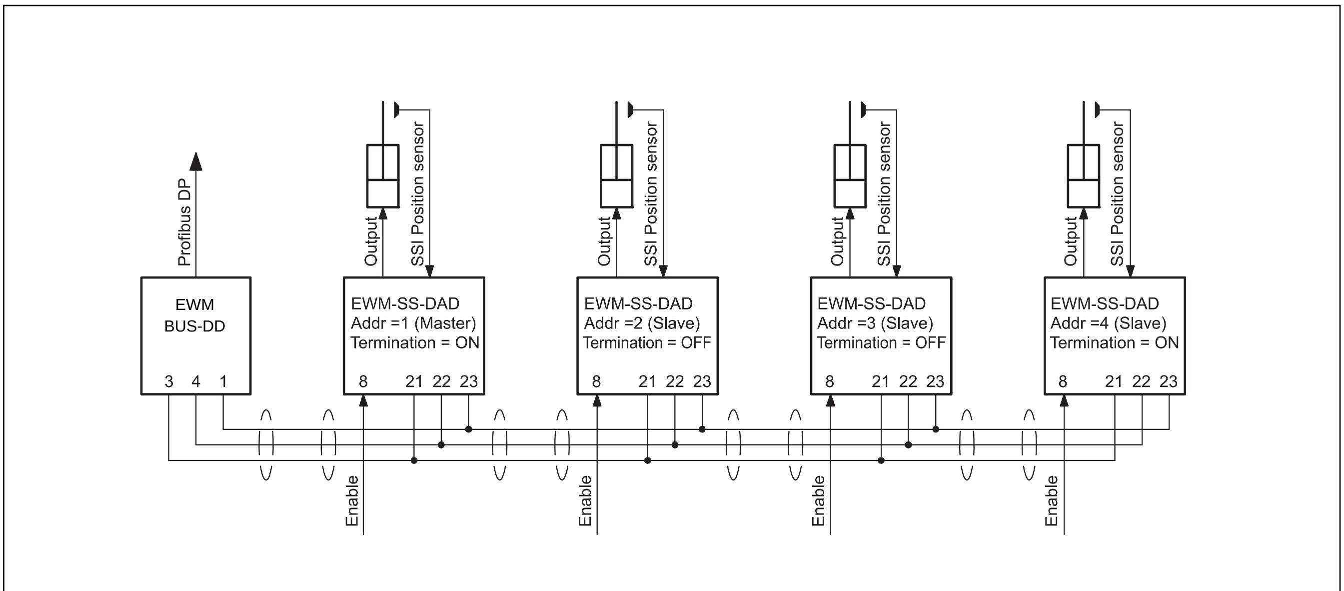
PIN 8 ENABLE input:
This digital input signal initializes the application.
The analogue output is active and the READY signal indicates that all components are working correctly.
Target position is set to actual position and the drive is closed loop controlled.

ANALOGUE INPUT AND OUTPUT

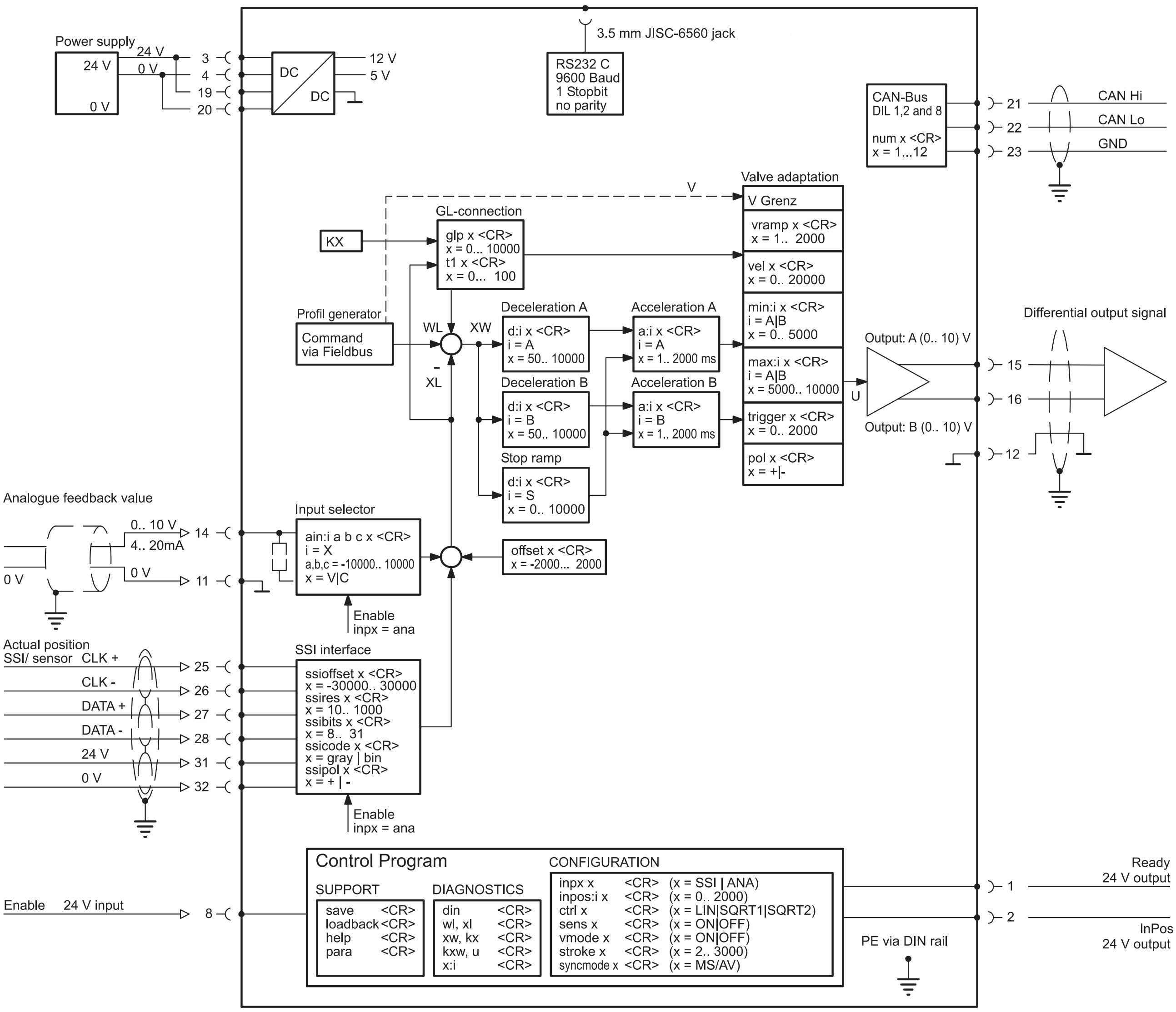
PIN 14 Analogue feedback value (X),
range 0 ÷ 100% corresponds to 0 ÷ 10V or 4 ÷ 20 mA

PIN 15/16 Differential output (U)
±100% corresponds to ± 10V differential voltage, optionally (E1 version) current output ±100% corresponds to 4 ÷ 20 mA (PIN 15 to PIN 12)

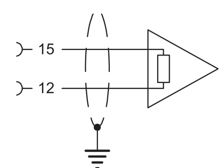
8.1 - Wiring for 4-axes synchronization



9 - EWM-DD-DAD CARD BLOCK DIAGRAM



OUTPUT SIGNAL - E1 VERSION



10 - PROFIBUS COMMUNICATION

The Profibus board controls the modules by sending 8 bytes of data, which contain information on two control words, the command position (position setpoint) and speed control (speed setpoint). The EWM-SS-DAD cards send back to the bus-card two status words, the nominal current position and current actual position, for a total of 24 bytes of data.

Using ST command in EWMPC, those data can be read out. and they appearing in this way:

(high byte / low byte)
control word : 1110 1000 / 0000 0000
control word 2 : 0010 0000 / 0010 0000
status word : 1101 0000 / 1101 0000
status word 2 : 0010 0000 / 0010 0000
position setpoint: 22400 (command position in HEX via Profibus)
speed setpoint: lfff (command speed in HEX via Profibus)

Enable: enabled (module = enabled (Profibus & Hardware-enable))

10.1 - Data sent to the axes

The EWM-BUS-DD card is set as follows:
(Hi = High byte; Lo = low byte)

Byte	Function	Comment
0	control word Hi	unsigned int
1	control word Lo	
2	command position Hi	unsigned long
3	command position..	
4	command position ..	
5	command position Lo	
6	velocity Hi	unsigned int
7	velocity Lo	
8	control word 2 Hi	unsigned int
9	control word 2 Lo	
10 - 23	reserved	no function

10.1.1 - Axes control

Only the first four axes may be activated individually, the other axes must be enabled for groups of four axes at a time, with the indicator x SEL, according to the following:

Address	Controlled axes					
SEL	**1 to 4**	**5 to 8**	**9 to 12**	**13 to 16**	**17 to 20**	**21 to 24**
2	0	0	0	0	1	1
1	0	0	1	1	0	0
0	0	1	0	1	0	1

10.1.2 - Control words

The control words contain the following informations:

ENABLE: Must be activated in addition to the hardware signal.
START: In case of increasing edge the current command position is taken over, in case of deactivated START the system about a brake ramp is stopped.
GL-ACTIVE: Over this bit the overlapped synchronism controller is activated.
SEL x: Groups of each four modules with the information about status and positions can be read - by the control of the three select-bits -back.

Byte 0 - control word Hi		
bit	**Function**	
0	Axis START 4	start 1 = active
1	Axis START 3	start 1 = active
2	Axis START 2	start 1 = active
3	Axis START 1	start 1 = active
4	SEL 2	selection 1 = active
5	SEL 1	selection 1 = active
6	SEL 0	selection 1 = active
7	Enable (with which enable hardware links)	operation 1 = active

Byte 1 - control word Lo		
bit	**Function**	
0	GL- Active ext 2 (axis 9 to 12)	1 = GL active (group 2)
1	GL- Active ext 1 (axis 5 to 8)	1 = GL active (group 1)
2	START ext 2 (axis 9 to 12)	1 = start (group 2)
3	START ext 1 (axis 5 to 8)	1 = start (group 1)
4	GL- Active axis 4	synch 1 = active
5	GL- Active axis 3	synch 1 = active
6	GL- Active axis 2	synch 1 = active
7	GL- Active axis 1	synch 1 = active

Byte 8 - control word 2 Hi		
bit	**Function**	
0	Reserved	
1	Reserved	
2	Reserved	
3	START ext 5 (start of axis 13 to 16)	1 = start (group 5)
4	START ext 4 (start of axis 17 to 20)	1 = start (group 4)
5	START ext 3 (start of axis 13 to 16)	1 = start (group 3)
6	Reserved	
7	Reserved	

Byte 9 - control word 2 Lo		
bit	**Function**	
0	Reserved	
1	Reserved	
2	Reserved	
3	GL- Active ext 5 (axis 21 to 24)	1 = GL active (group 5)
4	GL- Active ext 4 (axis 17 to 20)	1 = GL active (group 4)
5	GL- Active ext 3 (axis 13 to 16)	1 = GL active (group 3)
6	Reserved	
7	Reserved	

10.1.3 - Position setpoint description
Command position: according to the sensor resolution.

Byte 2 to 5 - command position		
bit	**Function** defined by the sensor resolution	
from 0 to 7	Command position Lo byte	Byte 5
from 8 to 15	Command position	Byte 4
from 16 to 23	Command position	Byte 3
from 24 to 31	Command position Hi byte	Byte 2

Example of calculation of position control for SSI sensor resolution = 5 µm and 100% stroke = 300 mm.

Position setpoint = 150 mm (= 50% stroke)

STROKE €SSIRES = 100% stroke (dec)

300 € 200 = 60.000 (dec) EA60 (hex)
50% di 60.000 = 30.000 (dec) 7530 (hex)

Example of calculation of position control for ANA sensor with 100% stroke = 300 mm. With analog sensors SSIRES value is preset and unchangeable.

Position setpoint = 150 mm (= 50% stroke)

STROKE €SSIRES = 100% stroke (dec)

300 € 1000 = 300.000 (dec) 493E0 (hex)
50% di 300.000 = 150.000 (dec) 249F0 (hex)

Position setpoint to be sent
with decimal value 150,000 :

hex **00 02 49 F0**

Byte 5
Byte 2 Byte 4
Byte 3

10.1.4 - Speed setpoint description
Command velocity: 0x3fff corresponds to 100 %.

Byte 6 and 7 - command velocity		
bit	**Function** max value 0x3FFF	
from 0 to 7	velocity Lo byte	Byte 7
from 8 to 15	velocity Hi byte	Byte 6

10.2 - Updating data
The EWM-SS-DAD cards send back to the bus-card two status words, the received setpoint command and the current actual position, totally of 24 bytes of data.

Byte	Function	Comment
0	status word Hi	unsigned int
1	status word Lo	
2	control position* Hi	unsigned long
3	control position*	
4	control position*	
5	control position* Lo	
6	status word 2 Hi	unsigned int
7	status word 2 Lo	
8	actual pos. axes 1,5,9,13,17,21 Hi	unsigned long
9	actual pos. axes 1,5,9,13,17,21	
10	actual pos. axes 1,5,9,13,17,21	
11	actual pos. axes 1,5,9,13,17,21 Lo	
12	actual pos. axes 2,6,10,14,18,22 Hi	unsigned long
13	actual pos. axes 2,6,10,14,18,22	
14	actual pos. axes 2,6,10,14,18,22	
15	actual pos. axes 2,6,10,14,18,22 Lo	
16	actual pos. axes 3,7,11,15,19,23 Hi	unsigned long
17	actual pos. axes 3,7,11,15,19,23	
18	actual pos. axes 3,7,11,15,19,23	
19	actual pos. axes 3,7,11,15,19,23 Lo	
20	actual pos. axes 4,8,12,16,20,24 Hi	unsigned long
21	actual pos. axes 4,8,12,16,20,24	
22	actual pos. axes 4,8,12,16,20,24	
23	actual pos. axes 4,8,12,16,20,24 Lo	

(*****) If the average-value control is active (SYNCMODE = AV) the acknowledged value is the calculated position; If the MASTER / SLAVE (SYNCMODE = MS) is active the acknowledged value will be the command position.

Current command position: is interpreted according to mode differently.
Standard mode : target command position
NC-mode : (VMODE = ON) calculated command position of the generator.

Actual position: according to the sensor resolution.

Example: reading the value of stroke 299251:

hex **00 04 90 F3**

Byte 12
Byte 9 Byte 11
Byte 10

10.2.1 - Status word descriptions

READY: System is ready.

INPOS: Depending on the mode set, can transmit a position or, in NC mode, the following error control information.

GL-ERROR: The synchronism error is indicated over this bit by the parameter GLERROR dependently.

SENSOR ERROR: When the sensor monitoring is activated, the READY signal is deactivated with a sensor error.

COMERROR: Communication error on the CAN Bus. This message will be sent only from the module No. 1. if general communication problems are found or if a module is faulty

Always the hardware enable signal has to be deactivated at a sensor error (READY Signal) or when a COM error appear.

Byte 0 - status word Hi		
bit	**Function**	
0	INPOS axis 4	1= in position
1	INPOS axis 3	1= in position
2	INPOS axis 2	1= in position
3	INPOS axis 1	1= in position
4	READY axis 4	1= ready
5	READY axis 3	1= ready
6	READY axis 2	1= ready
7	READY axis 1	1= ready

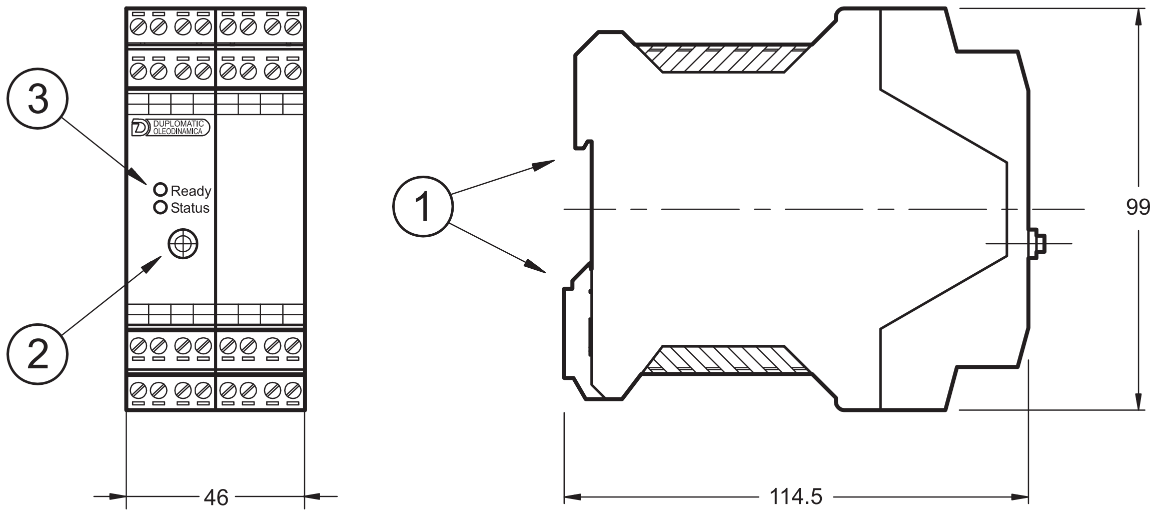
Byte 1 - status word Lo		
bit	**Function**	
0	COMerror	1 = no error
1	reserved	
2	reserved	
3	reserved	
4	axis GL-Error 4	1 = no error
5	axis GL-Error 3	1 = no error
6	axis GL-Error 2	1 = no error
7	axis GL-Error 1	1 = no error

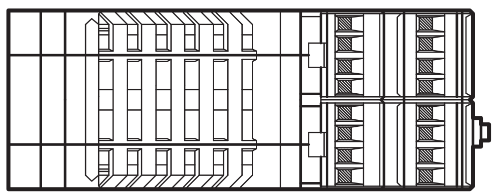
Byte 6 - status word 2 Hi		
bit	**Function**	
0	INPOS axis 4, 8, 12, 16, 20, 24	1= no error Corresponding signal indicator through selection bits Sel_0 to Sel_2 in the control word Hi
1	INPOS axis 3, 7, 11, 15, 19, 23	
2	INPOS axis 2, 6, 10, 14, 18, 22	
3	INPOS axis 1, 5, 9, 13, 17, 21	
4	READY axis 4, 8, 12, 16, 20, 24	1= Ready Corresponding signal indicator through selection bits Sel_0 to Sel_2 in the control word Hi
5	READY axis 3, 7, 11, 15, 19, 23	
6	READY axis 2, 6, 10, 14, 18, 22	
7	READY axis 1, 5, 9, 13, 17, 21	

Byte 7 - status word 2 Lo		
bit	**Function**	
0	reserved	
1	reserved	
2	reserved	
3	reserved	
4	GL-Error axis 4, 8, 12, 16, 20, 24	1= no error Corresponding signal indicator through selection bits Sel_0 to Sel_2 in the control word Hi
5	GL-Error axis 3, 7, 11, 15, 19, 23	
6	GL-Error axis 2, 6, 10, 14, 18, 22	
7	GL-Error axis 1, 5, 9, 13, 17, 21	

The status word 2 concerns the messages in the EXTENDED mode.

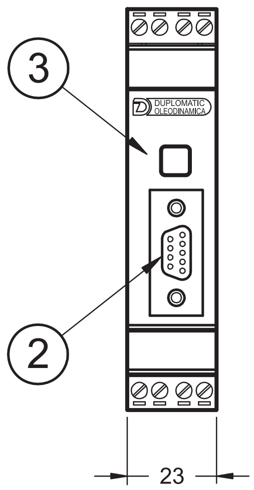
11 - OVERALL AND MOUNTING DIMENSIONS OF EWM-SS-DAD

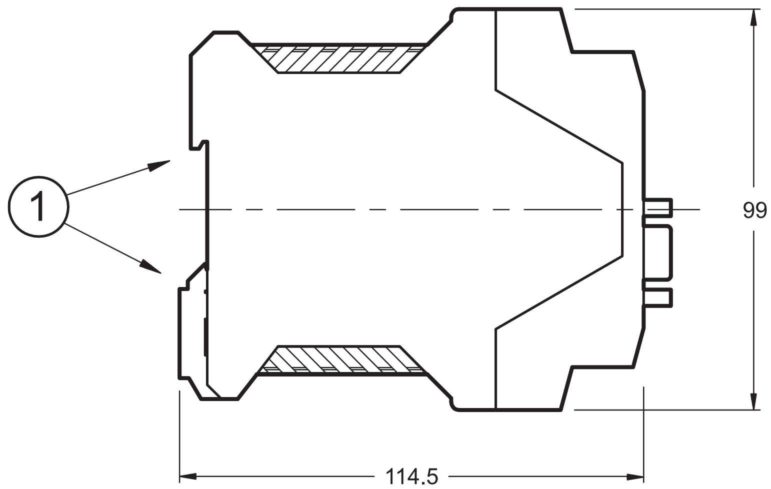




1	DIN EN 50022 rail type fastening
2	Plug for PC cable connection
3	LED for output signals

12 - OVERALL AND MOUNTING DIMENSIONS OF EWM-BUS-DD





1	DIN EN 50022 rail type fastening
2	Profibus interface port
3	Display

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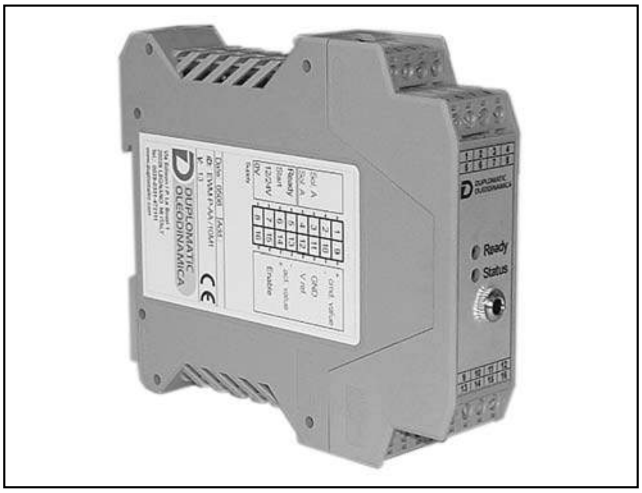
DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

89 500/112 ED



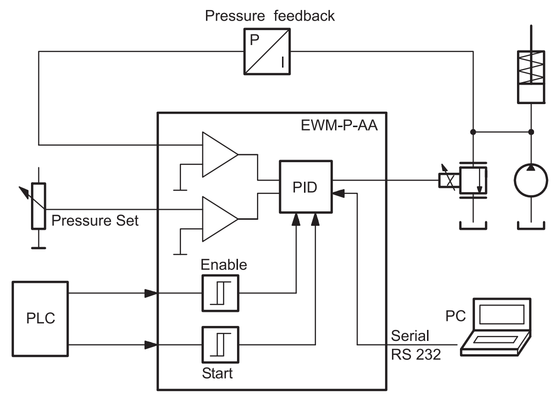
EWM-P-AA

DIGITAL CARD FOR PRESSURE AND FORCE CONTROL IN CLOSED LOOP SYSTEMS

SERIES 10

RAIL MOUNTING TYPE: DIN EN 50022

OPERATING PRINCIPLE



„ The EWM-P-AA is used to closed loop control of pressure reducing and pressure relief valves. The card integrates also an embedded power amplifier for a direct control of proportional valves.

„ This card works as a bypass control module. The command value is directly transferred to the control output (pressure valve) and the closed loop compensates only the linearity failures. In most of cases the optimization is possible without any measuring instruments (only one manometer is necessary).

„ The card allows to set the following parameters: ramp up, ramp down, PID parameters, dither, frequency and amplitude, PWM, maximum and minimum pressure.

„ The card use the RS232C interface, and is settable via notebook, using the software kit (EWMPC).

TECHNICAL CHARACTERISTICS

Power supply	V DC	12 ÷ 30 ripple included external fuse 3,0 A
Current consumption	A	1,0 ÷ 2,6 depending from solenoid current
Command value	V mA	0 ÷ 10 (R_I = 100 k) 4 ÷ 20 (R_I = 390)
Pressure signal accuracy	%	0,1
Feedback value	V mA	0 ÷ 10 (R_I = 33 k) 4 ÷ 20 (R_I = 250)
Output current	A	1,0 -1,6 - 2,6
Interface		RS 232 C
Electromagnetic compatibility (EMC): according to 2004/108/CE standards		Emissions EN 61000-6-4 Immunity EN 61000-6-2
Housing material		thermoplastic polyamide PA6.6 combustibility class V0 (UL94)
Housing dimensions	mm	120 (d) x 99(h) x 23(w)
Connector		4x4 poles screw terminals - PE direct via DIN rail
Operating temperature range	°C	-20 / +60
Protection degree		IP 20

1 - IDENTIFICATION CODE

E	W	M	-	P	-	A	A	/	10	M1

- E W M: Digital card for closed loop systems DIN EN 50022 rail mounting
- P: Pressure control
- A: Analogue command value
- A: Analogue feedback value
- 10: Series No. (from 10 to 19 sizes and mounting dimensions remain unchanged)
- M1: Embedded power ampli“er

This module is useful for pressure control in very different applications. The output signal can control various kind of pressure valves, but the controller structure is optimized for pressure closed loop control system with typical pressure valves. An integrated power stage for a direct control of the valve and high dynamic control loops (1 msec for pressure control and 0,167 msec for the current loop control) offers a simple solution.

This module is recommended where open loop applications are not sufficient concerning the accuracy.

Pressure controls with constant pumps or remote controllable servo pumps and for force and torque controls with cylinders and motor drives are typical applications.

2 - FUNCTIONAL SPECIFICATIONS

2.1 - Power supply
This card is designed for 12 to 30 VDC (typical 24 V) of a power supply. This power supply must correspond to the actual EMC standards.

All inductivities at the same power supply (relays, valves) must be provided with an over voltage protection (varistors, free-wheel diodes).

It is recommended to use a regulated power supply (linear or switching mode) for the card supply and for the sensors.

NOTE: the value of the power supply voltage on the card must not be lower than the rated working voltage of the solenoid to be controlled.

2.2 - Electrical protections
All inputs and outputs are protected against overvoltage and have filters.

2.3 - Digital Input
The card accepts digital input voltage from 12 to 24 V, with current <0,1A. Low level <4; High level >12V. See the block diagram at paragraph 8 for the electric connections.

2.4 - Command Input
The card accepts analogue command input, with voltage 0÷10V (R_I= 100) and current 4÷20 mA (R_I= 390).

2.5 - Input feedback values
The card accepts analogue feedback input. The feedback value must be 0 ÷ 10V (R_I= 100) or 4 ÷ 20 mA (R_I= 390).

The parameters are settable via software (see the parameter table)

2.6 - Output values
The output current value for this card is settable via software. The available values are 1,0, 1,6 and 2,6 A.

2.7 - Digital Output
A digital output is available (READY) and its signal is displayed from the green led.

3 - LED SIGNALS

There are two leds on the card, but only the GREEN one works.

GREEN: Shows if the card is ready.

ON - The card is supplied and the system is ready
OFF - No power supply or ENABLE non activated
FLASHING - Failure detected (solenoid or 4÷20 mA) only if the parameter SENS is ON.

YELLOW: No function.

4 - ADJUSTMENTS

On the EWM cards, the adjustment setting is possible only via software. Connecting the card to the PC, the software automatically recognises the card model and shows a table with all the available commands, with their parameters, the default setting, the measuring unit and an explanation of the command and its uses. The parameters changes depending on the card model.

5 - INSTALLATION

The card is designed for rail mounting type DIN EN 50022.

The wiring connections are on the terminal strip located on the bottom of the electronic control unit. It is recommended to use cable sections of 0.75 mm^2, up to 20 m length and of 1.00 mm^2 up to 40m length, for power supply and solenoid connections on version M2. For other connections it is recommended to use cables with a screened sheath connected to earth only on the card side.

NOTE 1

To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the wiring diagram.

As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electric motors, inverters and electrical switches).

EXAMPLE OF PARAMETERS TABLE

Command	Parameters	Default	Units	Description
mode x	x = EXT|STD	STD	-	Operating mode changing. Various commands are blanked out in STD.
ts x	x= 4… 30	10	0,1 ms	Permette di modi“care il tempo di campionamento del controllo.
sens x	x = ON|OFF	On	-	This command is used to activate and disable monitoring functions (4 20 mA sensors, solenoid current flow monitoring and internal module monitoring).Normally, monitoring is always active as otherwise no errors are signaled via the PIN 1 (READY) output. It can, however, be disabled for fault finding.
ain:i A B C X	I= W|X A= -10000…10000 B= -10000…10000 C= -500…10000 X= V|C	 1000 1000 0 V	 - - 0,01% -	This command can be used to scale the individual inputs. The following linear equation is used for scal-ing. Output = A/B · (Input … C) The •CŽ value is the offset (e. g. to compensate the 4 mA in case of a 4 20 mA input). The variables A and B define the gain factor.
aa:i x	i= UP|DOWN x= 0..60000	 100	 ms	Two quadrant ramp function. The ramp time is separately set for UP and DOWN ramps.
lim:i x	i= I|S :I 0… 10000 :S 0… 10000	 2500 2500	 0,01% 0,01%	The integrator function is controlled by this command. **LIM:I** Limitation of the integrator range (faster control function by reduced pressure overshoots). By a high nonlinearity of the valve the LIM value must be sufficient to compensate it. **LIM:S** Controls the integrator function. To reduce pressure overshoots, an activation point for the in-tegrator can be programmed via the LIM:S value. (e.i. 2500=25% of command pressure = activation point)
c:i x	I= P|I|D|T1|FF :P x= 0… 10000 :I x= 2… 21000 :D x= 0… 120 :T1 x= 0… 100 :SC x= 0… 10000	 :P 100 :I 4020 :D 0 :T1 100 :SC 8000	 0,01 0,1 ms 0,1 ms 0,1 ms 0,01%	**PID**-compensator for pressure limitation: **P**-gain, 50 = gain of 0,5. **I** -gain, integrator time in ms, >2010 deactivate the function. **D**-gain, **T1**-filter for D-gain. **SC** feed forward (direct control of the output).
c_ext:i x	i = P1|T1 :P1 x= 0… 10000 :T1 x= 0… 1000	- 0 20	 0,01 ms	Extended PID compensator function. A second PT1control path parallel to the standard P gain can be activated. P1 gain of this path, T1 time constant factor of this path.
min x **max x** **trigger x**	X= 0… 6000 X= 3000… 10000 X= 0… 10000	0 10000 200	0,01% 0,01% 0,01%	Dead band compensation for proportional valves with positive overlap- A good compensation improve the positioning accuracy. **min** = Zero point setting /following error compensation **max** = Maximum output signal limitation. **trigger** = Trigger threshold for activating the MIN parameter.
current:i x	i= A x= 0-1-2	 0	 -	Output current range: **0** = 1,0 A, **1** = 1,6 A e **2** = 2,6A.
dampl:i x	i= A x= 0..2000	 600	 0,01%	Dither amplitude. Standard values between 500 and 1200 (good performances are obtained with a set value = 700).
dfreq:i x	x= 60… 400	120	Hz	Dither frequency. . Different amplitudes or frequencies may be required depending on the valve.
pwm:i x	i= A x= 100..7700	 2600	 Hz	PWM frequency. A PWM frequency 2000 Hz improve the current loop dynamic. Valves with low dynamic and high hysteresis work better with PWM freq between 100 and 500 Hz. In this case, DAMPL must be = 0.
ppwm:i x **ipwm:i x**	i= A x= 1… 30 x= 5… 100	 7 40	 - -	The PI current controllers for the solenoids. These parameters should not be changed without appropriate measurement ca-pabilities and experience. If the PWM frequency is > 2500 Hz the dynamic response of the current controller can be increased.Typical values are: PPWM = 7 15 and IPWM = 20 40. If the PWM frequency is < 250 Hz the dynamic response of the current controller must be reduced.Typical values are: PPWM = 1 3 and IPWM = 40 80.

In environments that are critical from the electromagnetic interference point of view, a complete protection of the connection wires can be requested.

6 - SOFTWARE KIT EWMPC/10 (code 3898401001)

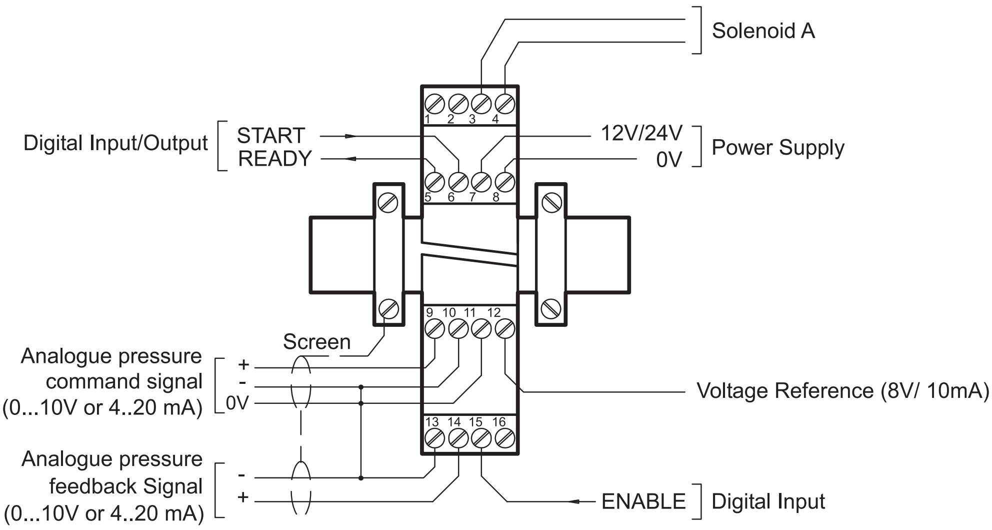
The software kit includes a USB cable (2.70 mt lenght) to connect the card to a PC or notebook and the software.

During the identification all information are read out of the module and the table input will be automatically generated.

Some functions like baud rate setting, remote control mode, saving of process data for later evaluation are used to speed up the installation procedure.

The software is compliant with Microsoft XP® operating systems.

7 - WIRING DIAGRAM



DIGITAL INPUT AND OUTPUT

PIN 5 — READY output:
General operationally, ENABLE is active and there is no sensor error (by use of 4÷ 20 mA sensors).
This output corresponds with the green LED.

PIN 6 — START Input:
The controller is active; the external analogue command value is taken over.

PIN 15 — ENABLE Input:
This digital input signal initializes the application. The analogue output is active and the READY signal indicates that all components are working correctly. The system works in open loop (like a simple power amplifier).

ANALOGUE INPUT

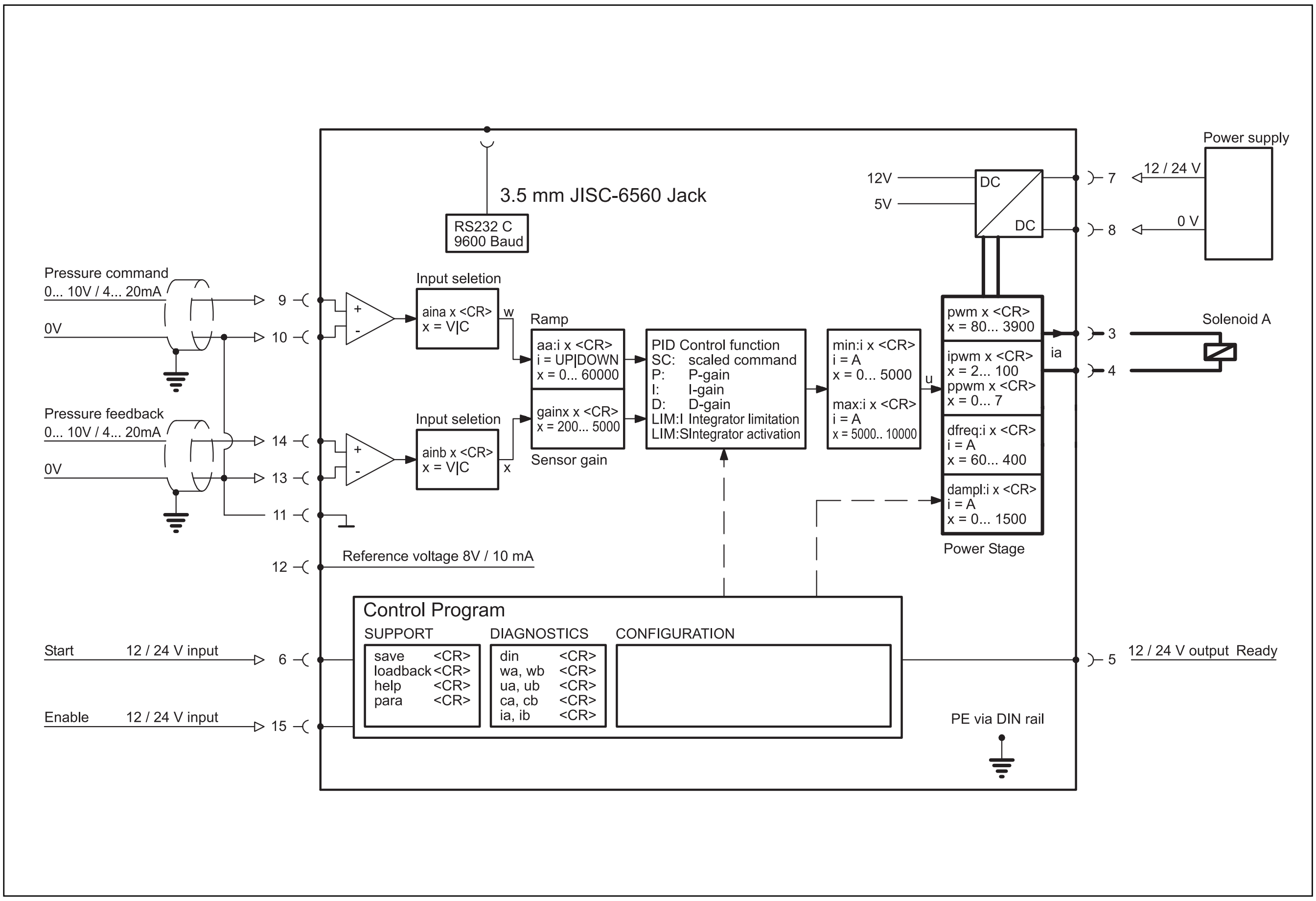
PIN 9/10 — Pressure command (W)
range 0 ÷ 100%
corresponds to 0 ÷ 10V or 4 ÷20 mA

PIN 13/14 — Pressure feedback (X)
range 0 ÷ 100%
corresponds to 0 ÷ 10V or 4 ÷20 mA

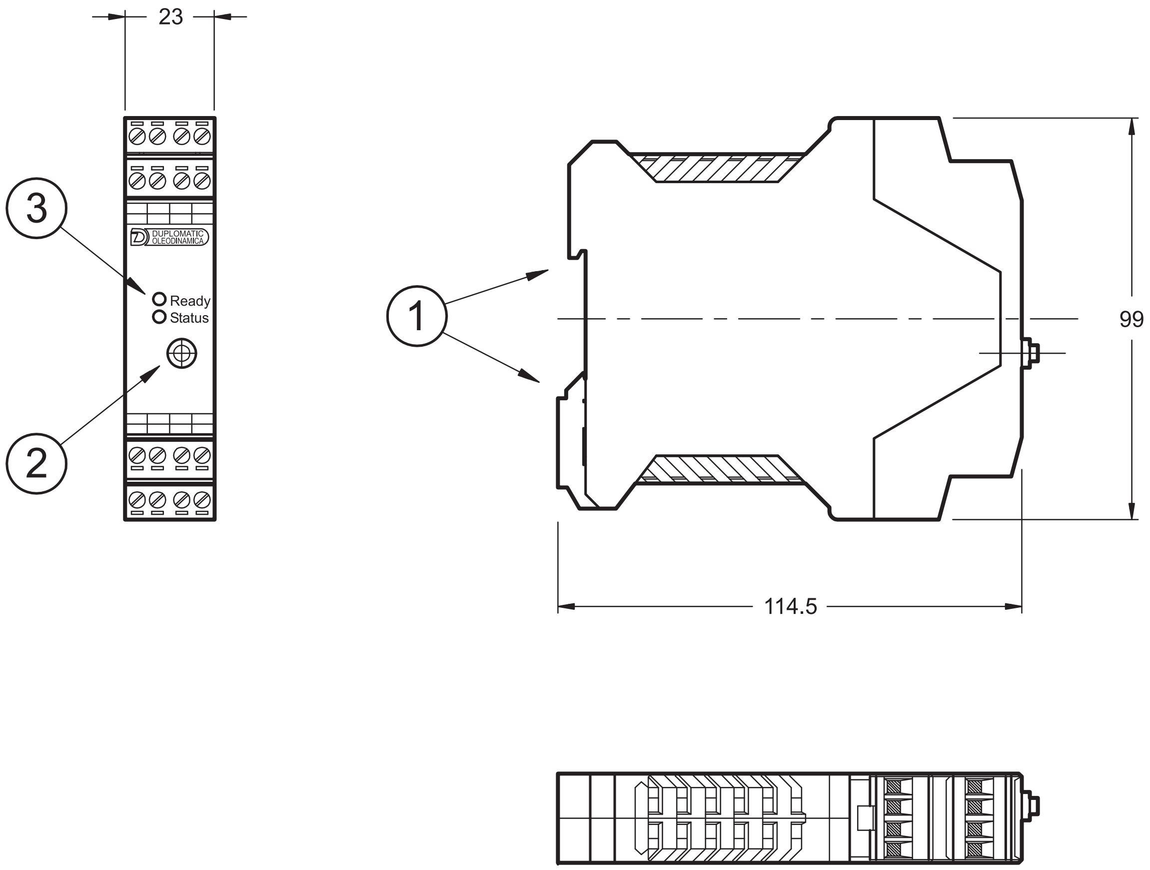
ANALOGUE OUTPUT

PIN 3/4 — PWM output for controlling of the valve.

