



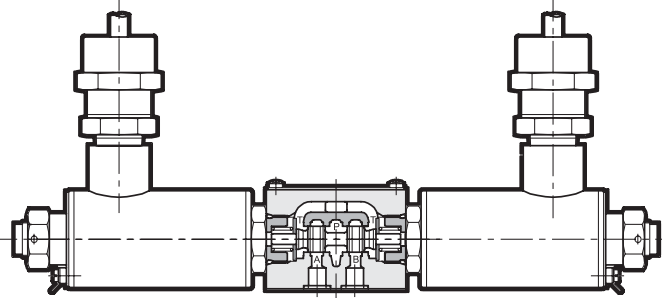
**EXPLOSION-PROOF VERSION
SOLENOID OPERATED
DIRECTIONAL CONTROL VALVES
in compliance with ATEX 94/9/CE
SERIES 21**

MD1K-MD1KD **ISO 4401-03 (CETOP 03)**
E4P4K-E4P4KD **CETOP P05**
E07P4K-E07P4KD **ISO 4401-07 (CETOP 07)**
E5P4K- E5P4KD **ISO 4401-08 (CETOP 08)**

p max (see table of performances)

Q max (see table of performances)

OPERATING PRINCIPLE



- The solenoid operated directional control valves are in compliance with ATEX 94/9/CE standards and are suitable for the use in potentially explosive atmospheres, that fall within either the ATEX II 2G for gas (K version) or the ATEX II 2D for dust (KD version) classification.
- Thanks to the solenoid special construction, these valves allow a safe operation on systems installed in a dangerous environment due to explosion risks (see par. 6.2 for electrical characteristics).
- These valves are direct operated type, ISO 4401-03 (CETOP 03) size and pilot operated type, CETOP P05, ISO 4401-07 (CETOP 07), ISO 4401-08 (CETOP 08). The piloted valve ISO 4401-10 (CETOP 10) can be supplied upon request.
- With the valve and the distributor the statement of conformity to the upmentioned standards is always supplied.

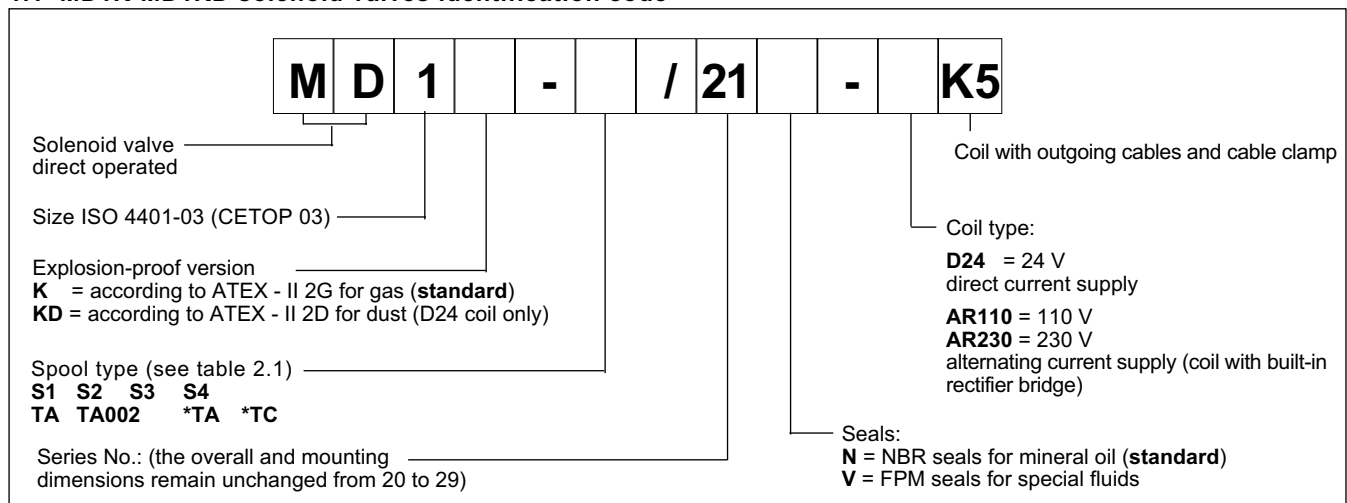
PERFORMANCES (with mineral oil of viscosity of 36 cSt at 50°C)

		MD1K MD1KD	E4P4K E4P4KD	E07P4K E07P4KD	E5P4K E5P4KD
Maximum operating pressure: P - A - B ports (standard) T port	bar	350 140	320 see operating limits at paragraph 4.4		
Maximum flow	l/min	see par. 4.2	150	300	600
Electrical feature		see paragraph 6			
Ambient temperature range	°C	-20 / +40			
Fluid temperature range	°C	-20 / +60			
Fluid viscosity range	cSt	10 ÷ 400			
Fluid contamination degree		According to ISO 4406:1999 class 20/18/15			
Recommended viscosity	cSt	25			
Mass: single solenoid valve double solenoid valve	kg	2,5 3,6	9 10,2	9,5 10,7	16 17,2

