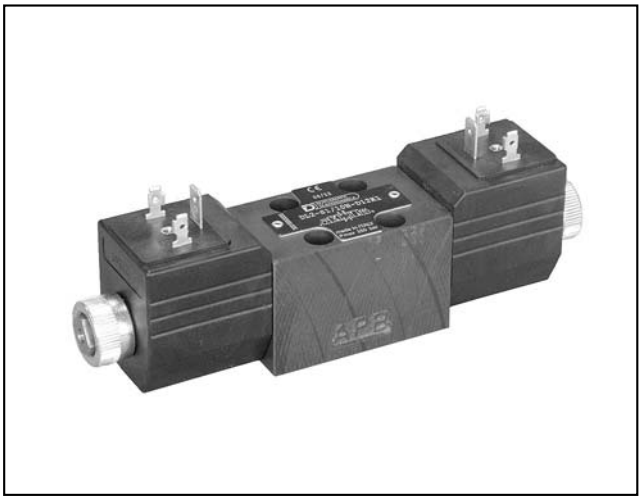


DL2

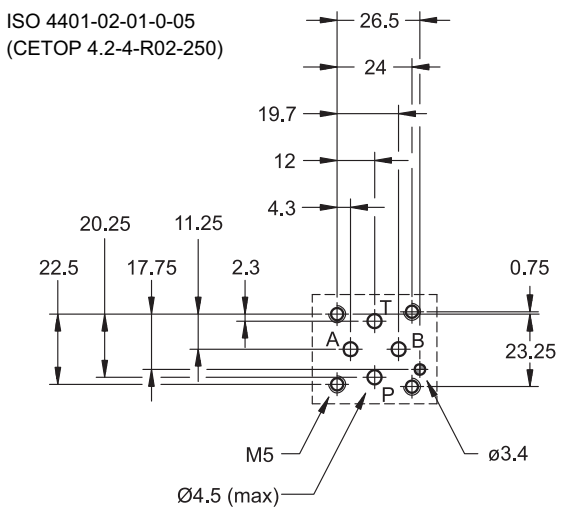
SOLENOID OPERATED DIRECTIONAL CONTROL VALVE COMPACT VERSION

SERIES 10

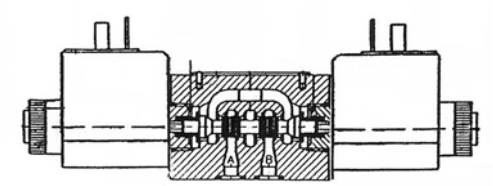
SUBPLATE MOUNTING
ISO 4401-02 (CETOP R02)

p max **250** bar
Q max **20** l/min

MOUNTING SURFACE



OPERATING PRINCIPLE



— Direct acting, subplate mounting directional control valve, with mounting surface according to ISO 4401-02 (CETOP RP 121H) standards.

— Compact design with reduced solenoid dimensions, suitable for mini-power packs and mobile and agricultural applications.

— The valve body is made with high strength iron castings provided with wide internal passages in order to minimize the flow pressure drop. Wet armature solenoids with interchangeable coils are used (for further information on solenoids see paragraph 7).

— The valve is supplied with 4 way designs, with 2 or 3 positions and with several interchangeable spools with different porting arrangements.

— The valve is available with DC or rectified current solenoids.

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

Maximum operating pressure: - ports P - A - B - port T	bar	 250 160
Maximum flow rate	l/min	20
Pressure drop Δp-Q	see paragraph 4	
Operating limits	see paragraph 5	
Electrical features	see paragraph 7	
Electrical connections	DIN 43650	
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Masse: single solenoid valve double solenoid valve	kg	0,8 1,1

1 - IDENTIFICATION CODE

D	L	2	-		/	10		-		K1

Solenoid operated directional control valve

Compact version

ISO 4401-02 (CETOP R02) size

Spool type (see paragraph 2):

S* **TA**
SA* **TB**
SB*

Series no.:
(the overall and mounting dimensions remain unchanged from 10 to 19)

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

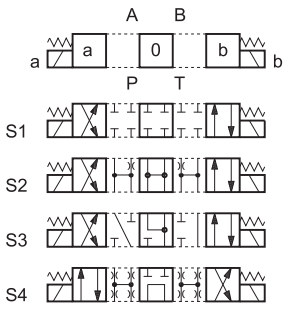
Coil electrical connection:
plug for connector type DIN 43650 (**standard**)

Power supply
D12 = 12 V } direct current
D24 = 24 V }
R110 = 110 V } rectified current
R230 = 230 V }
D00 = valve without coils (see **NOTE**)

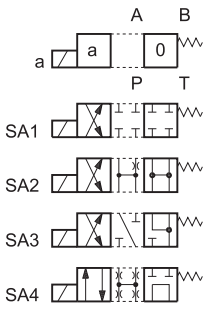
NOTE: Coils locking ring and related OR are supplied together with valves.

2 - SPOOL TYPE

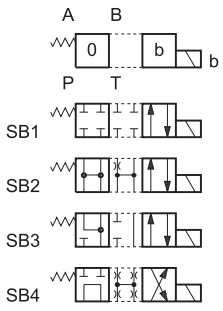
Type **S***:
2 solenoids - 3 positions
with spring centering



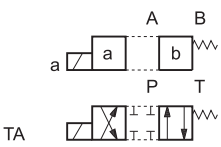
Type **SA***:
1 solenoid side A
2 positions (central + external)
with spring centering



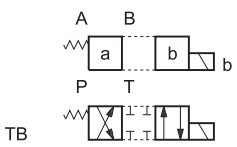
Type **SB***:
1 solenoid side B
2 positions (central + external)
with spring centering



Type **TA**:
1 solenoid side A
2 external positions
with return spring



Type **TB**:
1 solenoid side B
2 external positions
with return spring

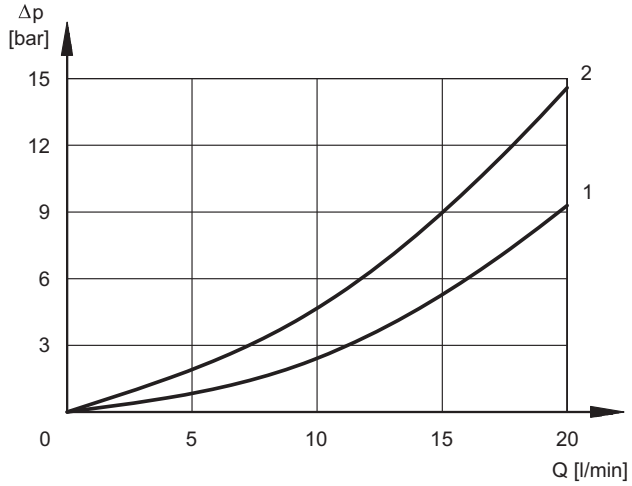


3 - HYDRAULIC FLUIDS

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

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

4 - PRESSURE DROPS Δp-Q (obtained with viscosity of 36 cSt at 50 °C)



ENERGIZED VALVE

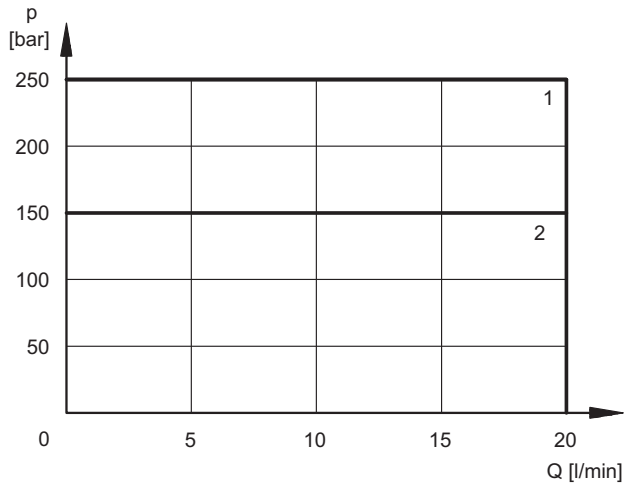
SPOOL	FLOW DIRECTIONS			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPHS			
S1, SA1, SB1	1	1	1	1
S2, SA2, SB2	1	1	1	1
S3, SA3, SB3	1	1	1	1
S4, SA4, SB4	2	2	2	2
TA, TB	1	1	1	1

For the pressure drop with a de-energized valve P→T of the spools S2 and S4 refer to the curve 1.

5 - OPERATING LIMITS

The curves define the flow rate operating fields according to the valve pressure of the different versions. The operating limits can be considerably reduced if a 4-way valve is used as 3-way valve with port A or B plugged or without flow.

The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage. The value have been obtained with mineral oil, viscosity 36 cSt, temperature 50 °C and filtration according to ISO 4406:1999 class 18/16/13.



SPOOL	CURVE
S1, S3, S4, TA, TB	1
S2	2

6 - SWITCHING TIMES

The values indicated are obtained with spool S1, according to ISO 6403 standard, with mineral oil viscosity 36 cSt at 50°C.

TIMES (±10%) [ms]	
ENERGIZING	DE-ENERGIZING
25 ÷ 75	15 ÷ 25

7 - ELECTRICAL FEATURES

7.1 - Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation.
The coil is fastened to the tube by a threaded ring, and can be rotated 360°, to suit the available space.
The interchangeability of coils of different voltages is allowed within the same type of supply current, alternating or direct.

NOTE: In order to further reduce the emissions, with DC supply, use of type H connectors is recommended. These prevent voltage peaks on opening of the coil supply electrical circuit (see cat. 49 000).

SUPPLY VOLTAGE FLUCTUATION	+5% -10% Vnom
MAX SWITCH ON FREQUENCY	10.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	In compliance with 2004/108/EC
LOW VOLTAGE	In compliance with 2006/95 EC
CLASS OF PROTECTION : Atmospheric agents CEI EN 60529 Coil insulation (VDE 0580) Impregnation:	 IP 65* class H class F

(*) The protection degree is guaranteed only with the connector correctly connected and installed

7.2 - DC valve - Current and power consumption

In direct current energizing, current consumption stays at fairly constant values, essentially determined by Ohm's law: V = R x I

'R' coil must be used when the valve is fed with AC power supply subsequently rectified by means of rectifier bridge, externally or incorporated in the "D" type connector (see cat. 49 000).
The table shows current and power consumption values for DC and rectified current coil types.