8 - CARD BLOCK DIAGRAM



9 - OVERALL AND MOUNTING DIMENSIONS



1	DIN EN 50022 rail type fastening
2	Plug for connection PC cable
3	LED for OUTPUT signal

DUPLOMATIC OLEODINAMICA
DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

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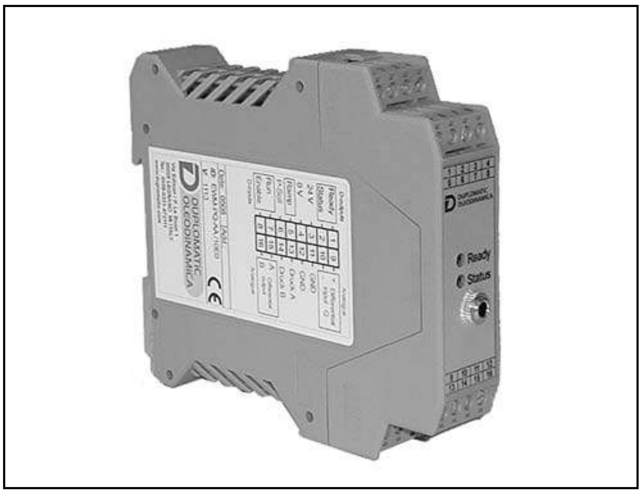
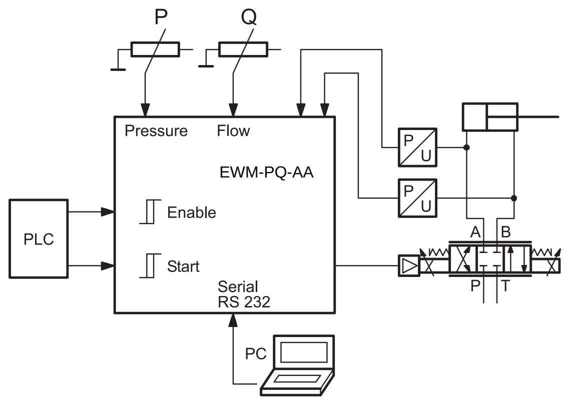


EWM-PQ-AA

DIGITAL CARD
FOR PRESSURE/FLOW CONTROL
IN CLOSED LOOP SYSTEMS
SERIES 10

RAIL MOUNTING TYPE:
DIN EN 50022

OPERATING PRINCIPLE



„ The EWM-PQ-AA has been developed as a classic p/Q controller but it work well also with high response valves via an analogue command input for pressure and flow.

„ The p/Q controller automatically switches between Q and p control modes to assure that the set point limits for P has not to exceed.

„ The pressure feedback is analogue type.

„ The card use the RS232C interface, and is settable via notebook, using the software kit EWMPC.

TECHNICAL CHARACTERISTICS

Power supply	V DC	12 ÷ 30 ripple included external fuse 1,0 A
Current consumption	mA	100
Command value	V mA	0 ÷ 10 (R_I = 33 k) 4 ÷ 20 (R_I = 250)
Speed input (Q input)	V	±10 (R_I = 90 k)
Feedback value	V mA	0 ÷ 10 (R_I = 33 k) 4 ÷ 20 (R_I = 250)
Output value: - E0 version - E1 version	V mA	±10 (max load 5 mA) 4 ÷ 20 (max load 390)
Sensor resolution for command and feedback value, and for speed (Q) input	%	0,012
Interface		RS 232 C
Electromagnetic compatibility (EMC): according to 2004/108/CE standards		Emissions EN 61000-6-3 Immunity EN 61000-6-2
Housing material		thermoplastic polyammide PA6.6 combustibility class V0 (UL94)
Housing dimensions	mm	120 (d) x 99(h) x 23(w)
Connector		4x4 poles screw terminals - PE direct via DIN rail
Operating temperature range	°C	-20 / +60
Protection degree		IP 20

1 - IDENTIFICATION CODE

E	W	M	-	PQ	-	A	A	/	10	

Digital card for closed loop systems
DIN EN 50022 rail mounting

Pressure and flow control

Analogue command value

Analogue feedback value

Output value:
E0 = voltage ±10V (**standard**)
E1 = current 4 ÷ 20 mA

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

For p/Q control a dynamic zero-overlapped control valve is necessary. If the B-side of the cylinder can not be relieved, pressure in both cylinder sides has to be measured.

The cylinder can be driven in both directions (flow control in open loop) with the analogue Q command input value (±10 V) and limits the max velocity. The pressure limitation control function is only active with a positive Q signal with a closed loop function.

The P command value pre-sets the max differential pressure. If this pressure (or force) exceeds, the controller reduces the output signal to the valve (also in the negative range), so that the preset pressure will be kept. To go backwards for keeping the force is possible.

The process is controlled by different digital input and output.

2 - FUNCTIONAL SPECIFICATIONS

2.1 - Power supply

This card is designed for 12 to 30 VDC (typical 24 V) of power supply. This power supply must correspond to the actual EMC standards.

All inductivities at the same power supply (relays, valves) must be provided with an over voltage protection (varistors, free-wheel diodes).

It is recommended to use a regulated power supply (linear or switching mode) for the card supply and for the sensors.

2.2 - Electrical protections

All input and output are protected against overvoltage and have filters.

2.3 - Digital input

The card accepts digital input. The digital input must have a voltage from 12 to 24 V with current <0,1A. See the block diagram at paragraph 8 for the electric connections.

Low level <4V   High level >12V

2.4 - Command input

The command input it•s analogue type and must be 0 ÷ 10V (R_I = 33 k) or 4 ÷ 20 mA (R_I = 250)

2.5 - Input feedback values

The card accepts analogue feedback input. The feedback value must be 0 ÷ 10 V(R_I = 33k) or 4 ÷ 20 mA (R_I = 250).

2.6 - Command speed (Q) input

The speed input it•s analogue type and must be ±10V (R_I = 90 k).

2.7 - Output values

The card is designed for two type of output values, voltage ±10V with max load 5 mA (E0 version) or current 4 ÷ 20 mA with max load 390 (E1 version); standard output value is E0 type.

2.8 - Digital Output

Two digital output are available, INPOS and READY, and their signals are displayed from the leds.

Low level <4V   High level >10V (I max 50 mA with load of 200)

3 - LED SIGNALS

There are two leds on the card:

GREEN: Shows if the card is ready.

ON - The card is supplied or ENABLE is inactive.
OFF - No power supply
FLASHING - Failure detected (internal or 4 ÷ 20 mA) only if SENS parameter is ON

YELLOW: Is the signal of the control error monitoring.

ON - No control error
OFF - Error detected, depending of a parameter error.

4 - ADJUSTMENTS

On the EWM card family, the adjustment setting is possible only via software. Connecting the card to the PC, the software automatically recognises the card model, and shows a table (see example on next page) with all the available parameters, with their commands, the default setting, the measuring unit and an explanation of the command and its uses.

The parameters changes depending on the card model, and they are fully described in the *Overhaul manual*.

EXAMPLE OF PARAMETERS TABLE

Commands	Parameter	Defaults	Units	Description
ain:i a b c x	i= W|X1|X2 a= -10000… 10000 b= -10000… 10000 c= -10000… 10000 x= V|C	 : 10000 : 10000 : 0 : V	 - - 0,01% -	Analogue output selection. **W, X1** and **X2** for the inputs and **V** = voltage, **C** = current. With the parameters **a**, **b** and **c** the inputs can be scaled (output = a / b * (input - c)). Because of the programming of the x-value (x = C) the corresponding input will be switched over to current automatically.
a:i x	i= UP|DOWN x= 0..60000	:UP 100 :DOWN 100	ms ms	Ramp times for pressure UP and DOWN.
c:i x	i= P|I|D|T1|IC :P x= 0… 10000 :I x= 2… 2050 :D x= 0… 120 :T1 x= 0… 100 :SC x= 0… 10000	 :P 50 :I 400 :D 0 :T1 1 :SC 10000	 0,01 ms ms ms 0,01%	PID-compensator for pressure limitation: **P**-gain, 50 corresponded with a nominal gain of 0,5. **I**-gain, integrator time in ms, >2010 for deactivation. **D**-gain, **T1**-time for damping of the D part. **SC** command signal scaling (direct control of the output).
error x	x= 2… 2000	200	0,01%	Range for the error window (status output).
foffset	X= -5000… 5000	0	0,01%	The offset will be added to the actual value.
pol x	x= +|-	+	-	For changing the output polarity. All A and B adjustments depend on the output polarity. The right polarity should be defined first.
sens x	x= on|off	on	-	Activation of the sensor and internal failure monitoring.
save	-	-	-	Storing the programmed parameter in E²PROM.
loadback	-	-	-	Reloading the parameter from E²PROM in working RAM
help	-	-	-	Help to the commands, for terminal programs only
para	-	-	-	Parameter list with programmed data, for terminal programs only
din	-	-	-	Status of the digital inputs.
w, x, xw, u, v	-	-	-	Actual signals: command value, actual value, process data, control divergence and reference value.
default	-	-	-	Preset values will be set.

5 - INSTALLATION

The card is designed for rail mounting type DIN EN 50022.

The wiring connections are on the terminal strip located on the bottom of the electronic control unit. It is recommended to use cable sections of 0.75 mm^2, up to 20 m length and of 1.00 mm^2 up to 40m length, for power supply and solenoid connections on version M2. For other connections it is recommended to use cables with a screened sheath connected to earth only on the card side.

NOTE 1

To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the wiring diagram.

As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electric motors, inverters and electrical switches).

In environments that are critical from the electromagnetic interference point of view, a complete protection of the connection wires can be requested.

6 - SOFTWARE KIT EWMPC/10 (code 3898401001)

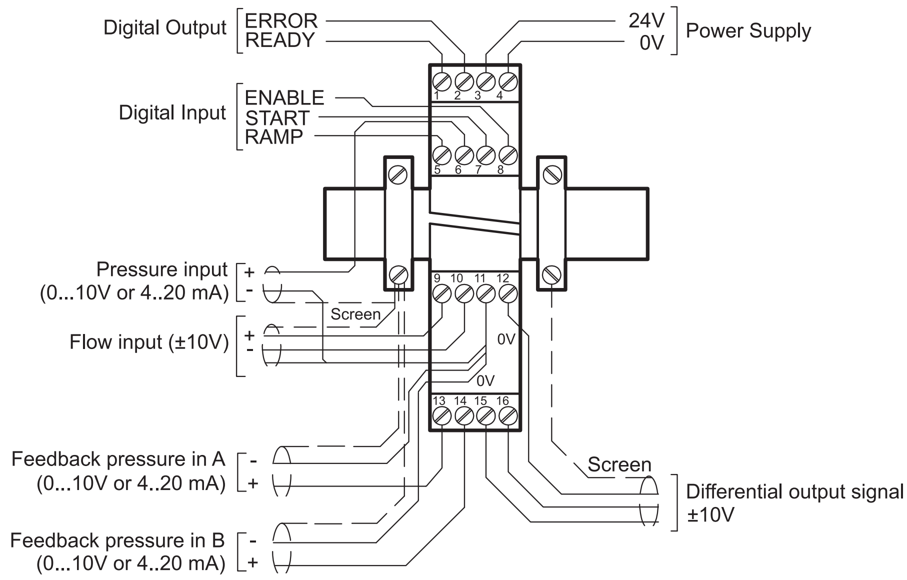
The software kit includes a USB cable (2.70 mt lenght) to connect the card to a PC or notebook and the software.

During the identification all information are read out of the module and the table input will be automatically generated.

Some functions like baud rate setting, remote control mode, saving of process data for later evaluation are used to speed up the installation procedure.

The software is compliant with Microsoft XP® operating systems.

7 - WIRING DIAGRAM



DIGITAL INPUT AND OUTPUT

PIN 1 — READY output:
General operationality, ENABLE is active and there is no sensor error (by use of 4 20 mA sensors). This output corresponds with the green LED.

PIN 2 — STATUS output:
Monitoring of the control error (ERROR). Depending on the ERROR command, the status output will be deactivated, if the control difference is greater then the adjusted window.

PIN 5 — RAMP- input:
The ramp times for pressure up and down will be activated.

PIN 7 — START input:
The controller is active; the external analogue command signal is taken over as command value.

PIN 8 — ENABLE input:
This digital input signal initializes the application. The analogue output is active and the READY signal indicates that all components are working correctly.
The Q command signal is controlling the output.

ANALOGUE INPUT

PIN 6 — Command pressure / force (W)
range 0 ÷100% corresponds to 0 ÷ 10V or 4 ÷20 mA

PIN 9/10 — External command speed (Q)
range ±100 % corresponds to ± 10 V

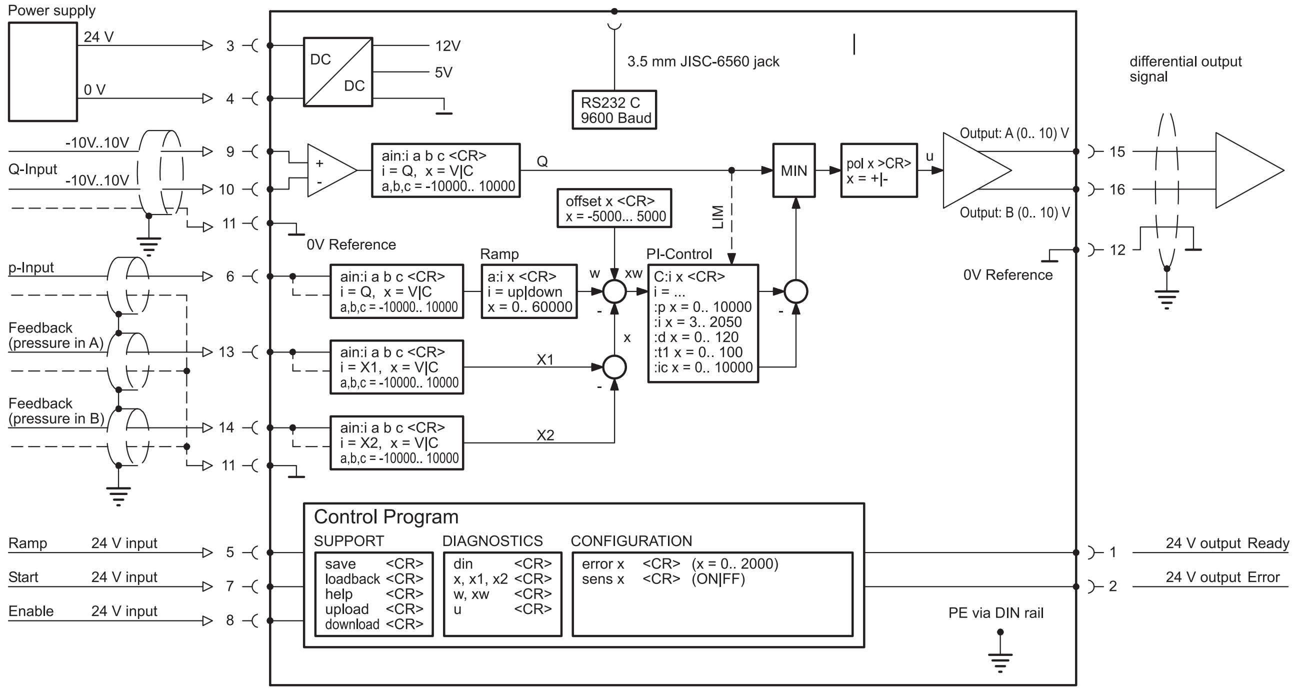
PIN 13 — Actual (feedback) value (X1)
range 0 ÷ 100% corresponds to 0 ÷ 10V or 4 ÷20 mA

PIN 14 — Actual (feedback) value (X2)
range 0 ÷ 100% corresponds to 0 ÷ 10V or 4 ÷20 mA

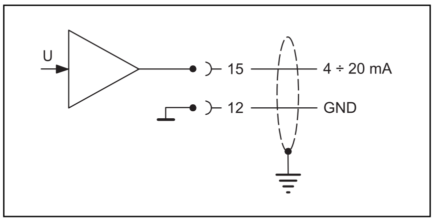
ANALOGUE OUTPUT

PIN 15/16 — Differential output (U) ± 100% corresponds to ± 10V differential voltage,
optionally (E1-version) current output ±100% corresponds to 4 ÷ 20 mA (PIN 15 to PIN 12)

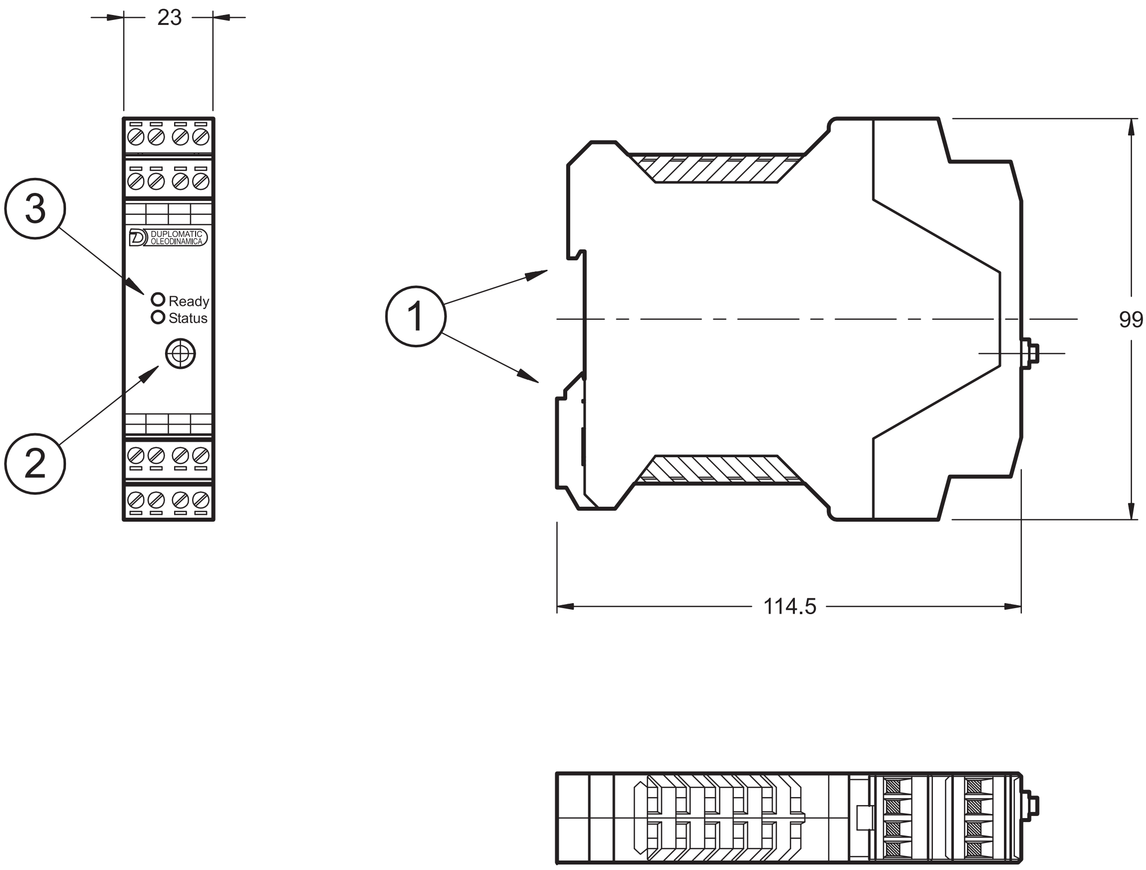
8 - CARD BLOCK DIAGRAM



OUTPUT SIGNAL - E1 VERSION



9 - OVERALL AND MOUNTING DIMENSIONS



1	DIN EN 50022 rail type fastening
2	Plug for connection PC cable
3	LED for OUTPUT signal

DUPLOMATIC OLEODINAMICA
DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

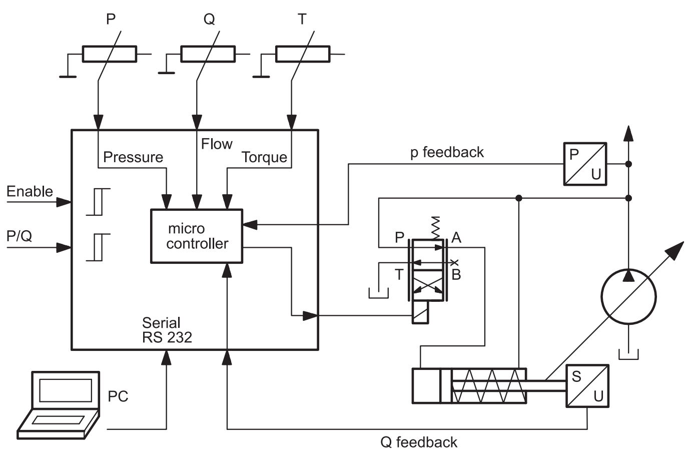
EWM-DP

CARD FOR DISPLACEMENT AND PRESSURE CONTROL ON PISTON PUMP IN CLOSED LOOP SYSTEMS

SERIES 10

RAIL MOUNTING TYPE:
DIN EN 50022

OPERATING PRINCIPLE



„ This card has been developed for the displacement, pressure and max power / torque limitation control for servo pumps.

„ Various adjustable parameters enable an optimized adaptation to the respective pump type. The control structure can drive a proportional directional control valve for displacement and pressure control.

„ These controls perform high dynamics and fine regulations, direcltly commamded with the analogue input.

„ The card use the RS232C interface, and is settable via notebook, using the kit (EWMPC).

TECHNICAL CHARACTERISTICS

Power supply	V DC	10 ÷ 30 ripple included - external fuse 5,0 A fast
Current consumption	mA	<100 + solenoid current
Pressure control command	V mA	0 ÷ 10 (R_I = 25 k) 4 ÷ 20 mA (R_I = 250)
Flow control command	V	0 ÷ 10 (R_I = 25 k)
Power limitation command	V	0 ÷ 10 (R_I = 25 k)
Feedback values: - ”ow - pressure		0 ÷ 10V (R_I = 25 k) 0 ÷ 10V (R_I = 25 k) or 4 ÷ 20 mA (R_I = 250)
Output value:	A	1,0 - 1,6 - 2,6
Sensor resolution	%	0,0125
Interface		RS 232 C
Electromagnetic compatibility (EMC): according to 2004/108CE standards		Emissions EN 61000-6-3 Immunity EN 61000-6-2
Housing material		thermoplastic polyammide PA6.6 -combustibility class V0 (UL94)
Housing dimensions	mm	120(d) x 99(h) x 46(w)
Connector		4x4 poles screw terminals - PE direct via DIN rail
Operating temperature range	°C	-20 / +60
Protection degree		IP 20

1 - IDENTIFICATION CODE

E	W	M	-	DP	-	A	A	/	10	M1

Digital card for closed loop systems
DIN EN 50022 rail mounting

Displacement and pressure control

Analog command value

Analog feedback value

Output value:
Embedded power ampli“er

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

The EWM-DP card integrates the combined pressure and flow regulation with the electronic max power limitation.

The digital drive regulates the pump swash position according to the flow reference signal, using the feedback signals coming from the pressure transducer (that must be installed on the system).

If the real value of the pressure remain below the relevant reference signal provided by the machine controller the EWM-DP regulates the pump swash position; when the real pressure raise the relevant reference signal, the card perform the close loop control on the pressure. This option allows to realize accurate dynamic pressure profiles.

2 - FUNCTIONAL SPECIFICATIONS

2.1 - Power supply

This card is designed for 12 to 30 VDC (typical 24 V) of a power supply. This power supply must correspond to the actual EMC standards.

All inductivities at the same power supply (relays, valves) must be provided with an over voltage protection (varistors, free-wheel diodes).
It is recommended to use a regulated power supply (linear or switching mode) for the card supply and the sensors.

2.2 - Electrical protections

All inputs and outputs are protected against overvoltage and have filters.

2.3 - Digital Input

The card accepts digital input. The digital input must have a voltage from 12 to 24 V. All inputs are protected with suppressor diodes and RC-filters against transient overshoots. Low level: <4V, high level >10V, current < 0,1mA. See the block diagram at paragraph 8 for the electric connections.

2.4 - Flow command value

The card accepts analogue input. The command value must be 0 ÷ 10 V (R_I = 25 k).

2.5 - Pressure command value

The card accepts analogue input. The command value must be 0 ÷ 10 V (R_I = 25 k) or 4 ÷ 20 mA. (R_I = 250).

2.6 - Power limitation value

The card accepts analog input. The command value must be
0 ÷ 10 V (R_I = 25 k).

2.7 - Input feedback values

The card accepts feedback analogue input. The value must be 0 ÷ 10 V (R_I = 25 k) or 4 ÷ 20 mA. (R_I = 250) for the pressure feedback and a 0 ÷ -10 V (R_I = 25 k) value for ”ow signal. The sensor parameters are settable via software (see parameters table).

2.8 - Output values

The output current value for this card is settable via software. The available values are 1,0 - 1,6 and 2,6 A.

2.9 - Digital Output

Two digital output are available, STATUS and READY, and their signals are displayed from the LEDS. The digital output must have a voltage from 12 to 24 V. All output are protected with suppressor diodes and RC-filters against transient overshoots. Low level: <4V, high level >10V, current max 50mA (with load 200).

3 - LED FUNCTIONS

There are two LED on the card: GREEN and YELLOW.

GREEN: Shows if the card is ready.

ON - The card is supplied
OFF - No power supply
FLASHING - Failure detected (internal or 4 20 mA).
Only if SENS = ON

YELLOW: Shows the card status

ON - System is in power/torque limitation
OFF - Displacement and pressure control.

4 - ADJUSTMENTS

On the EWM card family, the adjustment setting is possible only via software.

Connecting the card to the PC, the software automatically recognises the card model, and shows a table (see at next page) with all the available parameters, with their commands, the default setting, the measuring unit and an explanation of the command and its uses.

The parameters changes depending on the card model, and they are fully described in the *Overhaul manual*.

5 - INSTALLATION

The card is designed for rail mounting type DIN EN 50022.

The wiring connections are on the terminal strip located on the bottom of the electronic control unit. It is recommended to use cable sections of 0.75 mm^2, up to 20 m length and of 1.00 mm^2 up to 40m length, for power supply. For other connections it is recommended to use cables with a screened sheath connected to earth only on the card side.

NOTE 1

To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the wiring diagram.

As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electric motors, inverters and electrical switches).

In environments that are critical from the electromagnetic interference point of view, a complete protection of the connection wires can be requested.

EXAMPLE OF PARAMETERS TABLE

Commands	Parameter	Defaults	Units	Description
ain:i a b c x	i= wq|wp|xq|xp a= -10000… 10000 b= -10000… 10000 c= -10000… 10000 x= V|C	 : 1000 : 1000 : 0 : V	 - - 0,01% -	Analogue output selection. **W** and **X** for the inputs and **V** = voltage, **C** = current. With the parameters **a**, **b** and **c** the inputs can be scaled (output = a / b * (input - c)). Because of the programming of the **x**-value (**x** = **C**) the corresponding input will be switched over to current automatically. Feedback signals can be used in V mode only.
aq:i x **ap:i x**	i= up|down x= 5… 60000	 1	 ms	Ramp times **aa** for channel A and **ab** for channel B.
ctrl x	X = ON|OFF	ON	-	Control mode
pl:i x	I = PL|T1|EXT :PL 500… 10000 :T1 0… 2000 :EXT 0|1	 10000 67 0	 0,01% ms -	Power limitation.
cq1:i x	I= P|I|D|T1|V p= 0… 20000 i= 5… 1900 d= 0… 100 t1= 0… 100 lim= 0… 10000	 900 150 40 1 10000	 0,01 ms ms ms 0,01%	Control parameter for the displacement controller.
cp1:i x	I= P|I|D|T1|IC p= 0… 20000 i= 5… 1900 d= 0… 100 t1= 0… 100 IC= 0… 10000	 1500 2047 30 1 2000	 0,01 ms ms ms 0,01%	Control parameter for the pressure controller.
solenoid: x	single|double	single	-	No. of solenoids.
offset: x	x=0… 10000	1800	0,01%	Current offset for single solenoid valves
out: x	x= on|off	off	-	Output monitoring
minv:i x	i= A|B x= 0… 3000	 600	0,01%	Deadband compensation of positive overlapped proportional valves. Good adjustment will increase positioning accuracy
maxv:i x	i= A|B x= 0… 10000	 9500	0,01%	Maximum output range for adapting control range to maximum flow range.
trigger: x	x= 0… 10000	1	0,01%	Point to activate the deadband compensation (**min**). Also useful for reduced sensitivity in position with control valves.
current: x	x= 0, 1, 2	2		Output current range. **0** = 1,0 A range **1** = 1,6 A range **2** = 2,6 A range
dampl:i x	i= A|B x= 0… 3000	 700	 0,01%	Parametering of the dither amplitude in 0,01 % units of the nominal current range. Typical values between 500 and 1200 (with 700 we always had good experience).
dfreq:i x	i= A|B x= 60… 400	 200	 Hz	Preset of the dither frequency
pwm:i x	i= A|B x= 100… 7700	 3125	 Hz	Preset of the PWM frequency
ppwm:i x	i= A|B x= 1… 30	 25	- -	P-gain for control dynamics of the current control loop. Changing of these parameters should only be done by expert know how. A higher P-gain increases the control dynamics of the current control and also the effect of the dither adjustment
ipwm:i x	i= A|B x= 1… 100	 80	 -	I-gain for control dynamics of the current control loop. Changing of these parameters should only be done by expert know how
sens x	x= on|off	on	-	Activation of the sensor and internal failure monitoring.
wq, wp	-	-	-	Command signal
xq, xp				actual (feedback) signal
wl, xl				Power/torque control values
ia, ib				output current
default	-	-	-	Preset values will be set.

6 - SOFTWARE KIT EWMPC/10 (code 3898401001)

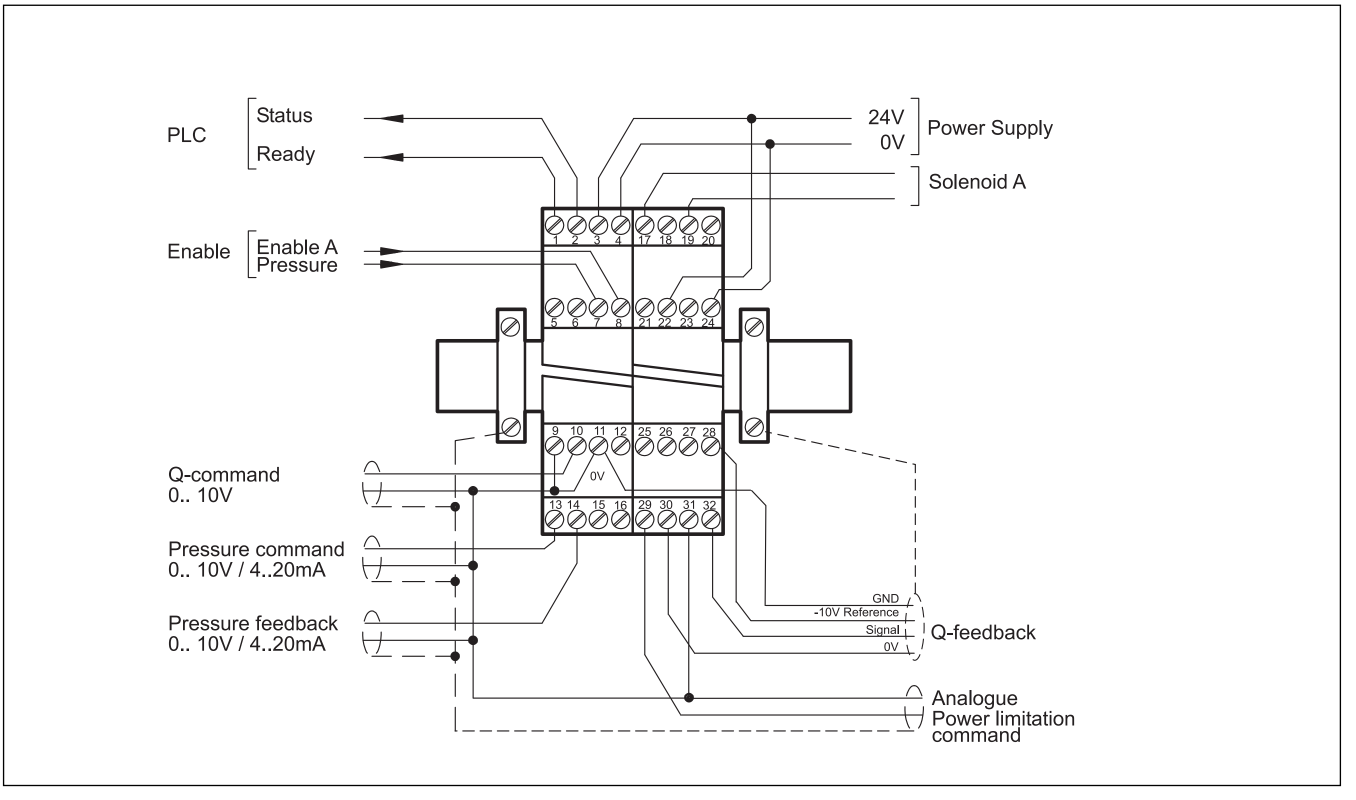
The software kit comprising a USB cable (2.70 mt lenght) to connect the card to a PC or notebook and the software.

During the identification all information are read out of the module and the table input will be automatically generated.

Some functions like baud rate setting, remote control mode, saving of process data for later evaluation are used to speed up the installation procedure.

The software is compliant with Microsoft XP® operating systems.

7 - WIRING DIAGRAM



DIGITAL INPUT AND OUTPUT

PIN 1 — READY output.
General monitoring function. If a PWM output (solenoid of the valve) or a feedback signal failed, the READY output is switched off. The ready output is corresponding with the green LED.

PIN 2 — STATUS output.
The system is in power (torque) limitation.

PIN 7 — PQ input:
The pressure limitation control function is active.

PIN 8 — ENABLE input:
This digital input signal initializes the application. The analogue output is active and the READY signal indicates that all components are working correctly.

ANALOGUE INPUT AND OUTPUT

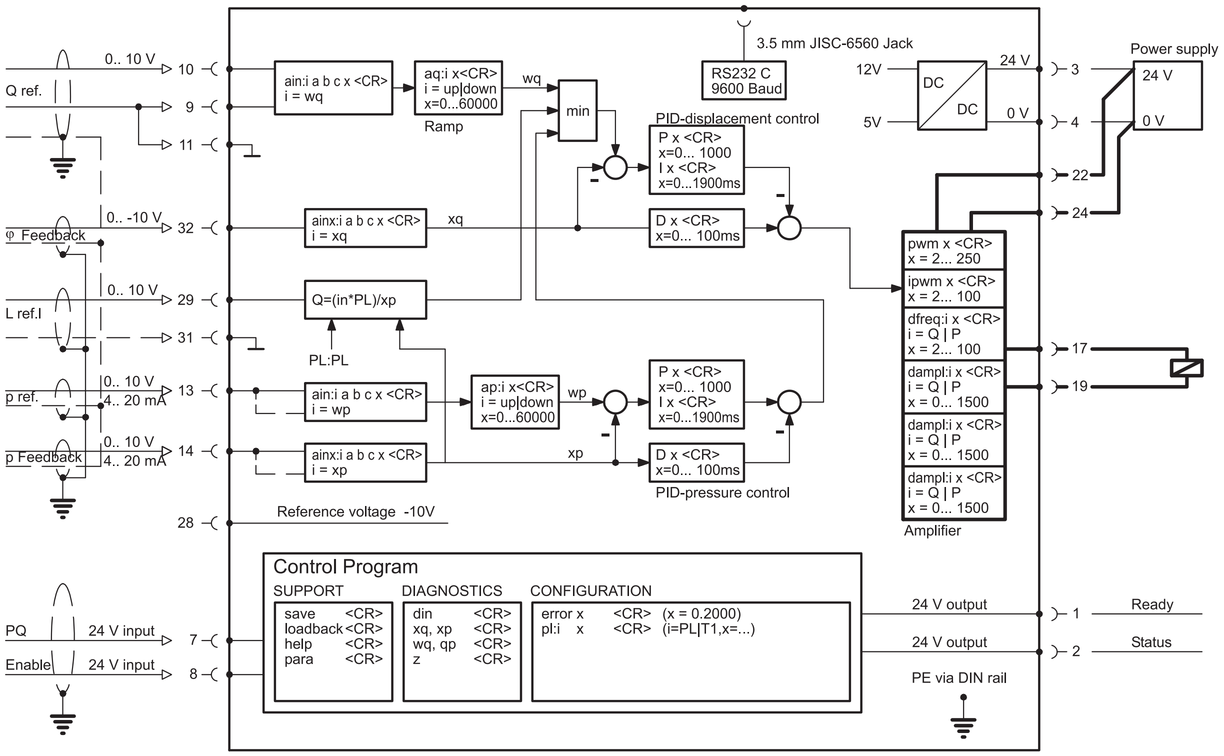
PIN 9/10 — Displacement command (WQ), range 0 ÷ 100 % corresponds to 0 ÷ 10 V

PIN 13 — Pressure command position (WP), range 0 ÷ 100% corresponds to 0 ÷ 10V or 4 ÷ 20 mA

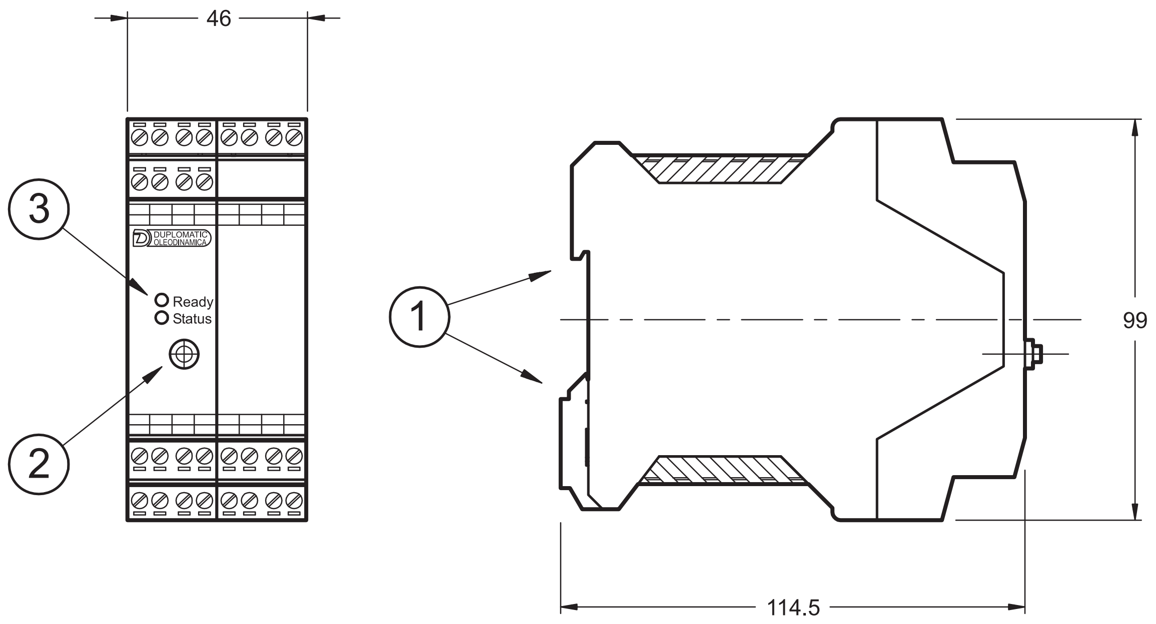
PIN 14 — Pressure Feedback (XP), range 0 ÷ 100% corresponds to 0 ÷ 10V or 4 ÷ 20 mA

PIN 32 — Displacement feedback (XQ), range 0 ÷ 100 % corresponds to 0 ÷ -10 V

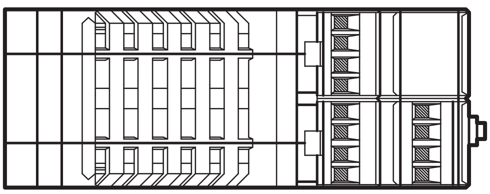
8 - CARD BLOCK DIAGRAM



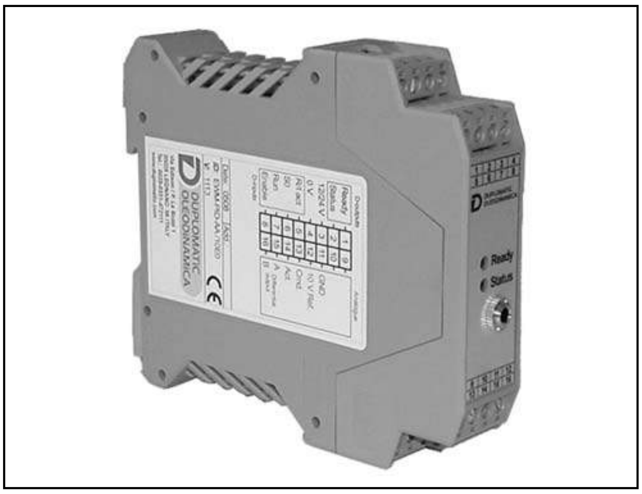
9 - OVERALL AND MOUNTING DIMENSIONS



1	DIN EN 50022 rail type fastening
2	plug for connection PC cable
3	LED for Output signals



DUPLOMATIC OLEODINAMICA
DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com



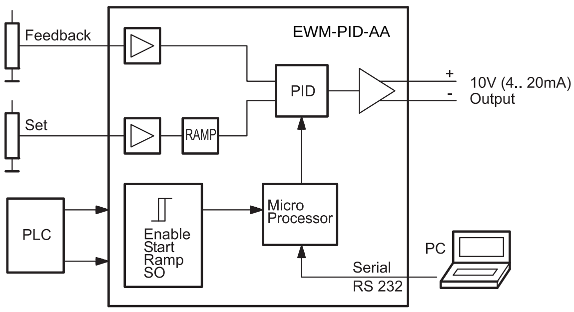
EWM-PID-AA

UNIVERSAL CONTROL CARD FOR CLOSED LOOP SYSTEMS

SERIES 10

RAIL MOUNTING TYPE: DIN EN 50022

OPERATING PRINCIPLE



- This card has been developed for universal closed loop control. The controller structure is designed as a classic PID algorithm with a short time of 1 ms. Alternatively different feedback value (4 ÷ 20 mA or 0 ÷10 V) can be adapted
- The output signal is available as an active difference signal for the direct connection to the valves with integrated electronics and the command value can be adapted by a ramp function.
- A digital input enables the switching between two parameter sets.
- The integrator function can be activated by an external input depending on the feedback signal.
- The card use the RS232C interface, and is fully settable via notebook, using the software kit (EWMPC).