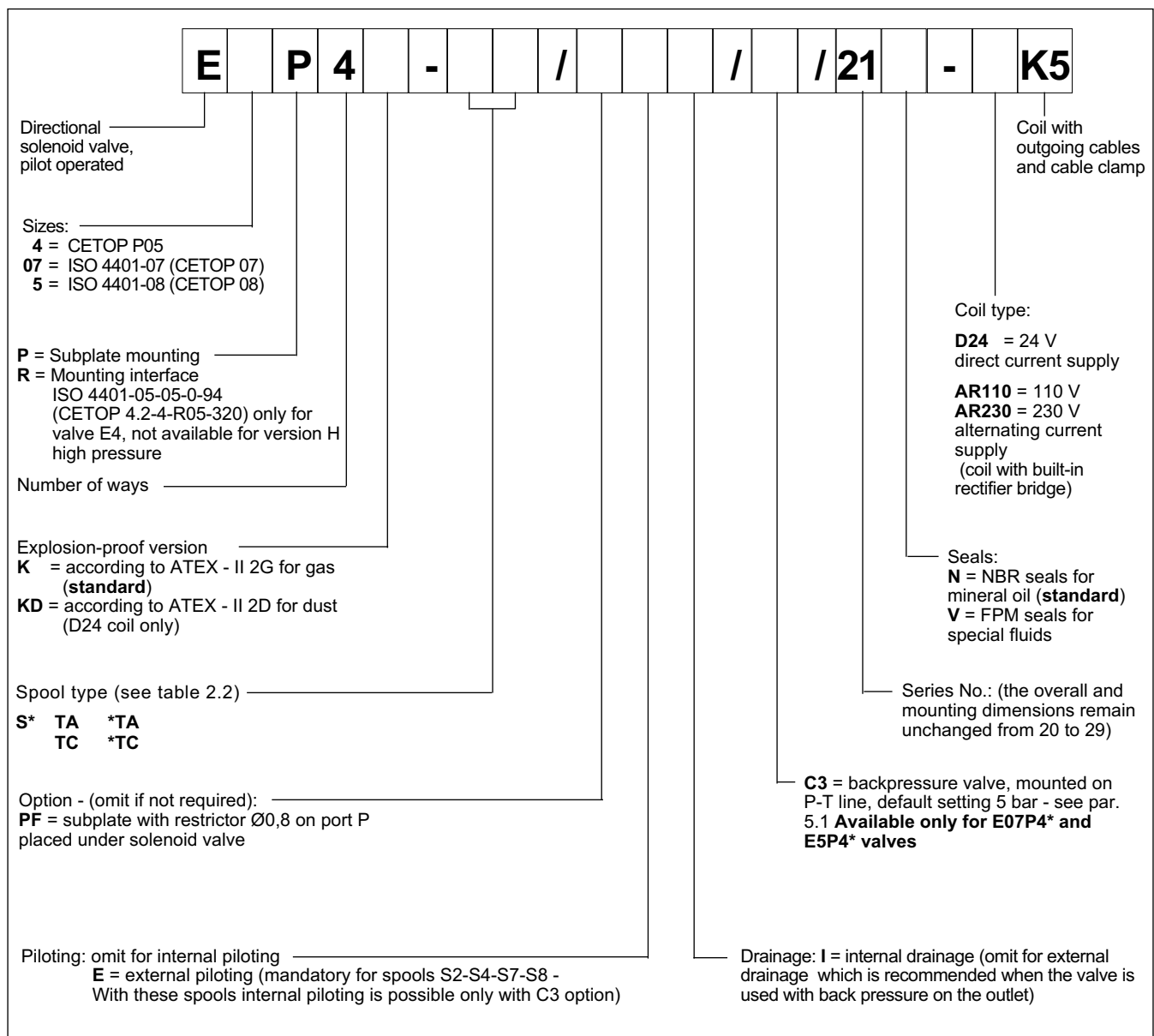


1 - IDENTIFICATION CODES

1.1 MD1K-MD1KD solenoid valves identification code



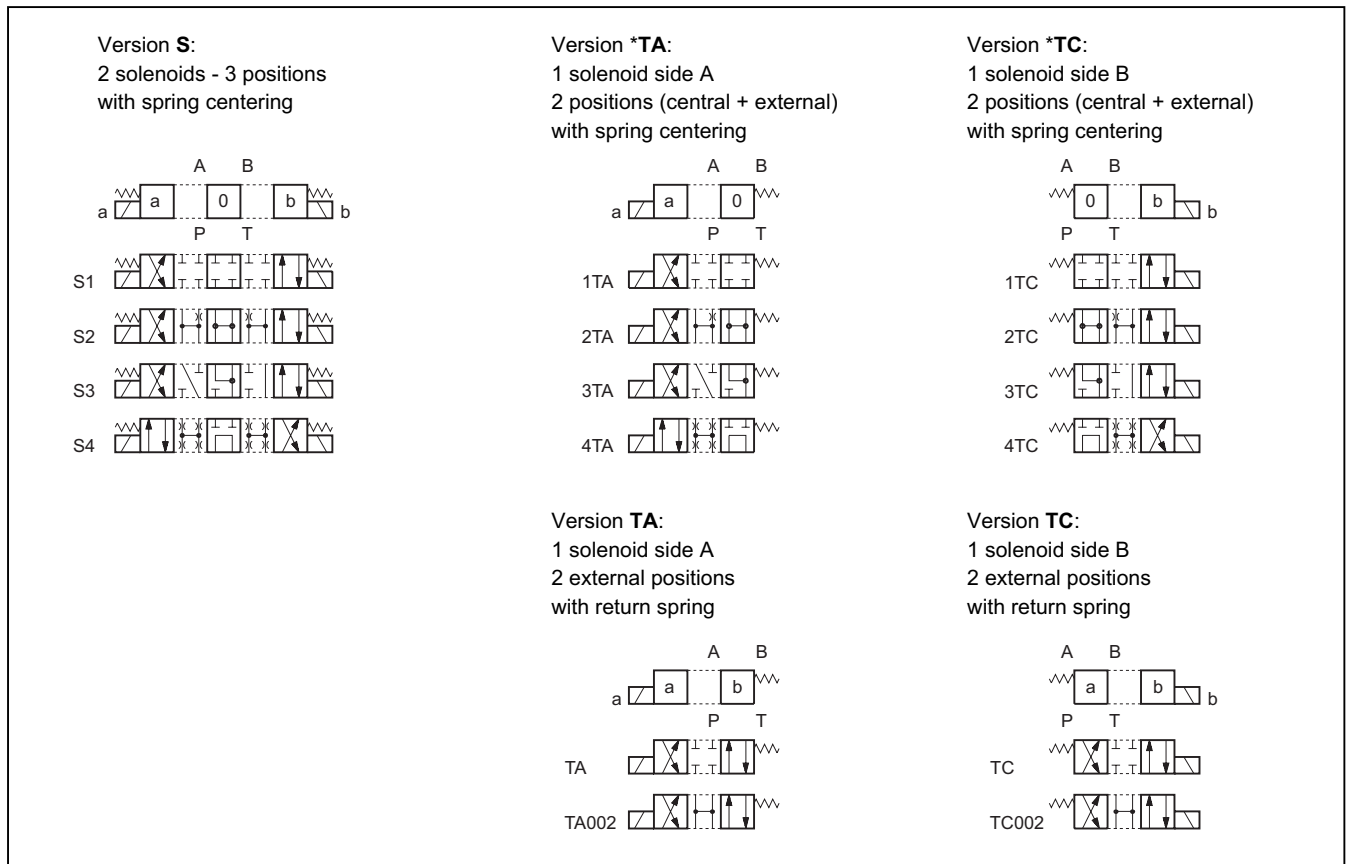
1.2 - E4P4K-E4P4KD, E07P4K-E07P4KD, E5P4K-E5P4KD pilot-solenoid valves