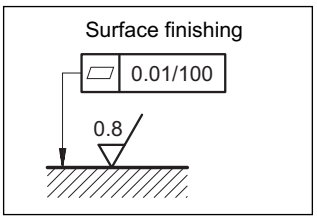
	Nominal voltage [V]	Resistance at 20°C [Ω] (±1%)	Current consumption [A] (±5%)	Power consumption (+5% -10%) [W]	[VA]
D12	12	6.7	2.4	28.8	
D24	24	24	1.2	28.8	
R110	110	350	0.3		29.7
R220	230	1500	0.15		31

8 - INSTALLATION

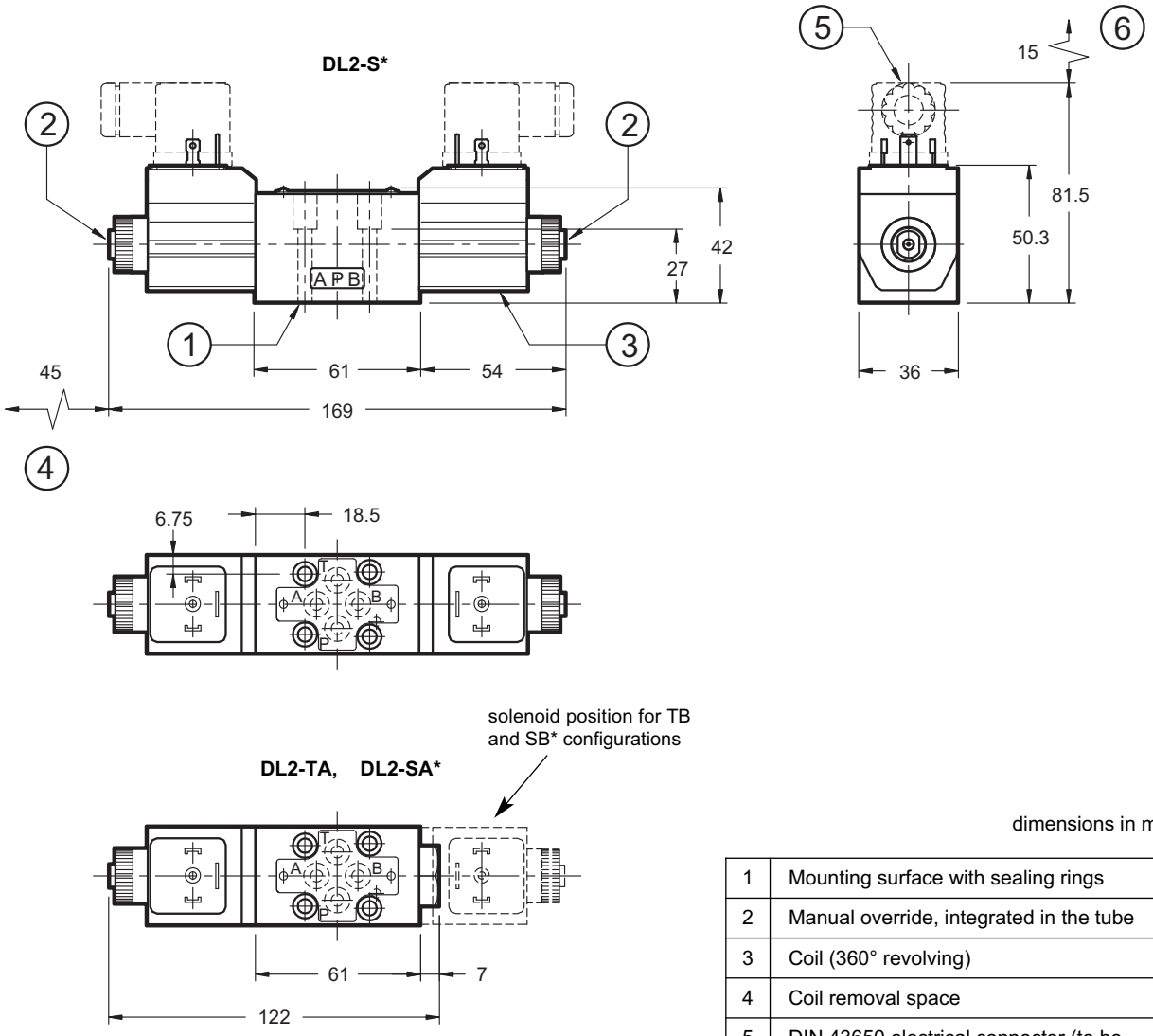
Configurations with centering and return springs can be mounted in any position.

Valve fitting takes place by means of screws or tie rods, fixing the valve on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing.

If the minimum values of planarity or smoothness are not met, fluid leakages between valve and mounting surface can easily occur.



9 - DL2 OVERALL AND MOUNTING DIMENSIONS



dimensions in mm

1	Mounting surface with sealing rings
2	Manual override, integrated in the tube
3	Coil (360° revolving)
4	Coil removal space
5	DIN 43650 electrical connector (to be ordered separately - see at catalogue 49 000)
6	Connector removal space

10 - ELECTRIC CONNECTORS

The solenoid valves are not supplied with connector. Connectors must be ordered separately.
For the identification of the connector type to be ordered, please see catalogue 49 000.

11 - FASTENING BOLTS AND SEALING RINGS

Single valve fastening: 4 SHC screws M5x35 - ISO 4762
Tightening torque: 5 Nm (bolts A 8.8)
Threads of mounting holes: M5x10
Sealing rings: N. 4 KANTSEAL type DKAR00011 (7.65x1.68x1.68) - 70 Shore

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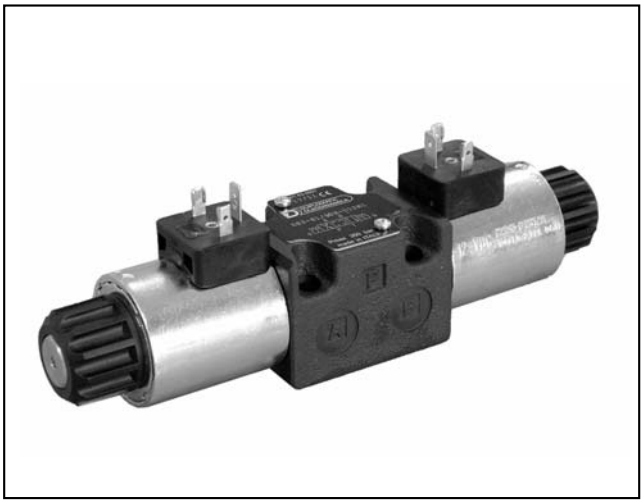


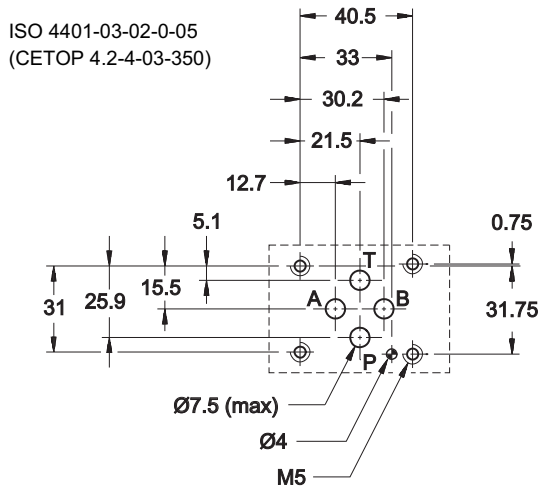
DS3

SOLENOID OPERATED DIRECTIONAL CONTROL VALVE

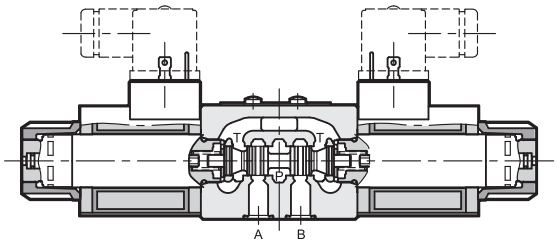
SUBPLATE MOUNTING
ISO 4401-03 (CETOP 03)

p max **350** bar
Q max **100** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



— Direct acting, subplate mounting directional control valve, with mounting surface according to ISO 4401 (CETOP RP121H) standards.

— The valve is supplied with 3 or 4 ways designs, with 2 or 3 positions with a wide range of interchangeable spools.

— The valve body is made with high strength iron castings provided with wide internal passages in order to minimize the flow pressure drop. Wet armature solenoids with interchangeable coils are used (for further information on solenoids see par. 7).

— The valve is available with DC or AC solenoids. DC solenoids can also be fed with AC power supply, by using connectors with a built-in rectifier bridge (see paragraphs 6.4 and 7.2).

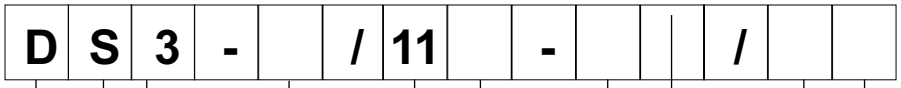
— The DC valve is also available in a soft-shifting version (see par. 14).

— Alternative to the standard manual override there are lever, push, boot and mechanical detent devices.

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

		CC	CA
Maximum operating pressure: - P - A - B ports - T port	bar	350 210	160
Maximum flowrate	l/min	100	
Pressure drops Δp-Q	see paragraph 4		
Operating limits	see paragraph 6		
Electrical features	see paragraph 7		
Electrical connections	see paragraph 11		
Ambient temperature range	°C	-20 / +50	
Fluid temperature range	°C	-20 / +80	
Fluid viscosity range	cSt	10 ÷ 400	
Fluid contamination degree	according to ISO 4406:1999 class 20/18/15		
Recommended viscosity	cSt	25	
Mass: single solenoid valve double solenoid valve	kg	1,5 2	1,4 2

1 - IDENTIFICATION CODE



Solenoid operated directional control valve

ISO 4401-03 (CETOP 03) size

Spool type (see paragraph 3)

S* **RSA*** **TA** **RK**
SA* **RSB*** **TB**
SB* **TA***
TB*

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

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

DC power supply
D12 = 12 V
D14 = 14 V
D24 = 24 V
D28 = 28 V
D48 = 48 V
D110 = 110 V
D220 = 220 V
D00 = valve without coils (see **NOTE 1**)

AC power supply
A24 = 24 V - 50 Hz
A48 = 48 V - 50 Hz
A110 = 110 V - 50 Hz / 120 V - 60 Hz
A230 = 230 V - 50 Hz / 240 V - 60 Hz
A00 = valve without coils (see **NOTE**)
F110 = 110 V - 60 Hz
F220 = 220 V - 60 Hz

Option: Surface treatment not standard. Omit if not required
(see **NOTE 2**)

Manual override:
omit for override integrated in the tube (**standard**)
CM = manual override, boot protected
CH = lever manual override (only for DC version)
CP = push manual override (only for DC version)
CK = knob manual override (only for DC version)
CPK = push manual override with mechanical retention (only for DC version)

Coil electrical connection (see par. 11):
K1 = plug for connector type DIN 43650 (**standard**)
K2 = plug for connector type AMP JUNIOR (available on D12 and D24 coils only)
K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S (available on D12 and D24 coils only)
K12 = plug for M12 connector
K1 coils and DUAL DIN 43560 connector delivered together

NOTE 1 : Coils locking ring and related OR are supplied together with valves.