TECHNICAL CHARACTERISTICS

Power supply	V DC	12 ÷ 30 ripple included external fuse 1,0 A
Current consumption	mA	100
Command value	V mA	0 ÷ 10 (R_I = 33 k) 4 ÷ 20 (R_I = 250)
Feedback value	V mA	0 ÷ 10 (R_I = 33 k) 4 ÷ 20 (R_I = 250)
Output value: - E0 version - E1 version	V mA	±10 (max load 5 mA) 4 ÷ 20 (max load 390)
Interface		RS 232 C
Electromagnetic compatibility (EMC): according to 2004/108/CE standards		Emissions EN 61000-6-3 Immunity EN 61000-6-2
Housing material		thermoplastic polyammide PA6.6 combustibility class V0 (UL94)
Housing dimensions	mm	120 (d) x 99(h) x 23(w)
Connector		4x4 poles screw terminals - PE direct via DIN rail
Operating temperature range	°C	-20 / +60
Protection degree		IP 20

1 - IDENTIFICATION CODE

E	W	M	-	PID	-	A	A	/	10	

Digital card for closed loop systems
DIN EN 50022 rail mounting

PID control

Analogue command value

Analogue feedback value

Output value:
E0 = voltage ±10V (**standard**)
E1 = current 4 ÷ 20 mA

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

2 - FUNCTIONAL SPECIFICATIONS

2.1 - Power supply
This card is designed for 12 to 30 VDC (typical 24 V) of a power supply. This power supply must correspond to the actual EMC standards.

All inductivities at the same power supply (relays, valves) must be provided with an over voltage protection (varistors, free-wheel diodes).

It is recommended to use a regulated power supply (linear or switching mode) for the card supply and for the sensors.

2.2 - Electrical protections
All input and output are protected against overvoltage and have filters.

2.3 - Digital input
The card accepts digital input. The digital input must have a voltage from 12 to 24 V with current <0,1A. As common potential 0V (PIN 4) is used. Low level <4V, high level > 12V. (See the block diagram at paragraph 8 for the electric connections.)

2.4 - Command input
The card accepts an analogue command value, The pin are 13 and 11. Voltage 0 ÷ 10 V (RI 33 k); current 4 ÷ 20 mA (R_I 250)

2.5 - Input feedback values
The card accepts analogue feedback input. The feedback value must be 0 ÷ 10 V (R_I 33 k) or 4 ÷ 20 mA (R_I 250) .The pin are 14 and 11.

2.6 - Output values
The card is designed for two type of output values, voltage ±10V (E0 version, pin 15 and pin 16) or current 4 ÷ 20 mA (E1 version, pin 15 and pin 12); standard output value is E0 type.

2.7 - Digital Output
Two digital output are available, INPOS and READY, and their signals are displayed from the leds.

3 - LED FUNCTIONS

There are two leds on the card: .

GREEN: Shows if the card is ready.
ON - The card is supplied
OFF - No power supply or ENABLE is inactive
FLASHING - Failure detected (internal or 4..20 mA) only if the SENS parameter is ON

YELLOW: Is the signal of the control error monitoring.
ON - No control error
OFF - Error detected, depending of a parameter error.

4 - ADJUSTMENTS

On the EWM card family, the adjustment setting is possible only via software. Connecting the card to the PC, the software automatically recognises the card model, and shows a table (see example on next page) with all the available parameters, with their commands, the default setting, the measuring unit and an explanation of the command and its uses.

The parameters changes depending on the card model, and they are fully described in the *Overhaul manual*.

5 - INSTALLATION

The card is designed for rail mounting type DIN EN 50022.

The wiring connections are on the terminal strip located on the bottom of the electronic control unit. It is recommended to use cable sections of 0.75 mm^2, up to 20 m length and of 1.00 mm^2 up to 40m length, for power supply. For further connections it is recommended to use cables with a screened sheath connected to earth only on the card side.

NOTE 1

To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the wiring diagram.

As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electric motors, inverters and electrical switches).

In environments that are critical from the electromagnetic interference point of view, a complete protection of the connection wires can be requested.

6 - SOFTWARE KIT EWMPC/10 (code 3898401001)

The software kit includes a USB cable (2.70 mt lenght) to connect the card to a PC or notebook and the software.

During the identification all information are read out of the module and the table input will be automatically generated.

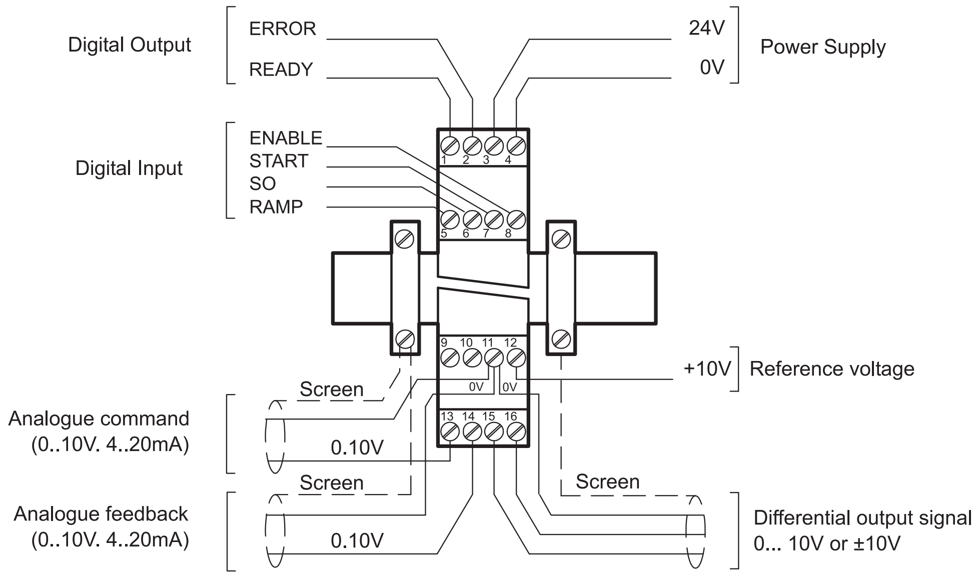
Some functions like baud rate setting, remote control mode, saving of process data for later evaluation, are used to speed up the installation procedure.

The software is compliant with Microsoft XP® operating systems.

EXAMPLE OF PARAMETERS TABLE

Commands	Parameter	Defaults	Units	Description
ain:i a b c x	i= W|X a= -10000… 10000 b= -10000… 10000 c= -10000… 10000 x= V|C	 : 10000 : 10000 : 0 : V	 - - 0,01% -	Analogue output selection. **W** and **X** for the inputs and **V** = voltage, **C** = current. With the parameters **a**, **b** and **c** the inputs can be scaled (output = a / b * (input - c)). Because of the programming of the x-value (x = C) the corresponding input will be switched over to current automatically.
a:i x	i= UP|DOWN x= 2..60000	:UP 100 :DOWN 100	ms ms	Time in ms for ramp UP and DOWN .
lim:i x	i= I|S|N :I 0… 10000 :S 0… 10000 :N -10000… 0	 2500 2500 0	 0,01% 0,01% 0,01%	Integrator limitation / activation LIM:I, general limitation (2500 = ±25%) LIM:S, Integrator activation depending on the command value. LIM:S 2500 (25%) = the integrator is active if the actual pressure is higher than 25% of the command pressure. LIM:N, limitation of the negative output range.
c0:i x **c1:i x**	i= P|I|D|T1|IC :P x= 0… 10000 :I x= 2… 2050 :D x= 0… 120 :T1 x= 0… 100 :SC x= 0… 10000	 :P 50 :I 400 :D 0 :T1 1 :SC 5000	 0,01 ms ms ms 0,01%	PID-compensator for pressure limitation: **P**-gain, 50 corresponded with a nominal gain of 0,5. **I**-gain, integrator time in ms, >2010 for deactivation. **D**-gain, **T1**-time for damping of the D part. **SC** command signal scaling (direct control of the output).
min:i x	i= A|B x= 0… 5000	:A 0 :B 0	0,01% 0,01%	Deadband compensation of positive overlapped proportional valves. Good adjustment will increase positioning accuracy.
max:i x	i= A|B x= 5000… 10000	:A 10000 :B 10000	0,01% 0,01%	Maximum output range for adapting control range to maximum flow range.
trigger x	x= 0… 2000	200	0,01%	Point to activate the deadband compensation (**min**). Also useful for reduced sensitivity in position with control valves.
error x	x= 2… 2000	200	0,01%	Range for the error window (status output).
pol x	x= +|-	+	-	For changing the output polarity. All A and B adjustments depend on the output polarity. The right polarity should be defined first.
sens x	x= on|off	on	-	Activation of the sensor and internal failure monitoring.
pin5 x	x= ramp|integ	ramp	-	Ramp or integrator control.
remote x **rc:s x** **rc:v x**	on|off x= 0… 15 x= 0… 10000	off - -	- - 0.01%	Remote control function. Emulation of the digital inputs. Emulation of the analogue command signal
save	-	-	-	Storing the programmed parameter in E²PROM.
loadback	-	-	-	Reloading the parameter from E²PROM in working RAM
din	-	-	-	Status of the digital inputs.
w, x, xw, u,	-	-	-	Actual signals: command value, actual value, process data, control divergence and reference value.
default	-	-	-	Preset values will be set.

7 - WIRING DIAGRAM



DIGITAL INPUT AND OUTPUT

PIN 1 — READY output:
General operationality, ENABLE is active and there is no sensor error (by use of 4 20 mA sensors). This output corresponds with the green LED.

PIN 2 — STATUS output:
Monitoring of the control error. Depending on the ERROR command, the status output will be deactivated, if the control difference is greater then the adjusted window.

PIN 5 — RAMP- input: (if command PIN5 = RAMP)
The ramp times for pressure up and down will be activated.
INTEG input (if command PIN5 = INTEG):
The integrator function is active, the ramps are always active.

PIN 6 — S0 input:
Switching over between parameter Set 0 and 1.

PIN 7 — START input:
The controller is active; the external analogue command value is taken over.

PIN 8 — ENABLE input:
This digital input signal initializes the application. The analogue output is active and the READY signal indicates that all components are working correctly.
The system works in open loop (like a simple power amplifier).

ANALOGUE INPUT

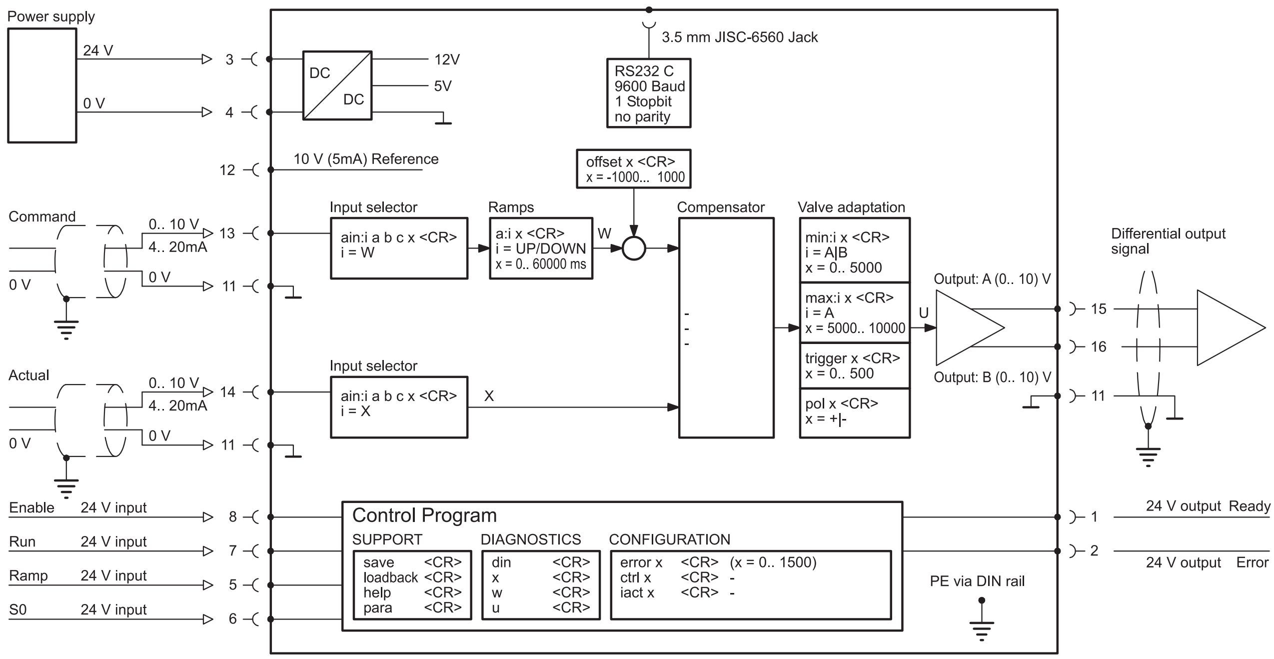
PIN 13 — Command value (W)
range 0 ÷ 100% corresponds to 0 ÷ 10V or 4 ÷20 mA

PIN 14 — Actual (feedback) value (X)
range 0 ÷ 100% corresponds to 0 ÷ 10V or 4 ÷20 mA

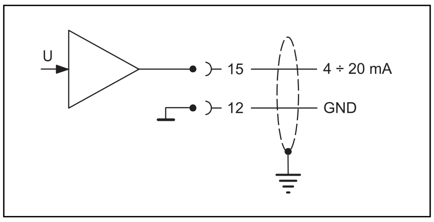
ANALOGUE OUTPUT

PIN 15/16 — Differential output (U) ± 100% corresponds to ± 10V differential voltage,
optionally (E1-version) current output ±100% corresponds to 4 ÷ 20 mA (PIN 15 to PIN 12)
See command LIM:N for limitation of the negative range.

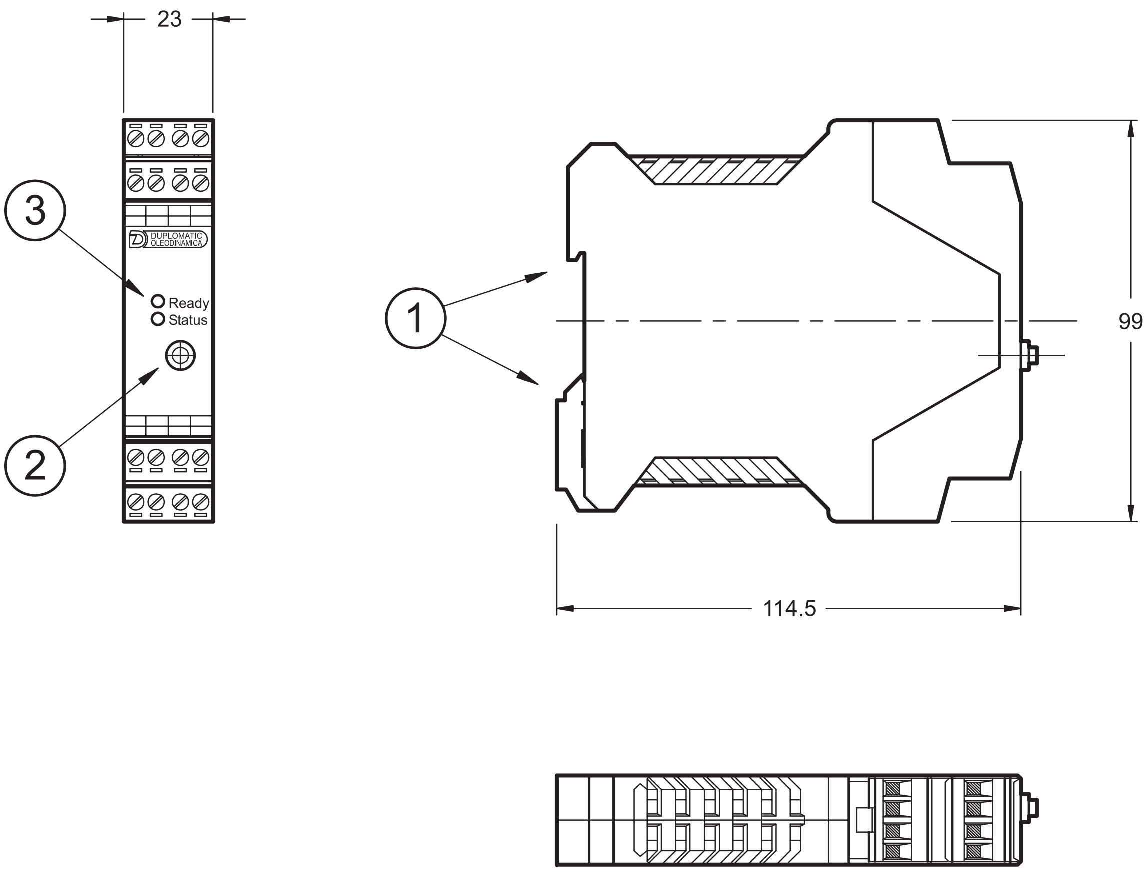
8 - CARD BLOCK DIAGRAM



OUTPUT SIGNAL - E1 VERSION



9 - OVERALL AND MOUNTING DIMENSIONS



1	DIN EN 50022 rail type fastening
2	Plug for connection PC cable
3	LED for OUTPUT signals

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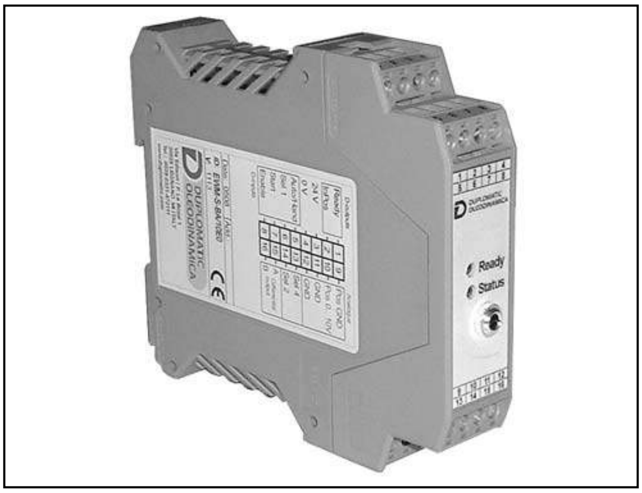
DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com



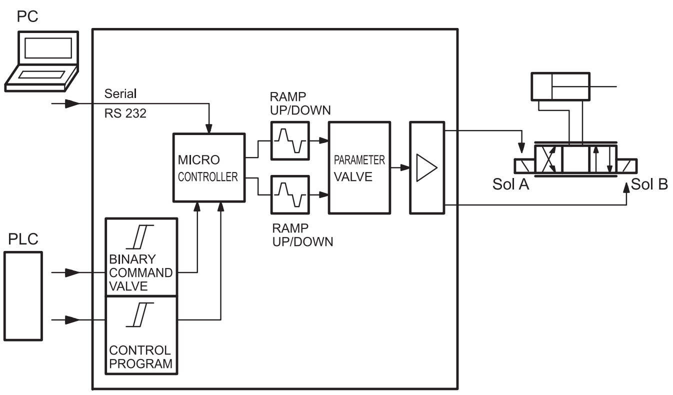
EWM-A-RL

DIGITAL CARD FOR FAST/SLOW SPEED CONTROL IN OPEN LOOP SYSTEMS

SERIES 10

RAIL MOUNTING TYPE: DIN EN 50022

OPERATING PRINCIPLE



- This card is designed to control proportional valves with one or two solenoids, with the current output controlled in open loop.
- The card moves the proportional valve via preset value input. Eight demand value input can be activated in binary mode, so it is possible to control speed, directional and ramp values without any analog card into the PLC.
- The card use the RS232C interface, and is settable via notebook, using the kit (EWMPC).

TECHNICAL CHARACTERISTICS

Power supply	V DC	12 ÷ 30 ripple included external fuse 5 A
Current consumption	mA	100 + solenoid current consumption
Command value		binary command with 8 bit
Output current	A	max 2,6
Interface		RS 232 C
Electromagnetic compatibility (EMC): according to 2004/108/CE standards		Emissions EN 61000-6-4 Immunity EN 61000-6-2
Housing material		thermoplastic polyamide PA6.6 -combustibility class V0 (UL94)
Housing dimensions	mm	120(d) x 99(h) x 23(w)
Connector		4x4 poles screw terminals - PE direct via DIN rail
Operating temperature range	°C	-20 / +60
Protection degree		IP 20

1 - IDENTIFICATION CODE

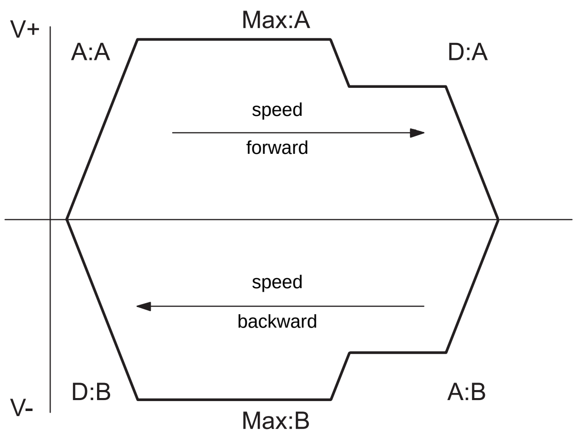
E	W	M	-	A	-	RL	/	10	M2

- E W M: Digital card for open loop systems DIN EN 50022 rail mounting
- A: Amplifier
- RL: Fast/slow speed control
- 10: Series No. (from 10 to 19 sizes and mounting dimensions remains unchanged)
- M2: Output value: with embedded power amplifier

The power amplifier is controlled by an enable input and three switch signals. Therefore 8 demand values can be activated binary.

In case of direct control (non binary) it is par example possible to preset the directions with two inputs and to switch over between rapid and slow speed with the third input.

The output current is closed loop controlled and therefore independent from the supply voltage and the solenoid resistance.



2 - FUNCTIONAL SPECIFICATIONS

2.1 - Power supply

This card is designed for 12 to 30 VDC (typical 24 V) of a power supply. This power supply must correspond to the actual EMC standards.
All inductivity at the same power supply (relays, valves) must be provided with an over voltage protection (varistors, free-wheel diodes).
It is recommended to use a regulated power supply (linear or switching mode) for the card supply and the sensors.

NOTE: in the type M2 the value of the power supply voltage on the card must not be lower than the rated working voltage of the solenoid to be controlled.

2.2 - Electrical protections

All inputs and outputs are protected against overvoltage and have filters.

2.3 - Reference signal

The card accepts digital input. The digital input must have a voltage from 12 to 24 V with current <0,1A. See the block diagram at paragraph 8 for the electric connections.

2.4 - Output values

The card has output values in current, settable via software between 1, 1,6 and 2,6 A.

2.5 - Digital Output

The digital output is READY signal, displayed from the green led.

3 - LED FUNCTIONS

There are two leds on the card: GREEN and YELLOW.

GREEN: Shows if the card is ready.

ON - The card is supplied
OFF - No power supply
FLASHING - Failure detected
Only if SENS = ON

YELLOW: Indicates the intensity of the output current.

4 - ADJUSTMENTS

On the EWM card family, the adjustment setting is possible only via software. Connecting the card to the PC, the software automatically recognises the card model, and shows a table (see example on next page) with all the available parameters, with their commands, the default setting, the measuring unit and an explanation of the command and its uses.

The parameters changes depending on the card model, and they are fully described in the *Overhaul manual*.

EXAMPLE OF PARAMETERS TABLE

Commands	Parameter	Defaults	Units	Description
s:i x	i= 0..7 x= 0..10000	- :0	- 0,01%	Definition of the target positions. The value **i** is related to the input selection (SEL1, SEL2 and SEL4; binary coded).
rmode x	x= SD|4Q	SD	-	Ramp function: **SD** = ramp time related to the setpoint value **4Q** = Four quadrants ramp, ramp-variable RA:1 to RA:4 is used
ra:i x	i= 0… 7 x= 0..600000	100	ms	**4Q** Ramp **RA:1** up (solenoid A), **RA:2** down (solenoid A) **RA:3** up (solenoid B), **RA:4** down (solenoid B) **SD** Ramp **RA:0** to **RA:7**
mode x	x= on|off	off	-	Activation or deactivation of the linearization defined by the CC command.
cc:i x y	i= -10… 10 x -10000… 10000 y -10000… 10000	5000	 0,01% 0,01%	Characteristic linearization.
rcurr x	i= A|B x= -10000… 10000	off	-	Real current input. **MIN** and **MAX** will be typed in, in mA. If *rcurr* = on; the command •currentŽ should not be used.
min:i x	i= A x= 0… 5000	 0	 0,01% / mA	Deadband compensation of positive overlapped proportional valves.
max:i x	i= A x= 300..10000	 10000	 0,01% / mA	Maximum output range for adapting control range to maximum flow range.
trigger x	x= 0… 2000	200	0,01%	Point to activate the deadband compensation (min). Also useful for reduced sensitivity in position with control valves.
sens x	x= ON|OFF	ON	-	Activation of the sensor and internal failure monitoring.
solenoids x	x= 1|2	2	-	Number of used solenoids. Two for directional valves, one for pressure or throttle valves.
current:i x	i= A x= 0, 1, 2	 0		Output current range. **0** = 1,0 A range **1** = 1,6 A range **2** = 2,6 A range DO NOT USE THIS COMMAND IF *rcurr* = ON.
dampl:i x	i= A x= 0..2000	 400	 0,01%	Parametering of the dither amplitude in 0,01 % units of the nominal current range. Typical values between 500 and 1200 (with 700 we always had good experience).
dfreq:i x	i= A x= 60… 400	 120	 Hz	Preset of the dither frequency
pwm:i x	i= A x= 100..7700	 2600	 Hz	Preset of the PWM frequency
ppwm:i x **ipwm:i x**	x= 1… 20 x= 5… 100	7 40	-	P-gain for control dynamics of the current control loop. Changing of these parameters should only be done by expert know how. A higher P-gain increases the control dynamics of the current control and also the effect of the dither adjustment. I-gain for control dynamics of the current control loop. Changing of these parameters should only be done by expert know how.
cmode x	X= ON|OFF	ON	-	Function of the output stage: OFF: function for closed loop positioning drives, ON: standard and for only one return line by two solenoids
save	-	-	-	Storing the programmed parameter in E²PROM.
loadback	-	-	-	Reloading the parameter from E²PROM in working RAM
help	-	-	-	Help to the commands, for terminal programs only
para	-	-	-	Parameter list with programmed data, for terminal programs only
din	-	-	-	Status of the digital inputs.
id	-	-	-	Display the module type, version and revision.
w, c, u, ia, ib	-	-	0,01%	Actual signals: command value, actual value, process data
default	-	-	-	Preset values will be set.

5 - INSTALLATION

The card is designed for rail mounting type DIN EN 50022.

The wiring connections are on the terminal strip located on the bottom of the electronic control unit. It is recommended to use cable sections of 0.75 mm^2, up to 20 m length and of 1.00 mm^2 up to 40m length, for power supply and solenoid connections on versions it is recommended to use cables with a screened sheath connected to earth only on the card side.

NOTE 1

To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the wiring diagram.

As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electric motors, inverters and electrical switches).

In environments that are critical from the electromagnetic interference point of view, a complete protection of the connection wires can be requested.

6 - SOFTWARE KIT EWMPC/10 (code 3898401001)

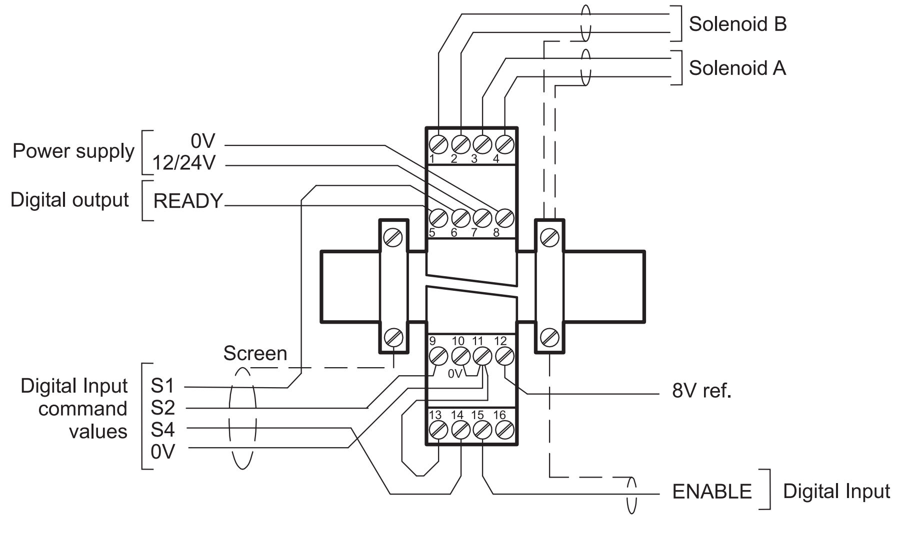
The software kit includes a USB cable (2.70 mt length) to connect the card to a PC or notebook and the software.

During the identification all information are read out of the module and the table input will be automatically generated.

Some functions like baud rate setting, remote control mode, saving of process data for later evaluation are used to speed up the installation procedure.

The software is compliant with Microsoft XP® operating systems.

7 - WIRING DIAGRAM



DIGITAL INPUT AND OUTPUT

PIN 1/2 PWM outputs for solenoid control. Solenoid B

PIN 3/4 PWM outputs for solenoid control. Solenoid A
STATUS output.

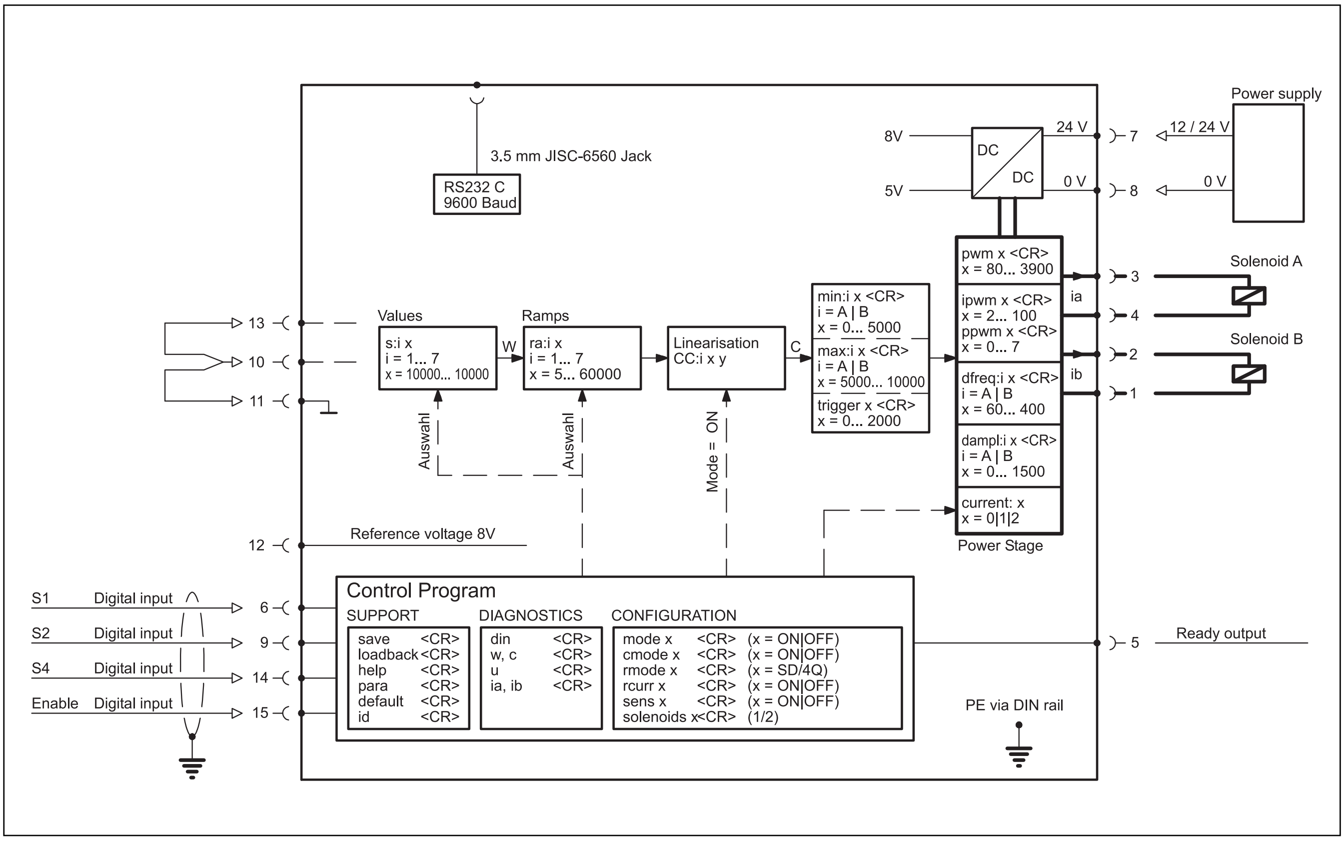
PIN 5 READY output.
This output is high when ENABLE is active and there is no sensor error. This output corresponds with the green LED.

PIN 15 ENABLE input:
This digital input signal initializes the application. The analogue output is active and the READY signal indicates that all components are working correctly. Error conditions are disabling by the ENABLE command.

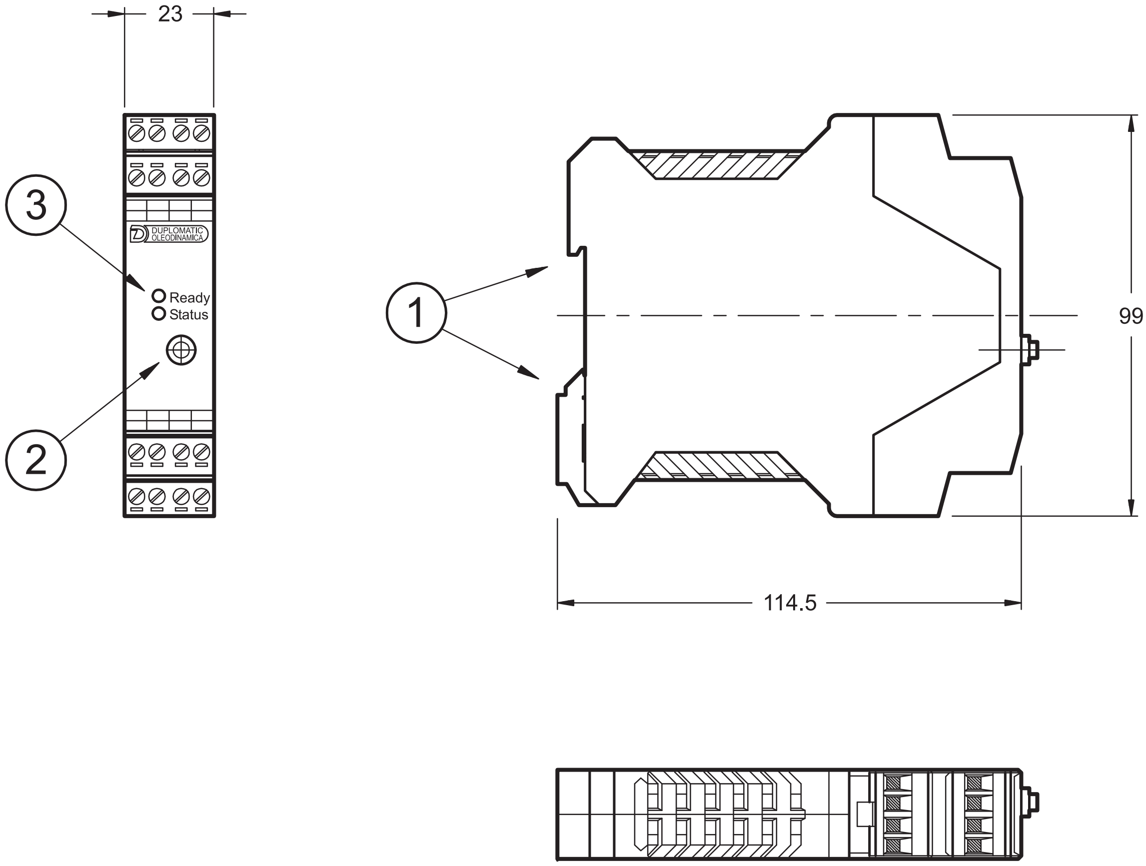
PIN 6 9 14 Digital control inputs to retrieve the appropriate setpoints. All setpoints, in a storage area be deposited, can be linked binary. S1: Pin 6, S2: Pin 9, S4: Pin 14.
see the table below.

Address	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
SEL 1	0	1	0	1	0	1	0	1
SEL 2	0	0	1	1	0	0	1	1
SEL 4	0	0	0	0	1	1	1	1

8 - CARD BLOCK DIAGRAM



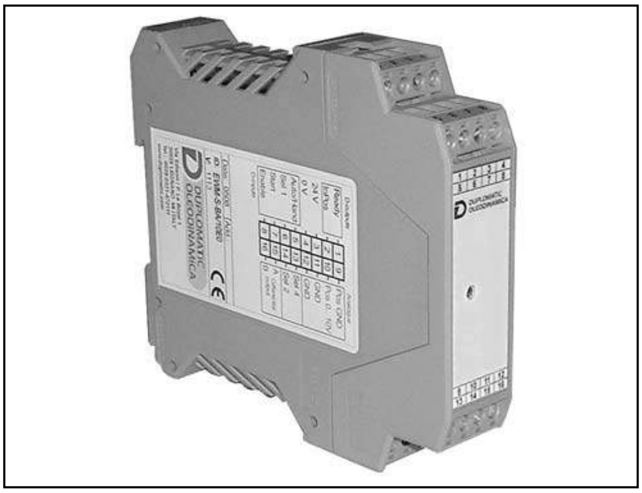
9 - OVERALL AND MOUNTING DIMENSIONS



1	DIN EN 50022 rail type fastening
2	Plug for PC cable connection
3	LED for output signals

DUPLOMATIC OLEODINAMICA

DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

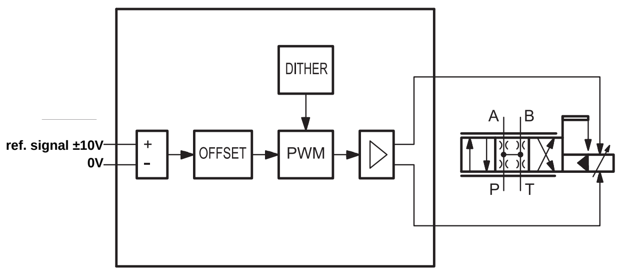


EWM-A-SV

ANALOG AMPLIFIER CARD
SERVOVALVE CONTROL
SERIES 10

RAIL MOUNTING TYPE:
DIN EN 50022

OPERATING PRINCIPLE



- This card is designed for a dynamic control of servovalves with the current output controlled in closed loop.
- This card is an analog amplifier that receive an analog input ±10V to move the servovalves via different values of current adjustable by DIL switches on board with steps of 10mA.
- This card has embedded an auxiliary supply positive and negative to power an external potentiometer.

TECHNICAL CHARACTERISTICS

Power supply	V DC	18 ÷ 30 ripple included
Current consumption	mA	100 + solenoid current consumption (max 300 mA)
Command position value	V	± 10 (R_I = 100 k)
Output current	mA	10 to 200 (DIL switches internal selection) (R_I = 33 for max I)
Dither Amplitude	Hz %	250 / 100 (DIL switch internal selection S6) 0...15 (5% pre-adjusted) of current
Offset	%	± 10
Auxiliary supply	V mA	± 10 10
Electromagnetic compatibility (EMC): according to 2004/108/EU standards		Emissions EN 61000-6-4 Immunity EN 61000-6-2
Housing material		thermoplastic polyamide PA6.6 -combustibility class V0 (UL94)
Housing dimensions	mm	120(d) x 99(h) x 23(w)
Connector		4x4 poles screw terminals - PE direct via DIN rail
Operating temperature range	°C	0 / 50
Protection degree		IP 20

1 - IDENTIFICATION CODE

E	W	M	-	A	-	SV	/	10	

Analog card for open loop systems DIN EN 50022 rail mounting

Amplifier

Servovalves control

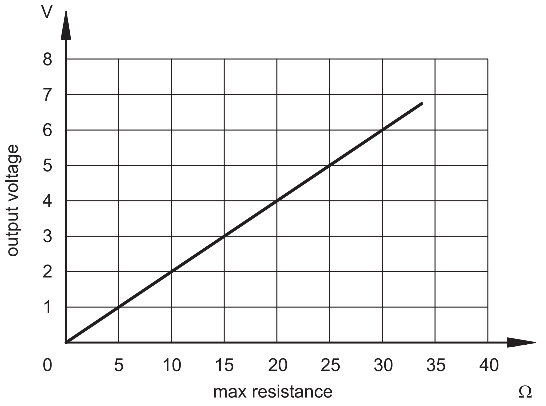
Series No. (from 10 to 19 sizes and mounting dimensions remains unchanged)

Output value:
See table at par. 2.4 to choose the correct value of current output
Only E means default setting without any value of current

The power amplifier is controlled by an analog input ± 10 Volt.

The output current is closed loop controlled and therefore independent from the supply voltage and the solenoid resistance.

The diagram below shows as resistence changes in function of output to keep constant current (I = 200mA)



2 - FUNCTIONAL SPECIFICATIONS

2.1 - Power supply

This card is designed for 12 to 30 VDC (typical 24 V) of a power supply. This power supply must correspond to the actual EMC standards.
All inductivity at the same power supply (relays, valves) must be provided with an over voltage protection (varistors, free-wheel diodes).
It is recommended to use a regulated power supply (linear or switching mode).

2.2 - Electrical protections

All inputs and outputs are protected against overvoltage and have filters.

2.3 - Reference signal

The card accepts an analogue input signal. The command value can be ± 10 V (R_I = 100k).

2.4 - Output values

The card has different output values in current between 10mA to 200mA. It is necessary to open the case and inside the card there are internal DIL switches (S1 S5) for the adjustements:

	Current	S1	S2	S3	S4	S5
E	0 mA	OFF	OFF	OFF	OFF	OFF
E10	10 mA	ON	OFF	OFF	OFF	OFF
E20	20 mA	OFF	ON	OFF	OFF	OFF
E30	30 mA	ON	ON	OFF	OFF	OFF
E40	40 mA	OFF	OFF	ON	OFF	OFF
E50	50 mA	ON	OFF	ON	OFF	OFF
E60	60 mA	OFF	ON	ON	OFF	OFF
E70	70 mA	ON	ON	ON	OFF	OFF
E80	80 mA	OFF	OFF	OFF	ON	OFF
E90	90 mA	ON	OFF	OFF	ON	OFF
E100	100 mA	OFF	ON	OFF	ON	OFF
E110	110 mA	ON	ON	OFF	ON	OFF
E120	120 mA	OFF	OFF	ON	ON	OFF
E130	130 mA	ON	OFF	ON	ON	OFF
E140	140 mA	OFF	ON	ON	ON	OFF
E150	150 mA	ON	ON	ON	ON	OFF
E160	160 mA	OFF	OFF	OFF	OFF	ON
E170	170 mA	ON	OFF	OFF	OFF	ON
E180	180 mA	OFF	ON	OFF	OFF	ON
E190	190 mA	ON	ON	OFF	OFF	ON
E200	200 mA	OFF	OFF	ON	OFF	ON

2.5 - Digital Output

The digital output is the POWER ON signal, displayed from the green led.