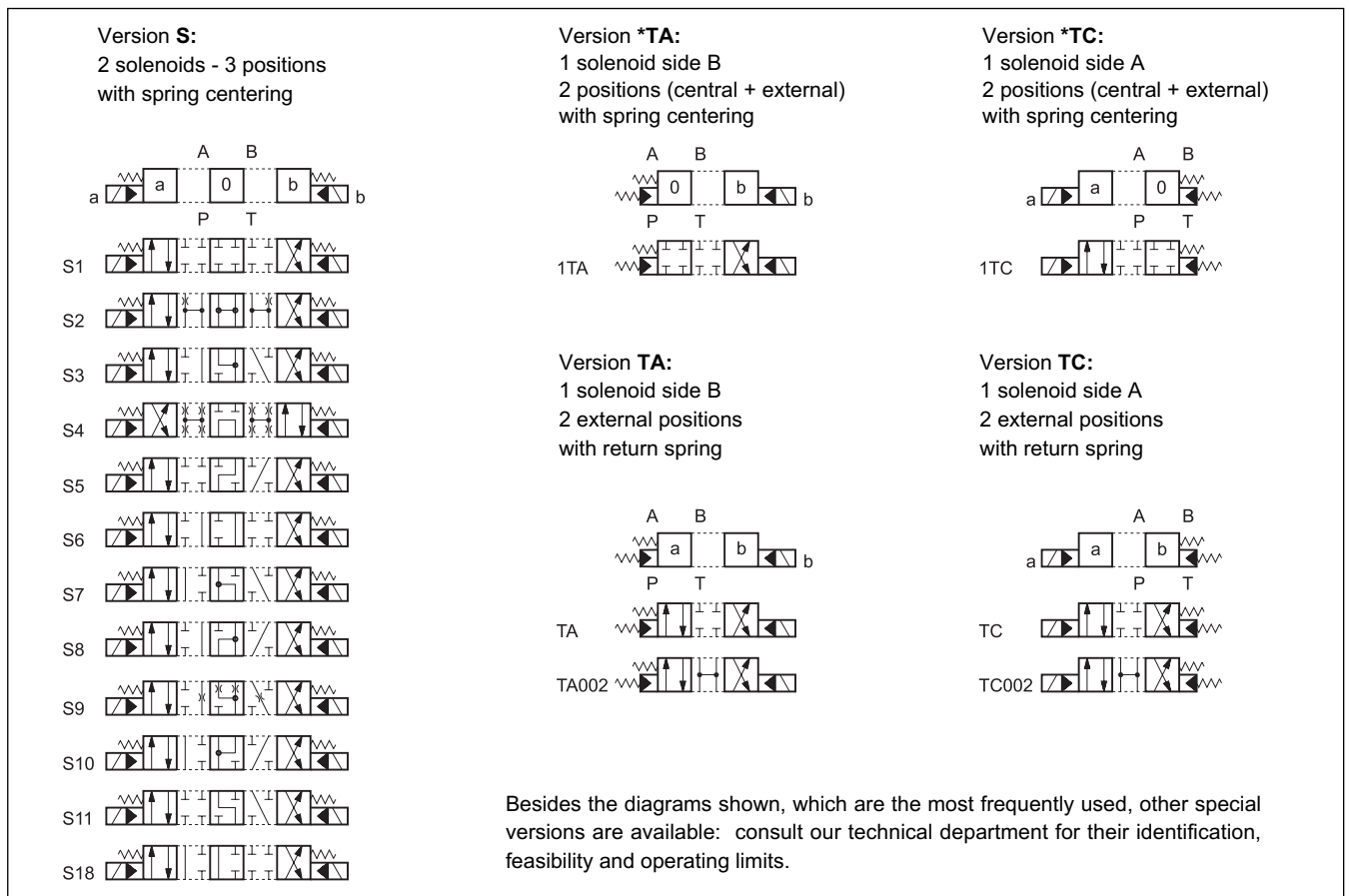


2 - SPOOL TYPES

2.1 - Spool types available for MD1K - MD1KD



2.2 - Spool types available for E4P4K - E4P4KD, E07P4K - E07P4KD, E5P4K - E5P4KD



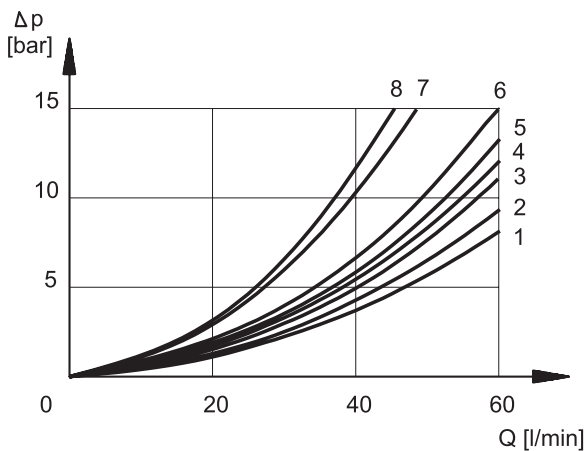


3 - HYDRAULIC FLUIDS

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 - PERFORMANCE CHARACTERISTICS (values obtained at viscosity 36 cSt at 50°C)

4.1 - Pressure drops Δp -Q MD1K- MD1KD

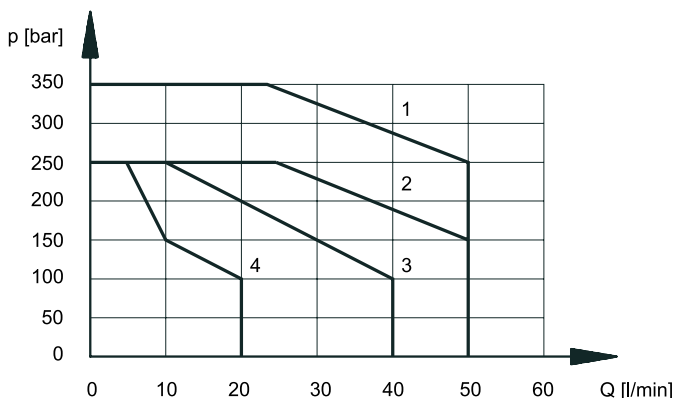


SPOOL	SPOOL POSITION	CONNECTIONS				
		P→A	P→B	A→T	B→T	P→T
CURVES ON GRAPH						
S1, 1TA, 1TC	energized	5	5	3	3	
S2, 2TA, 2TC	de-energized	2	2	1	1	6*
S3, 3TA, 3TC	de-energized	5	5	7*	7°	
S4, 4TA, 4TC	de-energized	8	8	7	7	7
TA, TC	energized	5	5	4	4	

* A-B locked °B locked °A locked

4.2 - Operating limits for MD1K - MD1KD

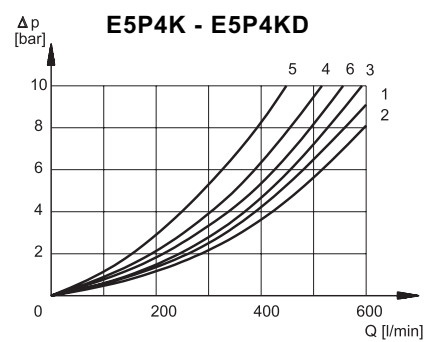
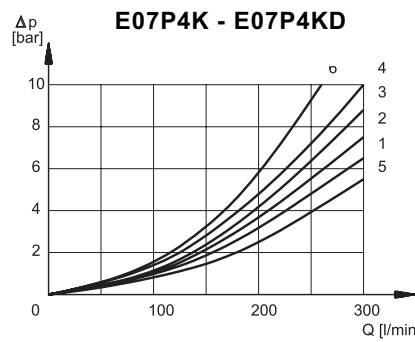
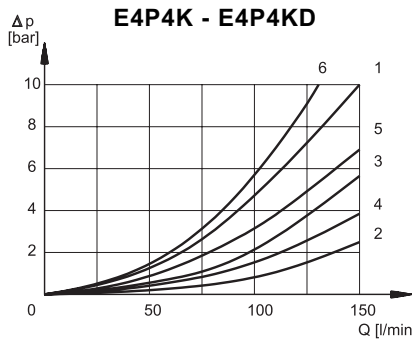
The curves define the flow rate operating fields according to the solenoid valve pressure. The values have been obtained with viscosity 36 cSt, temperature 50°C, filtration 25 µm and with solenoids at rated temperature, supplied with voltage equal to 90% of the nominal voltage.