NOTE 2:The valve is supplied with standard surface treatment of phosphating 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 ÷ 40µ

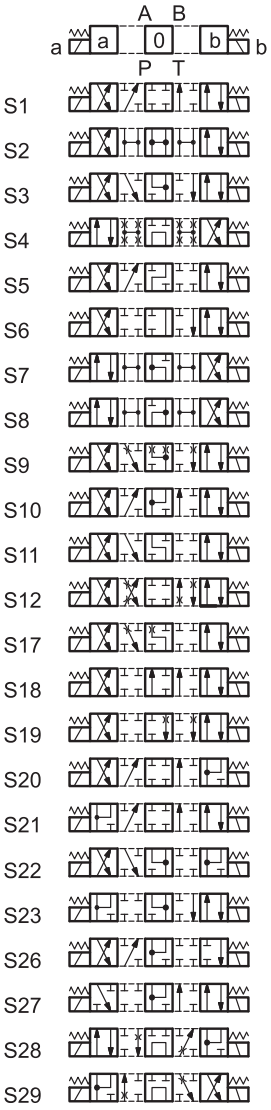
W4 = gas nitriding and oxidation process black colour

2 - HYDRAULIC FLUIDS

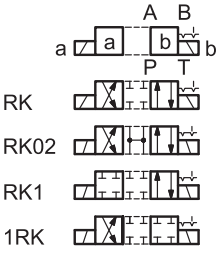
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N).
For fluids HFDR type (phosphate esters) use FPM seals (code V).
For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

3 - SPOOL TYPE

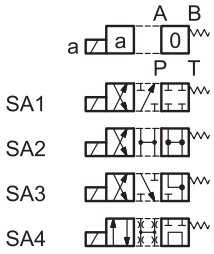
Type **S***:
2 solenoids - 3 positions
with spring centering



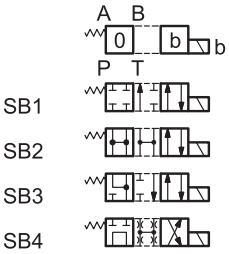
Type **RK**:
2 solenoids - 2 positions
with mechanical retention



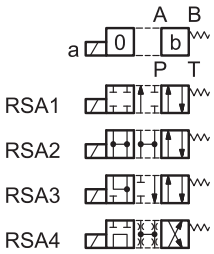
Type **SA***:
1 solenoid side A
2 positions (central + external)
with spring centering



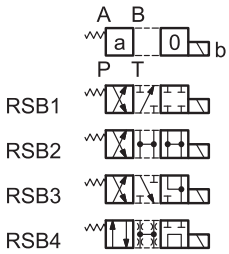
Type **SB***:
1 solenoid side B
2 positions (central + external)
with spring centering



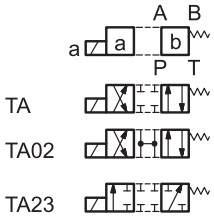
Type **RSA***:
1 solenoid side A
2 positions (external + central)
with return spring



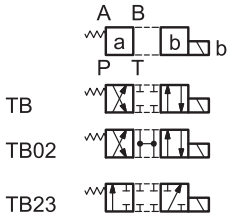
Type **RSB***:
1 solenoid side B
2 positions (external + central)
with return spring



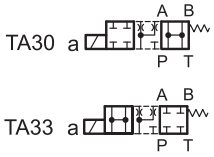
Type **TA**:
1 solenoid side A
2 external positions
with return spring



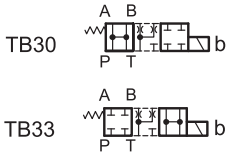
Type **TB**:
1 solenoid side B
2 external positions
with return spring



Type **TA***:
1 solenoid side A
2 positions with return spring

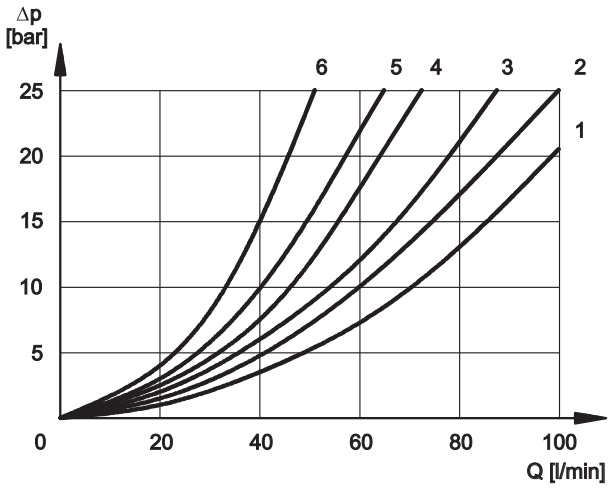


Type **TB***:
1 solenoid side B
2 positions with return spring



Besides the diagrams shown, which are the most frequently used, other special versions are available: consult our technical department for their identification, feasibility and operating limits.

4 - PRESSURE DROPS Δp-Q (obtained with viscosity 36 cSt at 50 °C)



For pressure drops between A and B lines of spools S10, S20, S21, S22 and S23, which are used in the regenerative diagram, refer to curve 5.

PRESSURE DROPS WITH VALVE IN ENERGIZED POSITION

SPOOL TYPE	FLOW DIRECTION			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPH			
S1, SA1, SB1	2	2	3	3
S2, SA2, SB2	1	1	3	3
S3, SA3, SB3, RSA3, RSB3	3	3	1	1
S4, SA4, SB4, RSA4, RSB4	5	5	5	5
S5	2	1	3	3
S6	2	2	3	1
S7, S8	4	5	5	5
S9	2	2	3	3
S10	1	3	1	3
S11	2	2	1	3
S12	2	2	3	3
S17	2	2	3	3
S18	1	2	3	3
S19	2	2	3	3
S20	1	5	2	
S21	5	1		2
S22	1	5	2	
S23	5	1		2
TA, TB	3	3	3	3
TA02, TB02	2	2	2	2
TA23, TB23	3	3		
RK	2	2	2	2
RK02	2	2	2	2
RK1, 1RK	2	2	2	2

PRESSURE DROPS WITH VALVE IN DE-ENERGIZED POSITION

SPOOL TYPE	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S2, SA2, SB2					2
S3, SA3, SB3, RSA3, RSB3			3	3	
S4, SA4, SB4, RSA4, RSB4					3
S5		4			
S6				3	
S7, S8			6	6	3
S10	3	3			
S11			3		
S18	4				
S22			3	3	
S23			3	3	

5 - SWITCHING TIMES

The values indicated are obtained according to ISO 6403 standard, with mineral oil viscosity 36 cSt at 50°C.

SPOOL TYPE	TIMES	
	ENERGIZING	DE-ENERGIZING
DC	25 ÷ 75 ms	15 ÷ 25 ms
AC	10 ÷ 25 ms	15 ÷ 40 ms

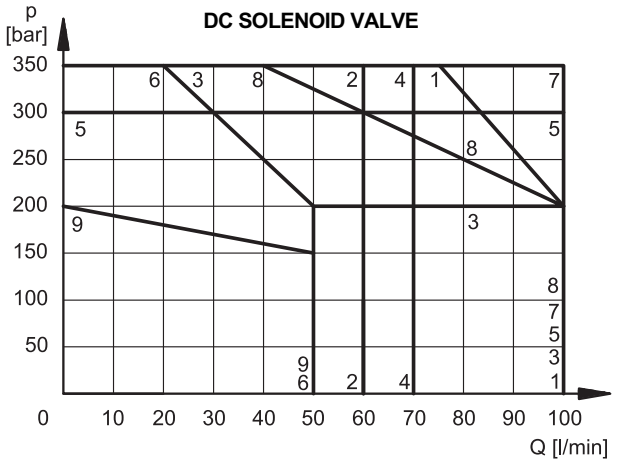
6 - OPERATING LIMITS

The curves define the flow rate operating fields according to the valve pressure of the different versions. The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage. The value have been obtained with mineral oil, viscosity 36 cSt, temperature 50 °C and filtration according to ISO 4406:1999 class 18/16/13.

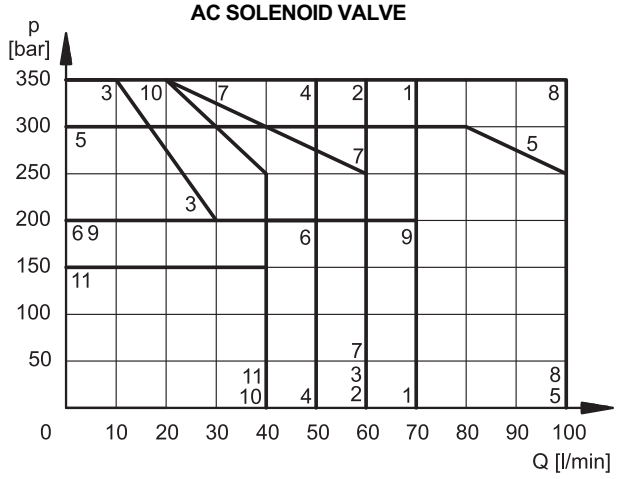
The limits for TA02 and TA spools refer to the 4-way operation. The operating limits of a 4-way valve in 3-way operation or with port A or B plugged or without flow are shown in the chart on the next page. The performance of the DC solenoid powered by AC with rectifier connectors are at par. 6.4. The performances of the soft-shift valve are shown at par. 14.

6.1 valves in standard operation

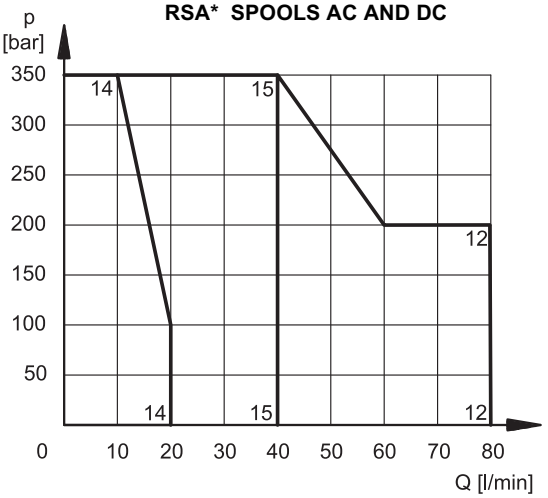
DC SOLENOID VALVE



AC SOLENOID VALVE



RSA* SPOOLS AC AND DC



DC SOLENOID VALVE

SPOOL	CURVE	
	P→A	P→B
S1,SA1,SB1	1	1
S2, SA2, SB2	2	2
S3, SA3, SB3	3	3
S4, SA4, SB4	4	4
S5	5	5
S6	4	6
S7	4	4
S8	4	4
S9	7	7
S10	7	7
S11	4	6
S12	1	1
S17	4	4
S18	5	5
S19	4	4
S20	6*	6
S21	6	6*
S22	9*	6
S23	6	9*
TA, TB	7	7
TA02, TB02	8	8
TA23, TB23	2	2
RK	7	7
RK02	8	8
RK1, 1RK	7	7

AC SOLENOID VALVE

SPOOL	CURVE	
	P→A	P→B
S1,SA1,SB1	1	1
S2, SA2, SB2	2	2
S3, SA3, SB3	3	3
S4, SA4, SB4	1	1
S5	5	5
S6	6	6
S7	4	4
S8	4	4
S9	7	7
S10	8	8
S11	6	6
S12	2	2
S17	7	7
S18	5	5
S19	7	7
S20	10*	10
S21	10	10*
S22	10*	10
S23	10	11*
TA, TB	1	1
TA02, TB02	1	1
TA23, TB23	2	2
RK	8	8
RK02	9	9
RK1, 1RK	8	8

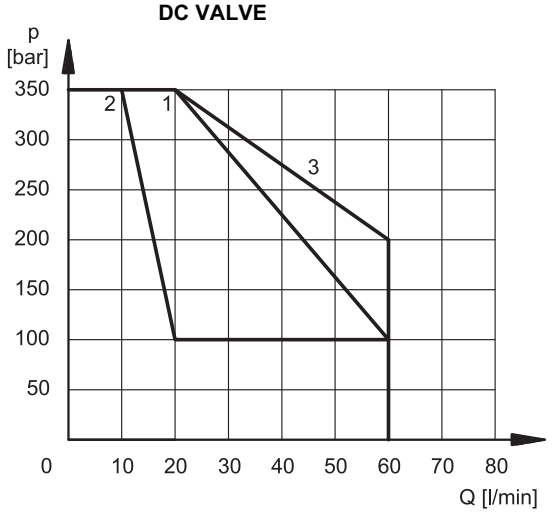
* Performance obtained for a valve with A and B lines connected the one to the piston-side chamber and the other to the rod-side chamber of a double-acting cylinder with area ratio 2:1.