3 - LED FUNCTIONS

There is only one green led.

GREEN: Shows if the card is ready.

ON - The card is supplied
OFF - No power supply

4 - ADJUSTMENTS

For these cards it is possible the regulation of offset and dither amplitude. It is necessary to open the case and inside the card there are offset and dither potentiometers for the adjustements.

4.1 - Offset
With this potentiometer it is possible to adjust the zero point. This module is pre-adjusted, often no further adjustment is necessary.

4.2 - Dither
With this potentiometer it is possible to adjust the dither amplitude. The dither amplitude have to be optimised to get best valve or drive performance. Dither adjustment will reduce hysteresis. The frequency range has to be selected by internal DIL switch S6:

S6	Dither
ON	250 Hz
OFF	100 Hz

5 - INSTALLATION

The card is designed for rail mounting type DIN EN 50022.

The wiring connections are on the terminal strip located on the bottom of the electronic control unit. It is recommended to use cable sections of 0.75 mm^2, up to 20 m length and of 1.00 mm^2 up to 40m length, for power supply and solenoid connections on versions it is recommended to use cables with a screened sheath connected to earth only on the card side.

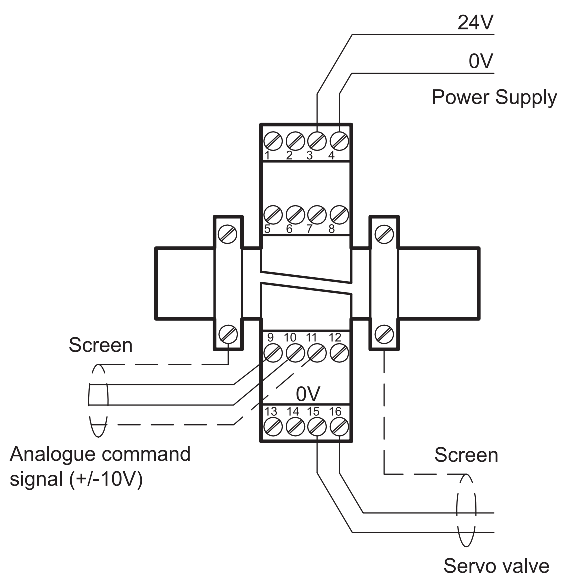
NOTE

To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the wiring diagram.

As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electric motors, inverters and electrical switches).

In environments that are critical from the electromagnetic interference point of view, a complete protection of the connection wires can be requested.

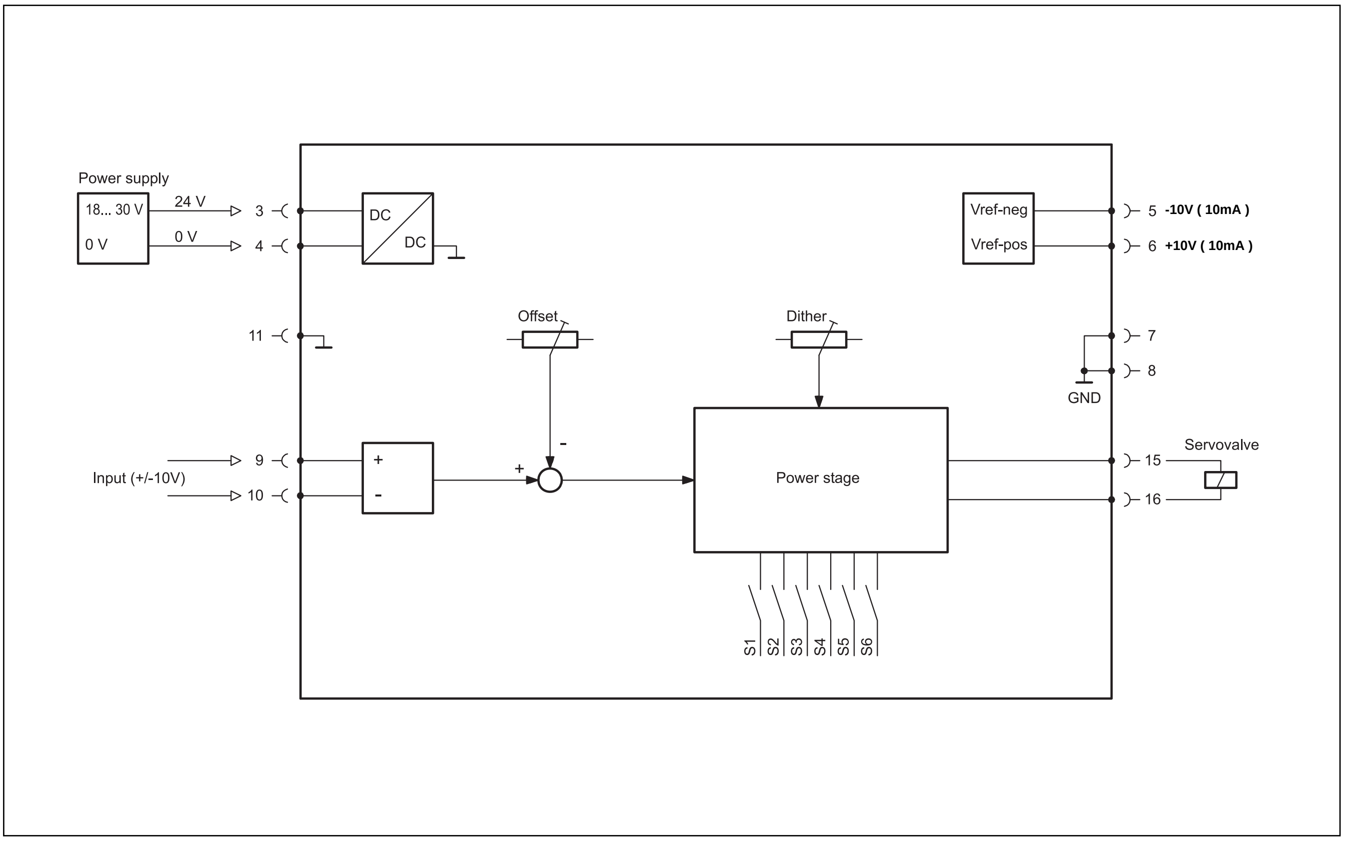
6 - WIRING DIAGRAM



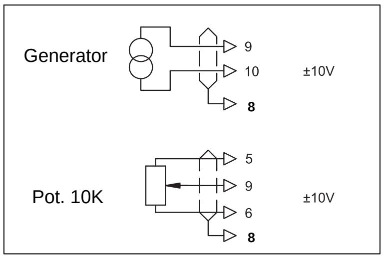
ANALOG INPUT AND OUTPUT

PIN 15/16	PWM outputs for coils control.
PIN 5/6	Auxiliary supply +10V (PIN 6) and -10V (PIN 5) to power external potentiometer.
PIN 9/10	Reference signal ±10V

7 - CARD BLOCK DIAGRAM

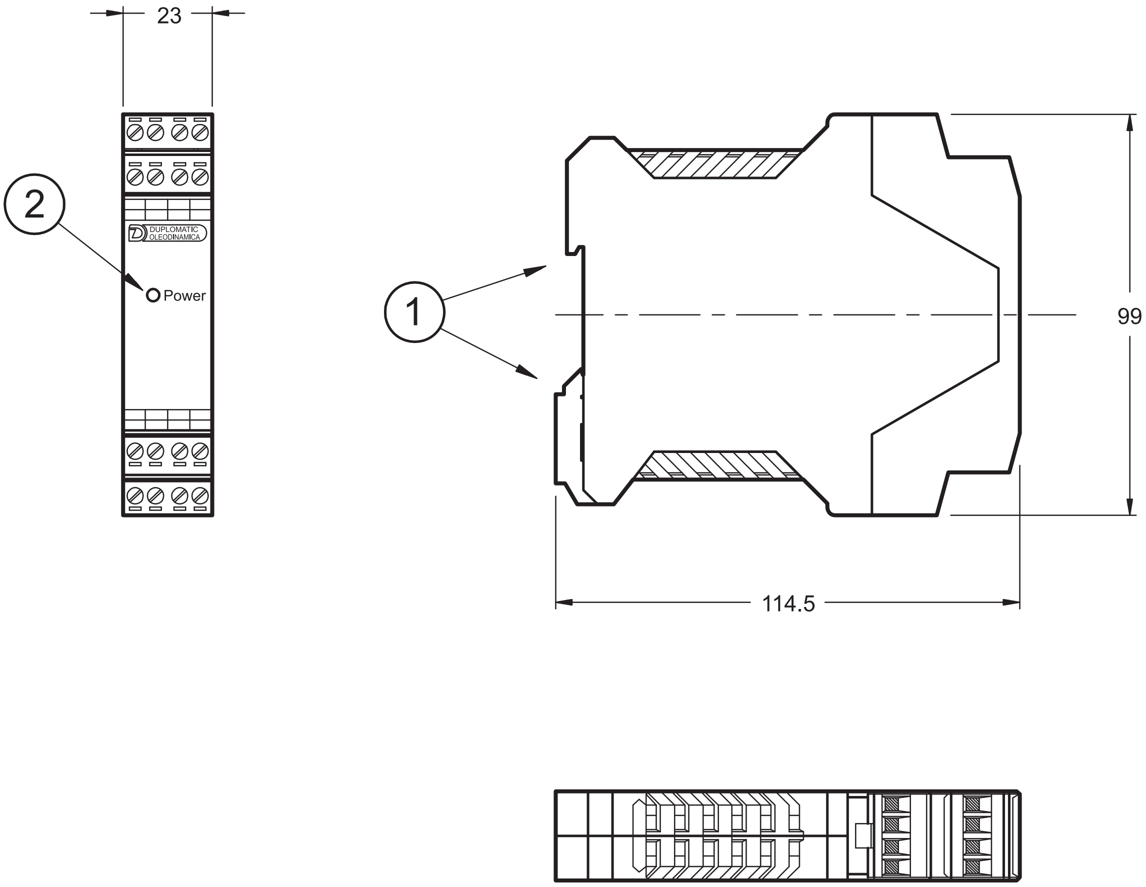


AVAILABLE COMMAND SIGNALS



NOTE: with the potentiometer as reference signal it is necessary to connect PIN 10 with PIN 11.

8 - OVERALL AND MOUNTING DIMENSIONS



1	DIN EN 50022 rail type fastening
2	LED for power on signal

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DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

PSC

CARD HOLDERS FOR ELECTRONIC CONTROL UNITS IN EUROCARD FORMAT

SERIES 20

IEC 60603-2 (DIN 41612)

TECHNICAL CHARACTERISTICS

CARD HOLDER TYPE		32D	48F
Connector type		IEC 603 / DIN 41612 female	
Number of poles		32	48
Connector shape		D	F
Nominal voltage	V	250	
Nominal current	A	4	
Flexible conductors max section	mm^2	2,5	
Stiff conductors max section	mm^2	4	
Conductors wiring		terminal block with fastening bolts	

DESCRIPTION

— The card holders type PSC are accessories suitable to be installed on electronic control units type UEIK.

— They are available with a IEC 603 / DIN 41612 connector, with a female fitting, either D shape 32 poles, or F shape 48 poles.

— They are supplied with a special safety locking, which blocks the electronic control unit and prevents any accidental contact loss between the two used connectors.

— The conductor wiring is carried out via a terminal block with fastening bolts.

— They can be installed inside a switchboard and be fixed directly on a plate.

1 - IDENTIFICATION CODE

P	S	C	-		/	20

Card holders for electronic control units in Eurocard format

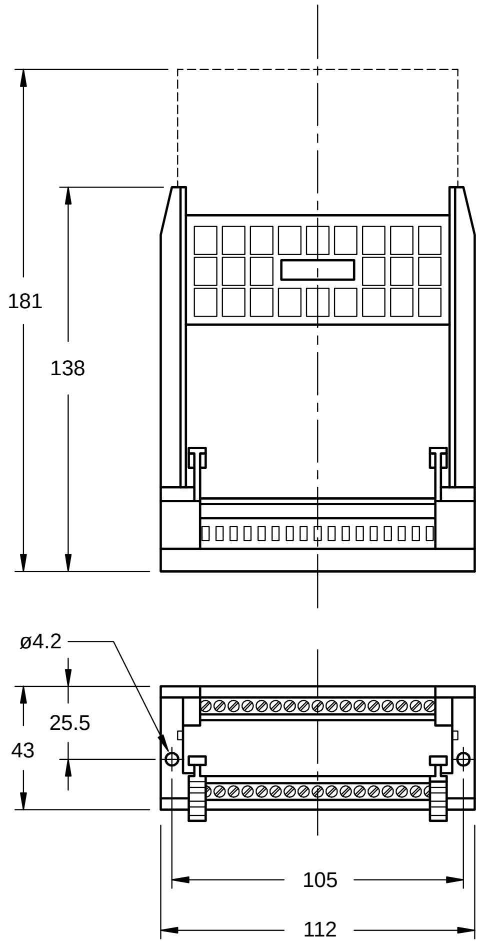
Number of poles and connector shape:
32D = 32 poles, D shape
48F = 48 poles, F shape

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

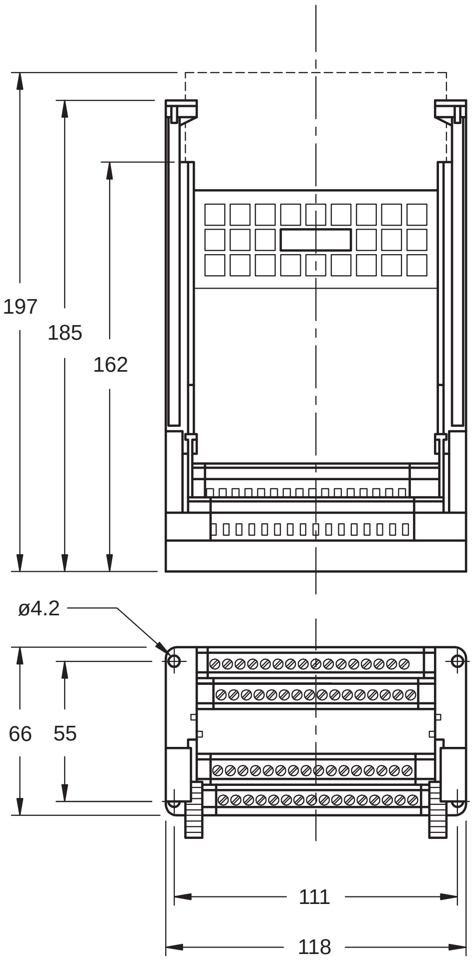
2 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

PSC-32D/20



PSC-48F/20



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20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

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 837-1/6		1.6
Thermal drift		± 0,4% / 10K in the measure range
Protection class according to EN 60529 - IEC 529		IP 65
Ports according to EN 837-1/6		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 97/23/CE of 29.05.97 art. 3 par. 3
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.

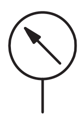
— The case is made of stainless steel and the connection is made of copper alloy.

— The filling in liquid is made of 85% glycerin and 15% distilled water.

— As they are realised in compliance with 97/23/CE of the 29-05-97 art. 3 par. 3, only the ones with the end scale of 250 and 400 bar have the marking CE on the dial.

— 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	**060** = 0 ÷ 60 bar	**400** = 0 ÷ 400 bar
010 = 0 ÷ 10 bar	**100** = 0 ÷ 100 bar	
016 = 0 ÷ 16 bar	**160** = 0 ÷ 160 bar	
025 = 0 ÷ 25 bar	**250** = 0 ÷ 250 bar	

Connection type:
R = radial connector
PF = flange connector

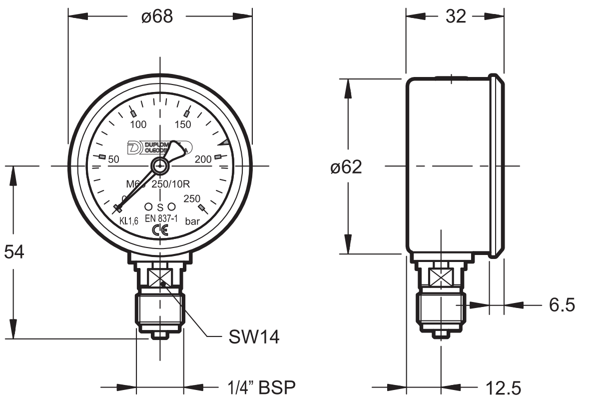
Series N. (the overall and mounting dimensions remain unchanged from 10 to 19)

NOTE: the models N. 006, 010, 016 and 025 are available with radial connector (**R**) only.

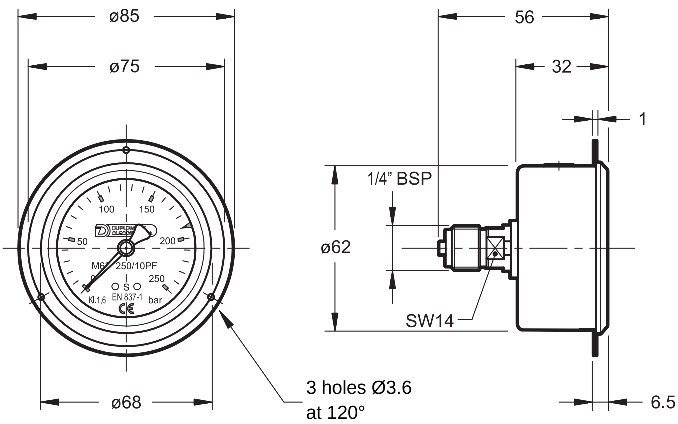
2 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

M63-*/10R



M63-*/10PF



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DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

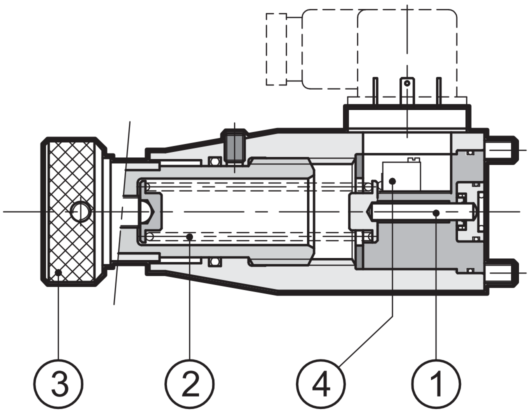
PS*

PISTON TYPE PRESSURE SWITCH

SERIES 21

p max **650** bar
max adjustable **p 35 - 140 - 350 - 630** bar

OPERATING PRINCIPLE



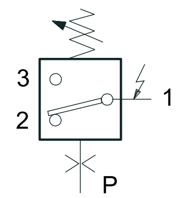
- PS* are piston type, hydro-electrical pressure switches.
  The internal electrical contact is switched when the operating pressure reaches the set value.
- The line pressure acts on piston (1) which is directly loaded by a spring (2) on the opposite side. The spring load is adjustable by means of the 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 1/4Ž BSP threaded port type.
- Standard supply is with adjustment knob and with pressure scale.

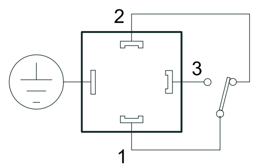
TECHNICAL CHARACTERISTICS

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

HYDRAULIC SYMBOL





CONNECTION SCHEME

1 - IDENTIFICATION CODE

P	S			/	21		-	K1	/	K

Piston type pressure switch

Mounting type:
P = subplate mounting
T = threaded port 1/4Ž BSP

Pressure adjustment range:
2 = 3 ÷ 35 bar **6** = 10 ÷ 350 bar
4 = 6 ÷ 140 bar **8** = 20 ÷ 630 bar

Adjustment knob

Electrical connection: for DIN 43650 connector (included in the supply)

Seals: **N** = standard NBR seals for mineral oils (**standard**)
V = FPM seals for special fluids

Series N. (the overall and mounting dimensions remain unchanged from 20 to 29)

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.

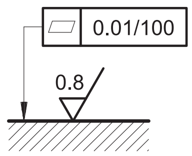
3 - ELECTRICAL CHARACTERISTICS

		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 at 500 Vdc			
Max switching rate	switches/min	120			
Protection class (according to CEI EN 60529)		IP 65			

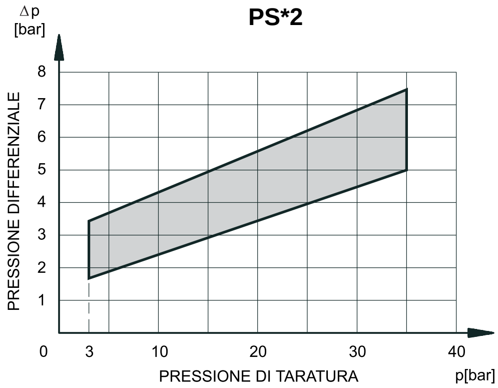
4 - INSTALLATION

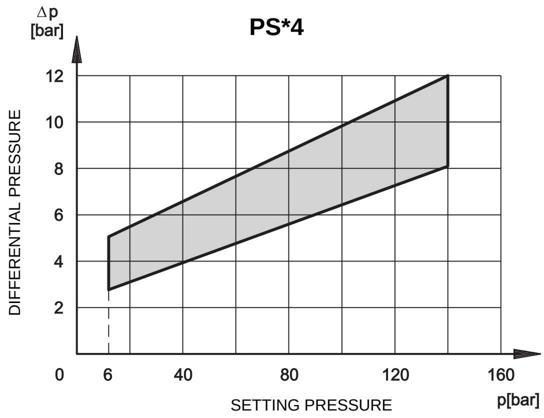
The pressure switches can be installed in any position without impairing its correct operation. Ensure that there is no air in the hydraulic circuit.
The subplate mounting pressure switch PSP type is fixed by means of screws on a flat surface with planarity and roughness values equal to or better than 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.

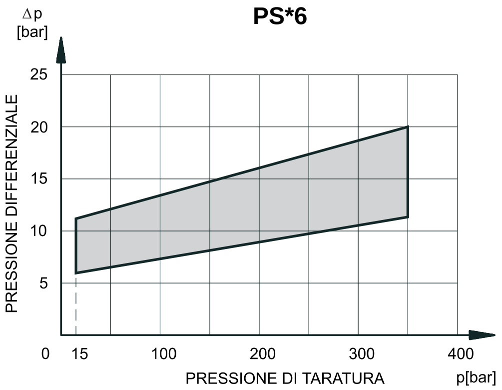
Surface finishing

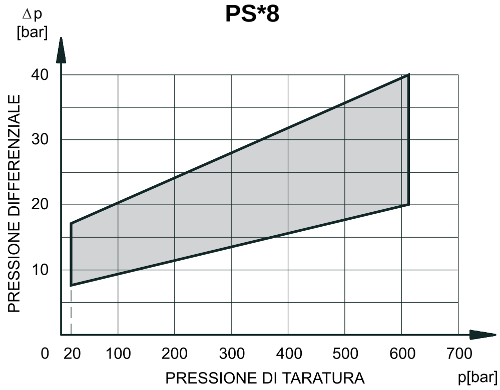


5 - HYSTERESIS CHARACTERISTICS (values measured with viscosity of 36 cSt at 50°C)







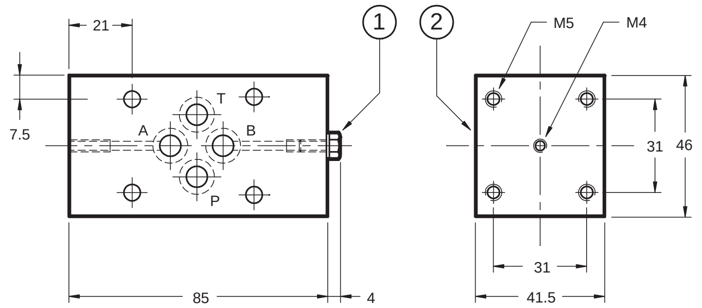


6 - SUBPLATES FOR STACK MOUNTING

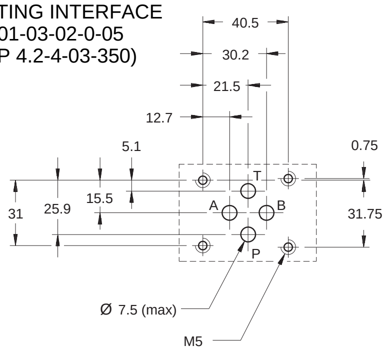
The PSP pressure switches can be stack mounted by means of ISO 4401-03 (CETOP 03 subplates), code 1950611 and 1950621.
The subplate code 1950611 permits the connection between the pressure switch and A and/or B ports, depending on where the bolt (1) is installed. The subplate code 1950621 permits the connection between the pressure switch and the P port.

SUBPLATE CODE 1950611 (A and B ports connection)

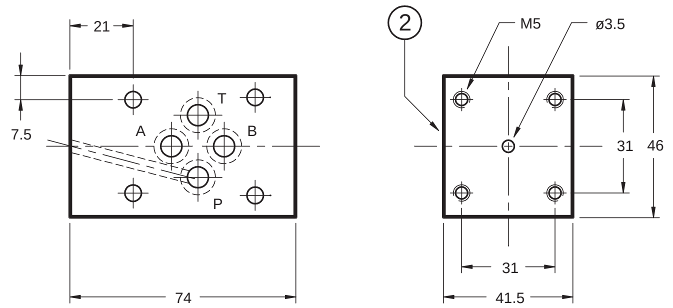
MAX PRESSURE 350 BAR



MOUNTING INTERFACE
ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)



SUBPLATE CODE 1950621 (P port connection)

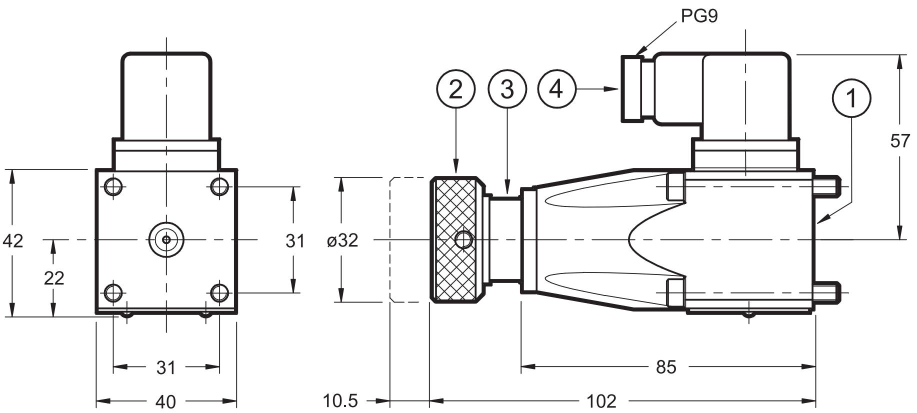


dimensions in mm

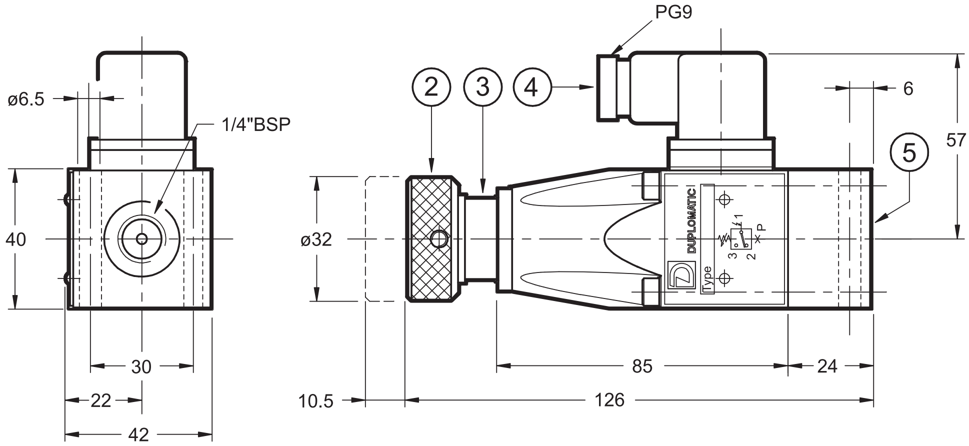
1	Hexagonal head M4x12 bolt with •bonded sealŽ type 400-002 (Dowty) Unscrew the bolt and its seal from the side where the switch is installed
2	Mounting surface with sealing rings 4 OR type 2037 (9.25x1.78) - 90 Shore

7 - OVERALL AND MOUNTING DIMENSIONS

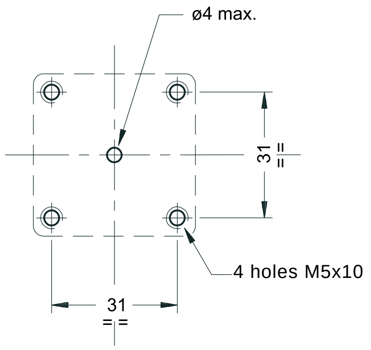
PSP



PST



MOUNTING INTERFACE (PSP version)



fastening bolts (PSP version)
N. 4 bolts M5x45 - ISO 4762 12.9 resistance class (included in the supply)
Tightening torque: 8 Nm

dimensions in mm

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	DIN 43650 electrical connector 3 poles + ground supplied with pressure switch
5	Interface plate for pipe connection: - 1/4Ž 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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20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

PTH
PRESSURE TRANSDUCER
SERIES 20

p max **40 - 100 - 250 - 400** bar

DESCRIPTION

This series of pressure transducers has been designed in order to be used for the main industrial applications and on moving machines.

The main feature of this transducer is to ensure its functioning also in bad working conditions, especially for what concerns the fluid temperature range which can go from a minimum of - 40 °C up to a maximum of + 120 °C

The functioning of this transducer is based on the strain-gauge principle, 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 which is in contact with the fluid is made of stainless steel and the transducer is completely fluid-proof.

The protection class of the electrical connection is IP65 for the version with DIN connector, while the version with the M12 connector has a protection class IP67.

They are available with current output signal 4 ÷ 20 mA or with voltage output signal 0 ÷ 10 V and they have the reverse polarity protection.

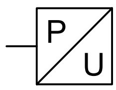
These transducers are available in 4 different pressure ranges, from 40 to 400 bar.

TECHNICAL CHARACTERISTICS (see paragraph 3)

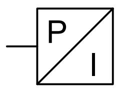
Nominal pressure P_N	bar	40 - 100 - 250 - 400
High dynamic pressure	% P_N	75
Maximum pressure	% P_N	200
Class of precision	% P_N	0,5
Output signal — voltage current	V mA	0 ÷ 10 4 ÷ 20
Working temperature range	°C	-40 / +120

HYDRAULIC SYMBOLS

PTH-*/20E0-*



PTH-*/20E1-*



1 - IDENTIFICATION CODE

P	T	H	-		/	20	E		-	

Pressure transducer

High dynamic performance

Nominal pressure
040 = 40 bar **250** = 250 bar
100 = 100 bar **400** = 400 bar
(other pressure values are available upon request)

Series N. (the overall and mounting dimensions remain unchanged from 20 to 29)

Integrated electronics with analogic output

Output signal
0 = 0 ÷ 10 V
1 = 4 ÷ 20 mA **(standard)**
(Other types of output signal are available on request)

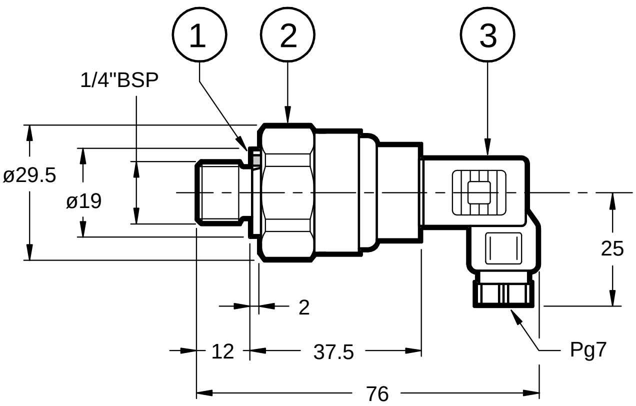
Electrical connection
K10 = Reduced electrical connector DIN 43650 **(standard)**
K12 = electrical connector M12 (on request)

NOTE: the standard hydraulic connection is with threaded port of G 1/4 DIN 3852 and integrated seal.
Other types of connection are available upon request.

2 - OVERALL AND MOUNTING DIMENSIONS

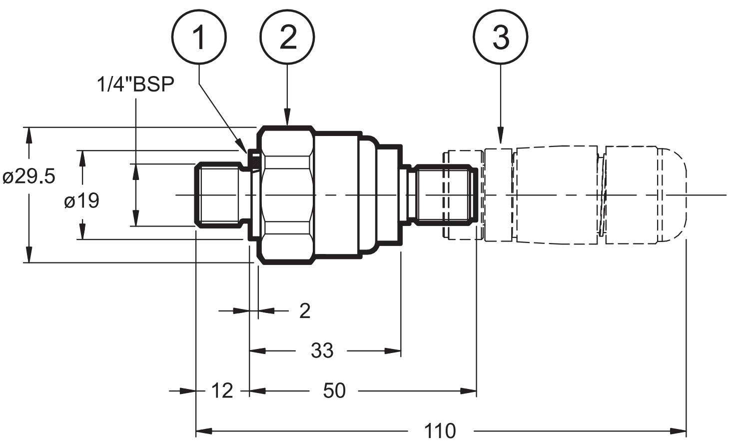
PTH-*/20E*-K10

dimensions in mm



1	Integrated plain seal in viton
2	Hexagonal: spanner 27 Tightening torque 25 Nm max
3	Reduced electrical connector DIN 43650 **delivered with the transducer**

PTH-*/20E*-K12



1	Integrated plain seal in viton
2	Hexagonal: spanner 27 Tightening torque 25 Nm max
3	Electrical connector 5 pin M12 - IP67 PG7 EC5S/M12L/10 cod. 3491001001 (**to be ordered separately**)

3 - TECHNICAL CHARACTERISTICS

Nominal pressure P_N	bar	**40**	**100**	**250**	**400**
Maximum pressure	x P_N	x 2	x 2	x 2	x 2
Cracking pressure	x P_N	x 6	x 5	x 4	x 3,5

Output signal		**E0**	**E1**
		0 ÷ 10 V	4 ÷ 20 mA
Max current consumption	mA	≤ 12	23
Supply voltage	DC V	12 ÷ 30	10 ÷ 28
Load resistance	KΩ	2,5	see par.. 4.2
Response time	ms	< 1	
Class of precision	% P_N	0,5	
Hysteresis	% P_N	± 0,2	
Repeatability	% P_N	± 0,05	
Linearity	% P_N	± 0,2	
Stability after 1 million cycles	% P_N	± 0,1	
Working temperature range	°C	- 40 / + 120	
Thermal drift from 0 to + 100 °C	% P_N	± 1	

In compliance with EC standards	Emission 61000-6-3	Immunity 61000-6-2
Vibration resistance	> 20 G	
Pressure connection	G 1/4” with integrated seal	
Electrical connection	3 poles + earth DIN 43650 reduced connector for K10 connection	
	M12x1 4 pin straight connector for K12 connection (upon request)	
Protection class (EN 60529)	IP 65 for K10 connection	IP 67 for K12 connection
Ambient temperature range	- 20 / + 80 for K10 connection	- 25 / + 85 for K12 connection
Body material	AISI 304	
Mass	0,1 kg	

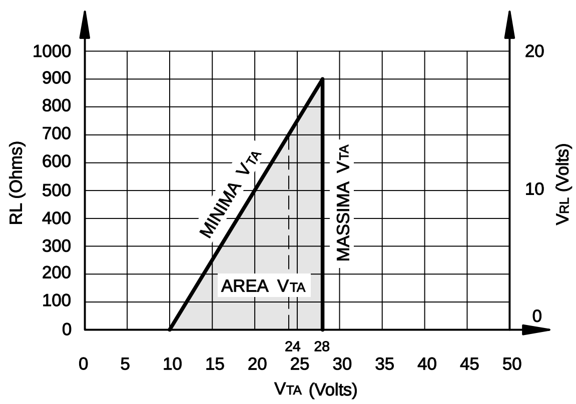
4 - TRANSDUCER VOLTAGE

4.1 - PTH-*/20E0-*

These transducers have been equipped with voltage stabilizer which supplies the electric circuit with constant voltage, independently from power supply voltage.
We recommend a stabilized power supply voltage of 24 VDC.

4.2 - PTH-*/20E1-*

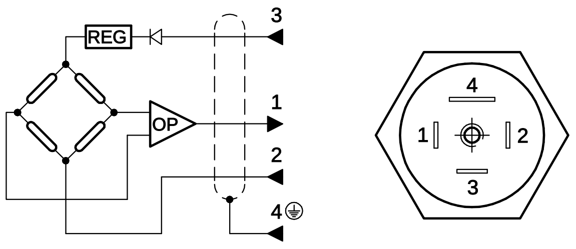
We report the functioning diagram of the transducer.
The VTA area represents the functioning zone of the transducer related to the chosen load resistance R_L . We recommend a power supply voltage of 24 VDC and a load resistance of 700 Ohm.



N.B. Outside the VTA area the correct functioning of the transducer is not assured.

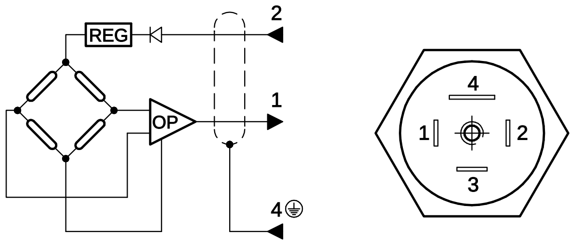
5 - WIRING DIAGRAMS

PTH-*/20E0-K10



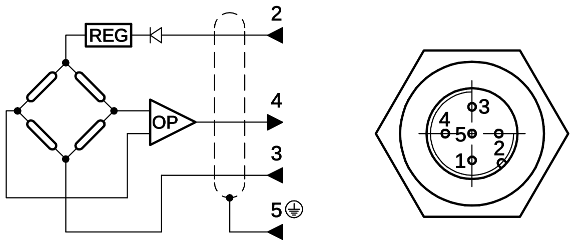
1 = output 0 ÷ 10 V
2 = 0 V
3 = 12 ÷ 30 VDC
4 (indicated on the connector by the symbol ⏚ = GND

PTH-*/20E1-K10



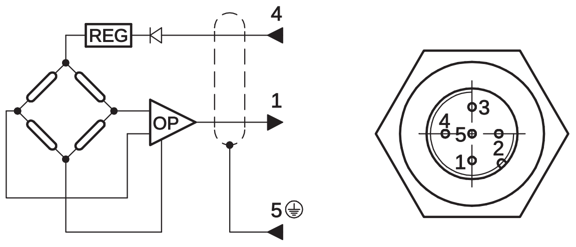
1 = output 4 ÷ 20 mA
2 = 10 ÷ 28 VDC
3 = not connected
4 (indicated on the connector by the symbol ⏚) = GND

PTH-*/20E0-K12



1 = not connected
2 = 10 ÷ 30 VDC
3 = 0 V
4 = output 0 ÷ 10 V
5 = GND

PTH-*/20E1-K12



1 = output 4 ÷ 20 mA
2 = not connected
3 = not connected
4 = 10 ÷ 28 Vdc
5 = GND

DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

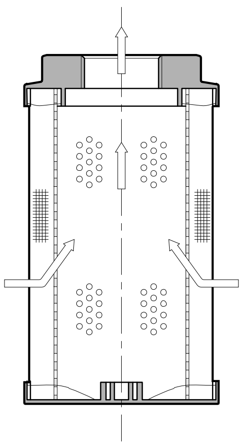
FSI

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 [l/min] (**NOTE 1**)	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

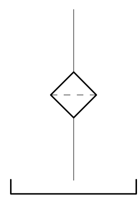
As for fluids whose viscosity degree at a specific operating pressure is different from 36 cSt, the real pressure drop has to be changed according to the following ratio:

$$\text{real } \Delta p \text{ value} = 0.02 \cdot \frac{\text{real Q}}{\text{table Q}} \cdot \frac{\text{real viscosity degree (cSt)}}{36}$$

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”

Filter element metallic strainer. 90 µm filtration degree

Standard filter element

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

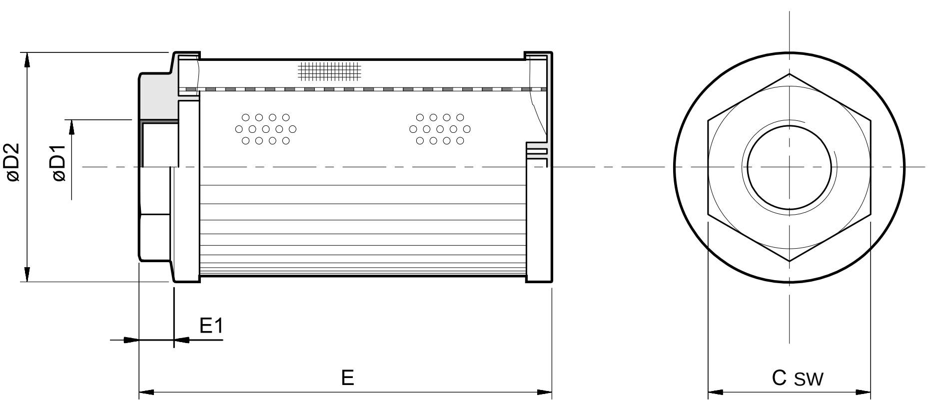
Without a by-pass valve

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



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 ¼”	99	135	15	70
1½”	99	218	15	70
2”	130	201	15	70
2 ½”	130	253	15	101
3”	130	253	15	101

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DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

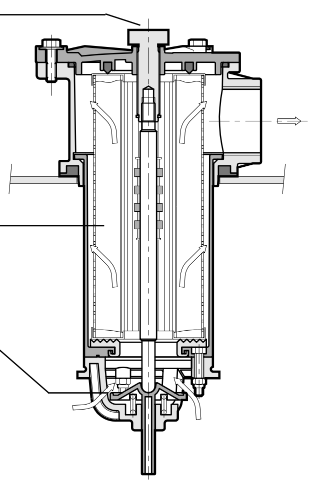
FST

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 m 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

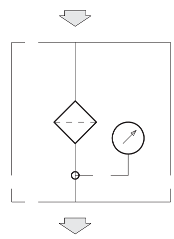
Filter code	port dimensions		Mass [kg]	Rated flow (indicative) [l/min]	Rated filtration degree [m]
	BSP	SAE flange			
FST-TB114	1 ¼Ž	-	1,6	70	90
FST-FS212	-	2 ½Ž	3,0	100	
FST-FS300	-	3Ž	13,0	200	
FST-FS400	-	4Ž	16,0	300	

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.