CURVE	SPOOL TYPE
1	S1, 1TA, 1TC
2	TA, TC
3	S2, 2TA, 2TC
3	S4, 4TA, 4TC
4	S3, 3TA, 3TC



4.3 - Pressure drops Δp -Q for E4P4K - E4P4KD, E07P4K - E07P4KD, E5P4K - E5P4KD



SPOOL	SPOOL POSITION	E4P4K - E4P4KD				
		CONNECTIONS				
		P → A	P → B	A → T	B → T	P → T
S1	Energized	1	1	2	3	
S2	De-energized Energized	5	5	2	4	6*
S3	De-energized Energized	1	1	1° 2	1° 4	
S4	De-energized Energized	6	6	3	5	6
S5	De-energized Energized	1	1 5	2	3	
S6	De-energized Energized	1	1	2	1 4	
S7	De-energized Energized	6	6	3	5	6°
S8	De-energized Energized	6	6	6° 3	5	
S9	Energized	1	1	2	2	
S10	De-energized Energized	1° 5	1° 5	2	3	
S11	De-energized Energized	1	1	1 2	3	
S18	De-energized Energized	5 5	1	2	3	
TA	De-energized Energized	1	1	4	3	

E07P4K - E07P4KD					
CONNECTIONS					
P → A	P → B	A → T	B → T	P → T	
1	1	2	3		
5	5	1	2		6*
1	1	4° 1	4° 2		
6	6	3	4		6
1	4 5	2	3		
1	1	2	4 2		
6	6	3	4		6°
6	6	4	3		6°
1	1	2	3		
4° 5	4° 5	2	3		
1	1	3 1	3		
4 5	1	2	3		
1	1	2	3		

E5P4K - E5P4KD					
CONNECTIONS					
P → A	P → B	A → T	B → T	P → T	
1	1	2	3		
2	2	1	2		6*
1	1	4° 1	4° 2		
6	6	3	4		5
1	4 2	2	3		
1	1	2	4 2		
6	6	3	4		5°
6	6	4	3		5°
1	1	2	3		
4° 2	4° 2	2	3		
1	1	3 1	3		
4 2	1	2	3		
1	1	2	3		

* A-B blocked ● B blocked ° A blocked

4.4 - Operating limits for E4P4K - E4P4KD, E07P4K - E07P4KD, E5P4K - E5P4KD

PRESSURES [bar]		
	MIN	MAX
Piloting pressure	5	210
Pressure on line T with internal drainage	-	140
Pressure on line T with external drainage	-	250

MAXIMUM FLOW RATES [l/min]	E4P4K - E4P4KD		E07P4K - E07P4KD		E5P4K - E5P4KD	
	PRESSURES					
Spool type	210 bar	320 bar	210 bar	320 bar	210 bar	320 bar
S4, S7, S8	120	100	250	200	500	450
All other spools	150	120	300	250	600	500



4.5 Switching times

The values indicated refer to a solenoid valve S1 configuration with Q = 25 l/min, p = 150 bar and with PA and BT connections. The switch on and off times are obtained at the time a pressure variation occurs on the line.

TIMES (±10%)	ENERGIZING	DE-ENERGIZING
MD1K - MD1KD	100 ms	80 ms

The values indicated refer to a solenoid operated directional control valve operating with piloting pressure = 100 bar and with PA and BT connections.

The switch on and off times are obtained at the time a pressure variation occurs on the line.

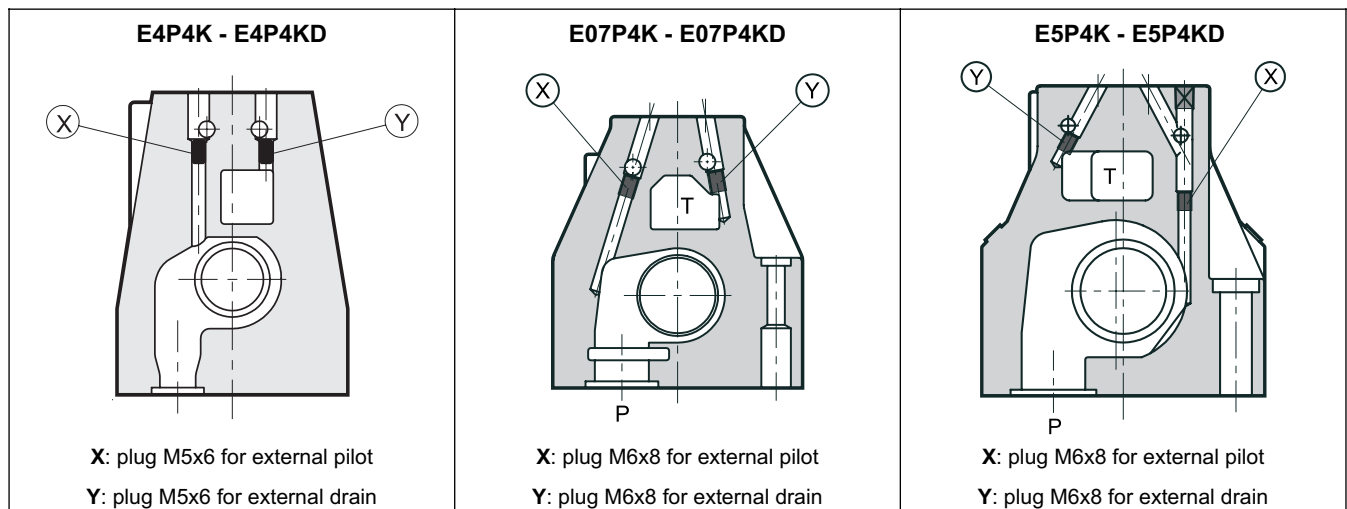
TIMES (± 10%) [ms]	ENERGIZING		DE-ENERGIZING	
	2 Pos.	3 Pos.	2 Pos.	3 Pos.
E4P4K - E4P4KD	70	60	70	50
E07P4K - E07P4KD	70	60	80	50
E5P4K - E5P4KD	80	60	90	60

5 - PILOTING AND DRAINAGE

The E*P4K and E*P4KD 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	
E*P4*~**	INTERNAL PILOT AND EXTERNAL DRAIN	NO	YES
E*P4*~**/I	INTERNAL PILOT AND EXTERNAL DRAIN	NO	NO
E*P4*~**/E	INTERNAL PILOT AND EXTERNAL DRAIN	YES	YES
E*P4*~**/EI	INTERNAL PILOT AND EXTERNAL DRAIN	YES	NO



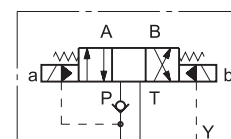
5.1 - Check valve incorporated on line P