SPOOL	CURVE
RSA1	12
RSA2	
RSA3	14
RSA4	15

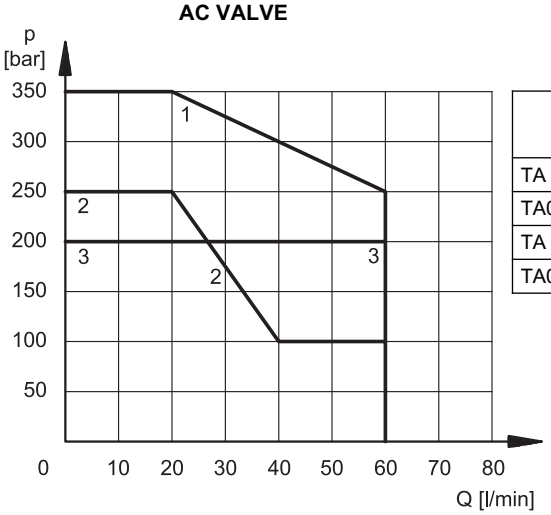
6.2 4-way valve in 3-way operation

Operating limits of a 4-way valve in 3-way operation or with port A or B plugged or without flow.

DC VALVE

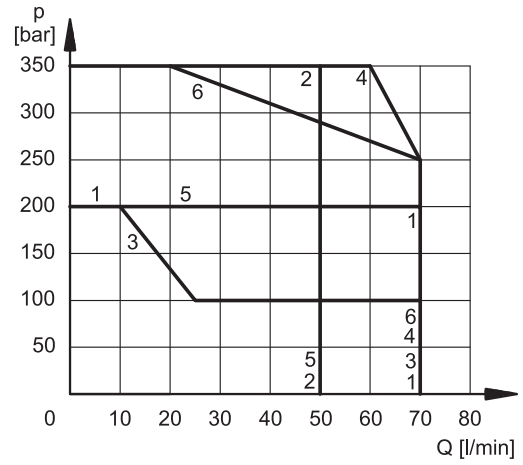


AC VALVE



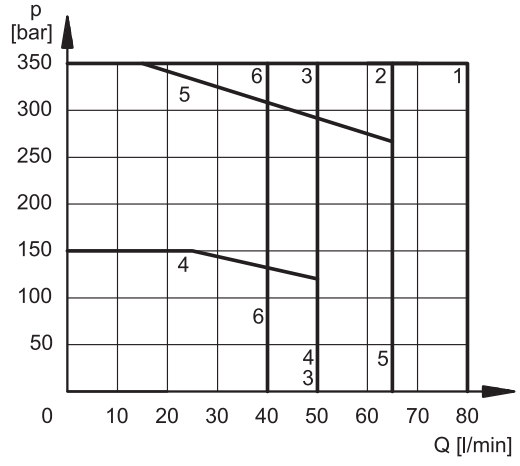
SPOOL	CURVE	
	DC	AC
TA backpr. A	1	1
TA02 backpr. A	1	1
TA backpr. B	2	1
TA02 backpr. B	3	3

6.3 AC solenoid valve with coil A110 fed with 110V - 60 Hz



SPOOL	CURVE	
	P→A	P→B
S1,SA1, SB1	1	1
S2, SA2, SB2	2	2
S3, SA3, SB3	3	3
S4, SA4, SB4	4	4
S9	5	5
TA, TB	2	2
RK	6	6

6.4 Operating limits for DC solenoid valves fed with AC with rectifier connectors.



SPOOL	CURVE	
	P→A	P→B
S1, SA1, SB1	2	2
S2, SA2, SB2	3	3
S3, SA3, SB3	4	4
S4, SA4, SB4	2	2
S9	5	5
TA, TB	6	6
RK	1	1

7 - ELECTRICAL FEATURES

7.1 Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation.

The coil is fastened to the tube by a threaded ring, and can be rotated 360°, to suit the available space.

Protection from atmospheric agents CEI EN 60529

Plug-in type	IP 65	IP 67	IP 69 K
K1 DIN 43650	x (*)		
K2 AMP JUNIOR	x	x (*)	
K7 DEUTSCH DT04 male	x	x	x (*)
K12 DUAL DIN 43650	x	x (*)	

(*) The protection degree is guaranteed only with the connector correctly connected and installed

SUPPLY VOLTAGE FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY	18.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC) (NOTE)	In compliance with 2004/108/EC
LOW VOLTAGE	In compliance with 2006/95/EC
CLASS OF PROTECTION : Coil insulation (VDE 0580) Impregnation: (DC valve) (AC valve)	 class H class F class H

NOTE: In order to further reduce the emissions, with DC supply, use of type H connectors is recommended. These prevent voltage peaks on opening of the coil supply electrical circuit (see cat. 49 000).

7.2 Current and absorbed power for DC solenoid valve

The table shows current and power consumption values relevant to the different coil types for DC. The rectified current supply takes place by fitting the valve (with the exception of D12 coil) with an alternating current source (50 or 60 Hz), rectified by means of a bridge built-in to the “D” type connectors (see cat. 49 000), by considering a reduction of the operating limits (see diagram at paragraph 6.4).

Coils for direct current (values ±5%)

	Nominal voltage [V]	Resistance at 20°C [Ω]	Current consumpt. [A]	Power consumpt [W]	Coil code K1	K2	K7
D12	12	4,4	2,72	32,7	1903080	1903100	1902940
D14	14	7,2	1.93	27	1903086		
D24	24	18,6	1,29	31	1903081	1903101	1902941
D28	28	26	1,11	31	1903082		
D48	48	78,6	0,61	29,5	1903083		
D110	110	423	0,26	28,2	1903084		
D220	220	1692	0,13	28,2	1903085		

7.3 Current and absorbed power for AC solenoid valve

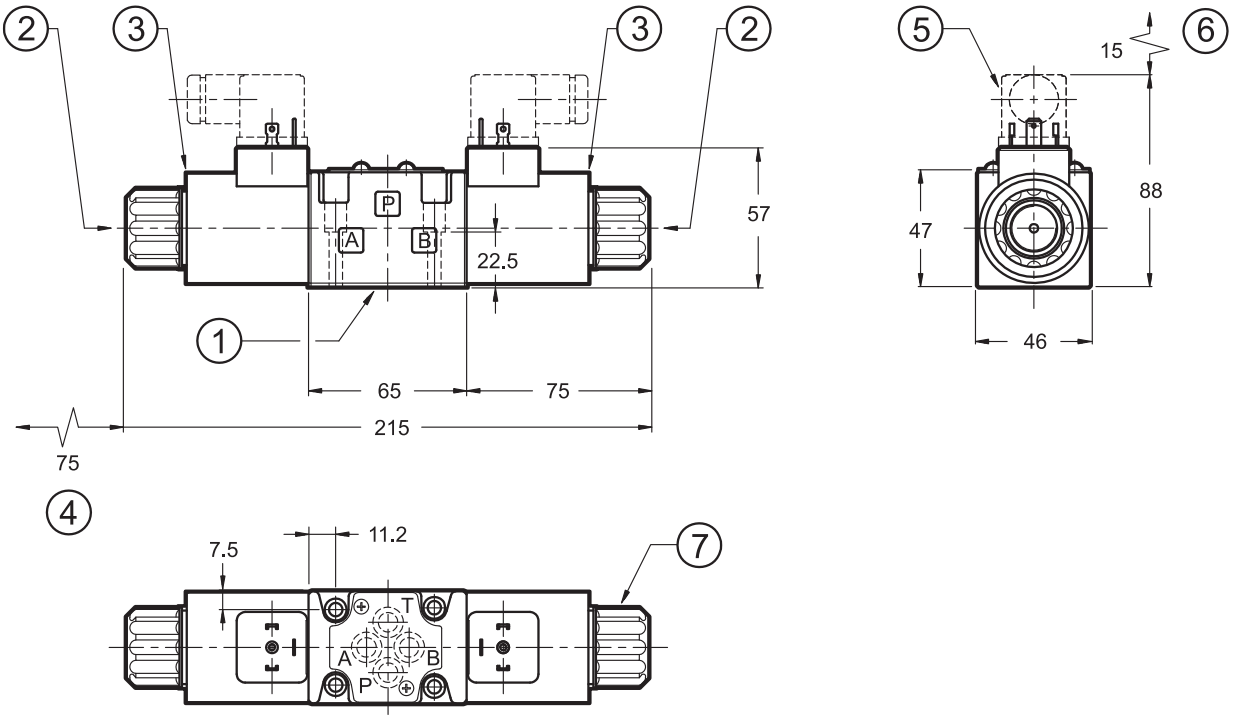
The table shows current and power consumption values at inrush and at holding, relevant to the different coil types for AC current.