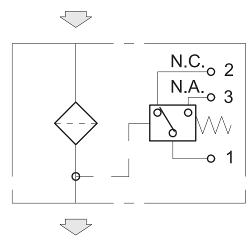
Collapsing differential pressure of the filter element	bar	1,0
Ambient temperature range	°C	-25 / +50
Fluid temperature range	°C	-25 / +110
Fluid viscosity range	cSt	10 ÷ 400

HYDRAULIC SYMBOL

Filter with indicator VS type



Filter with indicator ES type



1 - IDENTIFICATION CODE

F S T - [ ] [ ] [ ] [ ] [ ] - M 90 S / 10 [ ] - 0

Sealed flange suction filter

Port type
FS = SAE flange hydraulic connection (FST-F114 excluded)
TB = BSP threaded port (only for FST-F114)

Nominal dimension:
114 = 1 ¼Ž
212 = 2 ½Ž
300 = 3Ž
400 = 4Ž

Filter element metallic strainer 90 m filtration degree

Standard filter element

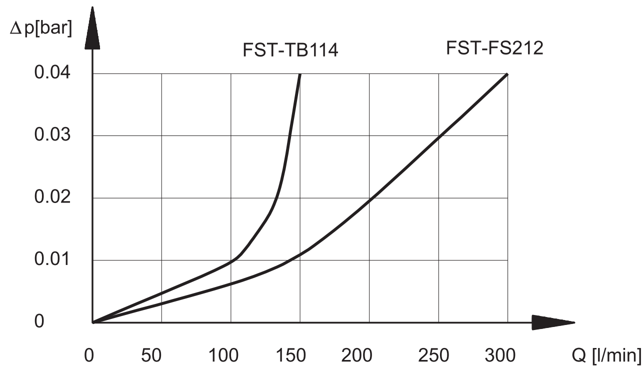
Series N. (from 10 to 19 sizes and mounting dimensions remain unchanged)

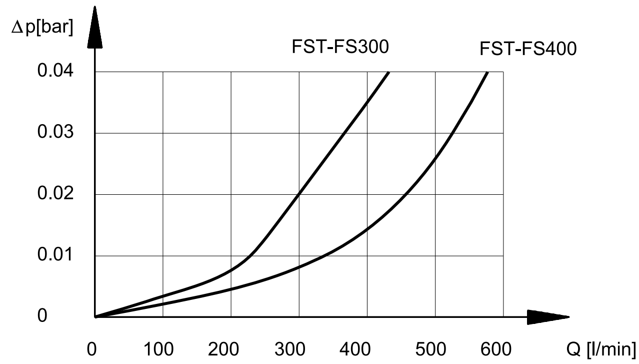
Seals:
N = standard NBR seals for mineral oils (**standard**)
V = FPM seals for special fluids

Without a by-pass valve

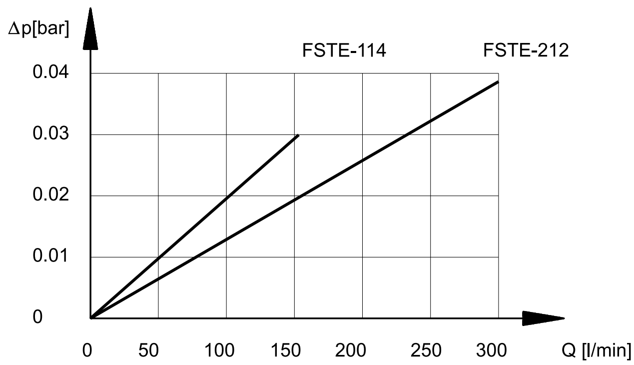
2 - CHARACTERISTIC CURVES (values measured with viscosity of 36 cSt at 50°C)

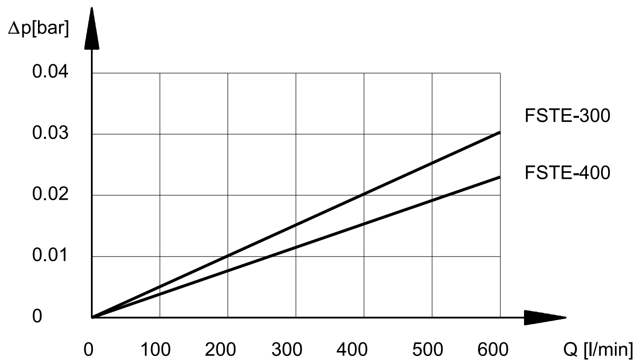
2.1 - Pressure drops through the filter body





2.2 - Pressure drops through 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 pl value = body p value + (real p value of the filter element x real viscosity value (cSt) / 36)

real p 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.

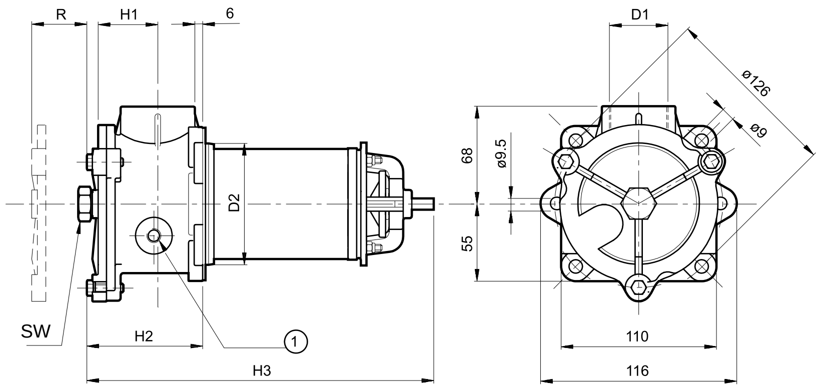
3 - HYDRAULIC FLUIDS

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.

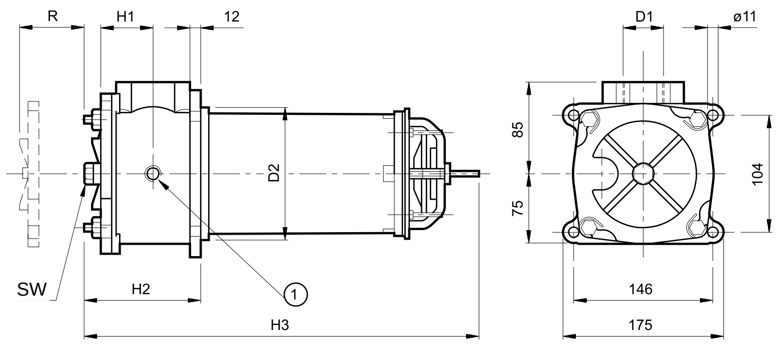
The fluid must be preserved in its physical and chemical characteristics.

4 - OVERALL AND MOUNTING DIMENSIONS

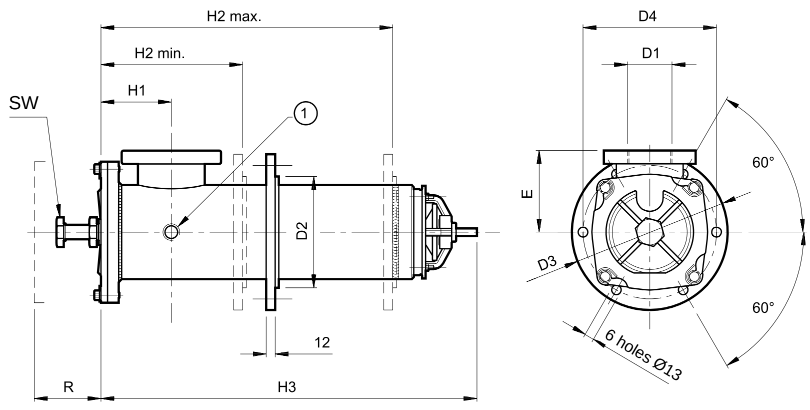
dimensions in mm



FST-TB114



FST-FS212



FST-FS300

FST-FS400

1	Clogging indicator port: 1/8Ž BSP usually plugged

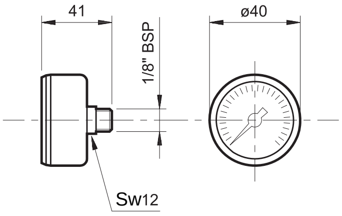
Filter code	D1	D2 **NOTE 3**	D3	D4	E	H1	H2 **NOTE 4**	H3	R*	Ch
FST-TB114	1 ¼Ž BSP	86	-	-	-	42	80	275	250	22
FST-FS212	2 ½Ž SAE	130	-	-	-	66	120	322	300	22
FST-FS300	3Ž SAE	150	210	180	110	95	174÷355	480	500	32
FST-FS400	4Ž SAE	180	242	210	120	122	250÷405	470	500	32

NOTE 3: tank hole = D2 + 1 (mm)
NOTE 4: for filters FSU-FS300 and FSU-FS400 the flange is not welded
R* = filter element removal space

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.

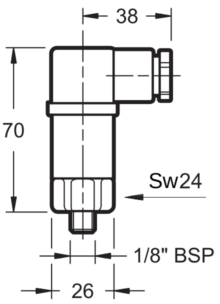
The indicator is supplied with a 0 ÷ -1 relative bar graduated scale and with a three-colour reading scale, which informs you about the clogging condition of the filter element:

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



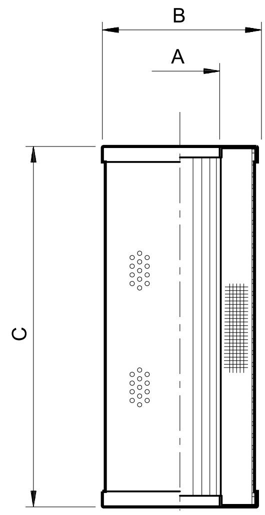
This indicator is a vacuum gauge sensitive to the suction depression, which operates by switching an electric contact when the filter element has reached the clogging limit.

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 ¼Ž **300** = 3Ž
212 = 2 ½Ž **400** = 4Ž

Filter element metallic strainer 90 m filtration degree

Standard filter element

Series N. (from 10 to 19 sizes and mounting dimensions remain unchanged)

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DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

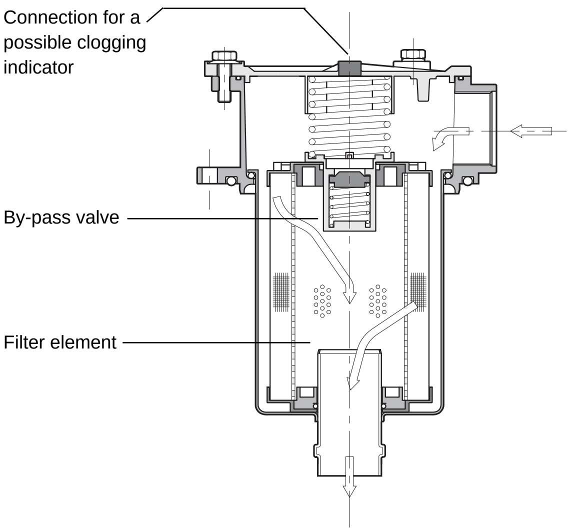
FRT

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 m absolute ($_{10}$ > 100) - ISO 4406:1999 class 18/16/13
  F25 = 25 m absolute ($_{25}$ > 100) - ISO 4406:1999 class 19/17/14
  P10 = 10 m nominal ($_{10}$ > 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

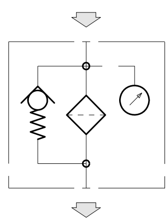
Filter code	BSP port dimensions	Mass [kg]	Rated flow (indicative) [l/min]		
			F10	F25	P10
FRT-TB012	1/2Ž	0,45	18	25	30
FRT-TB034	3/4Ž	0,95	50	70	85
FRT-TB100	1Ž	1,1	65	110	130
FRT-TB114	1 ¼Ž	2,1	150	190	210
FRT-TB112	1 ½Ž	3,1	160	250	290
FRT-TB200	2Ž	4,1	280	400	430

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

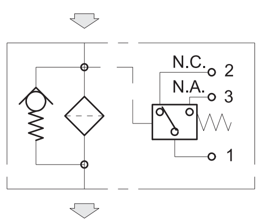
NOTE: the flow rates stated in the table correspond to a 0.5 bar pressure drop measured with mineral oil of viscosity 36 cSt at 50°C.
As for a different viscosity range, see **NOTE 2** - par. 2.2.

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 = 1/2Ž **114** = 1 ¼Ž
034 = 3/4Ž **112** = 1 ½Ž
100 = 1Ž **200** = 2Ž

Filtration degree:
F10 = 10 m fibre (10 > 100) - ISO 4406:1999 class 18/16/13
F25 = 25 m fibre (25 > 100) - ISO 4406:1999 class 19/17/14
P10 = 10 m paper (10 > 2) - ISO 4406:1999 class 21/19/16

By-pass valve
Opening pressure: 1.7 bar

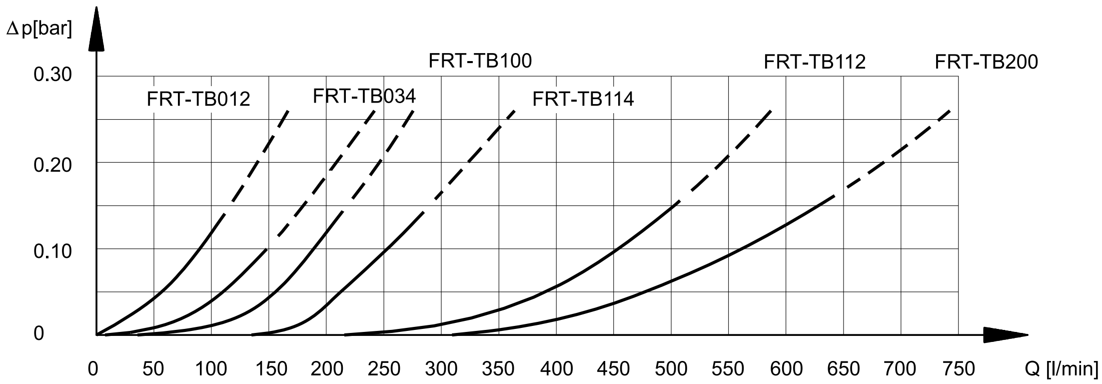
Seals:
N = NBR seals for mineral oils (**standard**)
V = FPM seals for special fluids

Series N. (from 10 to 19 sizes and mounting dimensions remain unchanged)

Standard filtering element

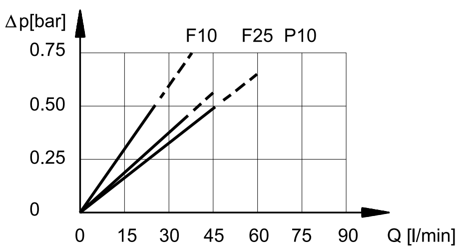
2 - CHARACTERISTIC CURVES (values measured with viscosity of 36 cSt at 50°C)

2.1 - Pressure drops through the filter body

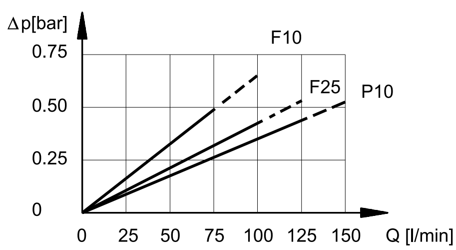


2.2 - Pressure drops through the FRTE filtering element

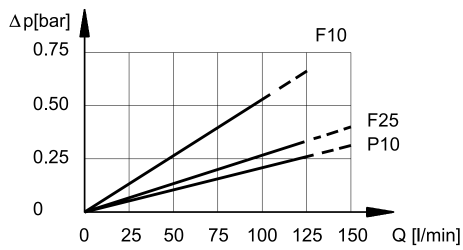
FRTE-012



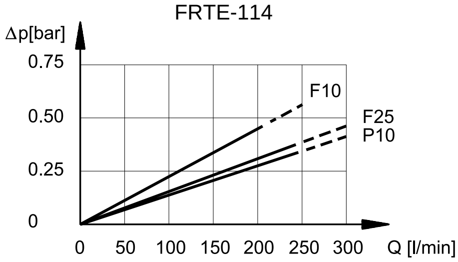
FRTE-034



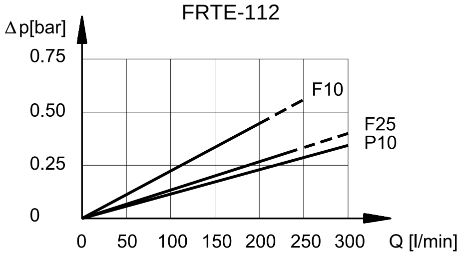
FRTE-100



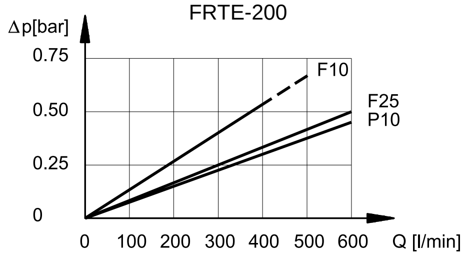
FRTE-114



FRTE-112



FRTE-200



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.

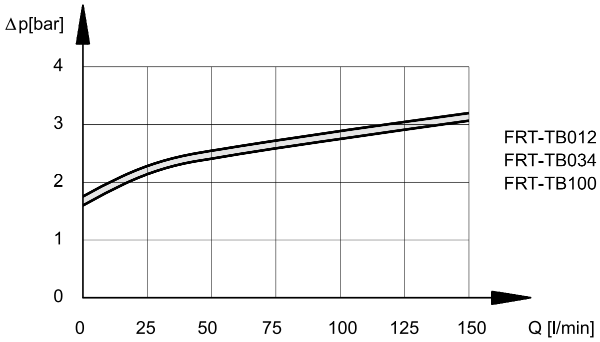
The total pressure drop through the filter is given by adding the body pressure drop values to those of the filter element. As for fluids whose viscosity degree at a specific operating pressure is different from 36 cSt, the filter total pressure drop has to be changed according to the following ratio:

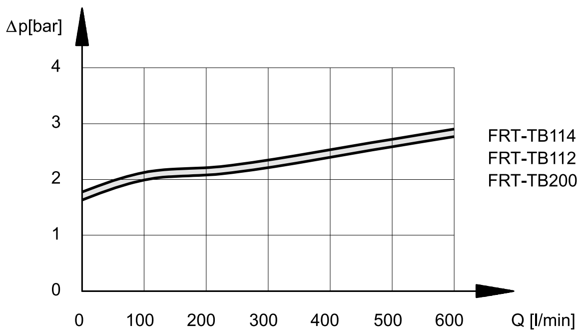
total p value = body p value + (real p value of the filter element x real viscosity value (cSt) / 36)

real p 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





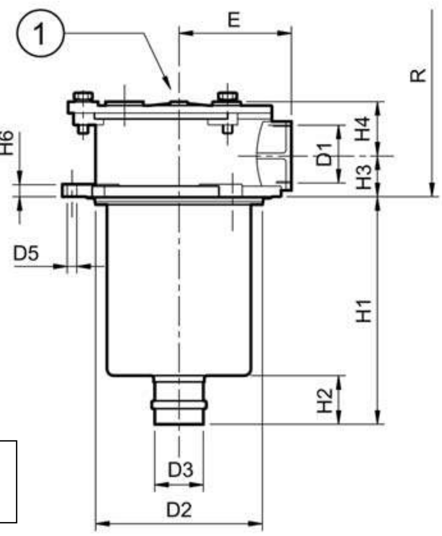
3 - HYDRAULIC FLUIDS

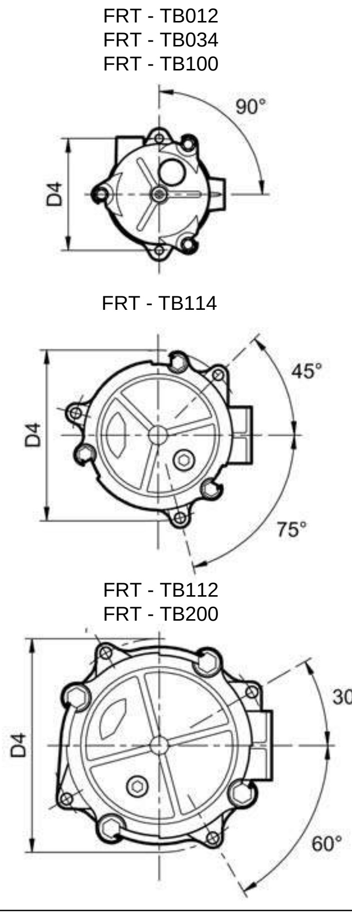
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at 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: 1/8Ž BSP usually plugged

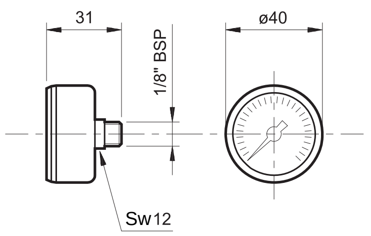
filter	D1	D2	D3	D4	D5	E	H1	H2	H3	H4	H6	R*
FRT - TB012	1/2Ž	67	24	90	6.5	50	80	20	22	33	9	120
FRT - TB034	3/4Ž	89	28	115	9	67	150	25	28	47	10	190
FRT - TB100	1Ž	89	40	115	9	67	234	30	28	47	10	270
FRT - TB114	1 ¼Ž	126	40	175	10.5	95	248	50	35	56	13	289
FRT - TB112	1 ½Ž	174	20	220	10.5	115	178	50	55	69	13	250
FRT - TB200	2Ž	174	63.5	220	10.5	115	285	50	55	69	13	355

R * = Filter element removal space starting from the tank surface

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

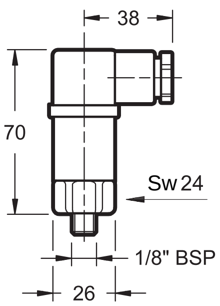


This indicator is a pressure gauge sensitive to the filter input pressure.

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



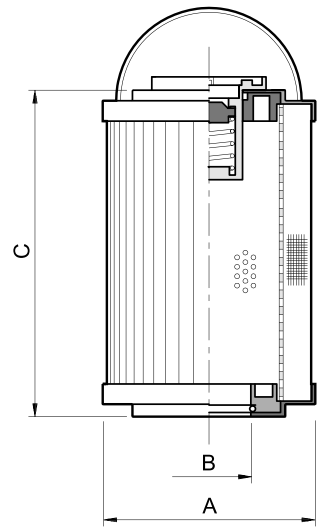
This indicator is a pressure switch sensitive to the filter input pressure, which switches an electrical contact when the filter element has reached the clogging limit.

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

F	R	T	E	-				-			S	/	10	

Filter element for a FRT filter

Nominal dimension
012 = 1/2Ž **114** = 1 ¼Ž
034 = 3/4Ž **112** = 1 ½Ž
100 = 1Ž **200** = 2Ž

Filtration degree: **F10** = fibre 10 m
F25 = fibre 25 m
P10 = paper 10 m

Standard filter element

Series N. (from 10 to 19 sizes and mounting dimensions are unchanged)

N = NBR seals for mineral oils (**standard**)
V = FPM seals for special fluids (upon request)

DUPLOMATIC OLEODINAMICA
DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

FRC

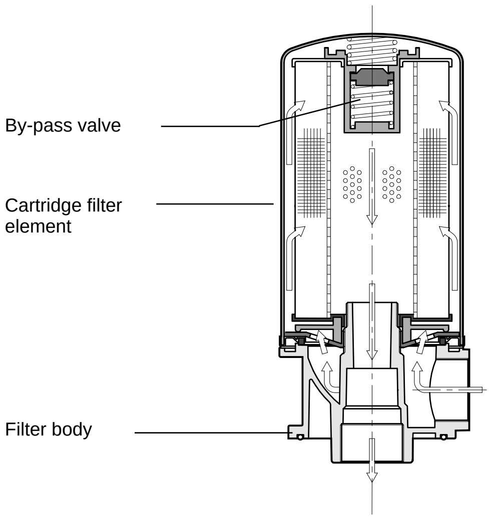
RETURN LINE FILTER FOR TANK TOP OR LINE MOUNTING

SERIES 10

p max **7** bar

Q max (see table of performances)

OPERATING PRINCIPLE



„ FRC filters can be mounted both on the tank cover by using a 4-hole flange fixing system with a direct bottom discharge, or on the return line.

„ The filter element with a screw on cartridge allows easy and practical replacement; a suitable membrane inside the cartridge prevents the residual oil from coming out.

„ The filter element is made of high efficiency filtering materials and is able to accumulate high quantities of contamination material. It is available with three different filtration degrees:

F25 = 25 m: absolute ($_{25}$ > 100) - ISO 4406:1999 class 19/17/14
P10 = 10 m: nominal ($_{10}$ > 2) - ISO 4406:1999 class 21/19/16
P25 = 25 m: nominal ($_{25}$ > 2) - ISO 4406:1999 class 24/22/19

„ FRC filters are always supplied with a by-pass valve.

„ All the FRC filters are designed to incorporate an electric or visual clogging indicator, to be ordered separately (see paragraph 5).

PERFORMANCES

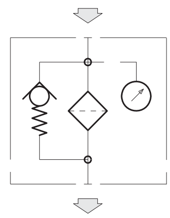
Filter code	BSP port dimensions	Mass [kg]	Rated flow (indicative) [l/min]				
			F25L	P10S	P10L	P25S	P25L
FRC-TB034	3/4Ž	1.6	65	65	70	70	75
FRC-TB112	1 ½Ž	2.2	180	150	200	200	200

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 - par. 2.2.

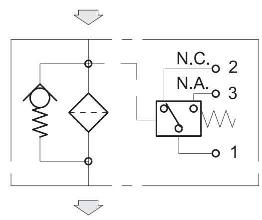
Maximum pressure	bar	7
Collapsing differential pressure of the filter element	bar	3.0
Differential pressure for the opening of the by-pass valve (±10 %)	bar	1,7
Ambient temperature range	°C	-25 / +50
Fluid temperature range	°C	-25 / +110
Fluid viscosity range	cSt	10 ÷ 400

HYDRAULIC SYMBOL

Filter with indicator VR type



Filter with indicator ER type



1 - IDENTIFICATION CODE

F	R	C	-	T	B				-				/	10		-	B

Return filter for tank top or line mounting

BSP threaded ports

Nominal dimension:
034 = 3/4Ž
112 = 1½Ž

Filtration degree:
F25 = fibre 25 m ($_{25}$ > 100) - ISO 4406:1999 class 19/17/14
P10 = paper 10 m ($_{10}$ > 2) - ISO 4406:1999 class 21/19/16
P25 = paper 25 m ($_{25}$ > 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

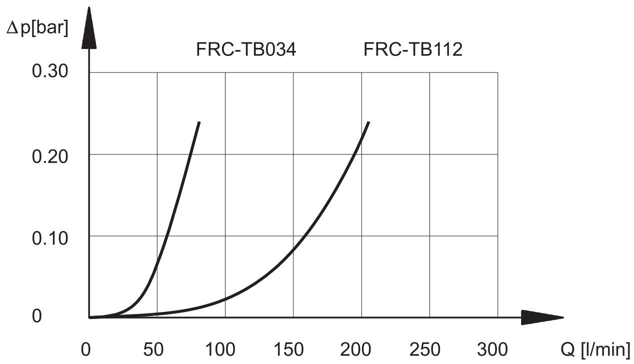
Series N.
(from 10 to 19 sizes and mounting dimensions remain unchanged)

Seals:
N = NBR seals for mineral oils (**standard**)
V = FPM seals for special fluids

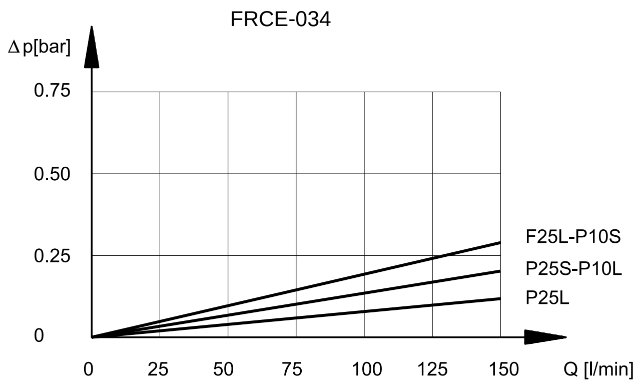
By-pass valve
Opening pressure: 1.7 bar

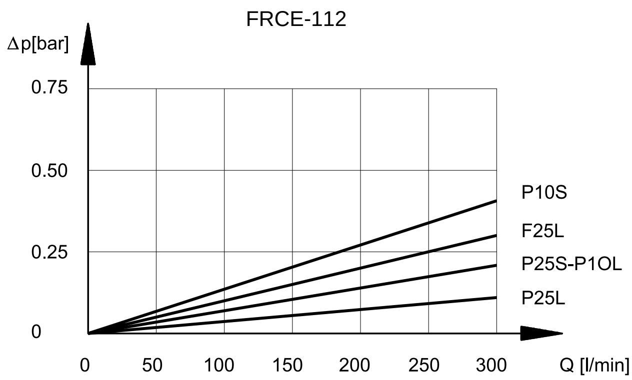
2 - CHARACTERISTIC CURVES (values measured with viscosity of 36 cSt at 50°C)

2.1 - Pressure drops through the filter body



2.2 - Pressure drops through the FRCE filter element



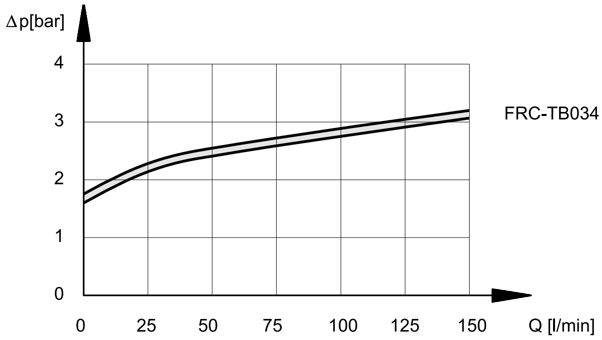


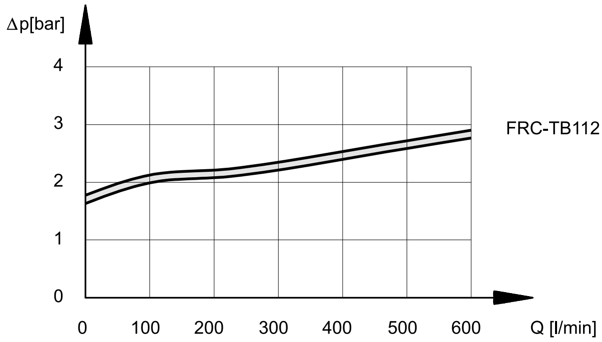
NOTE 2: The filter size has to be selected so that with the nominal flow rate the pressure drop is lower than 0.5 bar.
The total pressure drop through the filter is given by adding the body pressure drop values to those of the filter element.
As for fluids whose viscosity degree at a specific operating pressure is different from 36 cSt, the filter total pressure drop has to be changed according to the following ratio:
total pl value = body p value + (real p value of the filter element x real viscosity value (cSt) / 36)

real p 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.

2.3 - Pressure drops through the by-pass valve



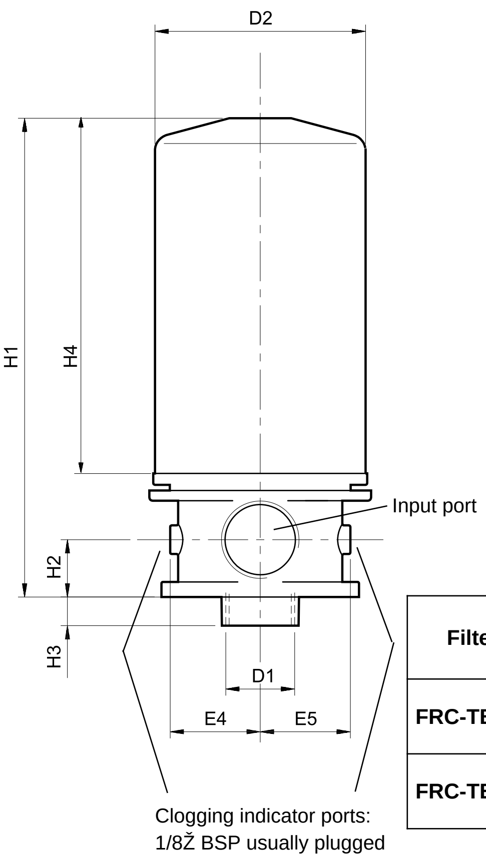


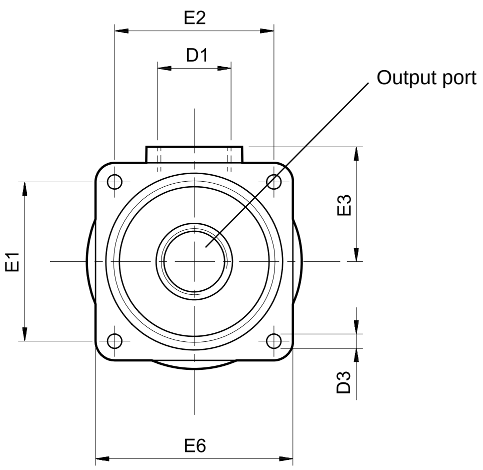
3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For 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





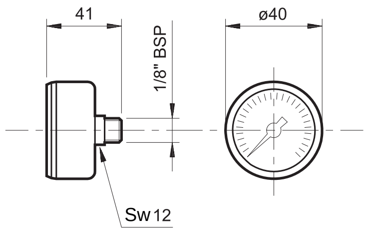
Filter	filter element	D1 (BSP)	D2	D3	H1	H2	H3	H4	E1	E2	E3	E4	E5	E6	R*
FRC-TB034	S	3/4Ž	95	7	196	25	18	146	70	70	50	38	38	108	211
	L				241			191							256
FRC-TB112	S	1 ½Ž	130	9	252	36	18	181	100	100	72	56	56	140	282
	L				297			226							327

R* = Filter element removal space above the tank surface

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

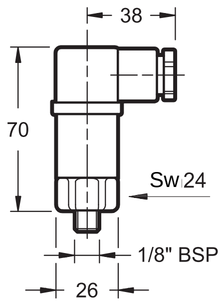


This indicator is a pressure gauge sensitive to the filter input pressure.

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



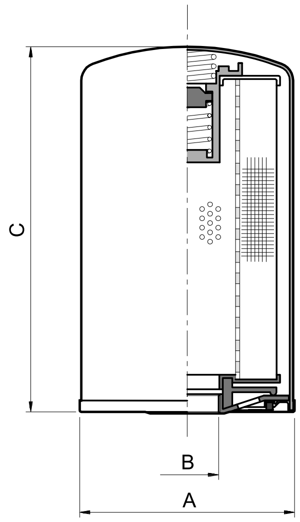
This indicator is a pressure switch sensitive to the filter input pressure, which switches an electric contact when the filter element has reached the clogging limit.

The contact can be wired in an open or closed condition (see the hydraulic symbol).

TECHNICAL SPECIFICATIONS

Operating pressure	bar	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]
FRCE - 034 -P*S	96,5	3/4Ž BSP	146	3305
FRCE - 034 -P*L	96,5	3/4Ž BSP	191	4745
FRCE - 034 -F25L	96,5	3/4Ž BSP	191	3630
FRCE - 112 -P*S	129	1 ¼Ž BSP	181	5560
FRCE - 112 -P*L	129	1 ¼Ž BSP	226	7360
FRCE - 112 -F25L	129	1 ¼Ž BSP	226	5890

FILTER ELEMENT IDENTIFICATION CODE

F R C E - _ _ _ - _ _ _ / 10 _

Cartridge filter element for FRC filters

Nominal dimension
034 = 3/4Ž **112** = 1 ½Ž

Filtration degree : F25 = fibre 25 m
P10 = paper 10 m
P25 = paper 25 m

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)

N = NBR seals for mineral oils (**standard**)
V = FPM seals for special fluids upon request

DUPLOMATIC OLEODINAMICA
DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

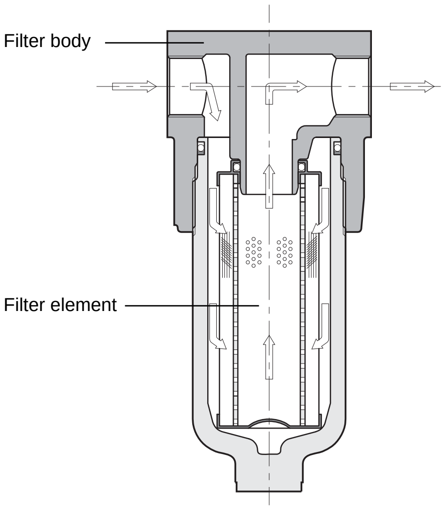
FPH

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 normal 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 m: absolute ($_5$> 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 m: absolute ($_{10}$> 100 - ISO 4406:1999 class 18/16/13)
F25 = 25 m: absolute ($_{25}$> 100 - ISO 4406:1999 class 19/17/14)

„ Those filters with a F10 and F25 filtration degree are supplied with a by-pass valve and have a cartridge 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

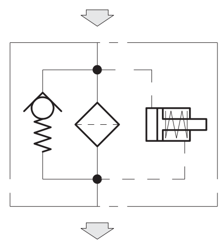
Filter code	BSP port dimensions	Mass [Kg]	Rated flow (indicative) [l/min]		
			H05	F10	F25
FPH-TB012	1/2Ž	4.4	10	27	33
FPH-TB034	3/4Ž	5.2	19	42	65
FPH-TB100	1Ž	8.2	40	95	105
FPH-TB114	1 ¼Ž	14	88	190	230
FPH-TB112	1 ½Ž	17.2	120	260	320

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.
As for a different viscosity range, see NOTE 2 - par. 2.2.

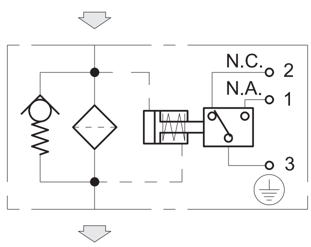
Maximum operating pressure	bar	420
Collapsing differential pressure of the filter element: H05 F-10-F25	bar	210 20
Differential pressure for the opening of the by-pass valve (±10 %)	bar	6
Ambient temperature range	°C	-25 / +50
Fluid temperature range	°C	-25 / +110
Fluid viscosity range	cSt	10 ÷ 400

HYDRAULIC SYMBOL

Filter with indicator VPM type



Filter with indicator EPM type



1 - IDENTIFICATION CODE

F	P	H	-	T	B				-			S	/	11		-	

High pressure delivery filter

BSP threaded ports

Nominal dimension:
012 = 1/2Ž **100** = 1Ž **112** = 1 1/2Ž
034 = 3/4Ž **114** = 1 1/4Ž

Filtration degree: **H05** = fibre 5 m ($_5$> 100) - ISO 4406:1999 class 17/15/12
F10 = fibre 10 m ($_{10}$> 100) - ISO 4406:1999 class 18/16/13
F25 = fibre 25 m ($_{25}$> 100) - ISO 4406:1999 class 19/17/14

Standard filter element

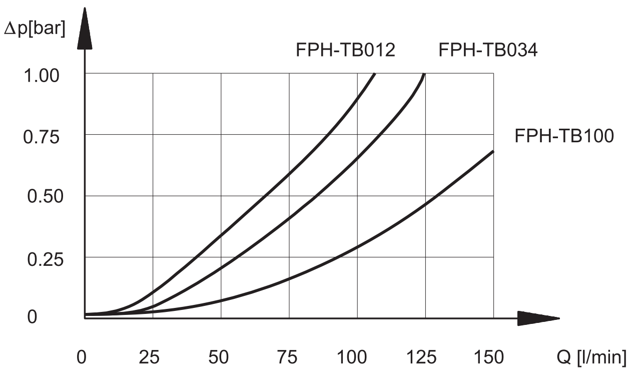
B = with by-pass valve
Opening pressure: 6 bar
0 = without by-pass valve
(compulsory for a H05 filtration degree)

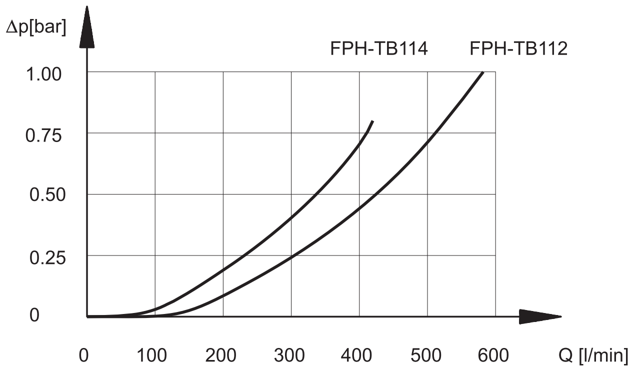
Seals:
N = NBR standard seals for mineral oils (**standard**)
V = FPM seals for special fluids

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

2 - CHARACTERISTIC CURVES (values measured with viscosity of 36 cSt at 50°C)

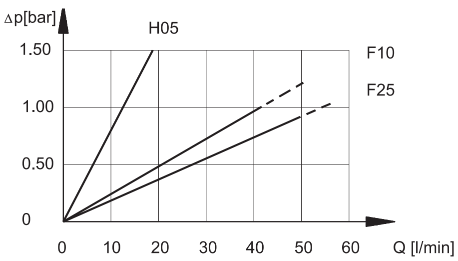
2.1 - Pressure drops through the filter body



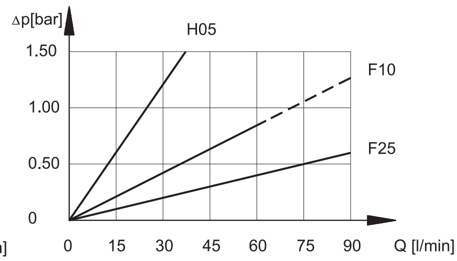


2.2 - Pressure drops through the FPHE filter element

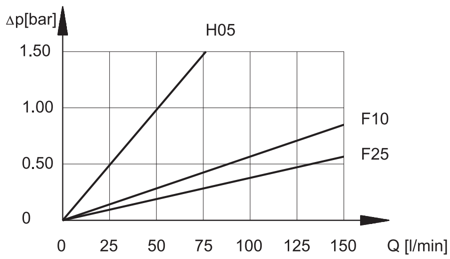
FPHE-TB012



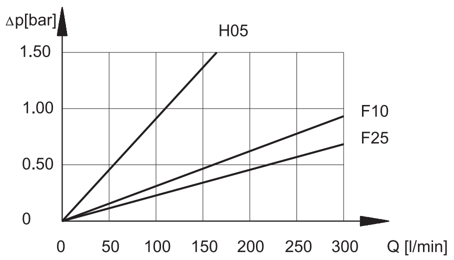
FPHE-TB034



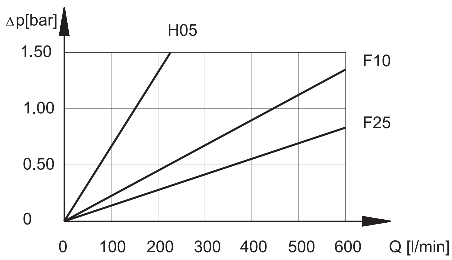
FPHE-TB100



FPHE-TB114



FPHE-TB112



NOTE 2: The filter size has to be selected so that with the nominal flow rate the pressure drop is lower than 0.8 bar.