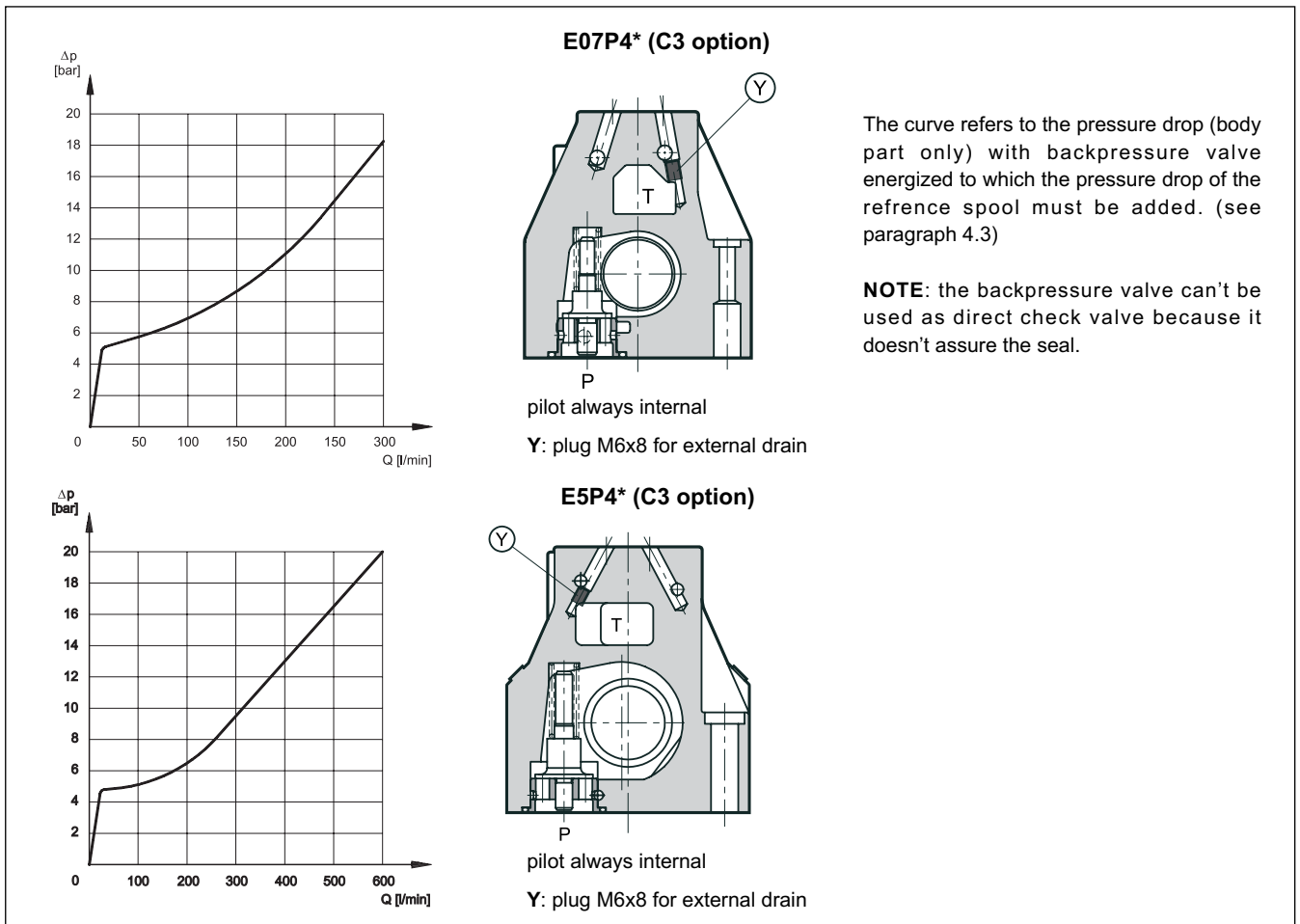
(Available only for valves E07P4* - E5P4*)

Valves E07P4* and E5P4* are available upon request with check valve incorporated on line P. This is particularly useful to obtain the necessary piloting pressure when the control valve, in the rest position, has line P connected to the T outlet (spools type S2, S4, S7, S8). The cracking pressure is 5 bar. Add **C3** to the identification code for this request (see par. 1.2).

C3 version is available only with internal pilot.

E*P4* /C3





6 - ELECTRICAL CHARACTERISTICS

6.1 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.

- Group: II (surface plants)
- Category: 2 (high protection for areas 1 and 2)
- Type of atmosphere: either G (explosive atmosphere with gas or vapours - K version) or D (explosive atmosphere with dust - KD version).

6.2 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 an hexagonal threaded nut provided with anti-unlocking safety screw and it can be turned 360° on its axis, depending on the available space.

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.

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

The AR coils (for alternating current supply) contain a built-in rectifier bridge.

6.3 Current and power consumption

The table shows current and power consumption values relevant to the different coil types, for direct or alternating 50 or 60 Hz current supply. AR coils must be used when the valve is fed with AC power supply and then rectified by means of the rectifier bridge incorporated into the coil.

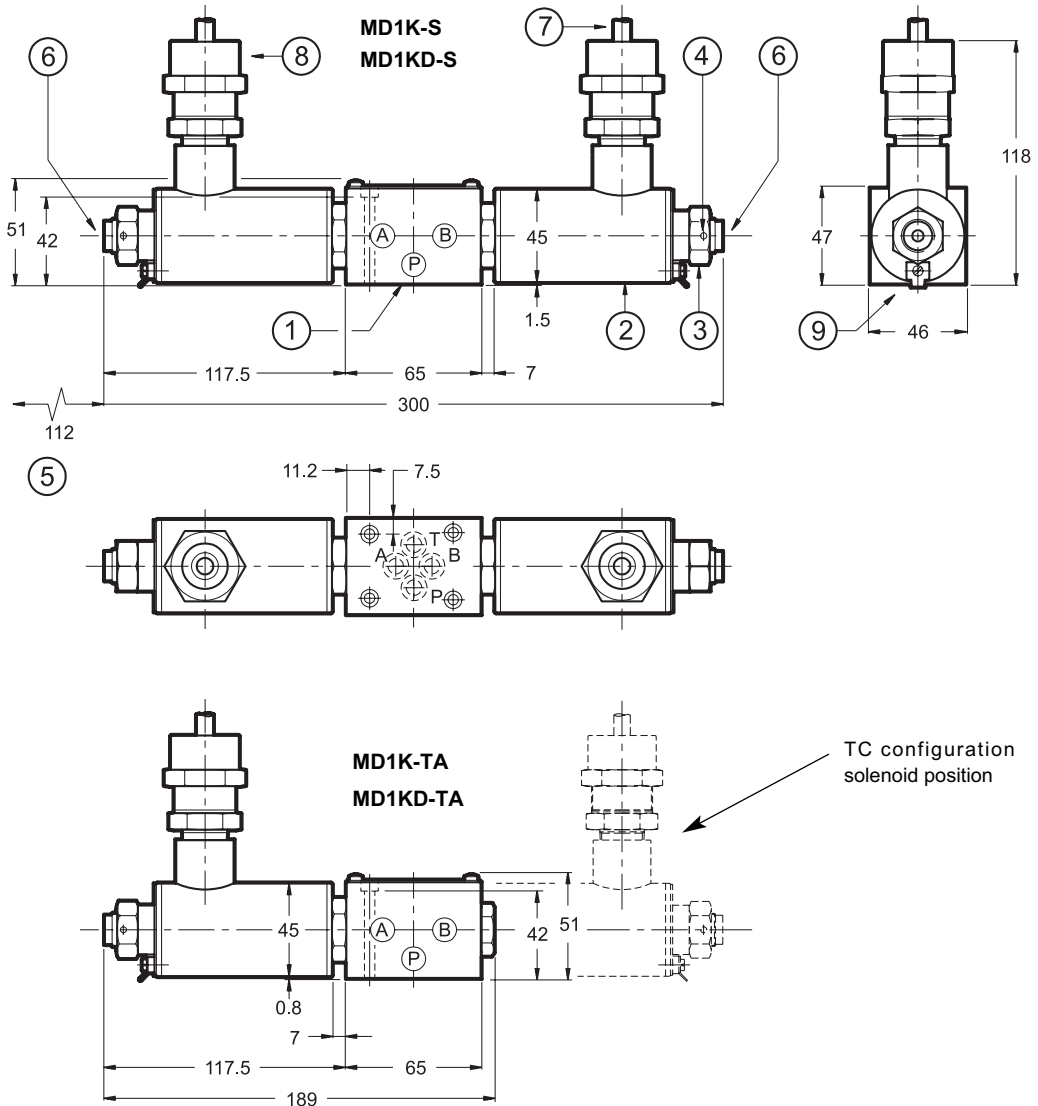
VOLTAGE SUPPLY FLUCTUATION	± 10% Vnom
MAX. SWITCH ON FREQUENCY MD1K - MD1KD E4P4K - E4P4KD, E07P4K - E07P4KD E5P4K - E5P4KD	8.000 ins/hr 6.000 ins/hr 4.000 ins/hr
DUTY CYCLE	100%
EXPLOSION-PROOF VERSION	According to ATEX 94/9/CE
ELECTROMAGNETIC COMPATIBILITY (EMC) EMISSIONS IMMUNITY	According to 89/336 CEE
LOW VOLTAGE	According to 73/23/CEE 96/68/CEE
TEMPERATURE CLASS	T5 (surface temperature ≤ 100°C)
Class of protection according to IEC 144 standards: Atmospheric agents Coil insulation	IP 67 class H