Coils for alternating current (values ± 5%)

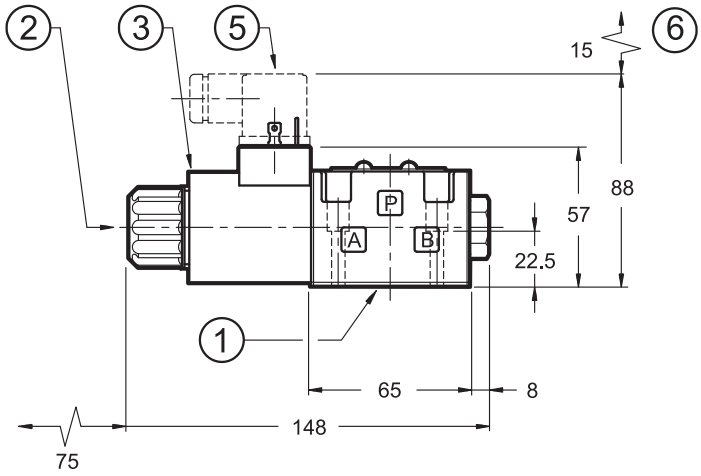
Suffix	Nominal Voltage [V]	Freq. [Hz]	Resistance at 20°C [Ω] (±1%)	Current consumption at inrush [A] (±5%)	Current consumption at holding [A] (±5%)	Power consumption at inrush (±5%) [VA]	Power consumption at holding (±5%) [VA]	Coil Code K1 e K12
A24	24	50	1,46	8	2	192	48	1902830
A48	48		5,84	4,4	1,1	204	51	1902831
A110	110V-50Hz 120V-60Hz	50/60	32	1,84	0,46	192	48	1902832
				1,56	0,39	188	47	
A230	230V-50Hz 240V-60Hz		140	0,76	0,19	176	44	1902833
				0,6	0,15	144	36	
F110	110	60	26	1,6	0,4	176	44	1902834
F220	220		106	0,8	0,2	180	45	1902835

8 - OVERALL AND MOUNTING DIMENSIONS FOR DC SOLENOID VALVES

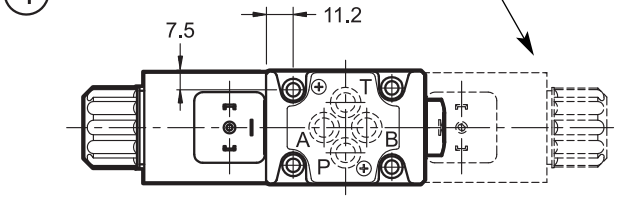
DS3 - S*
DS3 - RK



DS3-SA*, DS3-RSA*
DS3-TA, DS3-TA*



4 solenoid position for SB* , RSB*, TB and TB* configurations



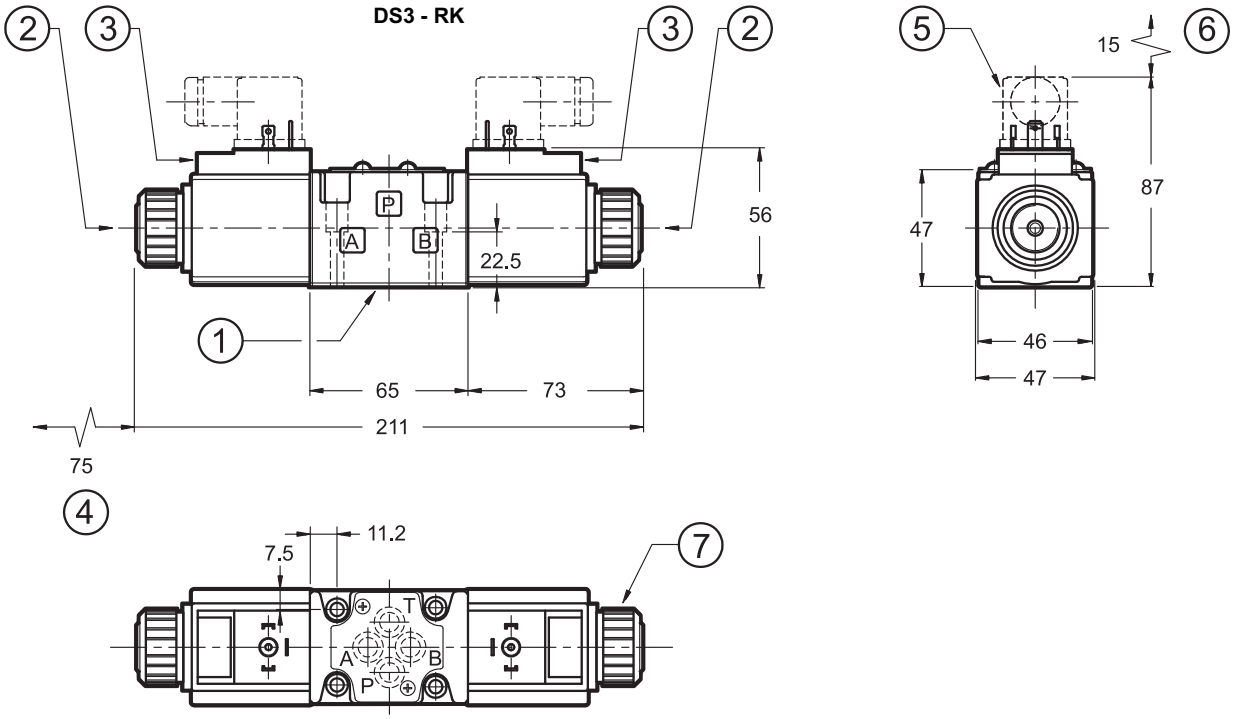
dimensions in mm

1	Mounting surface with sealing rings
2	Standard manual override included in the solenoid tube
3	Coil (360° revolving)
4	Coil removal space
5	DIN 43650 connector (standard K1 shown) to be ordered separately (see cat. 49 000)
6	Connector removal space
7	Locking ring: tightening torque 5 ±0.5 Nm

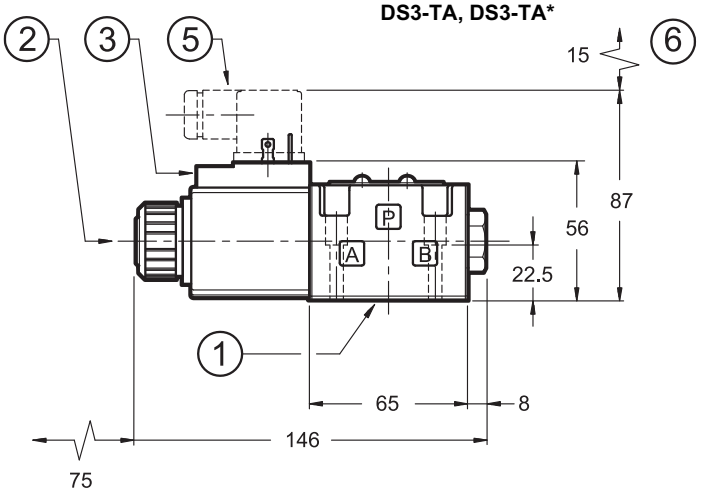
See par. 16 and 17 for fastening bolts and sealing rings

9 - OVERALL AND MOUNTING DIMENSIONS FOR AC SOLENOIDS VALVES

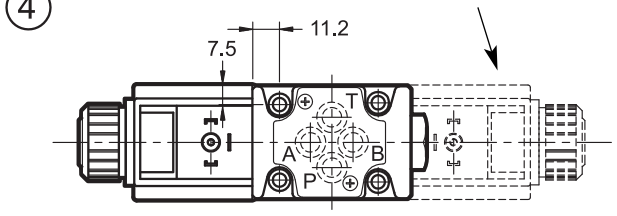
DS3 - S*
DS3 - RK



DS3-SA*, DS3-RSA*
DS3-TA, DS3-TA*



solenoid position for SB*, RSB*, TB and TB* configurations



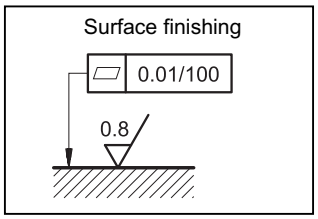
dimensions in mm

1	Mounting surface with sealing rings
2	Standard manual override included in the solenoid tube
3	Coil (90° revolving)
4	Coil removal space
5	DIN 43650 connector to be ordered separately (see cat. 49 000)
6	Connector removal space
7	Locking ring: tightening torque 5 ±0.5 Nm

See par. 16 and 17 for fastening bolts and sealing rings

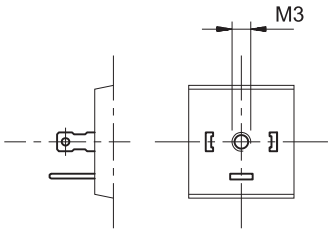
10 - INSTALLATION

Configurations with centering and return springs can be mounted in any position; type RK valves - without springs and with mechanical detent - must be mounted with the longitudinal axis horizontal. Valve fixing takes place by means of screws or tie rods, with the valve mounted on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing. If the minimum values of planarity and/or smoothness are not met, fluid leakages between valve and mounting surface can easily occur.

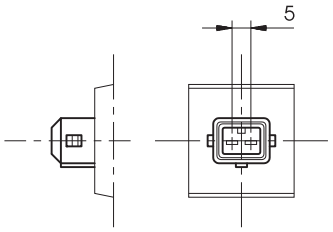


11 - ELECTRIC CONNECTIONS

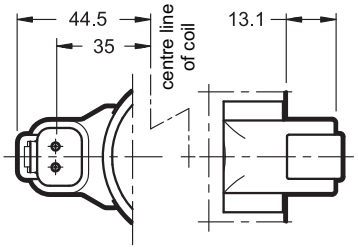
connection for DIN 43650 connector type
code **K1** (**standard**)



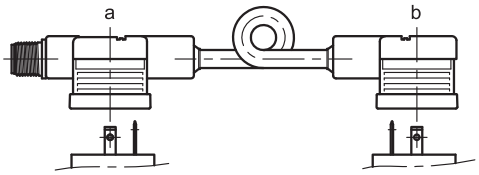
connection for AMP JUNIOR connector type
code **K2**



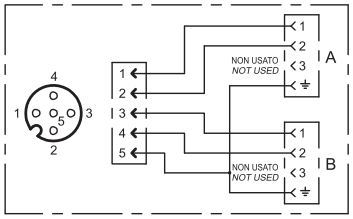
connection for
DEUTSCH DT06-2S male connector type
code **K7**



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



CONNECTOR M12x1 CONNECTION SCHEME



In K12 version the valve will be delivered together with the connector DUAL DIN 43650 with M12 connection already mounted on K1 coils. DUAL DIN connector allows to power two solenoids with a single cable with socket M12.

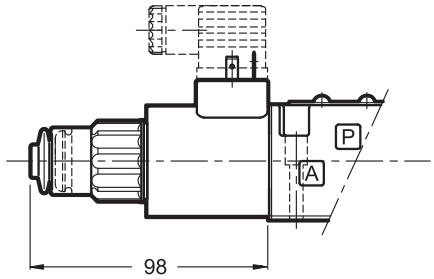
12 - ELECTRIC CONNECTORS

The solenoid operated valves are delivered without connector, except the version K12, where the connector is delivered together with the valve. For coils with standard electrical connections K1 type (DIN 43650) the connectors can be ordered separately. For the identification of the connector type to be ordered please see cat. 49 000. For K2 and K7 connection type the relative connectors are not available.