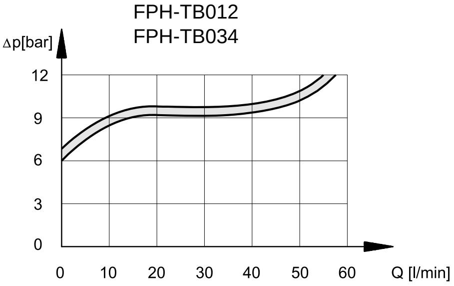
The total pressure drop through the filter is given by adding the body pressure drop values to those of the filter element. As for fluids whose viscosity degree at a specific operating pressure is different from 36 cSt, the filter total pressure drop has to be changed according to the following ratio:

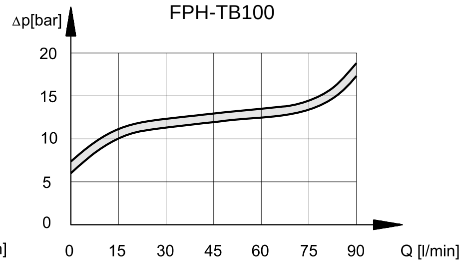
total pl value = body p value + (real p value of the filter element x real viscosity value (cSt) / 36)

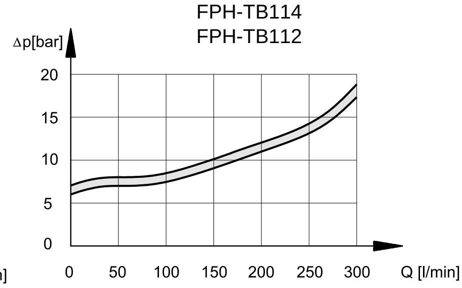
real p value of the filter element = value obtainable through the diagrams in par. 2.2

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





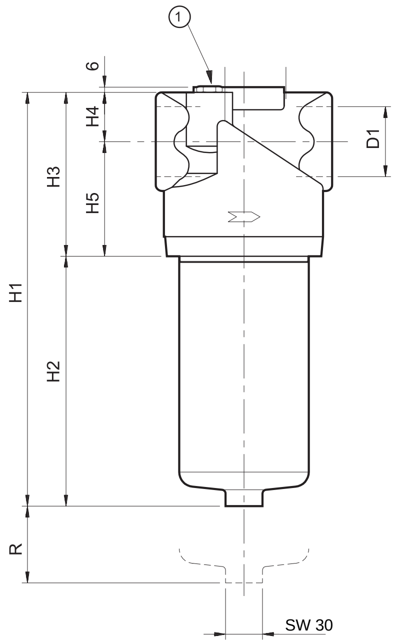


3 - HYDRAULIC FLUIDS

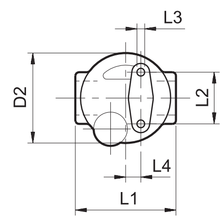
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures 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.

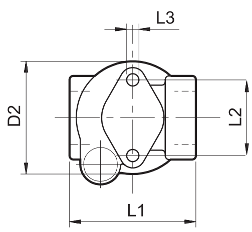
4 - OVERALL AND MOUNTING DIMENSIONS



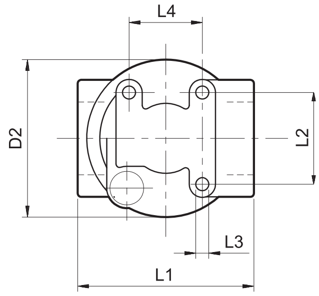
FPH - TB012
FPH - TB034



FPH - TB100



FPH - TB114
FPH - TB112



dimensions in mm

filter	D1	D2	H1	H2	H3	H4	H5	L1	L2	L3	L4	R*
FPH- TB012	1/2Ž	82	166	79	86	23	63	85	46	M8	12,5	100
FPH- TB034	3/4Ž	82	296	209	86	23	63	85	46	M8	12,5	100
FPH- TB100	1Ž	94	317	207	112	35	77	107	65	M8	-	100
FPH- TB114	1 ¼Ž	128	337	199	137	44	93	143	88	M10	43	100
FPH- TB112	1 ½Ž	128	457	319	137	44	93	143	88	M10	43	100

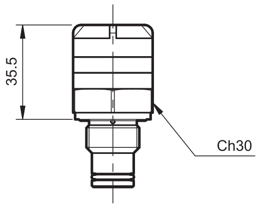
R* = removal space for filter element

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.

5.1 - Visual indicator for delivery filters
Identification code: VPM/10

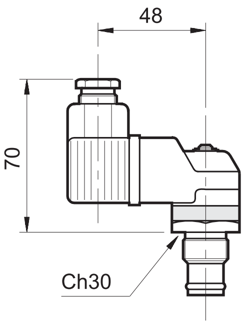


This indicator measures the differential pressure between the filter input and output.

The indicator is supplied with coloured bands, which informs you about the clogging condition of the filter element:

WHITE: efficient filter element p <5 bar (± 10%)
RED: the filter element has to be replaced p >5 bar (± 10%)

5.2 - Electric-visual indicator for delivery filters
Identification code: EPM/10



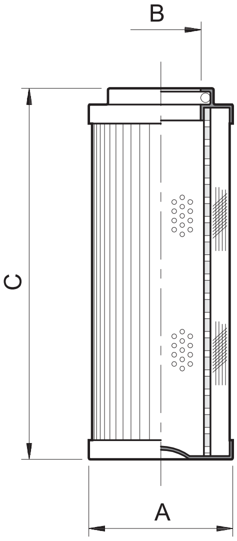
This indicator, apart from giving a visual indication, for example the VPM model, operates by switching an electric contact when the filter element has reached the clogging limit.

The contact can be wired in an open or closed condition (see the hydraulic symbol).

TECHNICAL SPECIFICATIONS

Differential operating pressure	bar	5
AC power supply		
Max. operating voltage	VAC	250 50/60 Hz
Max. load on the contacts (inductive or resistive)	A	1
DC power supply		
Max. operating voltage	VDC	125
Max. load on the contacts (with V at 30-50-75-125 VDC) resistive inductive	A	 2 - 0,5 - 0,25 - 0,2 2 - 0,5 - 0,25 - 0,03
Electric connector	DIN 43650	
Class of protection according to CEI EN 60529 (atmospheric agents)	IP65	

6 - FILTER ELEMENTS



filter element code	ØA	ØB	C	Average filtering surface [cm²]	
				H05	F12/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

F	P	H	E	-				-			S	/	10	

Filter element for FPH filters

Nominal dimension:
012 = 1/2Ž **114** = 1 1/4Ž
034 = 3/4Ž **112** = 1 1/2Ž
100 = 1Ž

Filtration degree: H05 = fibre 5 m
F10 = fibre 10 m
F25 = fibre 25 m

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)

DUPLOMATIC OLEODINAMICA

DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

DUPLOMATiC OLEODiNAMiCA

FPM

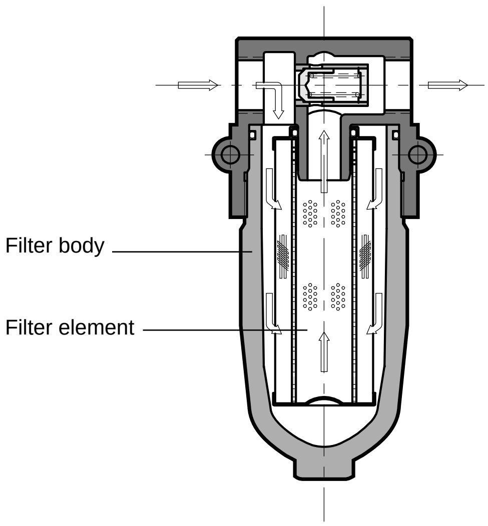
MEDIUM PRESSURE FILTER FOR LINE MOUNTING

SERIES 10

p max **210** bar

Q max (see table of performances)

OPERATING PRINCIPLE



„ The FPM 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 normal hexagon spanner to unscrew the bowl of the filter, which has a suitably shaped end.

„ FPM filters are designed to be installed on medium pressure lines up to 210 bar; the filter elements are made of high efficiency filtering materials and are available with three different filtration degrees:
F05 = 5 m absolute ($_5$ >100 - ISO 4401:1999 class 17/15/12)
F10 = 10 m absolute ($_{10}$>100 - ISO 4401:1999 class 18/16/13)
F25 = 25 m absolute ($_{25}$ >100 - ISO 4401:1999 class 19/17/14)

„ The filters are always supplied with a by-pass valve.

„ The filter elements are available in the standard version (S) or in the long-lasting version (L) is able to hold high quantities of contamination material. For all filter elements the collapsing differential pressure is 20 bar.

„ All the FPM filters are designed to incorporate a visual-differential or a visual-electric clogging indicator to be ordered separately (see paragraph 5).

PERFORMANCES

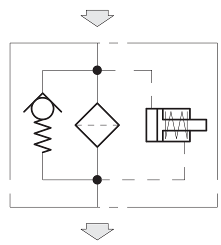
Filter code	BSP port dimensions	Mass [Kg]		Rated flow (indicative) [l/min]					
		type S	type L	F05S	F05L	F10S	F10L	F25S	F25L
FPM-TB012	1/2Ž	1,5	2,0	25	40	35	50	45	60
FPM-TB034	3/4Ž			35	50	50	65	65	80
FPM-TB100	1Ž			40	60	60	85	85	100

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.
As for a different viscosity range, see NOTE 2 - par. 2.2.

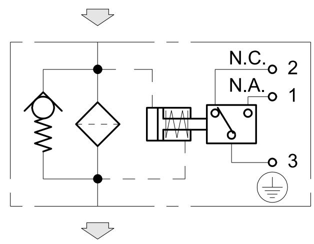
Maximum operating pressure	bar	210
Collapsing differential pressure of the filter element	bar	20
Differential pressure for the opening of the by-pass valve (±10 %)	bar	6
Ambient temperature range	°C	-25 / +50
Fluid temperature range	°C	-25 / +110
Fluid viscosity range	cSt	10 ÷ 400

HYDRAULIC SYMBOL

Filter with indicator VPM type



Filter with indicator EPM type



1 - IDENTIFICATION CODE

F	P	M	-	T	B				-				/	10		-	

Medium pressure delivery filter

BSP threaded ports

Nominal dimension:
012 = 1/2Ž **034** = 3/4Ž **100** = 1Ž

Filtration degree:
F05 = fibre 5 m ($_5$ > 100) - ISO 4401:1999 class 17/15/12
F10 = fibre 10 m ($_{12}$ > 100) - ISO 4401:1999 class 18/16/13
F25 = fibre 25 m ($_{25}$ > 100) - ISO 4401:1999 class 19/17/14

Type of filter element:
S = standard **L** = long-lasting element

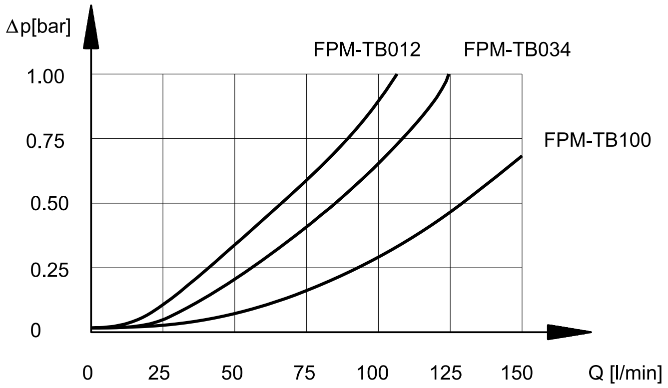
Series No. (from 10 to 19 sizes and mounting dimensions remain unchanged)

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
(upon request only)

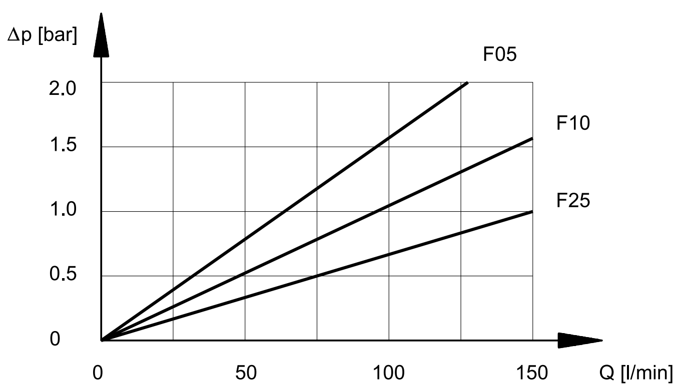
2 - CHARACTERISTIC CURVES (values measured with viscosity of 36 cSt at 50°C)

2.1 - Pressure drops through the filter body

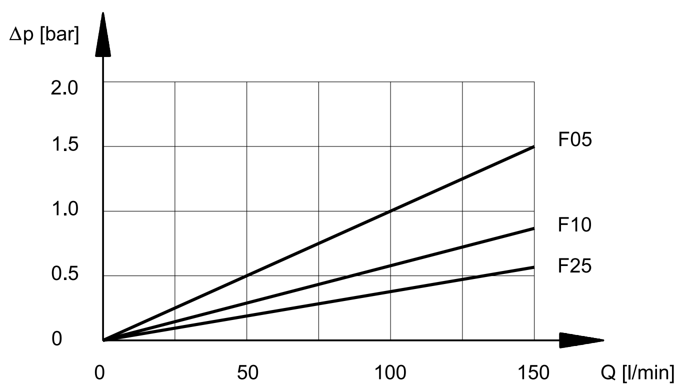


2.2 - Pressure drops through FPME filter element

FPME-*S
(standard filter element)



FPME-*L
(long-lasting filter element)



NOTE 2: The filter size has to be selected so that with the nominal flow rate the pressure drop is lower than 0.8 bar.

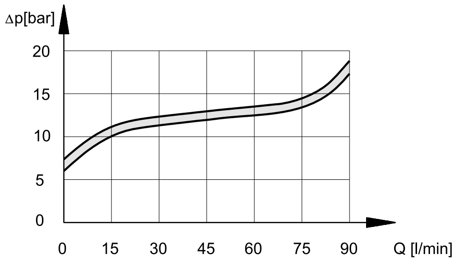
The total pressure drop through the filter is given by adding the body pressure drop values to those of the filter element. As for fluids whose viscosity degree at a specific operating pressure is different from 36 cSt, the filter total pressure drop has to be changed according to the following ratio:

total pl value = body p value + (real p value of the filter element x real viscosity value (cSt) / 36)

real p 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.

2.3 - Pressure drops through 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 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.

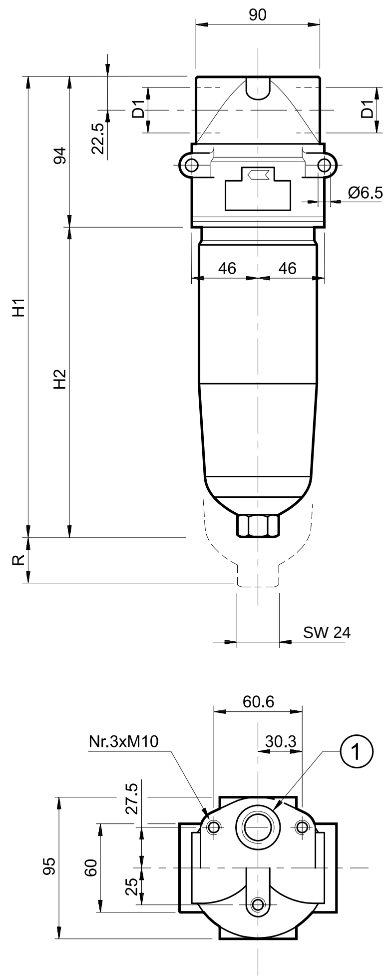
The fluid must be preserved in its physical and chemical characteristics.

4 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

Filter code	D1	H1	H2	R*
FPM-TB012-*S	1/2Ž	205	111	100
FPM-TB034-*S	3/4Ž	205	111	100
FPM-TB100-*S	1Ž	205	111	100
FPM-TB012-*L	1/2Ž	298	197	100
FPM-TB034-*L	3/4Ž	298	197	100
FPM-TB100-*L	1Ž	298	197	100

R* = Filter element removal space

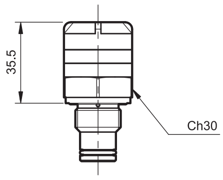


1	Clogging indicator port: M20 x 1,5

5 - CLOGGING INDICATORS

The filters are all designed to incorporate clogging indicators, which have to be ordered separately

5.1 - Visual indicator for medium pressure delivery filters
Identification code: VPM/10

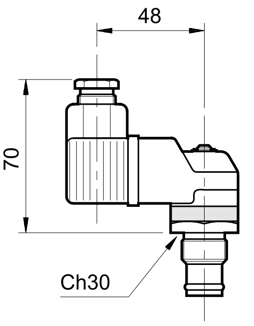


This indicator measures the differential pressure between the filter input and output.

The indicator is supplied with coloured bands, which informs you about the clogging condition of the filter element:

WHITE: efficient filter element p <5 bar (± 10%)
RED: the filter element has to be replaced p >5 bar (± 10%)

5.2 - Electric-visual indicator for delivery filters
Identification code: EPM/10



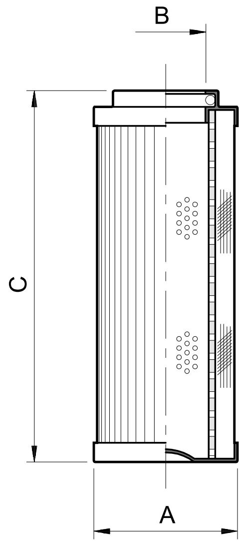
This indicator, apart from giving a visual indication, for example the VPM model, operates by switching an electric contact when the filter element has reached the clogging limit.

The contact can be wired in an open or closed condition (see the hydraulic symbol).

TECHNICAL SPECIFICATIONS

Differential operating pressure	bar	5
AC power supply		
Max. operating voltage	VAC	250 50/60 Hz
Max. load on the contacts (inductive or resistive)	A	5
DC power supply		
Max. operating voltage	VDC	125
Max. load on the contacts (with V at 30-50-75-125 VDC) resistive inductive	A	2 - 0,5 - 0,25 - 0,2 2 - 0,5 - 0,25 - 0,03
Electric connector	DIN 43650	
Class of protection according to CEI EN 60529 (atmospheric agents)	IP65	

6 - FILTER ELEMENTS



filter element code	ØA	ØB	C	Average filtering surface [cm²]
FPME - *S	52	23,5	115	975
FPME - *L	52	23,5	210	1830

FILTER ELEMENT IDENTIFICATION CODE

F	P	M	E	-				/	10	

Filter element for FPM filters

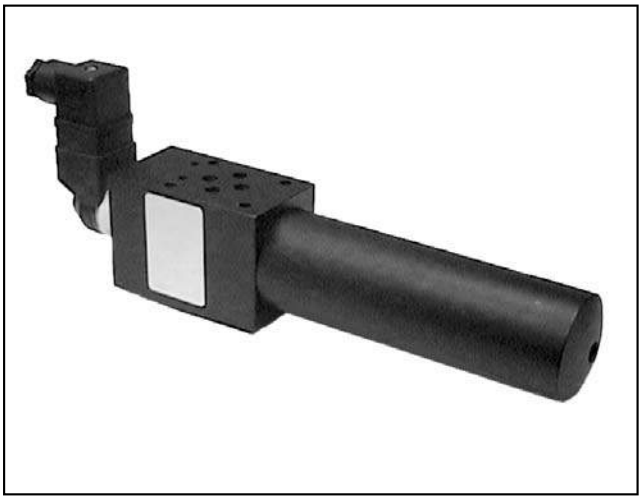
Filtration degree:
F05 = fibre 5 m
F10 = fibre 10 m
F25 = fibre 25 m

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)

DUPLOMATIC OLEODINAMICA
DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com



FPHM
PRESSURE FILTER
SERIES 10

MODULAR VERSION

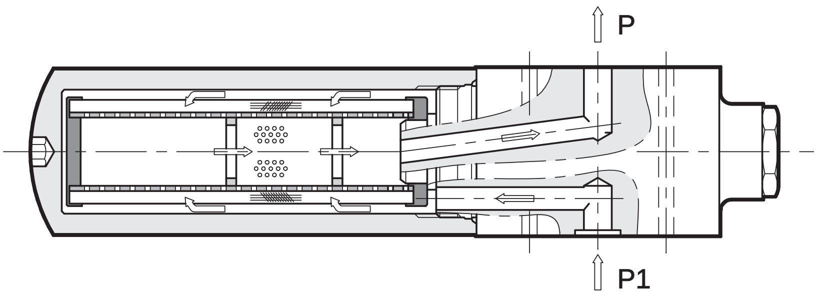
p max **320** bar
Q max (see table of performances)

OPERATING PRINCIPLE

- The FPHM filters are designed for the modular mounting directly under proportional valves or servovalves with ISO 4401 (CETOP RP 121H) interfaces.
- They are available in two nominal dimensions with ISO 4401-03 (CETOP 03) e ISO 4401-05 (CETOP 05) mounting surface.
- FPHM filters are designed for working pressures up to 320 bar. The filter elements are made of high efficiency filtering mate rials and are available with three different filtration degrees and with a collapsing differential pressure = 210 bar:

  F05 = 5 m absolute
  (ß$_{5}$>100 - ISO 4406:1999 class 17/15/12)
  F10 = 10 m absolute
  (ß$_{10}$>100 - ISO 4406:1999 class 18/16/13)
  F25 = 25 m absolute
  (ß$_{25}$>100 - ISO 4406:1999 class 19/17/14)

- All the FPHM filters are supplied without by-pass valve and are designed to incorporate a visual-differential or a visual-electric clogging indicator to be ordered separately (see paragraph 5).



PERFORMANCES

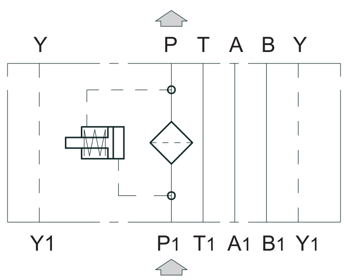
Filter	Dimensions	Mass [Kg]	Rated flow (indicative) [l/min]		
			F05	F10	F25
FPHM3	ISO 4401-03	2,5	12	13,5	16
FPHM5	ISO 4401-05	4,2	22	25	28

NOTE 1: The 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.

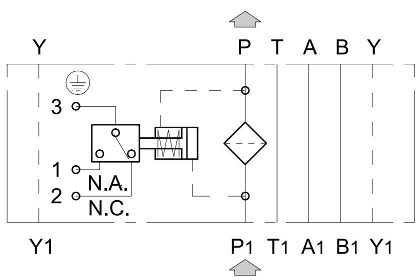
Maximum operating pressure	bar	320
Collapsing differential pressure of the filter element	bar	210
Ambient temperature range	°C	-25 / +50
Fluid temperature range	°C	-25 / +110
Fluid viscosity range	cSt	10 ÷ 400

HYDRAULIC SYMBOL

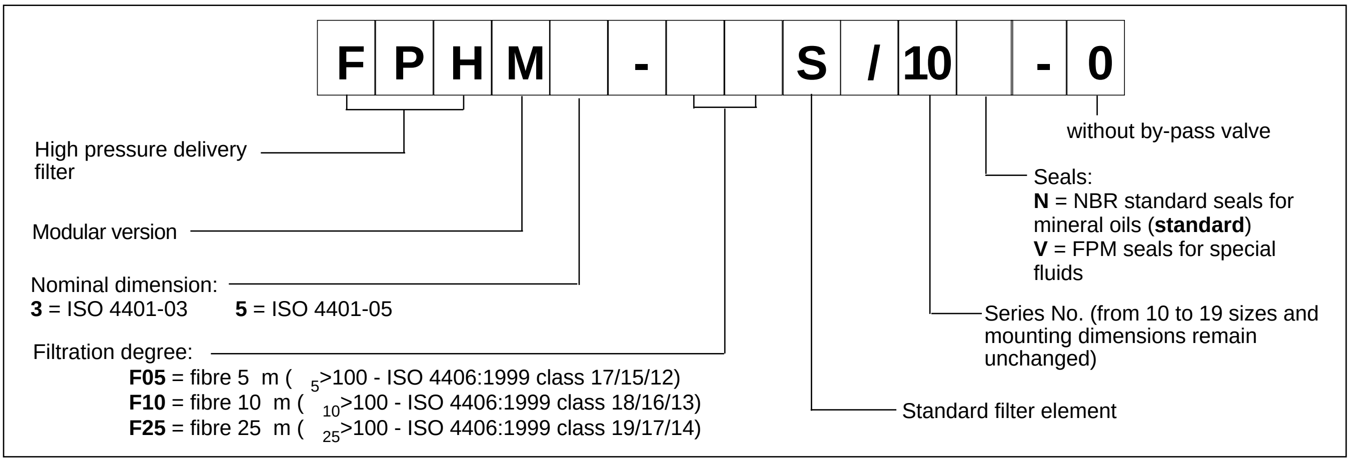
Modular filter with indicator VM type



Modular filter with indicator EM type

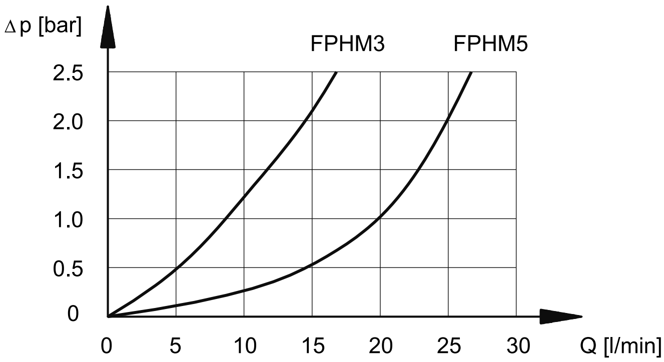


1 - IDENTIFICATION CODE



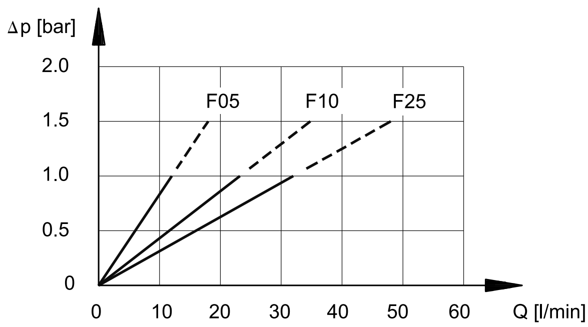
2 - CHARACTERISTIC CURVES (values measured with viscosity of 36 cSt at 50°C)

2.1 - Pressure drops through the filter body

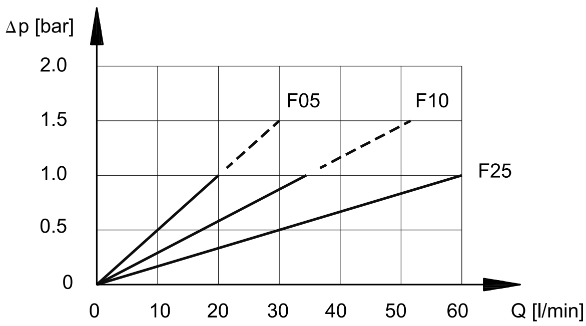


2.2 - Pressure drops through FPHME filter element

FPHME3



FPHME5



NOTE 2: The filter size has to be selected so that with the nominal flow rate the pressure drop is lower than 0.8 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 pl value = body p value + (real p value of the filter element x real viscosity value (cSt) / 36)

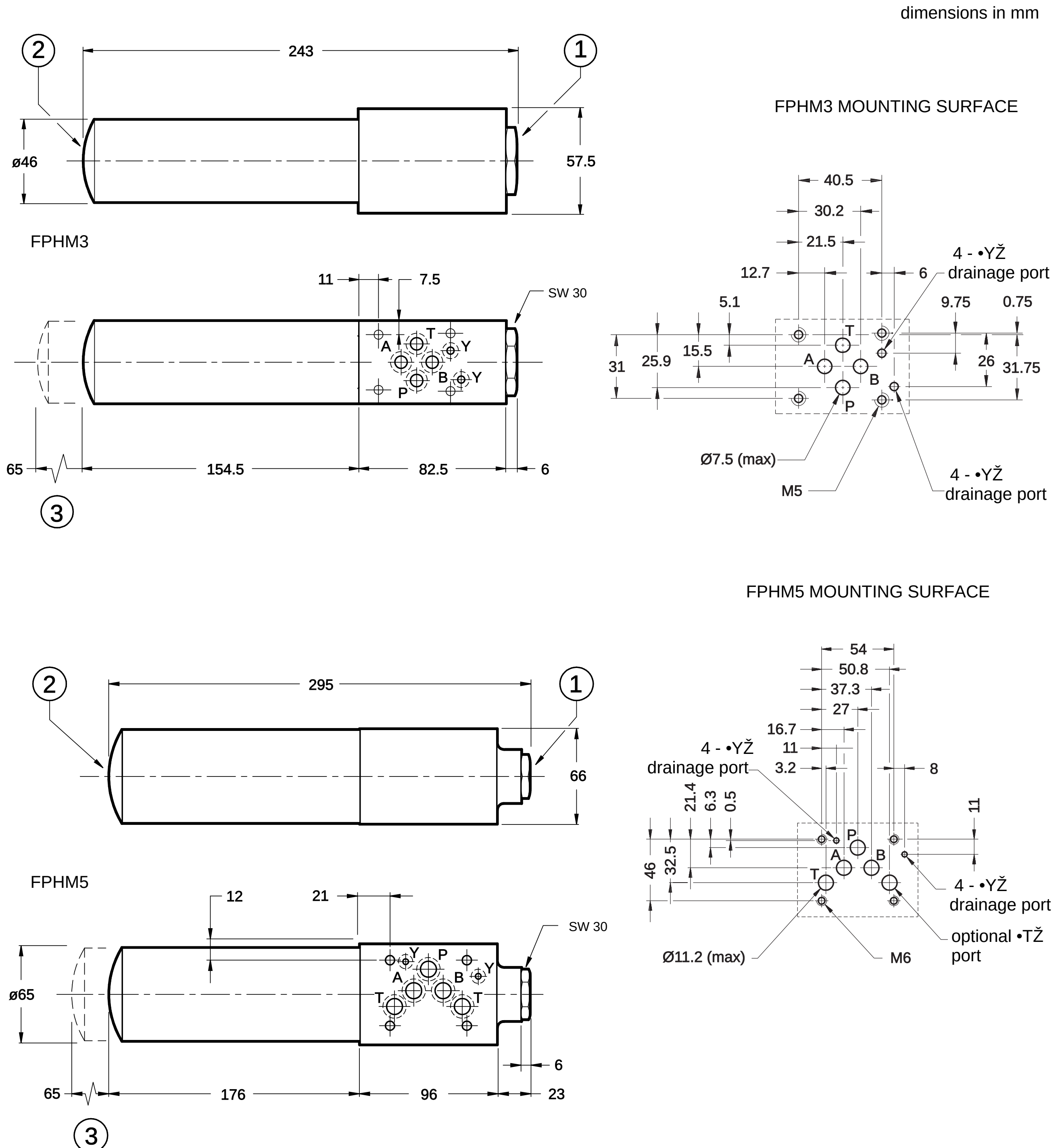
real p value of the filter element = value obtainable through the diagrams in par. 2.2

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



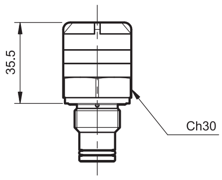
1	Clogging indicator port: M20x1,5
2	Wrench seat facility for housing removal: countersunk hex spanner 10

3	Mounting surface with sealing rings: **FPHM3**: 4 OR 108 (8.73x1.78) 2 OR 2025 (6.07x1.78) **FPHM5**: 5 OR 2050 (12.42x1.78) 2 OR 106 (6.75x1.78)
4	Filter element removal space

5 - CLOGGING INDICATORS

The filters are all designed to incorporate clogging indicators, which have to be ordered separately.

5.1 - Visual indicator for modular filters
Identification code: VM/10

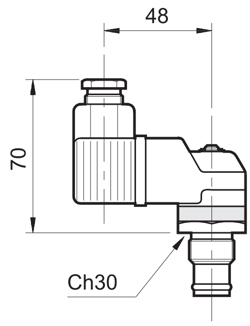


This indicator measures the differential pressure between the filter input and output.

The indicator is supplied with coloured bands, which informs you about the clogging condition of the filter element:

WHITE: efficient filter element p < 8 bar (± 10%)
RED: the filter element has to be replaced p > 8 bar (± 10%)

5.2 - Electric-visual indicator for modular filters
Identification code: EM/10



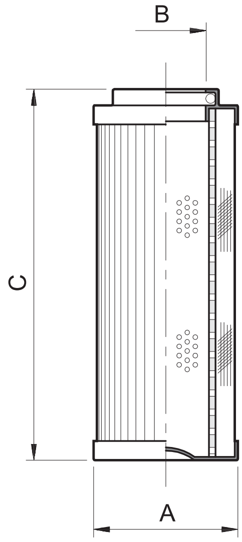
This indicator, apart from giving a visual indication, for example the VPM model, operates by switching an electric contact when the filter element has reached the clogging limit.

The contact can be wired in an open or closed condition (see the hydraulic symbol).

TECHNICAL SPECIFICATIONS

Differential operating pressure	bar	8
AC power supply		
Max. operating voltage	VAC	250 50/60 Hz
Max. load on the contacts (inductive or resistive)	A	5
DC power supply		
Max. operating voltage	VDC	125
Max. load on the contacts (with V at 30-50-75-125 VDC) resistive inductive	A	 2 - 0,5 - 0,25 - 0,2 2 - 0,5 - 0,25 - 0,03
Electric connector	DIN 43650	
Class of protection according to CEI 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

F	P	H	M	E		-			S	/	10	

Filter element for FPHM modular filter

Nominal dimension:
3 = ISO 4401-03
5 = ISO 4401-05

Filtration degree : **F05** = fibre 5 m
F10 = fibre 10 m
F25 = fibre 25 m

Standard filter element

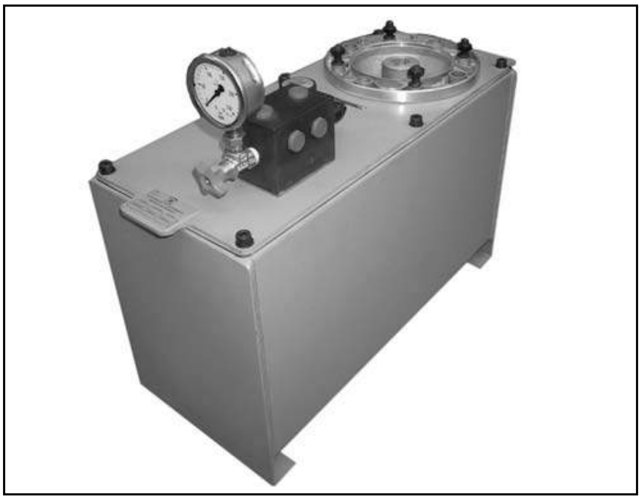
Series No. (from 10 to 19 sizes and mounting dimensions remain unchanged)

N = NBR seals for mineral oils **(standard)**
V = FPM seals for special fluids (upon request)

DUPLOMATIC OLEODINAMICA
DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

CTR*

HYDRAULIC POWER UNITS



TANK CAPACITY
from 8 lt to 150 lt

PUMP FLOW RATE
from 1,6 lt to 41lt

DESCRIPTION

The CTR* power units, are realised with a soaked gear pump and a vertically mounted electric motor.
The tank cover can be rotated of 180° without disassembling the installed components.
The standard components are intake filter, gear pump, motor - pump connection group, arrangement for the electric motor, pressure relief valve, a position for one electro-valve (not included in the supplying), manometer with the shut-off cock, oil charge cover and oil visual indicator.
The electric motor supplied is a eurotension4-poles three-phase asynchronous motor with shape B5 according to UNEL-MEC standards.
The available paintings are dull black RAL 9005 (**standard**), Grey RAL 7037 and Green RAL 6011.
The power units works with mineral oil (not included in the supplying).
To work with other hydraulic fluids, please consult our Technical Department.

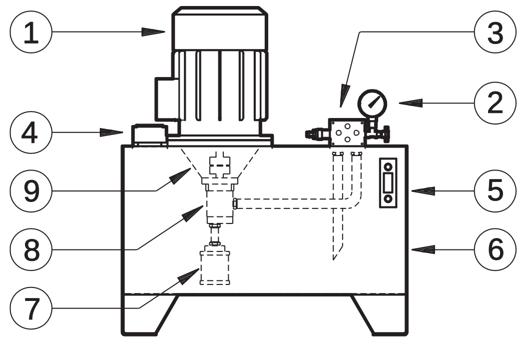
OPTIONALS
The standard power unit can be equipped with the following components:

CTR 0 - 1 - 2
- other settings for electro-valves ISO 4401-03 (CETOP 03) with P2D modular subplates
- thermostat
- level gauge
- return filter for line mounting
- other colour paintings under request

CTR 3 - 4
- high pressure pumps H version
- other settings for electrovalves ISO 4401-03 (CETOP 03) with P2D modular subplates.
- thermostat
- level gauge
- a return filter for line mounting
- an heat exchanger air/oil or water/oil
- other colour paintings under request

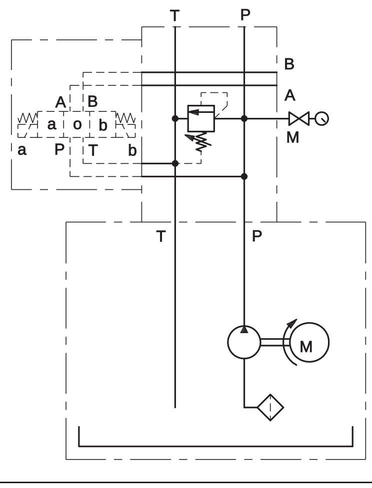
The standard power unit is delivered without the functional diagram.