Coil Type	Absorbed current A (± 5%)	Power (± 5%)	
		W	VA
D24	0,46	11	
AR110	0,1		11
AR230	0,05		11

Note: AR coils are for alternating current supply either 50 or 60 Hz. Not available for KD version.



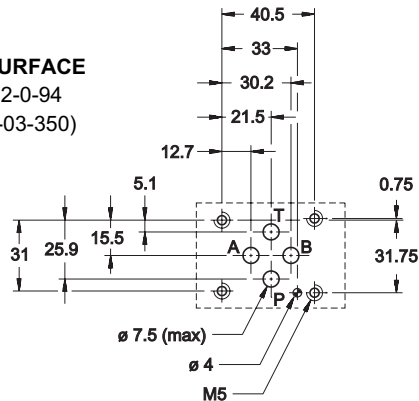
7 - OVERALL AND MOUNTING DIMENSIONS MD1K - MD1KD



TC configuration
solenoid position

dimensions in mm

MOUNTING SURFACE
ISO 4401-03-02-0-94
(CETOP 4.2-4-03-350)

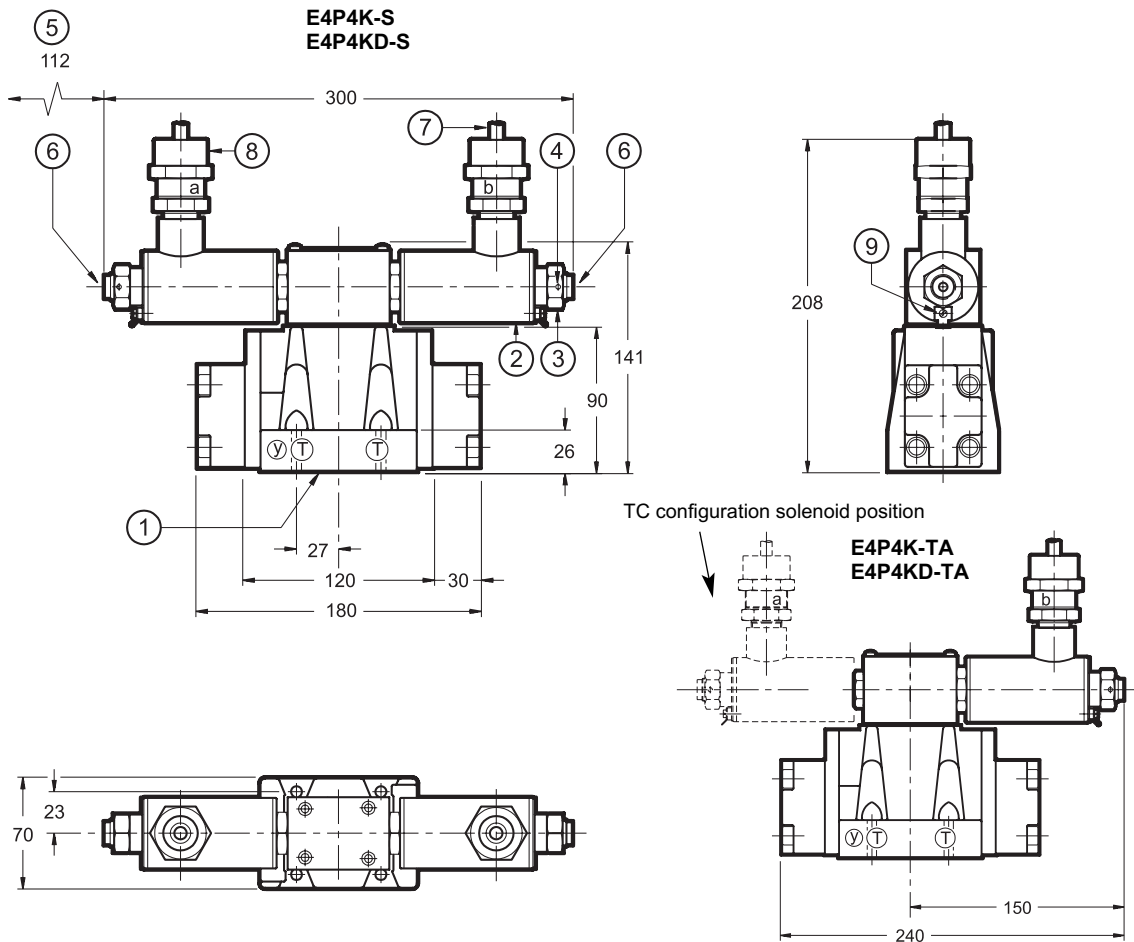


Single valve fastening: 4 bolts M5x50 (recommended class 12.9)
Tightening torque: 5 Nm (bolts 8.8) - 8 Nm (bolts 12.9)
Mounting holes threading: M5x10
Sealing rings: 4 OR type 2037 (9.25x1.78) - 90 Shore

1	Mounting interface with sealing rings
2	Explosion-proof solenoid
3	Hexagonal nut for coil fastening: spanner 24
4	Anti-unlocking safety screw: spanner 1,5
5	Coil removal space
6	Manual override
7	Fire-proof power cable CEI 20-22 L = 1500 mm external diameter = Ø 8 mm Wires number= 3 (2 poles + earth) Wires section= 1,5 mm ²
8	Cable clamp
9	Terminal for supplementary earth connection