13 - MANUAL OVERRIDES

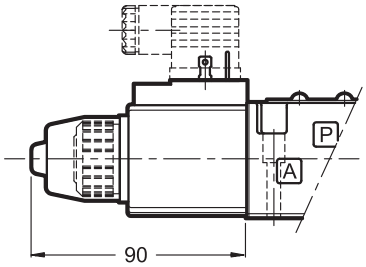
13.1 - Manual override, boot protected

CM-DS3/11 - Version for DC solenoid valve



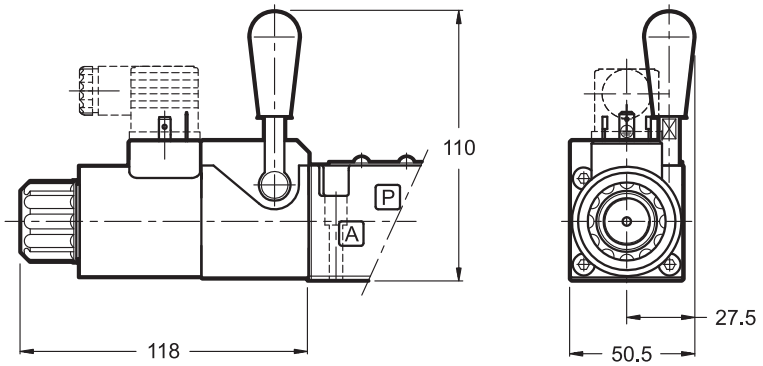
Code: 3401150006

Version for AC solenoid valve

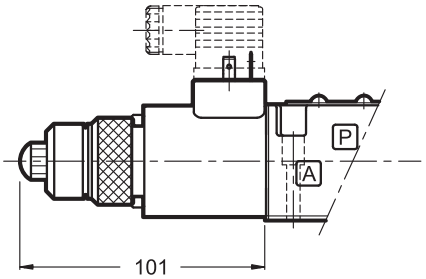


Code: 0269201

13.2 - CH-DS3/10 Lever manual override (only for DC solenoid valve)

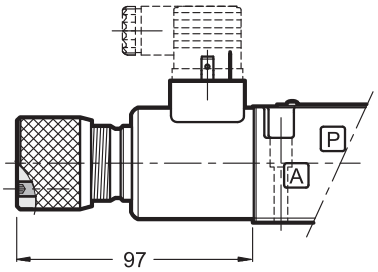


13.3 - CP-DS3/10 Push manual override (only for DC solenoid valve)



Code: 3401150005

13.4 - CK-DS3/10 Knob manual override (only for DC solenoid valve)

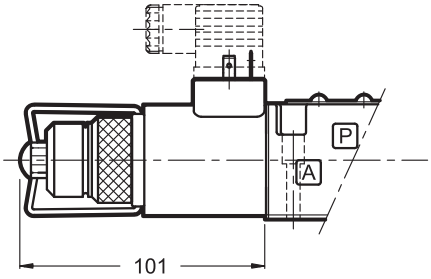


When the set screw is screwed and its point is aligned with the edge of the knob, tighten the knob till it touches the spool: in this position the override is not engaged and the valve is de-energized. After adjusting the override, tighten the set screw in order to avoid the knob loosing.

Spanner: 3 mm

Code: 3401150009

13.5 - CPK-DS3/10 Push manual override with mechanical retention (only for DC solenoid valve)



Code: 3401150004

14 - SOFT-SHIFTING VERSIONS FOR DC SOLENOID VALVE

Identification code

D S 3 - _ / 13 _ - _ _ / F _ _

Solenoid operated directional control valve

ISO 4401-03 (CETOP 03) size

Spool type

S1 **TA12**
S2F **TB12**
S4F **TA23**
S9 **TB23**
S12

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

NOTE :The valve is supplied with standard surface treatment of phosphating 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 ÷ 40µ

W4 = gas nitriding and oxidation process black colour

Coil type

D12 = 12 V
D24 = 24 V
D28 = 28 V
D110 = 110 V
D220 = 220 V

Coil electrical connection (see par. 11):

K1 = plug for connector type DIN 43650 (**standard**)

K2 = plug for connector type AMP JUNIOR
(available on D12 and D24 coils only)

K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S (available on D12 and D24 coils only)

K12 = plug for M12 connector K1 coils and DUAL DIN 43560 connector delivered together

Soft-shifting

Manual override (see par.1 and 13)

Option: non-standard surface treatment. Omit if not required (see **NOTE**)

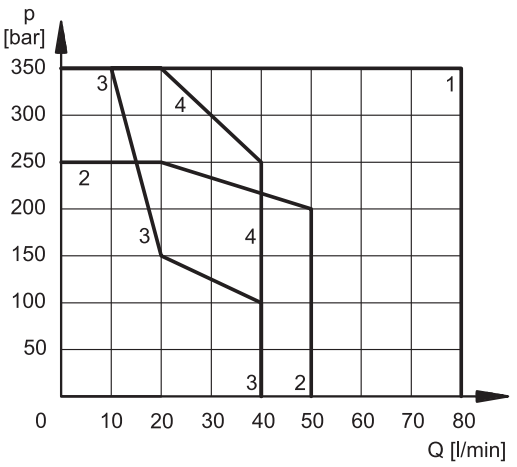
This version enables hydraulic actuators to perform a smooth start and stop by reducing the speed of movement of the valve spool.

The diagram on the side shows the operating limits of the spools available in the soft-shifting version (**NOTE**: for this version, the S9 spool must be used instead of the S3 one).

The table on the side shows the switching times. The values indicated are obtained according to ISO 6403 standard, with mineral oil viscosity 36 cSt at 50°C.

The shifting time and characteristics curves, are influenced by the viscosity (and thus by the temperature) of the operating fluid. Moreover, times can vary according to the flow rate and operating pressure values of the valve.

For the correct functioning of the soft-shifting, ensure that the solenoid tubes are always filled with oil. For this purpose, we recommend to install a backpressure valve set at 1 ÷ 2 bar on T line.



SPOOL	CURVE	TIMES [ms]	
		ENERGIZING	DE-ENERGIZING
S1, S12	1	350	200 ÷ 300
S2F	2	400	100 ÷ 250
S4F	4	350	150 ÷ 300
S9	1	400	200 ÷ 300
TA12, TB12	3	180	200 ÷ 300
TA23, TB23		300	200 ÷ 300

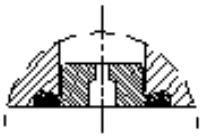
15 - PORT RESTRICTOR PLUGS

Port restrictor plugs are recommended for restricting when flows can occur during the switching processes, which exceed the performance limit of the valve or for circuit dampening.

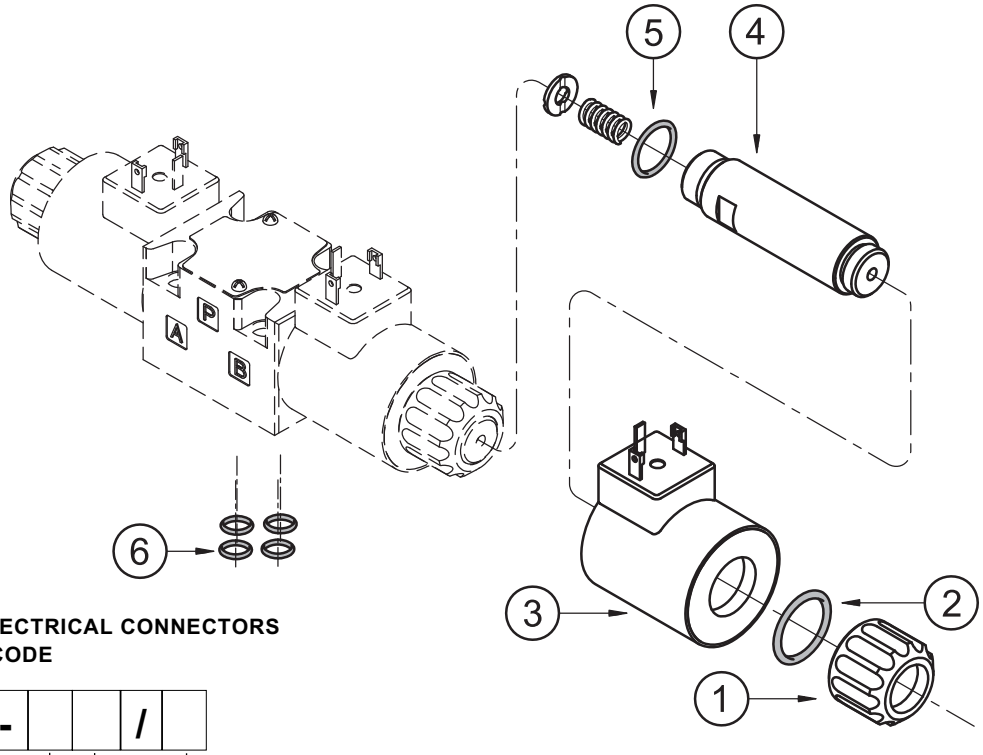
The port restrictor plugs can be ordered separately with the part numbers shown at left.

Ø (mm)	part number
blank	**0144162**
0.6	**0144163**
0.8	**0144033**
1	**0144034**

Ø (mm)	part number
1.2	**0144035**
1.5	**0144036**
1.8	**0144164**
2	**0144165**



16 - SPARE PARTS FOR DC SOLENOID VALVE



DC COILS AND ELECTRICAL CONNECTORS IDENTIFICATION CODE

C	22S3	-			/	

Supply voltage

D12 = 12 V
D14 = 14 V
D24 = 24 V
D28 = 28 V
D48 = 48 V
D110 = 110 V
D220 = 220 V

Series no.:
10 = for K7
11 = for K1, K2 and K12
(the overall and mounting dimensions remain unchanged from 10 to 19)

Coil electrical connection (see par. 11):

K1 = plug for connector type DIN 43650 (**standard**)

K2 = plug for connector type AMP JUNIOR (available on D12 and D24 coils only)

K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S (available on D12 and D24 coils only)

K12 = plug for M12 connector
K1 coils and DUAL DIN 43560 connector delivered together

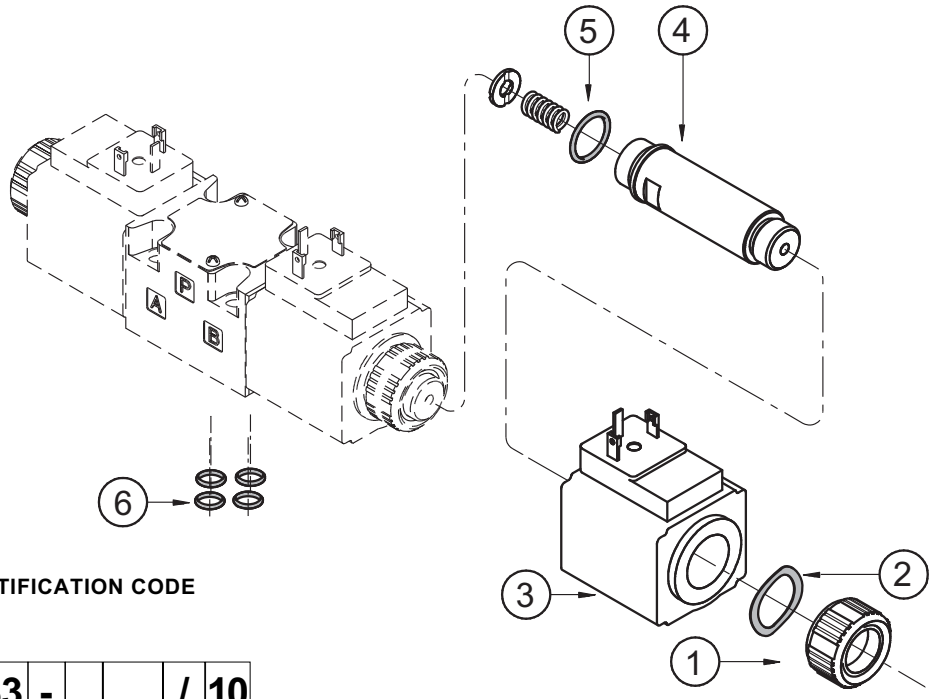
NOTE: the spare part of the connector K12 (DUAL DIN) may be ordered with code 0672136