STANDARD COMPONENTS



1) Electric motor
2) Manometer with shut-off selector
3) Pressure relief valve
4) Charge cover
5) Level gauge
6) Oil reservoir
7) intake filter
8) Gear pumps
9) Motor - pump connection group

HYDRAULIC SYMBOL



1 - CTR0 power unit

1.1 - Identification code

C	T	R	0	-	008	/				/	1P	-		/					/	40

power unit with soaked pump

Cover size

Tank capacity 8 dm^3

Electric motor shape B5
P = arrangement for motor mounting
M = electric motor already mounted

4-poles electric motor power:
0.25 = 0.25 kW
0.37 = 0.37 kW

Electric motor voltage
(omit for P version)
A = 230-400V / 50-60 Hz

Pump type **1P**
(see cat. 11 110 for the pump technical characteristics)

Pump flow rate(l/min) at 1500 rpm
(see flow rate / pressure table)

Standard panel with 3/8Ž rear ports
A = P2D-M* with 1 pos. ISO 4401-03 (CETOP 03)
B = P2T -M* with 2 pos. ISO 4401-03 (CETOP 03)

0 = without level gauge
1 = with level gauge

0 = without thermostat
1 = with thermostat

N = Dull black RAL 9005 **(standard)**
G = Grey RAL 7037
V = Green RAL 6011

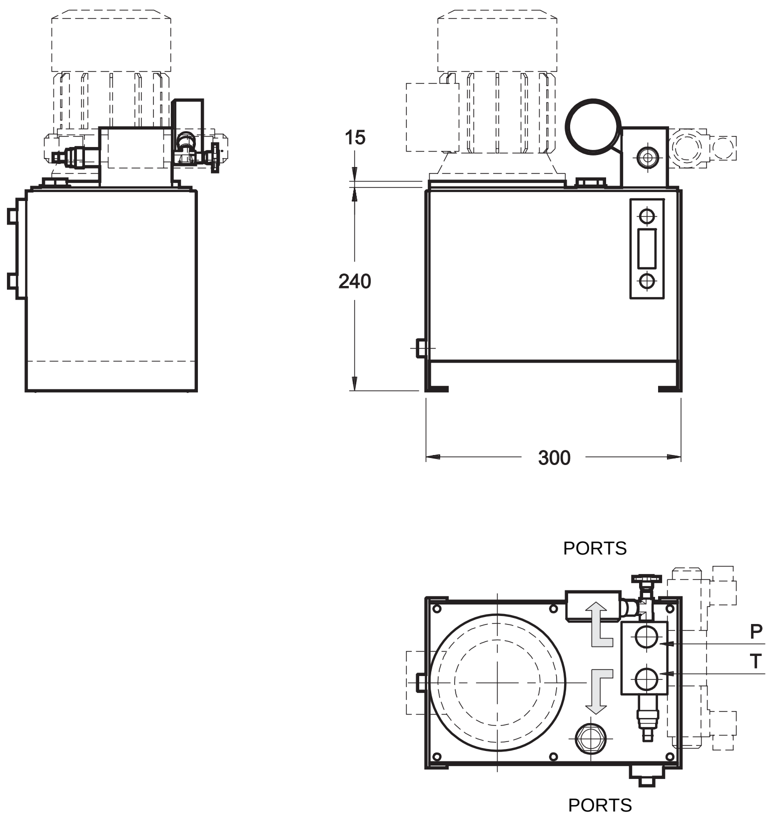
Series No. (from 40 to 49 sizes and mounting dimensions remain unchanged)

1.2 - Flowrate / pressure table

Electric motor flange size			Ø = 160	
CTR0	Pump type	Flow rate at 1500 rpm [lt/min]	Electric motor power [kW]	
			0,25	**0,37**
			Max pressure [bar]	
008	1P 1,6 R	**1,6** *	80	115
	2 R	**2,0**	65	95
	2,5 R	**2,4** *	55	80
	3,3 R	**3,2**	40	60
	4,2 R	**3,9** *	30	50
	5 R	**4,8**	25	40
	5,8 R	**5,5** *	20	35
	6,7 R	**6,3**	15	30
	7,5 R	**7,1**	10	25

* pumps for preferential choice

1.3 - Overall and mounting dimensions for CTR0



2 - POWER UNITS CTR1

2.1 - Identification code

C	T	R	1	-		/				/	1P	-		/						/	40

power unit with soaked pump

Cover size

Tank capacity
013 = 13 dm³
020 = 20 dm³

Electric motor B5 shape
P = Predisposition for motor assembly
M = Mounted electric motor

4-poles power electric motor:
0.55 = 0.55 kW
0.75 = 0.75 kW
1.1 = 1.1 kW
1.5 = 1.5 kW

Electric motor voltage
(omit for P version)
A = 230-400V / 50-60 Hz

Pump type **1P**
(see cat. 11 110 for the pump technical characteristics)

Flowrate pump (l/min)at 1500 rpm
(see flowrate / pressure table)

Standard panel with rear ports G 3/8Ž

A = P2D-M* with 1 pos. ISO 4401-03 (CETOP 03)
B = P2T-M* with 2 pos. ISO 4401-03 (CETOP 03)

0 = without level gauge
1 = with level gauge

0 = without thermostat
1 = with thermostat

Return filter:
0 = without filter
1 = filter with visual indicator
2 = filter with electric indicator

N = Dull black RAL 9005 **(standard)**
G = Grey RAL 7037
V = Green RAL 6011

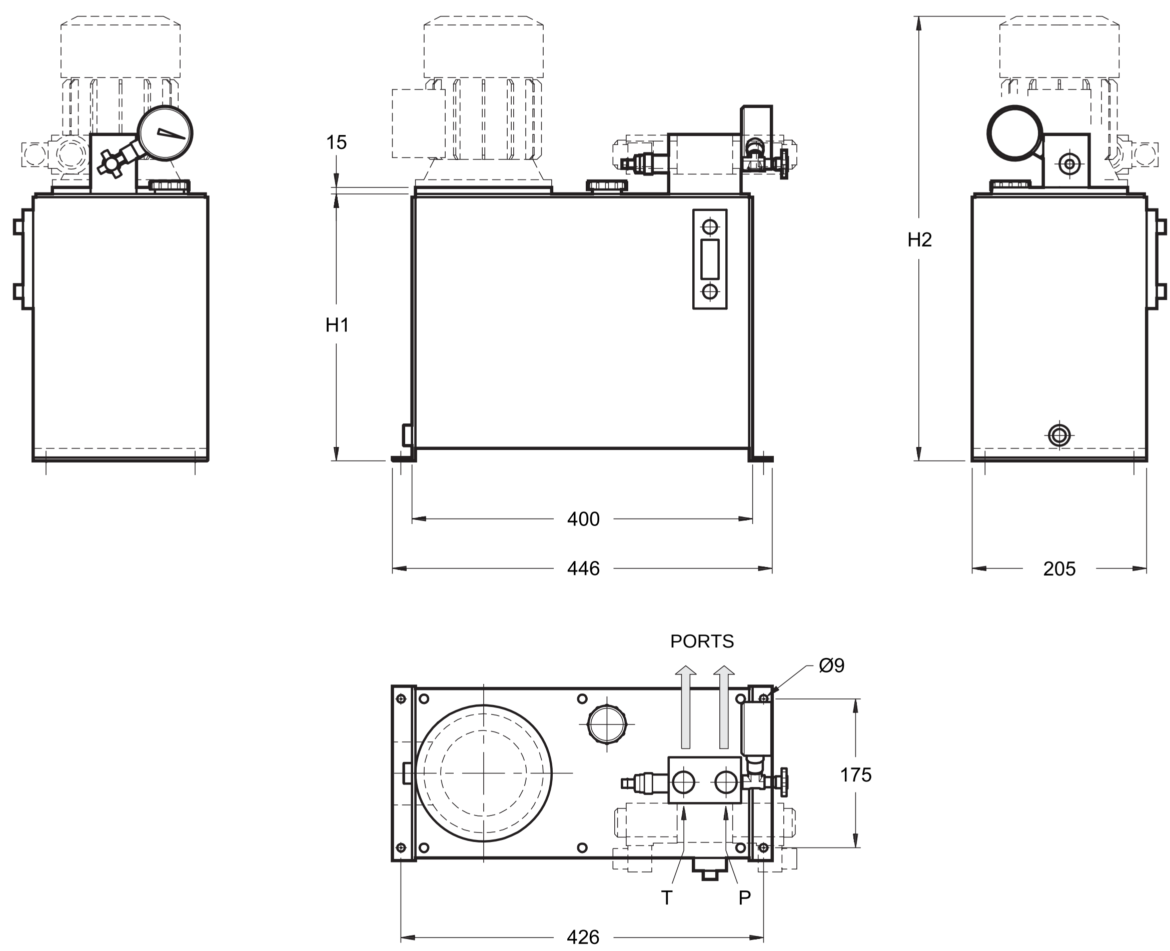
Series No. (from 40 to 49 sizes and mounting dimensions remain unchanged)

2.2 - Flowrate / pressure table

Electric motor flange size				Ø = 200			
CTR1		Pump type	Flow a 1500 rpm [lt/min]	Electric motor power [kW]			
				0,55	**0,75**	**1**	**1,5**
				max pressure [bar]			
020	013	1P 1,6 R	**1,6 ***	180	-	-	-
		2 R	**2,0**	145	195	-	-
		2,5 R	**2,4 ***	120	160	-	-
		3,3 R	**3,2**	90	120	160	-
		4,2 R	**3,9 ***	75	100	130	200
		5 R	**4,8**	60	80	110	160
		5,8 R	**5,5 ***	50	70	95	140
		6,7 R	**6,3**	45	60	80	120
		7,5 R	**7,1**	40	55	70	110
		9,2 R	**8,7 ***	35	45	60	90
		11,5 R	**11,9**	25	30	45	65

* pumps for preferential choice

2.3 - Overall and mounting dimensions for CTR1



	013	020
H1	235	315
H2 (max)	535	615

3 - POWER UNITS CTR2

3.1- Identification code

C	T	R	2	-	025	/				/	1P	-		/						/	40

power unit with soaked pump

Cover size

Tank capacity
025 = 25 dm^3

Electric motor B5 shape
P = Predisposition for motor assembly
M = Mounted electric motor

4-poles power electric motor:
0.55 = 0.55 kW
0.75 = 0.75 kW
1.1 = 1.1 kW
1.5 = 1.5 kW

Electric motor voltage
(omit for P version)
A = 230-400V / 50-60 Hz

Pump type **1P**
(see cat. 11 110 for the pump technical characteristics)

Flowrate pump (l/min) at 1500 rpm
(see flowrate / pressure table)

Standard panel with rear ports G 3/8Ž
A = P2D-M* with 1 pos. ISO 4401-03 (CETOP 03)
B = P2T -M* with 2 pos. ISO 4401-03 (CETOP 03)

0 = without level gauge
1 = with level gauge

0 = without thermostat
1 = with thermostat

Return filter:
0 = without filter
1 = filter with visual indicator
2 = filter with electric indicator

N = Dull black RAL 9005 **(standard)**
G = Grey RAL 7037
V = Green RAL 6011

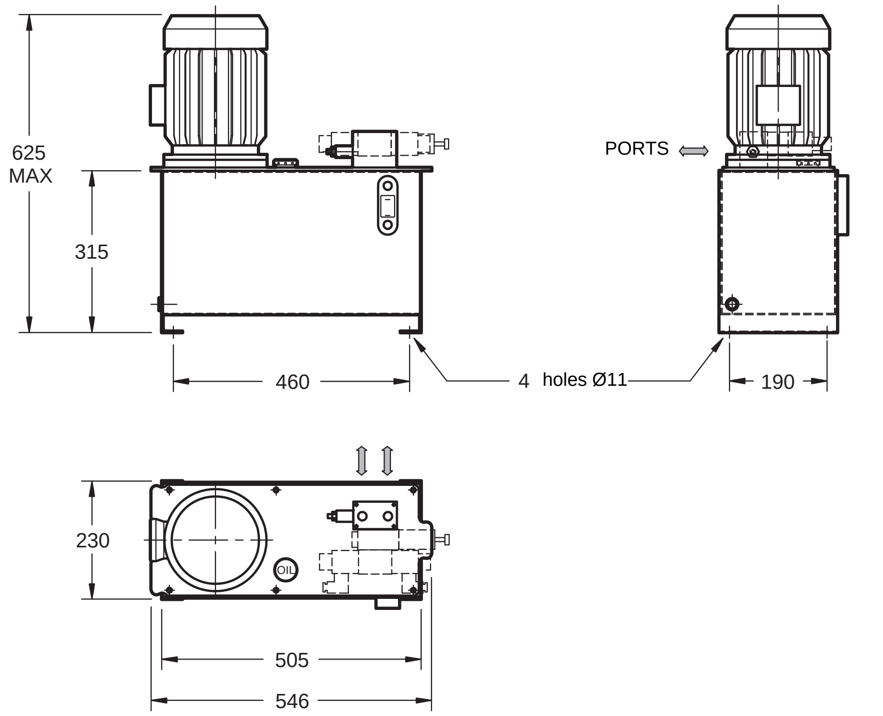
Series No. (from 40 to 49 sizes and mounting dimensions remain unchanged)

3.2 - Flowrate / pressure table

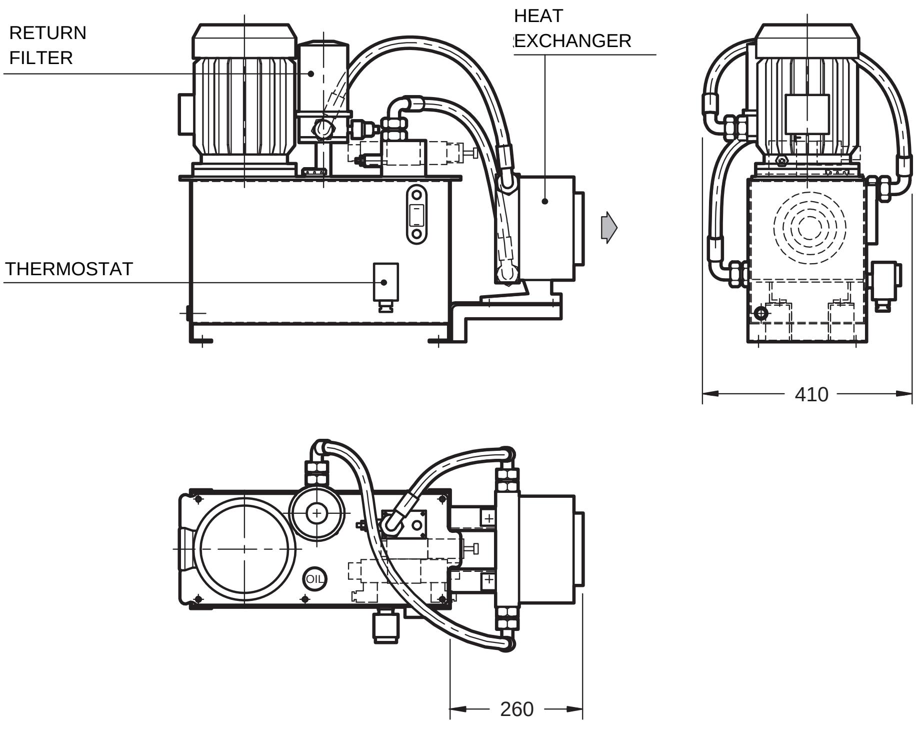
Electric motor flange size			Ø = 200			
CTR2	Pump type	Flowrate at 1500 rpm [lt/min]	Electric motor power [kW]			
			0,55	**0,75**	**1**	**1,5**
			max pressure [bar]			
025	1P 1,6 R	**1,6 ***	180	-	-	-
	2 R	**2,0**	145	195	-	-
	2,5 R	**2,4 ***	120	160	-	-
	3,3 R	**3,2**	90	120	160	-
	4,2 R	**3,9 ***	75	100	130	200
	5 R	**4,8**	60	80	110	160
	5,8 R	**5,5 ***	50	70	95	140
	6,7 R	**6,3**	45	60	80	120
	7,5 R	**7,1**	40	55	70	110
	9,2 R	**8,7 ***	35	45	60	90
	11,5 R	**11,9**	25	30	45	65
	GP1-0013	**2,0 ***	140	190	250	-
	0020	**3,0 ***	95	130	170	250

* pumps for preferential choice

3.3 - Overall and mounting dimensions for basic CTR2



3.4 - CTR2 with optionals



4 - POWER UNITS CTR3

4.1 - Identification code

C	T	R	3	-		/				/		-		/						/	40

power unit with soaked pump

Cover size

Tank capacity
035 = 35 dm^3
050 = 50 dm^3
075 = 75 dm^3

Electric motor B5 shape
P = Predisposition for motor assembly
M = Mounted electric motor

4-poles power electric motor:
0.55 = 0.55 kW
0.75 = 0.75 kW
1.1 = 1.1 kW
1.5 = 1.5 kW
2.2 = 2.2 kW
3 = 3 kW
4 = 4 kW

Electric motor voltage
(omit for P version)
A = 380-420V / 50Hz-440-480V/60Hz for motors from 2.2 kW to 7.5 kW
B = 230-400V/50-60 Hz for motors from 0.55 kW to 1.5 kW

Pump type :
GP1 **GP2**
(see cat. 11 100 for the pumps technical characteristics)

Flowrate pump (l/min) at 1500 rpm
(see flowrate / pressure table)

Standard panel with rear ports G 3/8Ž
A = P2D-M* with 1 pos. ISO 4401-03 (CETOP 03)
B = P2T -M* with 2 pos. ISO 4401-03 (CETOP 03)

0 = without level gauge
1 = with level gauge

0 = without thermostat
1 = with thermostat

Return filter:
0 = without filter
1 = filter with visual indicator
2 = filter with electric indicator

Heat exchanger:
0 = without exchanger
1 = oil/water exchanger 2010K
2 = oil/water exchanger 2020K

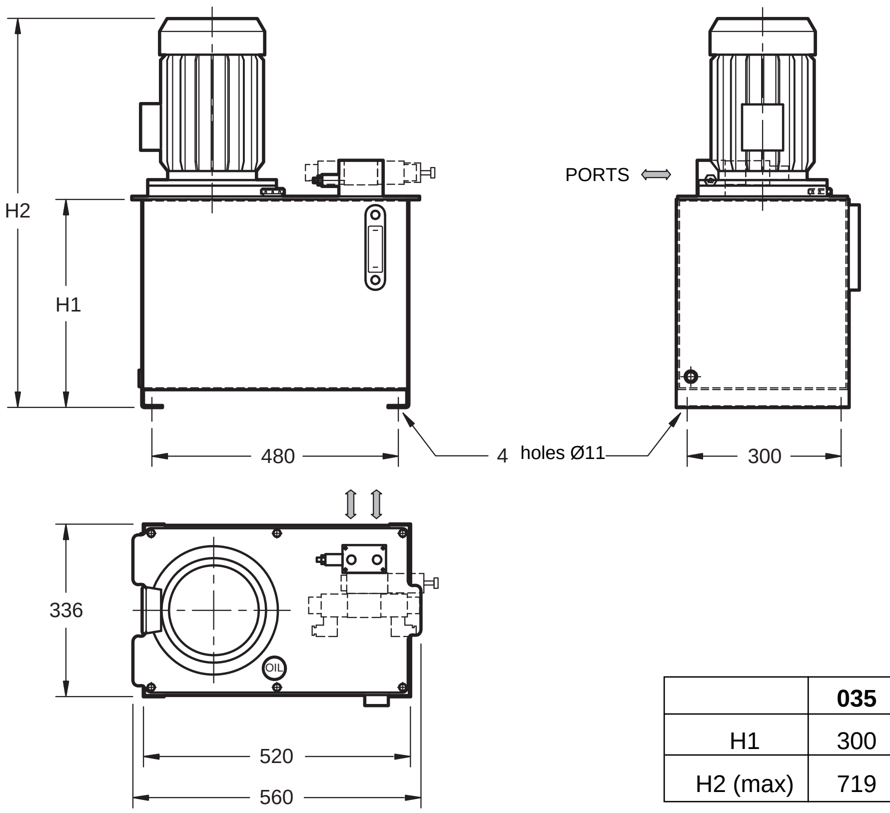
N = Dull black RAL 9005 **standard)**
G = Grey RAL 7037
V = Green RAL 6011

Series No. (from 40 to 49 sizes and mounting dimensions does not change)

4.2 - Flowrate / pressure table

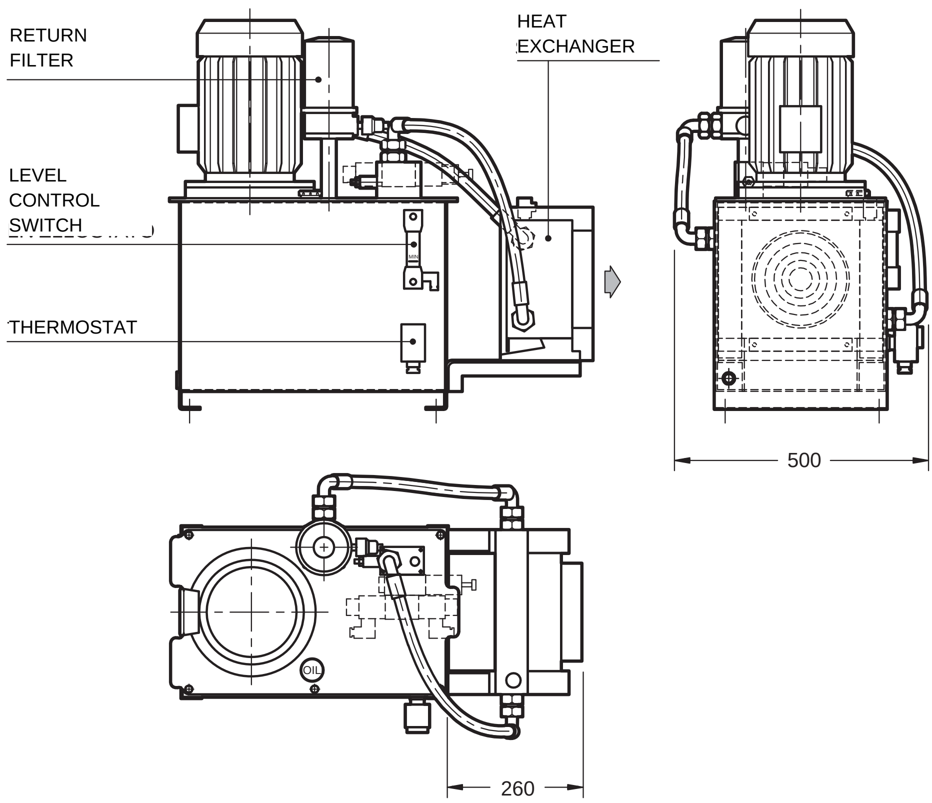
Electric motor flange size					Ø = 200				Ø = 250		
CTR3			Pump type	Flow rate at 1500 rpm [lt/min]	Electric motor power [kW]						
					0,55	**0,75**	**1,1**	**1,5**	**2,2**	**3**	**4**
					max pressure [bar]						
075	050	035	GP1-0013	**2,0**	145	195	-	-	-	-	-
			0020	**3,0**	90	120	160	-	-	-	-
			0027	**4,0**	75	100	130	200	-	-	-
			0034	**5,1**	60	80	110	160	-	-	-
			0041	**6,1 ***	45	60	80	120	185	-	-
			0051	**7,6 ***	35	50	65	105	150	200	-
			0061	**9,1**	30	40	55	85	125	170	-
			0074	**11,1 ***	25	30	45	65	100	140	180
			0091	**13,6**	20	25	40	55	85	115	150
			0108	**15,7**	15	20	35	50	70	95	130
			GP2-0113	**16,9 ***	10	15	30	45	65	90	120
			0140	**21,0 ***	-	10	25	35	55	75	100
			0158	**23,7**	-	-	20	30	45	65	85
			0178	**26,7 ***	-	-	15	25	40	55	75
			0208	**31,2**	-	-	10	20	35	50	65
			0234	**35,1 ***	-	-	-	15	30	45	60
			0279	**41,8**	-	-	-	10	25	35	50

4.3 - Overall and mounting dimensions for basic CTR3



	035	050	075
H1	300	405	550
H2 (max)	719	814	969

4.4 - CTR3 with optionals



5 - POWER UNITS CTR4

5.1 - Identification code

C T R 4 - [ ] / [ ] [ ] [ ] / [ ] - [ ] / [ ] [ ] [ ] [ ] [ ] [ ] / 40

power unit with soaked pump

Cover size

Tank capacity
100 = 100 dm^3
120 = 120 dm^3
150 = 150 dm^3

Electric motor B5 shape
P = Predisposition for motor assembly
M = Mounted electric motor

4-poles power electric motor:
2.2 = 2.2 kW
3 = 3 kW
4 = 4 kW
5.5 = 5.5 kW
7.5 = 7.5 kW
9 = 9 kW

Electric motor voltage
(omit for P version)
A = 230/400V / 50/60 Hz

Pump type :
GP1 **GP2**
(see cat. 11 100 for the pumps technical characteristics)

Flowrate pump (l/min) at 1500 rpm
(see flowrate / pressure table)

Standard panel with rear ports G 3/8Ž
A = P2D-M* with 1 pos. ISO 4401-03 (CETOP 03)
B = P2T -M* with 2 pos. ISO 4401-03 (CETOP 03)

P2X*M multi-station manifold ISO 4401-03 (CETOP 03) to use with GP2 pumps (rear ports G 1/2Ž)
C2 = 2 positions **C4** = 4 positions **C6** = 6 positions

0 = without level gauge
1 = with level gauge

0 = without thermostat
1 = with thermostat

Return filter:
0 = without filter
1 = filter with visual indicator
2 = filter with electric indicator

Heat exchanger:
0 = without exchanger
1 = oil/water exchanger 2010K
2 = oil/water exchanger 2020K

N = Dull black RAL 9005 **(standard)**
G = Grey RAL 7037
V = Green RAL 6011

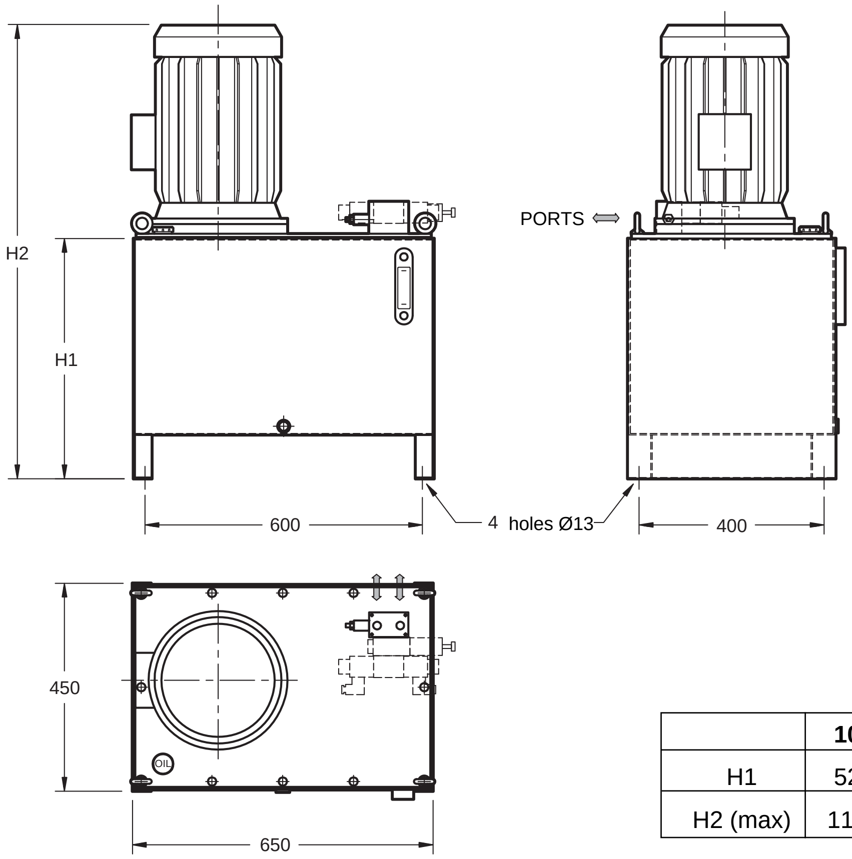
Series No. (from 40 to 49 sizes and mounting dimensions does not change)

5.2 - Flowrate / pressure table

Electric motor flange size					Ø = 250			Ø = 300		
CTR4			Pump type	Flow rate at 1500 rpm [lt/min]	Electric motor power [kW]					
					2,2	**3**	**4**	**5,5**	**7,5**	**9**
					max pressure [bar]					
150	120	100	GP1-0041	**6,1**	185	-	-	-	-	-
			0051	**7,6**	150	200	-	-	-	-
			0061	**9,1**	125	170	-	-	-	-
			0074	**11,1**	100	140	180	-	-	-
			0091	**13,6**	85	115	150	-	-	-
			GP2-095	**14,2 ***	80	110	145	200	-	-
			0113	**16,9 ***	65	90	120	170	-	-
			0140	**21 ***	55	75	100	135	185	-
			0158	**23,7 ***	45	65	85	120	165	-
			0178	**26,7 ***	40	55	75	105	145	-
			0208	**31,2 ***	35	50	65	90	125	150
			0234	**35,1 ***	30	45	60	80	110	130
			0279	**41,8**	25	35	50	70	95	110

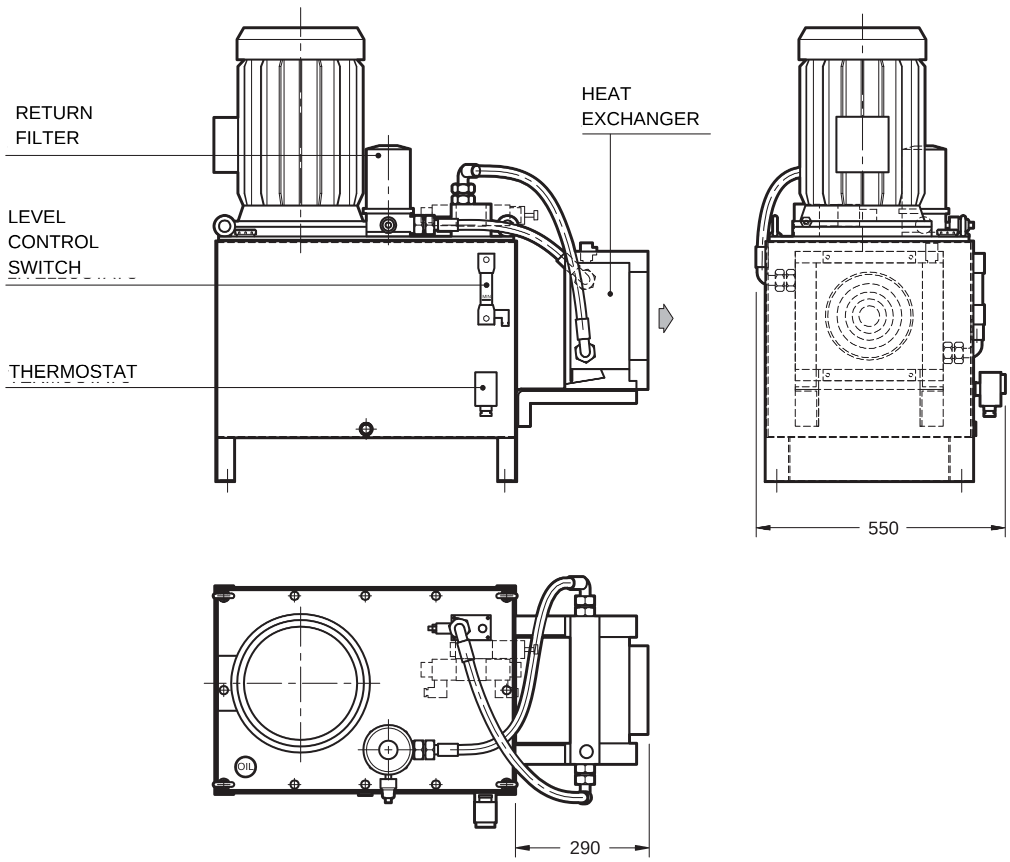
* pumps for preferential choice

5.3 - Overall and mounting dimensions for CTR4-P2



	100	120	150
H1	520	590	690
H2 (max)	1117	1187	1287

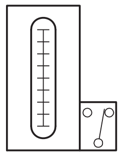
5.4 - Overall and mounting dimensions for CTR4-P2X*M

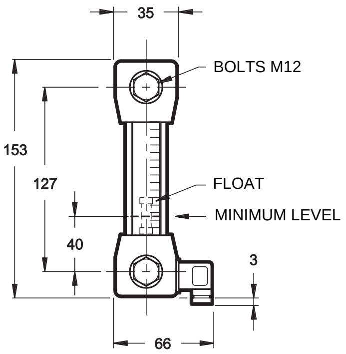


6 - ACCESSORIES

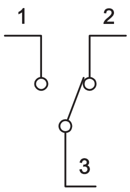
6.1 - Level gauge LV/E1-127-M12-SC cod. 0770764

Maximum pressure	bar	1
Working temperature	°C	-20 / +70
Transparent tube material	/	Nylon + glass 35%
Seals material	/	NBR
Reed in exchange	/	1A, 20W, 20VA, 200V

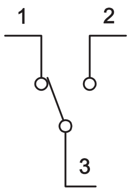




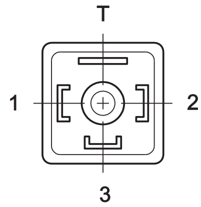
ELECTRIC DIAGRAM
(WITH FLUID)



ELECTRIC DIAGRAM
(WITHOUT FLUID)

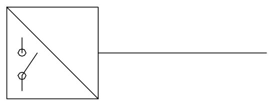


CONNECTOR CE DIN 40050
IP65 PG7

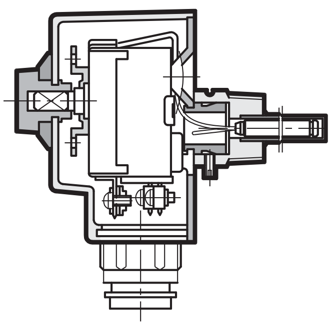


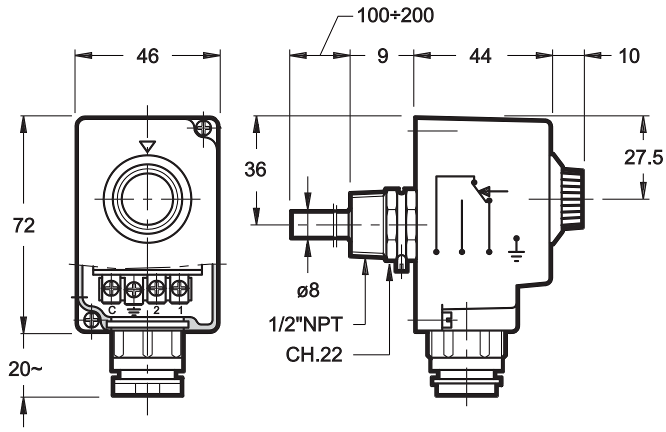
6.2 - Thermostat TC2 cod. 0630285

External sensor temperature range	°C	0/90
Degree of protection	/	IP40
Contacts	A	10
Max. voltage	V AC	250
Max. working temperature	°C	50
Cable guide	/	PG9
Housing material	/	Plastic
Contacts material	/	Silver
Capillary material	/	Copper
Pocket material	/	Brass
Mass	Kg	0.3



6.2.1 - Overall dimensions





6.3 - FRC return line filter for tank top or line mounting cod. 3951600004

6.3.1 - Technical data

Filter code	BSP port dimensions	Mass [kg]	Rated flow (indicative) [l/min] P25L
FRC-TB034	3/4Ž	1,6	75

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

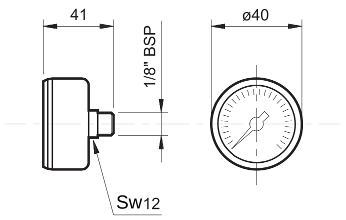
NOTE 1: The flow rate stated in the table correspond to a 0.5 bar pressure drop measured with mineral oil of viscosity 36 cSt at 50°C.
As for a different viscosity range, see the catalogue 95160.

For further detailed informations and overall dimensions please consult the catalogue 95160.

6.3.2 - Clogging indicators

The filters are all designed to incorporate clogging indicators, which have to be ordered separately.

1 - VR/10 Visual indicator for return filters
Identification code: 3959000003



This indicator is a pressure gauge sensitive to the filter input pressure.

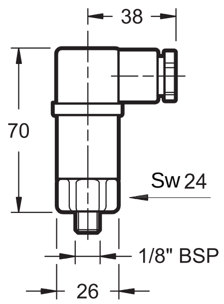
The indicator is supplied with a 0 ÷ 6 bar graduated scale and with a two-colour reading scale, which informs you about the clogging condition of the filter element:

GREEN: efficient filter element (0 ÷ 1.7 bar)
RED: the filter element has to be replaced (> 1.7 bar)

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	

2 - ER/11 Electric indicator for return filters
Identification code: 3959000016



This indicator is a pressure switch sensitive to the filter input pressure, which switches 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).

6.4 - Heat Exchanger oil/water with fixed blowing air flow .

6.4.1 - Technical data

		2010K	2020K
Code		**0713268**	**0712078**
Operating pressure	bar	20	
Test pressure	bar	35	
Maximum operating pressure	°C	120	
Air Flow	m^3/h	190	645
Capacity	litre	0,3	0,7
Three-phase supply voltage	V	230 - 400	
Frequency	Hz	50 / 60	
Rpm	kW	0,045	0,068
Thermostat regulation field	°C	40 - 28	50 - 38
Oil threaded inlet / outlet connections	-	1/2Ž BSP	1Ž BSP
Mass	kg	6	8
IP protection degree		IP54	IP44

CLEANING AND MAINTENANCE

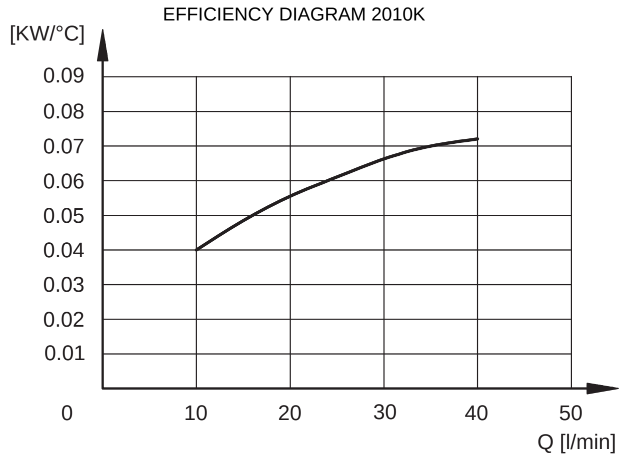
As a general rule verify that the voltage supply correspond to those shown on the plate.

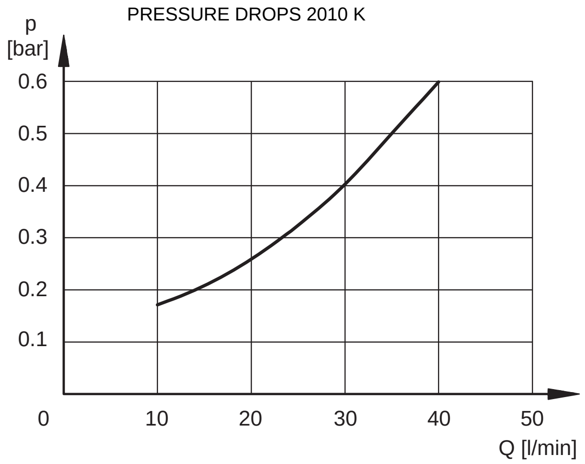
Cleaning oil side: The exchanger must be dismounted. Dirt can be removed by a detergent product as perchloride, in the opposite direction to normal. At the end it must be washed out with hot water.

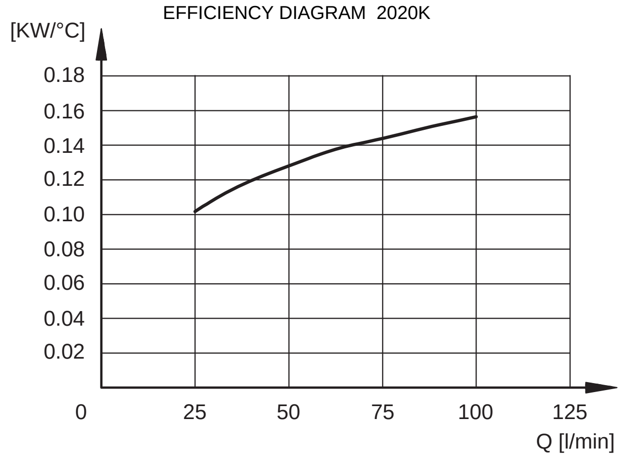
Cleaning air side: This can be done means of compressed air or water. The direction of the jet must be parallel to the fins, to avoid damaging them. If the dirt is oil or greasy it must be cleaned by a jet of steam or hot water.

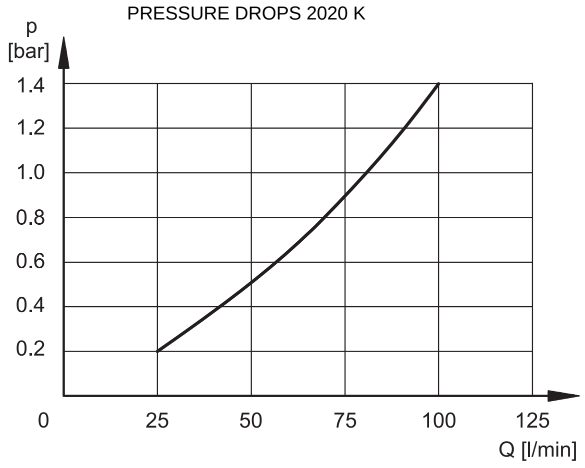
The electric motor must be protected during the cleaning operation.

6.4.2 - Characteristics



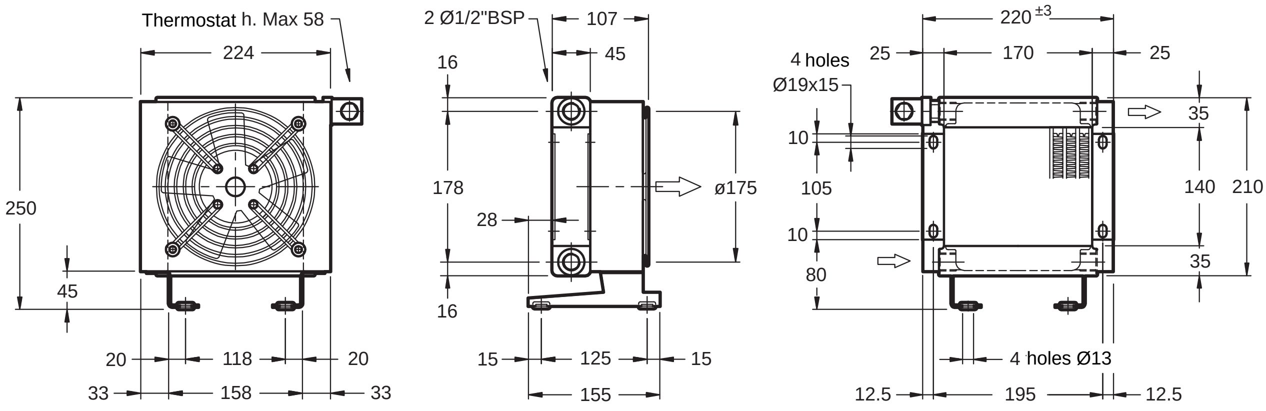




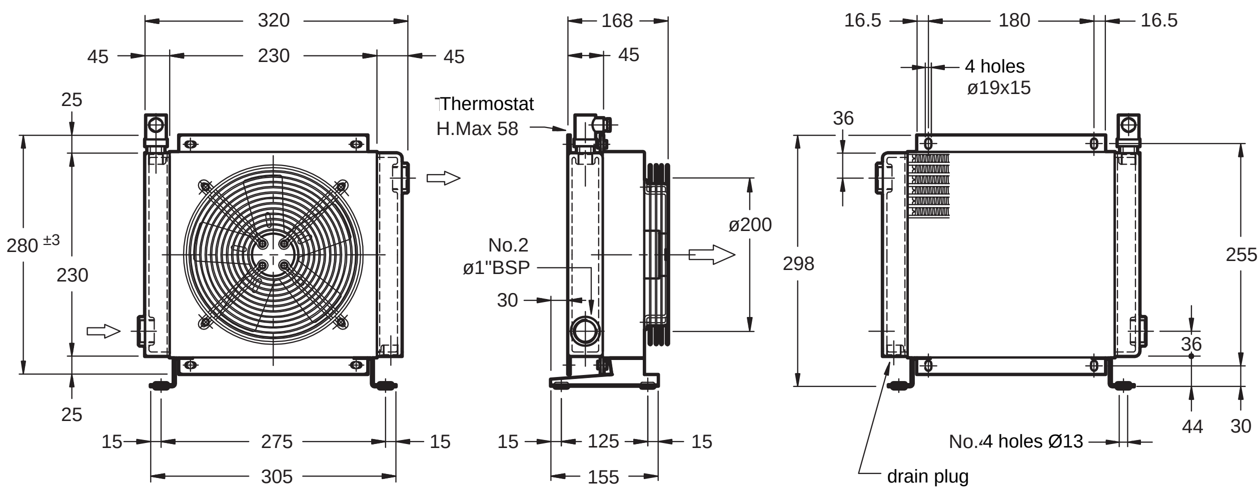


6.4.3 - Overall dimensions

HEAT EXCHANGER 2010 K



HEAT EXCHANGER 2020 K



DUPLOMATIC OLEODINAMICA

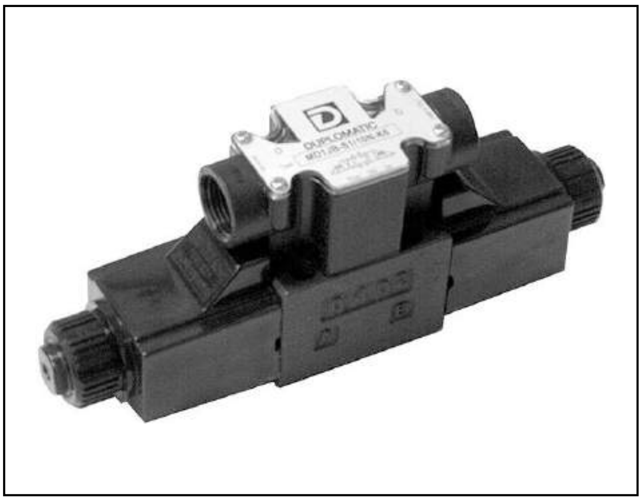
DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

MD1JB

SOLENOID OPERATED DIRECTIONAL CONTROL VALVES

ALTERNATING CURRENT

SERIES 10

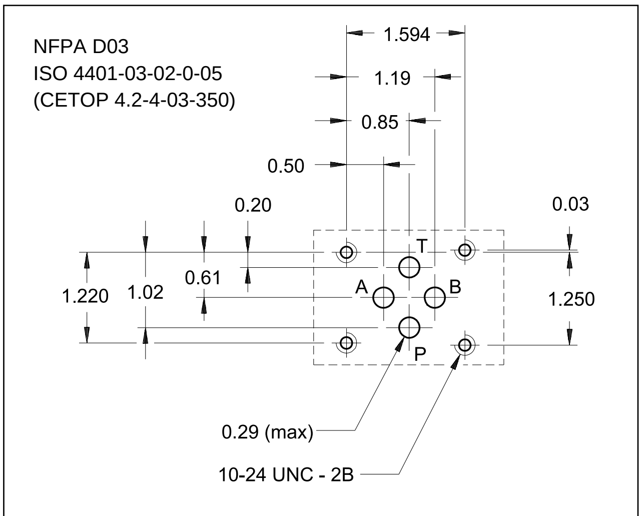


NFPA D03 (ISO 4401-03 /CETOP 03)

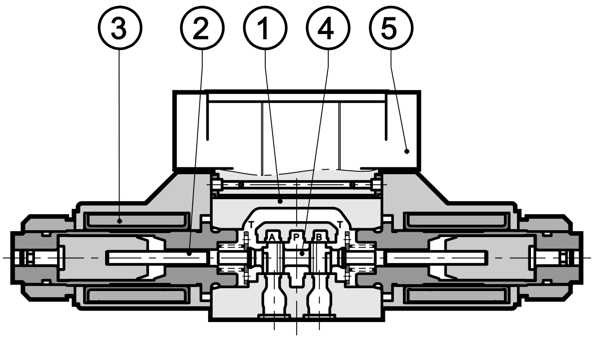
p max **5000** psi

Q max **18** GPM

MOUNTING INTERFACE



OPERATING PRINCIPLE



- Direct acting, subplate mounting directional control valve, with mounting surface according to NFPA D03 standard.
- The valve body (1) is made with high strength iron castings provided with wide internal passages in order to minimize the flow pressure drop. Wet armature solenoids (2) with easily removable interchangeable coils (3) are used (for further information on solenoids see par. 7). It is supplied with junction box (5) for the electrical connection.
- The valve is supplied with 3 or 4 way designs and with several interchangeable spools (4) with different porting arrangements.
- The valve is available with AC solenoids.