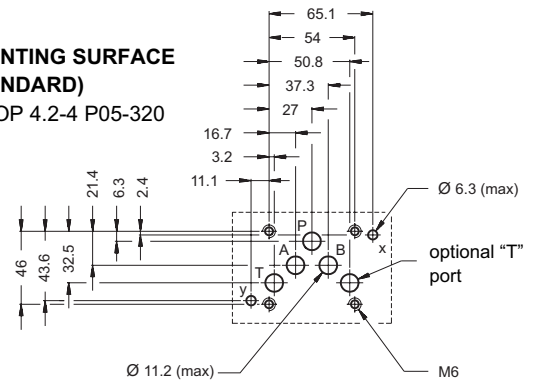
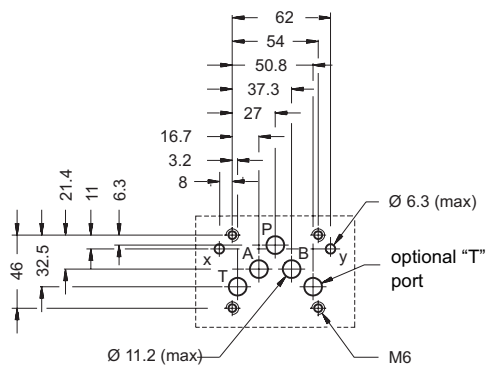


8 - OVERALL AND MOUNTING DIMENSIONS E4P4K - E4P4KD



Valves with mounting surface according to ISO 4401-05-05-0-94 (CETOP 4.2-4-R05-320) standards, are available upon request. See par. 1 for the identification code.

MOUNTING SURFACE (STANDARD) CETOP 4.2-4 P05-320



dimensions in mm

Single valve fastening: 4 bolts M6x35 (recommended class 12.9)

Tightening torque: 8 Nm (bolts 8.8) - 14 Nm (bolts 12.9)

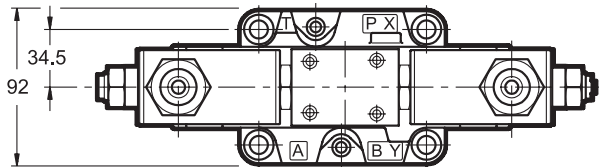
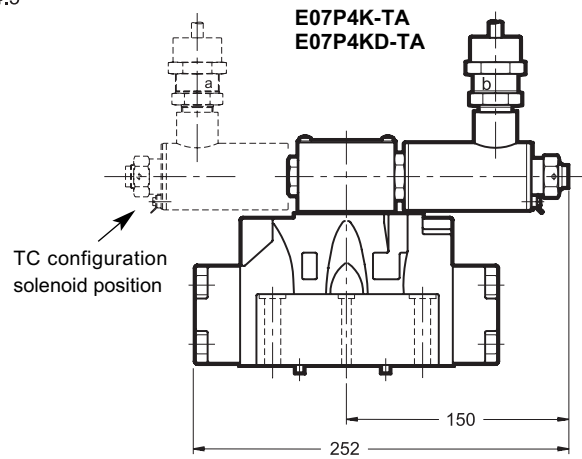
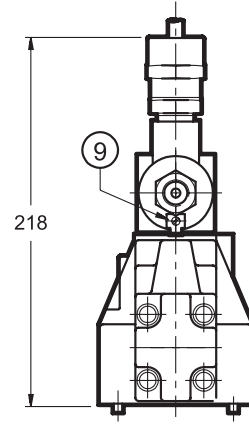
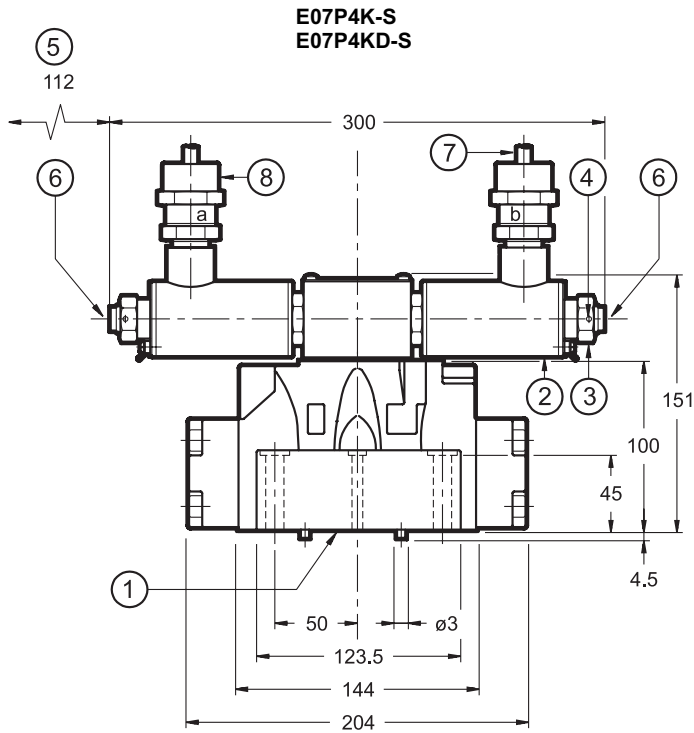
Mounting holes threading: M6x10

Sealing rings: 5 OR type 2050 (12.42x1.78) - 90 Shore
2 OR type 2037 (9.25 x 1.78) - 90 shore

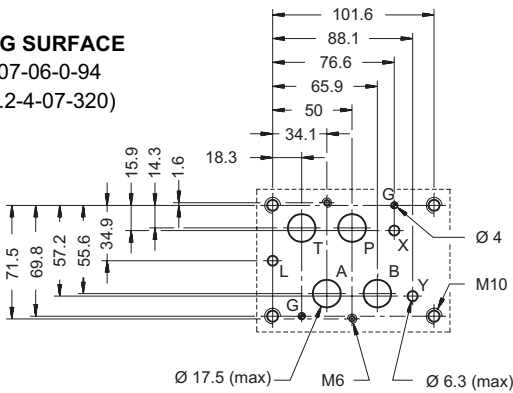
1	Mounting interface with sealing rings
2	Explosion-proof solenoid
3	Hexagonal nut for coil fastening: spanner 24
4	Anti-unlocking safety screw: spanner 1,5
5	Coil removal space
6	Manual override
7	Fire-proof power cable CEI 20-22: L = 1500 mm external diameter = Ø 8 mm Wires number= 3 (2 poles + earth) - Wires section= 1,5 mm ²
8	Cable clamp
9	Terminal for supplementary earth connection



9 - OVERALL AND MOUNTING DIMENSIONS E07P4K - E07P4KD



MOUNTING SURFACE
 ISO 4401-07-06-0-94
 (CETOP 4.2-4-07-320)