1	Coil locking ring with seal included cod. 0119412 Tightening torque 5 ±0.5 Nm
2	ORM type 0220-20 (22x2) - 70 Shore
3	Coil (see identification code)
4	Solenoid tube for standard version: TD22-DS3/10N (NBR seals) TD22-DS3/10V (FPM seals) Solenoid tube for version with soft-shifting: TD22-DS3F/10N (NBR seals) TD22-DS3F/10V (FPM seals) **NOTE:** OR n°5 included
5	OR type 2062 (15.6x1.78) - 70 Shore
6	N. 4 OR type 2037 (9.25x1.78) - 90 Shore

SEALS KIT

The codes include the O-Ring n° 2, 5 and 6.
Cod. 1985406 NBR seals
Cod. 1985410 FPM (viton) seals

17 - SPARE PARTS FOR AC SOLENOID VALVE



AC COILS IDENTIFICATION CODE

C	20.6S3	-			/	10

Supply voltage

A24 = 24 V - 50 Hz
A48 = 48 V - 50 Hz
A110 = 110 V - 50 Hz
120 V - 60 Hz
A230 = 230 V - 50 Hz
240 V - 60 Hz
F110 = 110 V - 60 Hz
F220 = 220 V - 60 Hz

K1 = Plug for connector type DIN 43650 (**standard**)
K12 = plug for M12 connector K1 coils and DUAL DIN 43560 connector delivered together

Series no.: (the overall and mounting dimensions remain unchanged from 10 to 19)

1	Coil locking ring cod. 0119333 Tightening torque 5 ±0.5 Nm
2	Snap ring cod. 0550483
3	Coil (see identification code on the side)
4	Solenoid tube : TA20.6-DS3/10N (NBR seals) TA20.6-DS3/10V (FPM seals) **NOTE**: OR n° 5 included
5	OR type 2062 (15.6x1.78) - 70 Shore
6	N. 4 OR type 2037 (9.25x1.78) - 90 Shore

NOTE: the spare part of the connector K12 (DUAL DIN) may be ordered with code 0672136

SEALS KIT

The codes include the OR nr. 5 and 6.
Cod. 1985406 NBR seals
Cod. 1985410 FPM (viton) seals

18 - VALVE FASTENING BOLTS

4 fastening bolts SHC M5x30
Tightening torque 5 Nm (bolts A 8.8)

19 - SUBPLATES (See catalogue 51 000)

Type PMMD-AI3G with rear ports 3/8” BSP
Type PMMD-AL3G with side ports 3/8” BSP

DUPLOMATIC OLEODINAMICA

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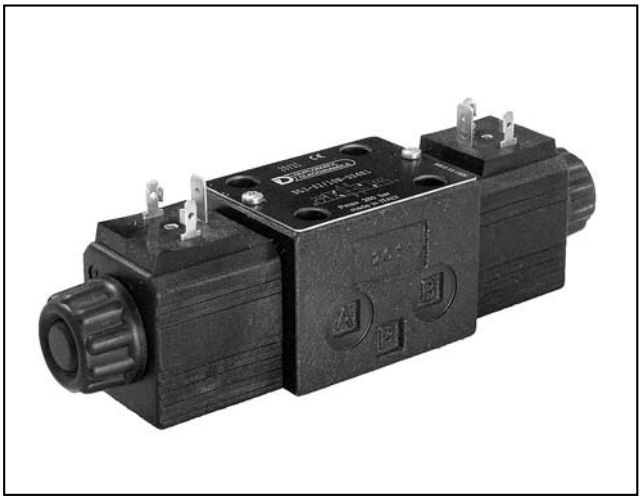


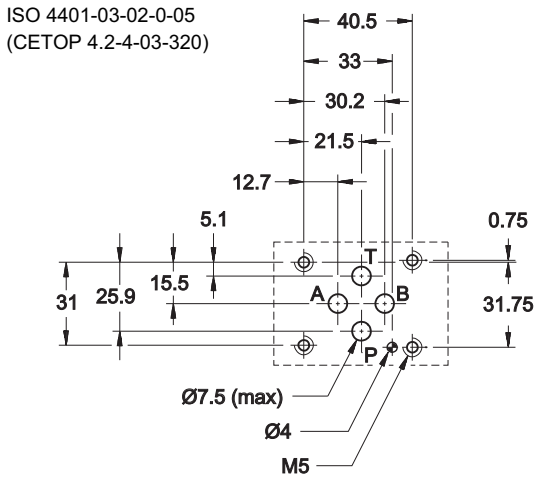
DL3

SOLENOID OPERATED DIRECTIONAL CONTROL VALVE COMPACT VERSION

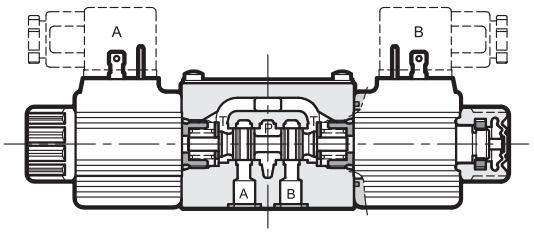
SUBPLATE MOUNTING
ISO 4401-03 (CETOP 03)

p max **280** bar
Q max **50** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



— Direct acting, subplate mounting directional control valve, with mounting surface according to ISO 4401-03 (CETOP RP 121H) standards.

— Compact design with reduced solenoid dimensions, suitable for mini-power packs and mobile and agricultural applications.

— The valve body is made with high strength iron castings provided with wide internal passages in order to minimize the flow pressure drop. Wet armature solenoids with interchangeable coils are used (for further information on solenoids see paragraph 7).

— The valve is supplied with 3 or 4 way designs and with several interchangeable spools with different porting arrangements.

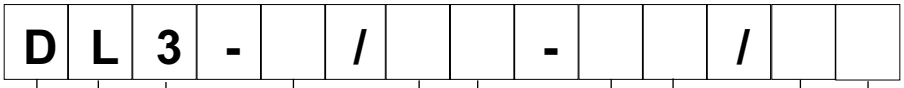
— The valve is available with DC or AC current solenoids and with several types of electrical connections to cover various installation requirements (see paragraphs 7, 12 and 13).

— The DC valve comes with boot protected manual override which ensures a protection degree IP69K with connections type K7 and K8.

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

		CC	CA
Maximum operating pressure: - ports P - A - B - port T	bar	280 250	160
Maximum flow rate	l/min	50	
Pressure drop Δp-Q	see paragraph 4		
Operating limits	see paragraph 5		
Electrical features	see paragraph 7		
Electrical connections	see paragraph 12		
Ambient temperature range	°C	-20 / +50	
Fluid temperature range	°C	-20 / +80	
Fluid viscosity range	cSt	10 ÷ 400	
Fluid contamination degree	according to ISO 4406:1999 class 20/18/15		
Recommended viscosity	cSt	25	
Masse: single solenoid valve double solenoid valve	kg	1,1 1,4	

1 - IDENTIFICATION CODE



Solenoid operated directional control valve

Compact version

ISO 4401-03 (CETOP 03) size

Spool type (see paragraph 3):

S*	**TA**
SA*	**TB**
SB*	**RK**

Series no.:

10 = for direct current valves
11 = for alternate current valves
(the overall and mounting dimensions remain unchanged from 10 to 19)

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

Option: Surface treatment not standard. Omit if not required (see **NOTE 2**)

Manual override (see par. 11)

on **DC** version:
omit for override integrated in the coil locking ring
CK = knob

on **AC** version:
omit for override integrated in the tube
CM = boot protected

Coil electrical connection:
(see paragraph 12)

DC supply
K1 = plug for connector type DIN 43650 (**standard**)
K2 = plug for connector type AMP JUNIOR
K4 = outgoing cables
K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S
K8 = plug for connector type AMP SUPER SEAL

AC supply
K1 = plug for connector type DIN 43650 (**standard**)

DC power supply
D12 = 12 V
D24 = 24 V
D28 = 28 V
D48 = 48 V
} direct current

R110 = 110 V
R230 = 230 V
} rectified current

D00 = valve without coils (see **NOTE 1**)

AC power supply
A24 = 24 V - 50 Hz
A48 = 48 V - 50 Hz
A110 = 110 V - 50 Hz
A230 = 230 V - 50 Hz
A00 = valve without coils (see **NOTE 1**)

NOTE 1: Coils locking ring and related OR are supplied together with valves.

NOTE 2:The valve is supplied with standard surface treatment of phosphating 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 ÷ 40µ

W4 = gas nitriding and oxidation process black colour

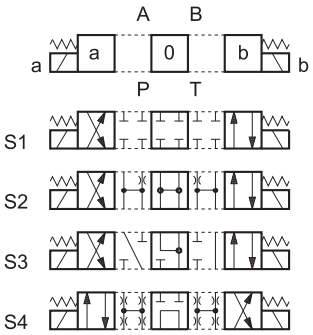
2 - HYDRAULIC FLUIDS

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

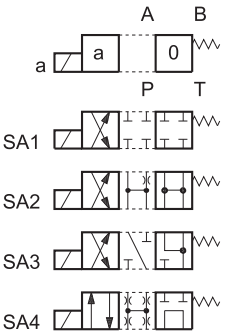
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

3 - SPOOL TYPE

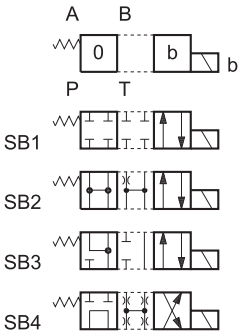
Type **S***:
2 solenoids - 3 positions
with spring centering



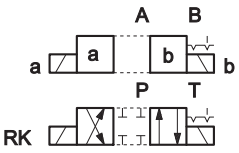
Type **SA***:
1 solenoid side A
2 positions (central + external)
with spring centering



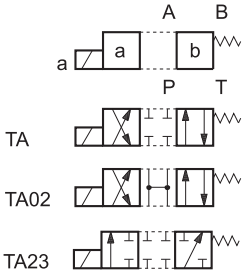
Type **SB***:
1 solenoid side B
2 positions (central + external)
with spring centering



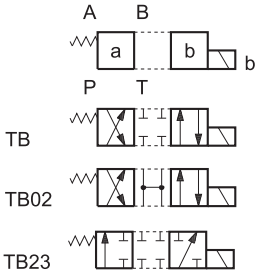
Type **RK**:
2 solenoids - 2 positions
with mechanical retention



Type **TA**:
1 solenoid side A
2 external positions
with return spring

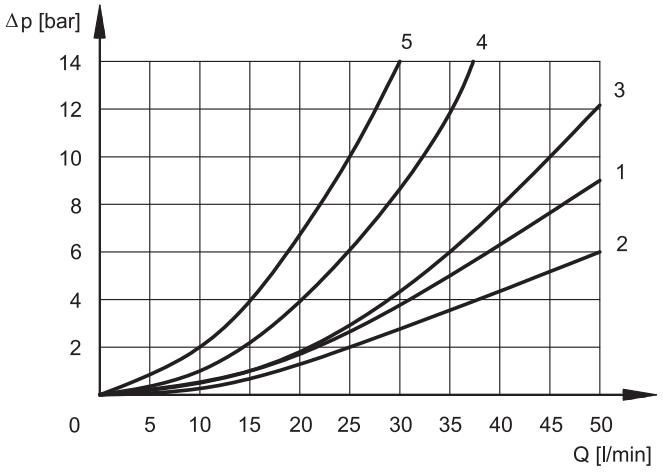


Type **TB**:
1 solenoid side B
2 external positions
with return spring



NOTE: Others spools available on request only.