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

Maximum operating pressure Ports P - A - B Port T	psi	5000 2000
Maximum flow rate	GPM	18
Pressure drop p-Q	see paragraph 4	
Operating limits	see paragraph 6	
Electrical features	see paragraph 7	
Electrical connections	junction box	
Ambient temperature range	°F	-4 / +125
Fluid temperature range	°F	-4 / +175
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 solenoide valve	lbs	4.4 3.3

1 - IDENTIFICATION CODE

M	D	1	JB	-		/	10		-		K6

Solenoid operated directional control valve

NFPA D03 size

Junction box

Configuration and spool type (see par. 3)

Coil electrical connection: 2 pins for junction box

Coil type

A120-60 = 110/120 V - 60 Hz
A240-60 = 220/240 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 from10 to 19)

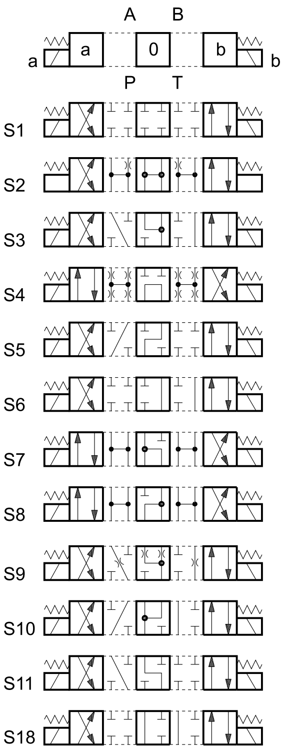
2 - HYDRAULIC FLUIDS

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.

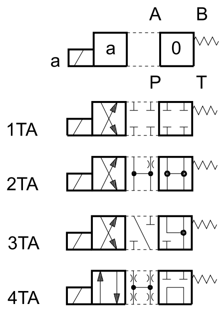
Using fluids at temperatures higher than 175 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

3 - CONFIGURATIONS

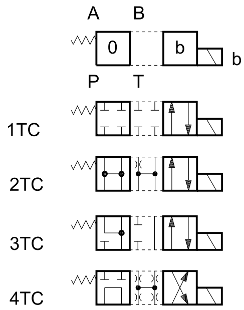
Type **S**:
3 positions with spring centering



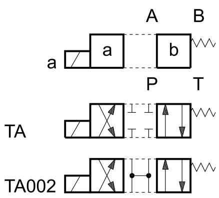
Type ***TA**:
2 positions with return spring



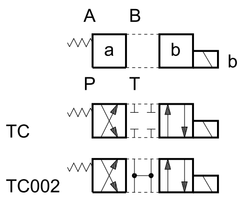
Type ***TC**:
2 positions with return spring



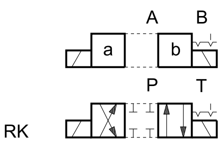
Type **TA**:
2 positions with return spring



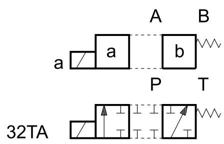
Type **TC**:
2 positions with return spring

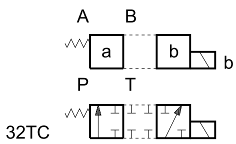


Type **RK**:
2 positions with mechanical retention



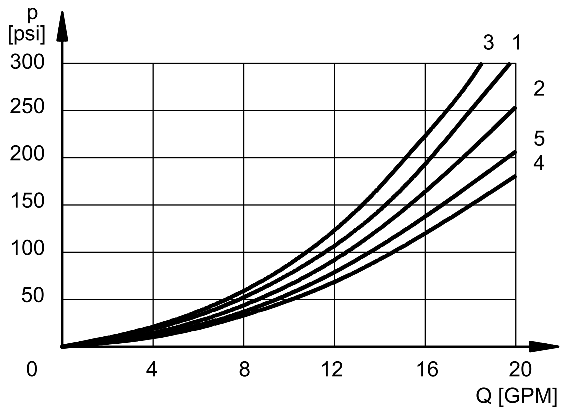
Model **32TA/32TC**:
3-way valve - 1 solenoid - 2 external position, return spring





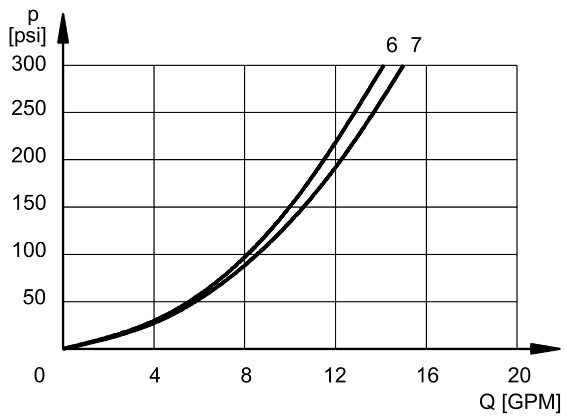
Besides the diagrams shown, which are the most frequently used, other special versions are available: consult our technical department for their identification, feasibility and operating limits.

4 - PRESSURE DROP Δp-Q (obtained with viscosity of 170 SSU at 120°F)



PRESSURE DROPS WITH VALVE ENERGIZED

SPOOL TYPE	FLOW DIRECTION			
	P-A	P-B	A-T	B-T
	CURVES ON GRAPH			
S1, 1TA, 1TC	1	1	2	2
S2, 2TA, 2TC	5	5	4	4
S3, 3TA, 3TC	1	1	4	4
S4, 4TA, 4TC	6	6	7	7
S5	1	5	2	2
S6	1	1	2	4
S7	5	6	7	7
S8	6	5	7	7
S9	1	1	2	2
S10	5	5	2	2
S11	1	1	4	2
S18	5	1	2	2
TA, TB	1	1	2	2
TA02, TB 02	1	1	2	2
32TA, 32TC	3	3		
RK	1	1	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					3*
S3, SA3, SB3			7 ■	7 ○	
S4, SA4, SB4					7
S5		7			
S6				7	
S7					7 ○
S8					7 ■
S9					
S10	7 ■	7 ○			
S11			7		
S18	7				

* A-B blocked ■ B blocked ○ A blocked

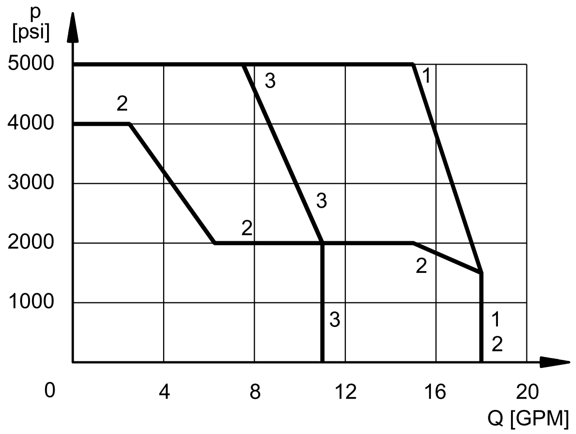
5 - SWITCHING TIMES

The values indicated refer to an S1 solenoid valve for Q=13 GPM, p=2,000 psi working with mineral oil at a temperature of 120 °F, a viscosity of 170 SSU and with PA and BT connections. The energizing times are obtained at the time the spool switches over. The de-energizing times are measured at the time pressure variation occurs on the line.

TIMES (±10%)	ENERGIZING	DE-ENERGIZING
AC solenoid	10 ÷ 25 ms	20 ÷ 40 ms

6 - OPERATING LIMITS

The curves define the flow rate operating fields according to the solenoid valve pressure with AC solenoids.
The values have been obtained with viscosity 170 SSU, temperature 120 °F, filtration 25 m and with solenoids at rated temperat ure and supplied with voltage equal to 90% of the nominal voltage.



SPOOL TYPE	CURVE	
	P-A	P-B
S1,1TA,1TC	1	1
S2, 2TA, 2TC	1	1
S3, 3TA, 3TC	2	2
S4, 4TA, 4TC	3	3
S5	1	1
S6	2	2
S7	3	3
S8	3	3

SPOOL TYPE	CURVE	
	P-A	P-B
S9	3	3
S10	1	1
S11	2	2
S18	1	1
TA, TC	1	1
TA02, TB02	1	1
32TA, 32TB	1	1
RK	1	1

The values indicated in the two graphs can be considerably reduced if a 4-way valve is used as a 3-way valve with port A or B plugged or without flow.
For valves having supply voltage of 120V-60Hz or 240V-60Hz performances may be slightly higher than the ones showed in the diagram.

7 - ELECTRICAL FEATURES

7.1 Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded onto 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 nut.
The interchangeability of coils of different voltages is allowed.

SUPPLY VOLTAGE FLUCTUATION	± 10% Vnom
MAX. SWITCH ON FREQUENCY	10.000 ins/hr
DUTY CYCLE	100%
Class of protection according to CEI EN 60529 Atmospheric agents Coil insulation Impregnation	 IP 65 class H class F

7.2 Current and absorbed power

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.

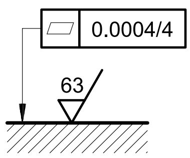
Coils (values ± 5%)

Type of coil	Frequency [Hz]	Nominal voltage [V]	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]	Code
C20.6-A120-60K6/10	60	110	27,5	1,8	0,36	198	39,6	1902820
		120		2	0,43	240	51,6	
C20.6-A240-60K6/10		220	110	0,86	0,17	189,2	37,4	1902821
		240		0,98	0,2	235,2	48	

8 - INSTALLATION

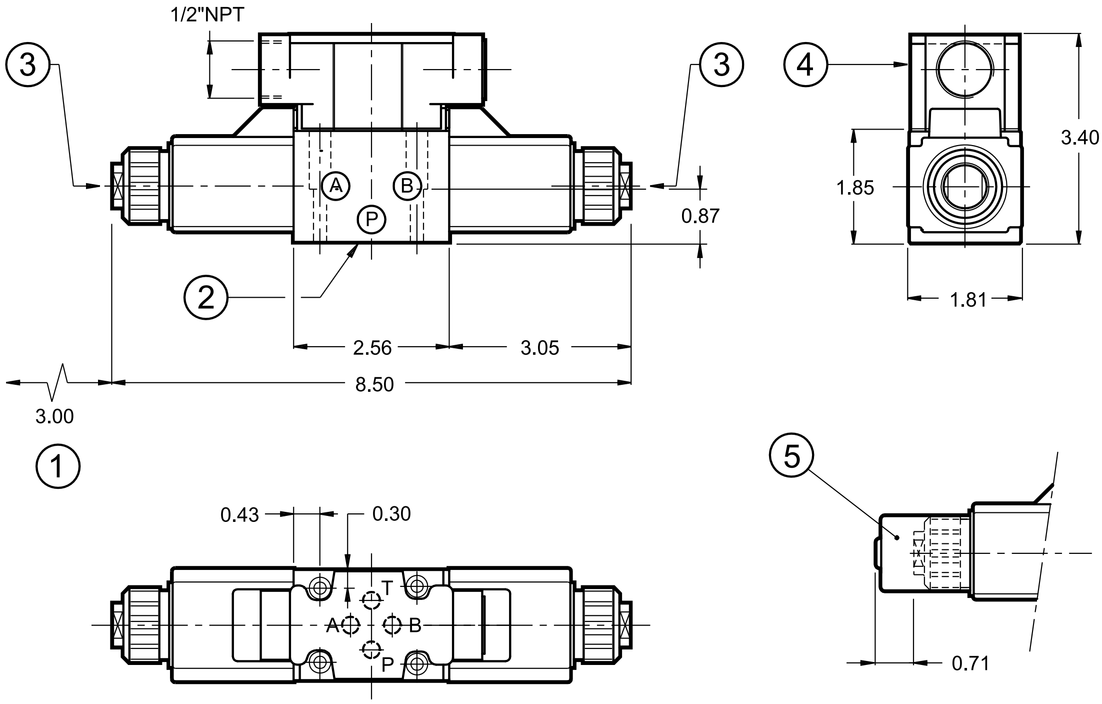
Configurations with centering and return springs can be mounted in any position; type RK valves - without a spring and with mechanical retention - must be mounted with the longitudinal axis horizontal. Valve fitting takes place by means of screws or tie rods, laying the valve on a lapped surface, with 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. For use in tropical climates, it is necessary to include the CM option.

Surface finishing

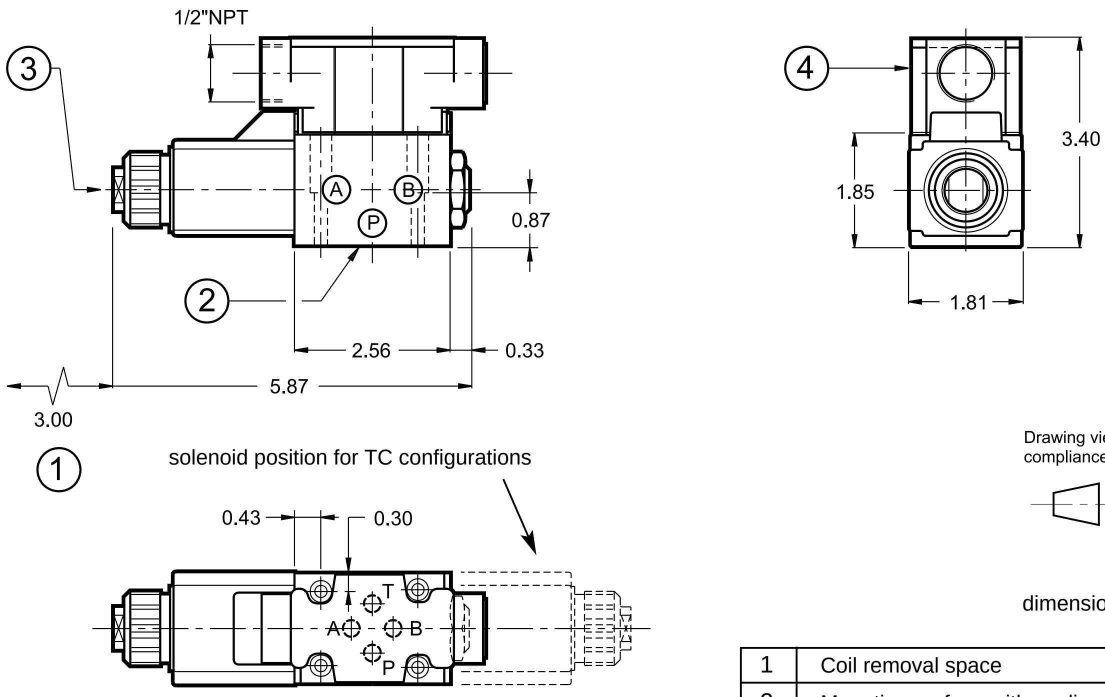


9 - OVERALL AND MOUNTING DIMENSIONS

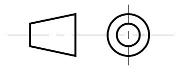
MD1JB - S
MD1JB - RK



MD1JB - TA



Drawing view in compliance with ISO 128

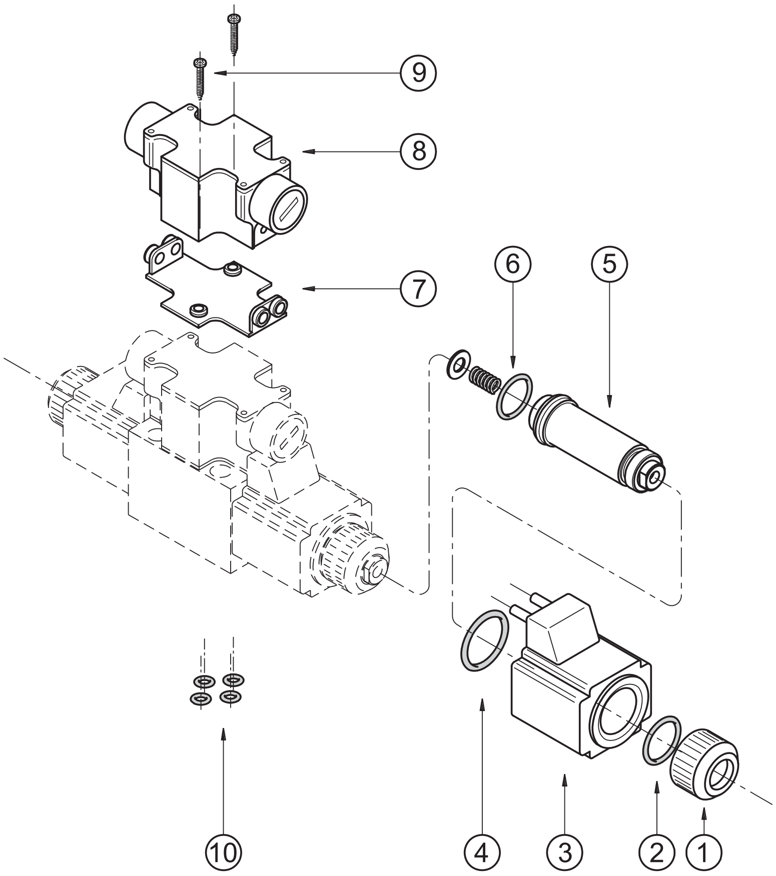


dimensions in inches

1	Coil removal space
2	Mounting surface with sealing rings
3	Manual override
4	Junction box
5	CM manual override, boot protected

See par. 10 and 11 for sealing rings and fastening bolts

10 - SPARE PARTS



1	Coil locking ring - code 0119333
2	O-Ring type 2-019 (2081) - 70 shore
3	Coil (see identification code on the side)
4	2 O-Ring type 3-910 - 70 shore
5	Solenoid tubes: TA20.6-M18/10N (NBR seals) TA20.6-M18/10V (FPM seals) **NOTE**: the tube is supplied with O-Ring rif. 7
6	O-Ring type 2-016 (2062) - 70 shore
7	Seal for junction box cod. 0119407
8	Junction box: EJB3-D/10 (double solenoid valve) EJB3-SA/10 (single solenoid valve MD1JB-TA/10) EJB3-SB/10 (single solenoid valve MD1JB-TC/10)
9	2 bolts M3x25
10	4 O-Ring type 2-012 (2037) - 90 shore

COILS IDENTIFICATION CODE

C	20.6	-		K6	/	10

Supply voltage

A120-60 = 110/120 V - 60 Hz
A240-60 = 220/240 V - 60 Hz

Series no. (the overall and mounting dimensions remain unchanged from 10 to 19)

Coil electrical connection: 2 pins for junction box

SEALS KIT

The codes here below include O-Rings ref.2, 4, 6 and 10.

Cod. 1985408 NBR seals
Cod. 1985409 FPM (viton) seals

11 - FASTENING BOLTS

4 bolts type 10-24 UNC - 2Bx2
Tightening torque 53 lbs·inch

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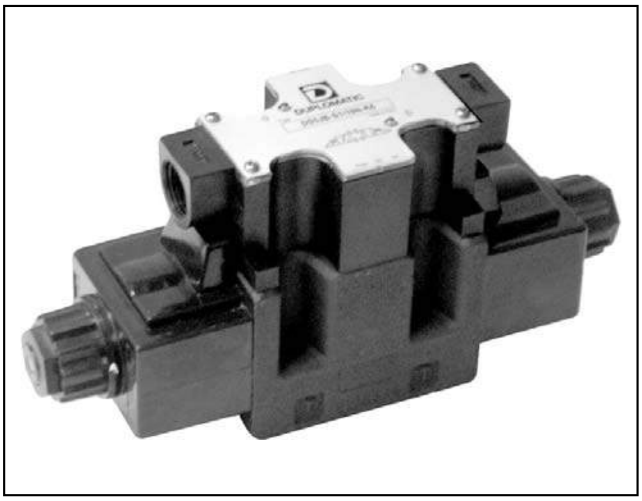
DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

UNIVERSAL HYDRAULICS INT'L LTD

9337 Ravenna Road, Unit G,
TWINSBURG, OHIO 44087
Phone +330-405-1800 - Fax +330-405-1801
E-mail: duplomatic@uhiltd.com



DS5JB

SOLENOID OPERATED DIRECTIONAL CONTROL VALVE

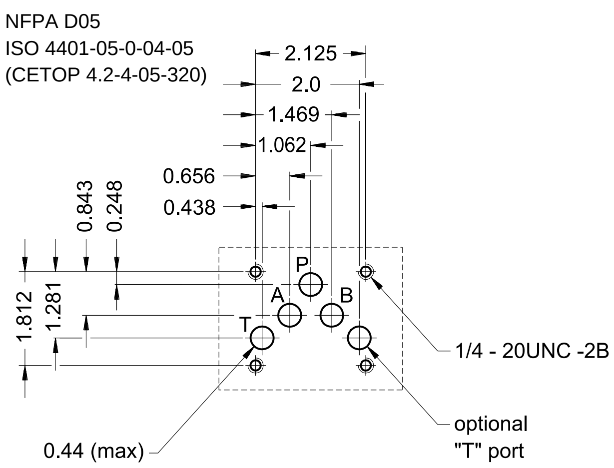
ALTERNATING CURRENT SERIES 10

NFPA D05 (ISO 4401-05 / CETOP 05)

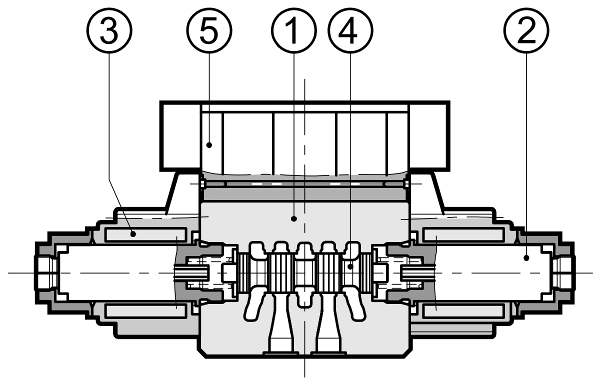
p max **4600** psi

Q max **32** GPM

MOUNTING INTERFACE



OPERATING PRINCIPLE



- Direct acting, subplate mounting directional control valve, with mounting surface according to NFPA D05 standard.
  - The valve body (1) is made with high strength iron castings provided with wide internal passages in order to minimize the flow pressure drop. Wet armature solenoids (2) with easily removable interchangeable coils (3) are used (for further information on solenoids see par. 7). It is supplied with junction box (5) for the electrical connection.
  - The valve is supplied with 3 or 4 way designs and with several interchangeable spools (4) with different porting arrangements.
  - The valve is available with AC solenoids.

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

Maximum operating pressure Ports P - A - B Port T	psi	4600 2000
Maximum flow rate	GPM	32
Pressure drop p-Q	see paragraph 4	
Operating limits	see paragraph 6	
Electrical features	see paragraph 7	
Electrical connections	junction box	
Ambient temperature range	°F	-4 / +125
Fluid temperature range	°F	-4 / +175
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 solenoide valve	lbs	5.5 7.5

1 - IDENTIFICATION CODE

D	S	5	JB	-		/	10		-		K6

Solenoid operated directional control valve

NFPA D05 size

Junction box

Configuration and spool type (see par. 3)

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

A120-60 = 120 V - 60 Hz
A220-60 = 220 V - 60 Hz

Coil electrical connection:
2 pins for junction box

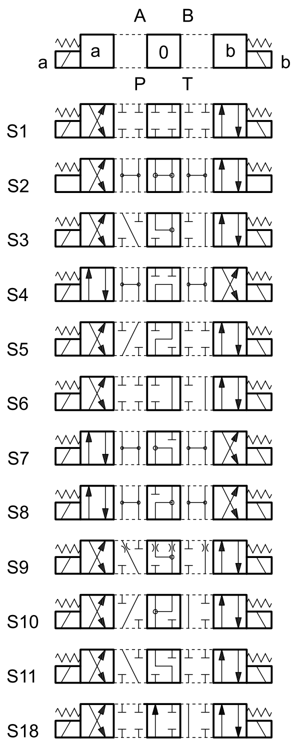
2 - HYDRAULIC FLUIDS

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.

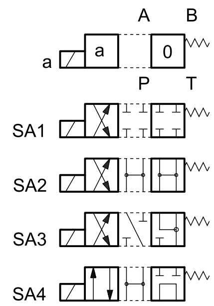
Using fluids at temperatures higher than 175 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

3 - CONFIGURATIONS

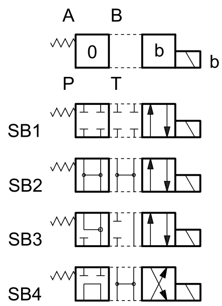
Type **S***:
2 solenoids - 3 positions
with spring centering



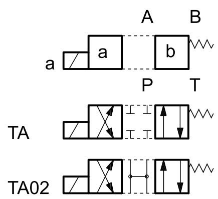
Type **SA***:
1 solenoid side A
2 positions (central + external)
with spring centering



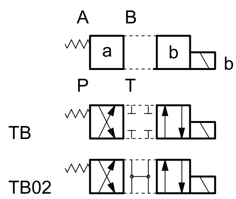
Type **SB***:
1 solenoid side B
2 positions (central + external)
with spring centering



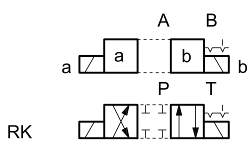
Type **TA**:
1 solenoid side A
2 external positions
with return spring



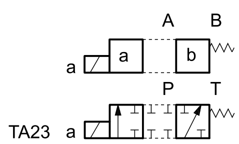
Type **TB**:
1 solenoid side B
2 external positions
with return spring

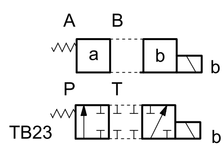


Type **RK**:
2 solenoids - 2 positions
with mechanical retention



Type **TA23 / TB23**
three-way valve - 1 solenoid - 2 external positions, return spring

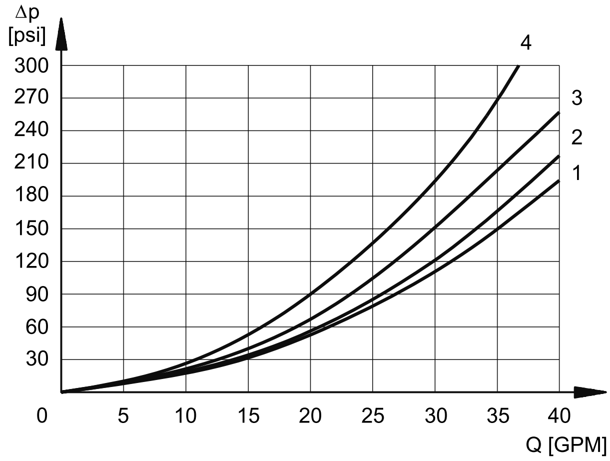




Note:Type TB23 corresponds to type 23TA of the old valve (D4D)

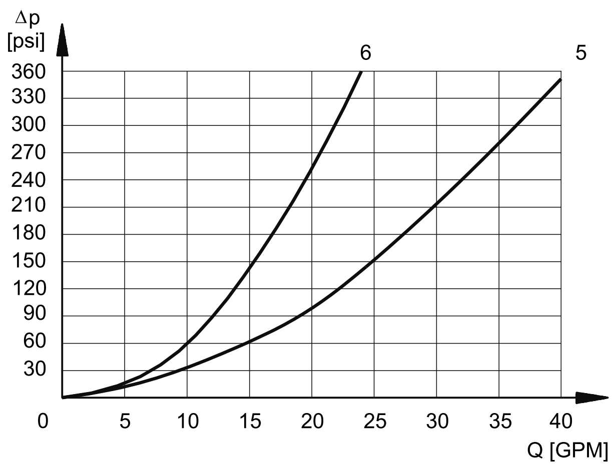
Besides the diagrams shown, which are the most frequently used, other special versions are available: consult our technical department for their identification, feasibility and operating limits.

4 - PRESSURE DROPS Δp-Q (obtained with viscosity 170 SSU at 120 °F)



PRESSURE DROPS WITH VALVE ENERGIZED

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	3	3	2	2
S7	1	1	2	2
S8	1	1	2	2
S9	3	3	2	2
S10	1	1	1	1
S11	3	3	2	2
S18	1	2	2	2
TA, TB	3	3	2	2
TA02, TB 02	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					5
S3, SA3, SB3			6	6	
S4, SA4, SB4					5
S5		3			
S6					
S7					
S8					
S9					
S10					
S11					
S18	3				

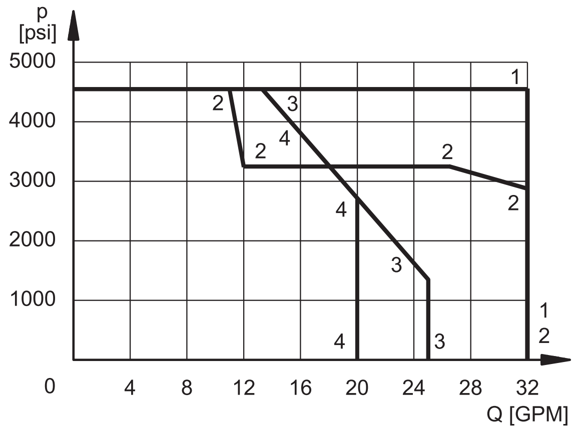
5 - SWITCHING TIMES

The values indicated are obtained according to ISO 6403 standard, with mineral oil viscosity 170 SSUat 120°F.

SOLENOID TYPE	TIMES	
	ENERGIZING	DE-ENERGIZING
AC	15 ÷ 25 ms	20 ÷ 50 ms

6 - OPERATING LIMITS

The curves define the flow rate operating fields according to the valve pressure with AC solenoids.
The value have been obtained accordind to ISO 6403, with mineral oil, viscosity 170 SSU, temperature 120 °F.



SPOOL TYPE	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	1	1
S6	2	1
S7	4	4
S8	4	4

SPOOL TYPE	CURVE	
	P-A	P-B
S9	2	2
S10	1	1
S11	1	2
S18	1	1
TA, TB	1	1
TA02, TB02	2	2
TA23, TB23	1	1
RK	1	1

NOTE: 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 a 3-way valve with port A or B plugged or without flow.

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.

SUPPLY VOLTAGE FLUNCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY	15.000 ins/hr
DUTY CYCLE	100%
Class of protection: Atmospheric agents (CEI EN 60529) Coil insulation (VDE 0580) Impregnation	 IP 65 (see note 2) 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

The table shows current and power consumption values at inrush and at holding, relevant to the different coil types for AC current.

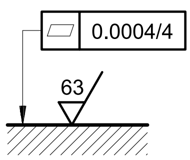
Coils (values ± 5%)

Type of coil	Frequency [Hz]	Nominal voltage [V]	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]	Code
C26-A120-60K6/10	60	120	9,65	4,5	0,88	540	105,6	1902840
C26-A220-60K6/10		220	29,6	2,5	0,46	550	101,2	1902841

8 - INSTALLATION

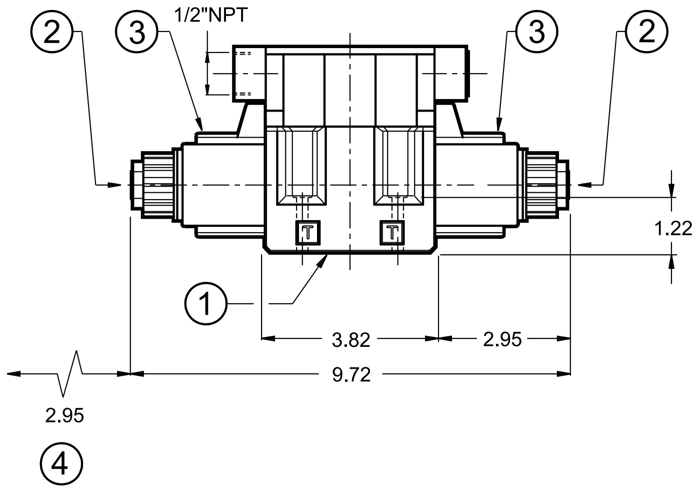
Configurations with centering and return springs can be mounted in any position; type RK valves - without springs and with mechanical detent - must be mounted with the longitudinal axis horizontal. Valve fixing is by means of screws or tie rods, with the valve mounted on a lapped surface, with values 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.

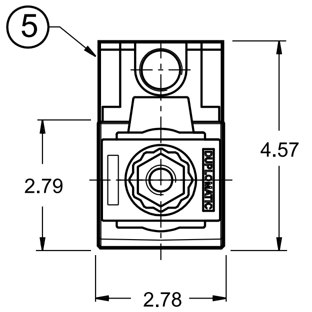
Surface finishing

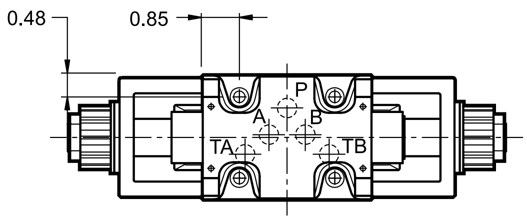


9 - OVERALL AND MOUNTING DIMENSIONS

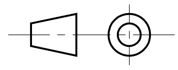
DS5JB - S*
DS5JB - RK



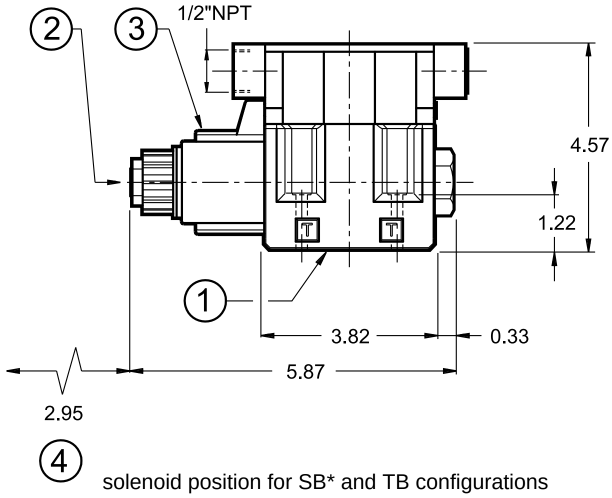


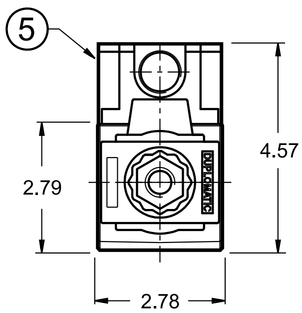


Drawing view in
compliance with ISO 128



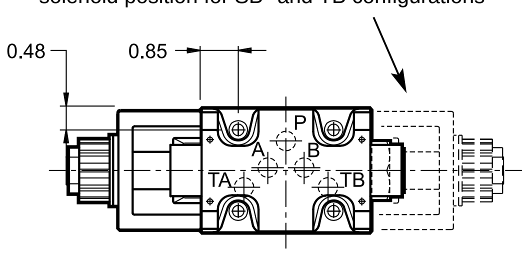
DS5JB - SA*
DS5JB - TA





dimensions in inches

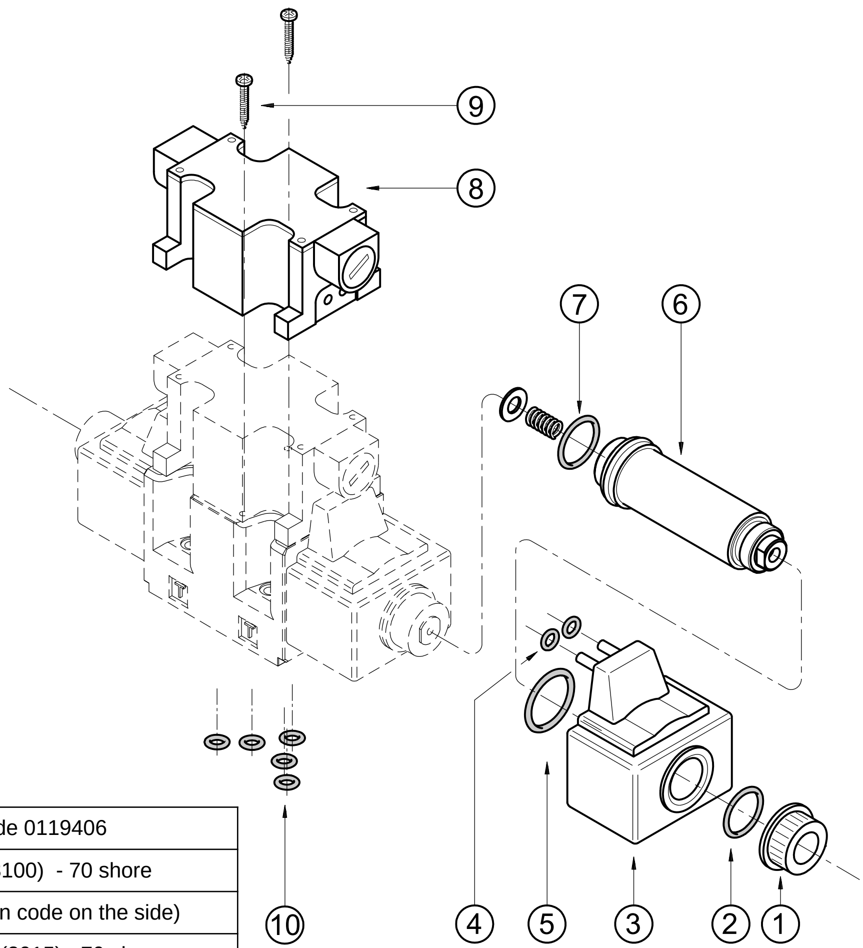
solenoid position for SB* and TB configurations



1	Mounting surface with sealing rings
2	Standard manual override included in the solenoid tube
3	Coil
4	Coil removal space
5	Junction box

See par. 10 and 11 for sealing rings and fastening bolts

10 - SPARE PARTS FOR AC SOLENOID VALVE



1	Coil locking ring - code 0119406
2	O-Ring type 2-120 (3100) - 70 shore
3	Coil (see identification code on the side)
4	2 O-Ring type 2-007 (2015) - 70 shore
5	O-Ring type 6-454 (ORM-0300-40) 70 shore
6	Solenoid tubes: TA26-M27/10N (NBR seals) TA26-M27/10V (FPM seals) **NOTE**: the tube is supplied with O-Ring rif. 7
7	2 O-Ring type 3-912 - 70 shore
8	Junction box: EJB5-D/10 (double solenoid valve) EJB5-S/10 (single solenoid valve)
9	2 bolts M3x35 (for single solenoid valve 1 bolt M3x35 + 1 bolt M3x6)
10	5 O-Ring type 2-014 (2050) - 90 shore

COILS IDENTIFICATION CODE

C	26	-		K6	/	10

Supply voltage

A120-60 = 120 V - 60 Hz
A220-60 = 220 V - 60 Hz

Coil electrical connection:
2 pins for junction box

Series no.: (the overall and mounting dimensions remain unchanged from10 to 19)

SEALS KIT

The codes here below include O-Rings ref. 2, 4, 6 and 10

Cod. 1984447 NBR seals
Cod. 1984448 FPM (viton) seals

11 - FASTENING BOLTS

4 bolts type 1/4-20 UNC-2Bx1 3/4 (12.9 class recommended)

Tightening torque 70 lbs·inch

DUPLOMATIC OLEODINAMICA

DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

UNIVERSAL HYDRAULICS INT•L LTD
9337 Ravenna Road, Unit G,
TWINSBURG, OHIO 44087
Phone +330-405-1800 - Fax +330-405-1801
E-mail: duplomatic@uhiltd.com