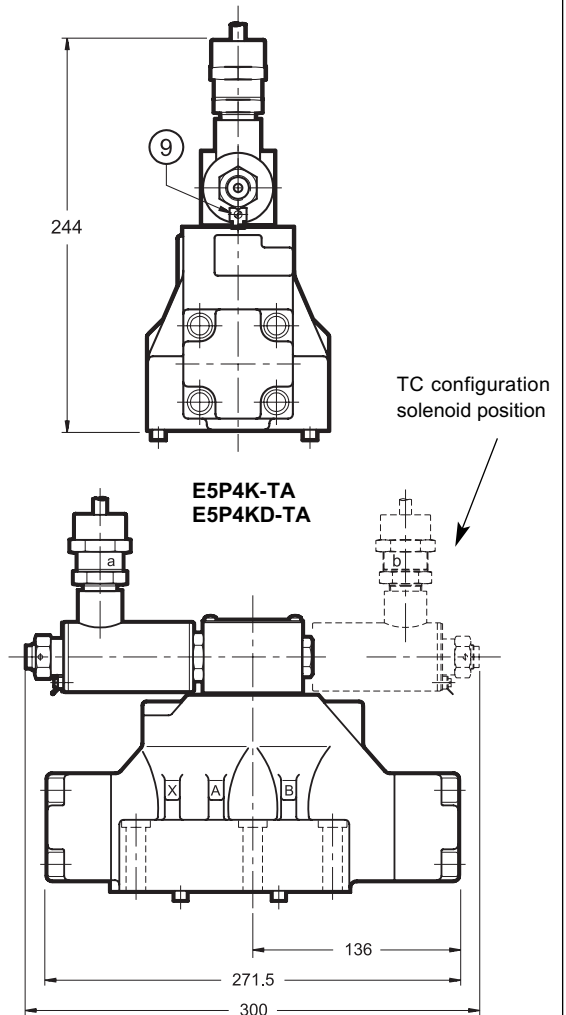
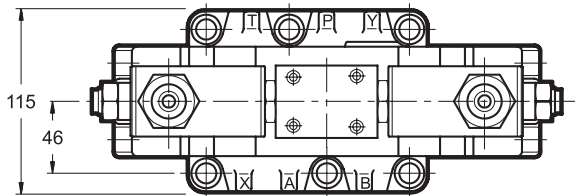
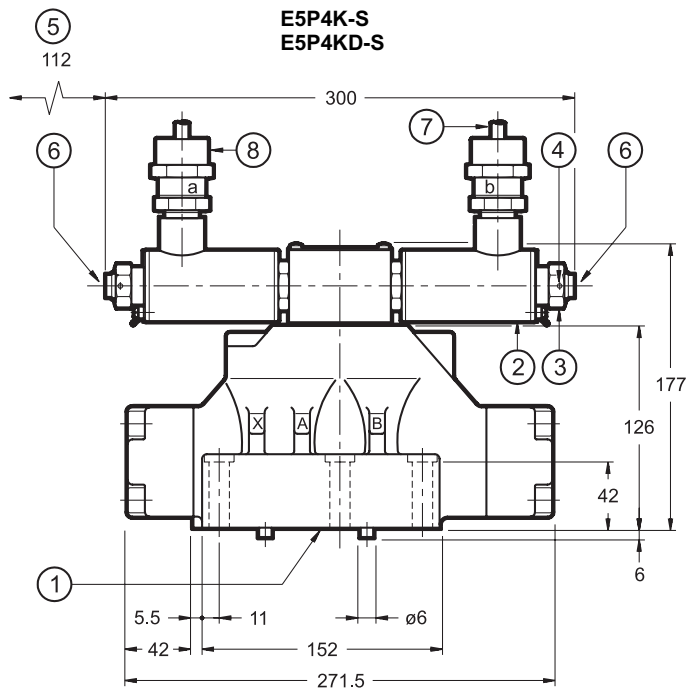
dimensions in mm

Single valve fastening:	4 bolts M10x60 (recommended class 12.9) 2 bolts M6x60 (recommended class 12.9)
Tightening torque	M10x60: 40 Nm (bolts 8.8) - 67 Nm (bolts 12.9) M6x60: 8 Nm (bolts 8.8) - 14 Nm (bolts 12.9)
Mounting holes threading:	M6x18; M10x18
Sealing rings:	4 OR type 130 (22.22x2.62) - 90 Shore 2 OR type 2043 (10.82x1.78) - 90 Shore

1	Mounting interface with sealing rings
2	Explosion-proof solenoid
3	Hexagonal nut for coil fastening: spanner 24
4	Anti-unlocking safety screw: spanner 1,5
5	Coil removal space
6	Manual override
7	Fire-proof power cable CEI 20-22 L = 1500 mm external diameter = Ø 8 mm Wires number = 3 (2 poles + earth) Wires section = 1,5 mm ²
8	Cable clamp
9	Terminal for supplementary earth connection

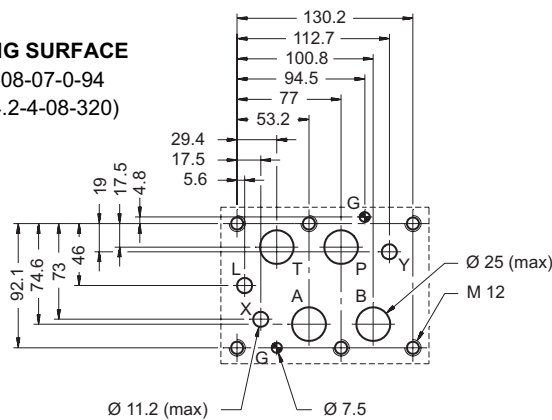


10 - OVERALL AND MOUNTING DIMENSIONS E5P4K - E5P4KD



MOUNTING SURFACE

ISO 4401-08-07-0-94
(CETOP 4.2-4-08-320)



dimensions in mm

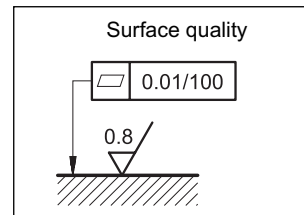
Single valve fastening:	6 bolts M12x60 (recommended class 12.9)
Tightening torque:	69 Nm (bolts 8.8) - 115 Nm (bolts 12.9)
Mounting holes threading:	M12x20
Sealing rings:	4 OR type 3118 (29.82x2.62) - 90 Shore 2 OR type 3081 (20.24x2.62) - 90 Shore

1	Mounting interface with sealing rings
2	Explosion-proof solenoid
3	Hexagonal nut for coil fastening: spanner 24
4	Anti-unlocking safety screw: spanner 1,5
5	Coil removal space
6	Manual override
7	Fire-proof power cable CEI 20-22 L = 1500 mm external diameter = Ø 8 mm Wires number= 3 (2 poles + earth) Wires section= 1,5 mm ²
8	Cable clamp
9	Terminal for supplementary earth connection



11 - INSTALLATION

Configurations with centering and recall springs can be mounted in any position. Valve fastening takes place by means of screws or tie rods, laying the valve on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing. If the minimum values of planarity or smoothness are not met, fluid leakages between valve and mounting surface can easily occur.



12 - SUBPLATES (see catalogue 51 000)

	E4P4K - E4P4KD	E07P4K - E07P4KD	E5P4K - E5P4KD
Type with rear ports	PME4-AI5G	PME07-AI6G	
Type with side ports	PME4-AL5G	PME07-AL6G	PME5-AL8G
Threading P, T, A, B, X, Y	3/4" 1/4" BSP	1" BSP 1/4" BSP	1 1/2" BSP 1/4" BSP



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