4 - PRESSURE DROPS Δp-Q (obtained with viscosity of 36 cSt at 50 °C)



ENERGIZED VALVE

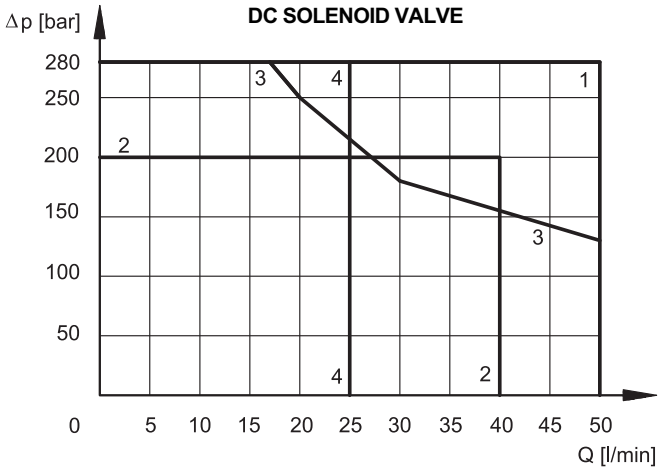
SPOOL	FLOW DIRECTIONS				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPHS				
S1	1	1	1	1	-
S2	1	1	2	2	3
S3	3	3	2	2	-
S4	4	4	4	4	5
RK	1	1	1	1	-
TA	3	3	3	3	-

5 - OPERATING LIMITS

The curves define the flow rate operating fields according to the valve pressure of the different versions. The values indicated in the graphs are relevant to the standard solenoid valve. The operating limits can be considerably reduced if a 4-way valve is used as 3-way valve with port A or B plugged or without flow.

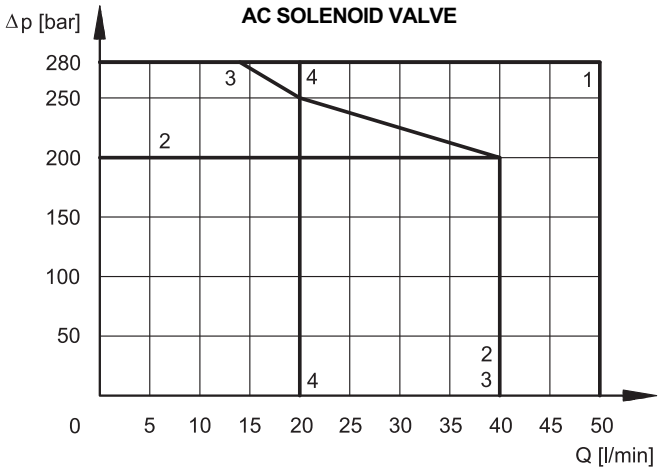
The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage. The value have been obtained with mineral oil, viscosity 36 cSt, temperature 50 °C and filtration according to ISO 4406:1999 class 18/16/13.

DC SOLENOID VALVE



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

AC SOLENOID VALVE



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

6 - SWITCHING TIMES

The values indicated are obtained with spool S1, according to ISO 6403 standard, with mineral oil viscosity 36 cSt at 50°C.

SUPPLY	TIMES (±10%) [ms]	
	ENERGIZING	DE-ENERGIZING
DC	25 ÷ 75	15 ÷ 25
AC	10 ÷ 25	15 ÷ 30

7 - ELECTRICAL FEATURES

7.1 Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation.
The coil is fastened to the tube by a threaded ring, and can be rotated +/- 90°, to suit the available space.
The interchangeability of coils of different voltages is allowed within the same type of supply current, alternating or direct.

Protection from atmospheric agents CEI EN 60529

Plug-in type	IP 65	IP 67	IP 69 K
K1 DIN 43650	x (*)		
K2 AMP JUNIOR	x	x (*)	
K4 outgoing cable	x	x	
K7 DEUTSCH DT04 male	x	x	x (*)
K8 AMP SUPER SEAL	x	x	x (*)

(*) The protection degree is guaranteed only with the connector correctly connected and installed

NOTE: In order to further reduce the emissions, with DC supply, use of type H connectors is recommended. These prevent voltage peaks on opening of the coil supply electrical circuit (see cat. 49 000).

SUPPLY VOLTAGE FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY	10.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	In compliance with 2004/108/CE
LOW VOLTAGE	In compliance with 2006/95 CE
CLASS OF PROTECTION : Coil insulation (VDE 0580) Impregnation:	 class H class H

7.2 DC valve - Current and power consumption

In direct current energizing, current consumption stays at fairly constant values, essentially determined by Ohm's law: V = R x I

"R" coil must be used when the valve is fed with AC power supply subsequently rectified by means of rectifier bridge, externally or incorporated in the "D" type connector (see cat. 49 000).
The table shows current and power consumption values for CC and RC coil types.

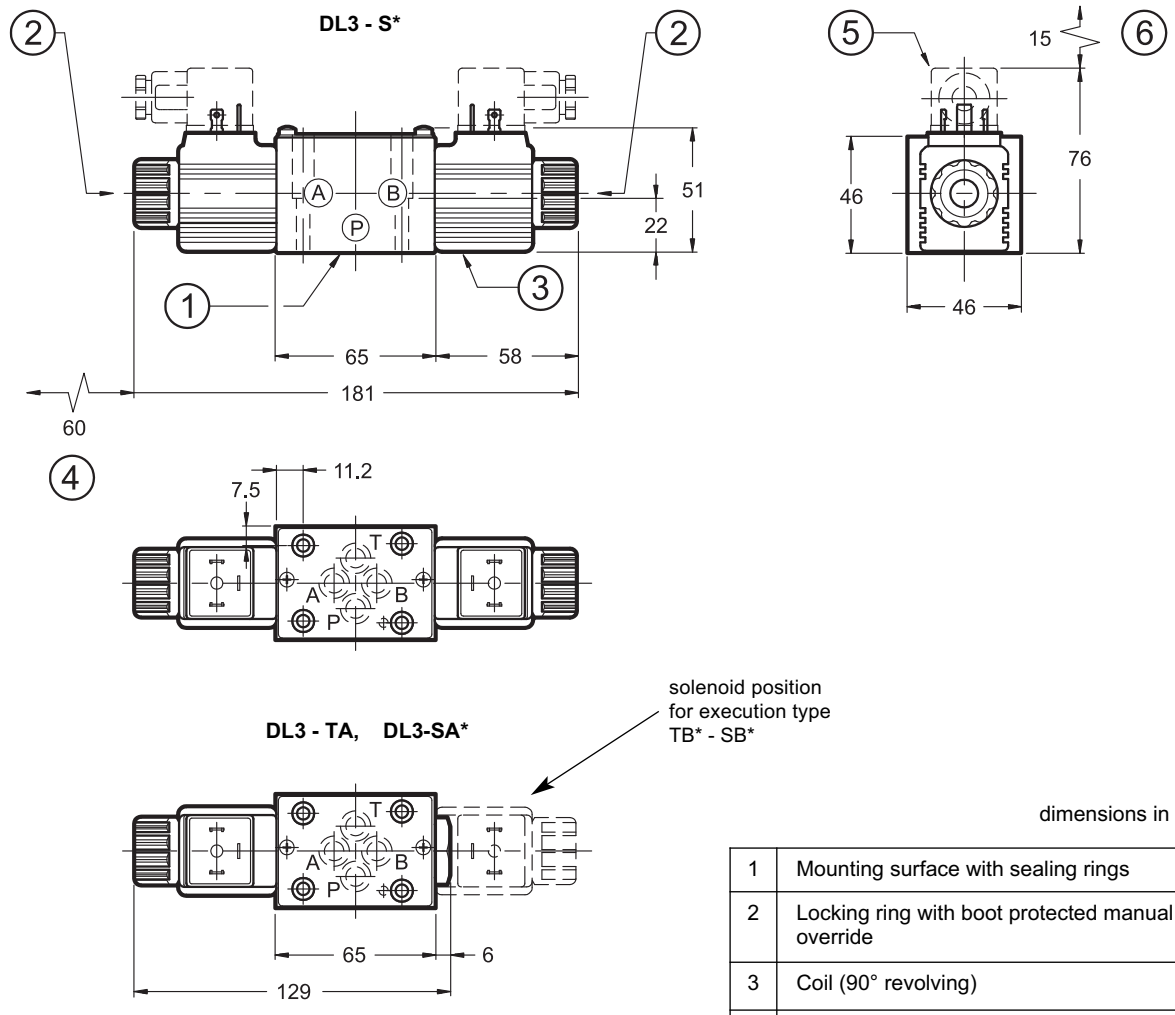
	Nominal voltage [V]	Resistance at 20°C [Ω] (±1%)	Current consumption [A] (±5%)	Power consumption (±5%) [W]	[VA]	Coil code K1	K2	K4	K7	K8
D12	12	5,4	2,2	26,5		1902740	1902750	1902770	1902980	1903020
D24	24	20,7	1,16	27,8		1902741	1902751	1902771	1902981	1903021
D28	28	27,5	1,02	28,5		1902744				
D48	48	82	0,58	28		1902745				
R110	110	363	0,25		27,2	1902742				
R230	230	1640	0,11		26,4	1902743				

7.3 AC valve - Current and power consumption

In alternating current energizing, an initial phase (maximum movement) is seen, during which the solenoid consumes elevated value currents (inrush current); the current values diminish during the plunger stroke until it reaches the minimum values (holding current) when the plunger reaches the stroke end. The table shows the values of absorption at the inrush and at holding.

	Nominal voltage [V]	Freq. [Hz]	Resistance at 20°C [Ω] (±5%)	Current consumption at inrush [A] (±10%)	Current consumption at holding [A] (±10%)	Power consumption at inrush (±10%) [VA]	Power consumption at holding (±10%) [VA]	Coil code K1
A24	24	50	2,7	4,5	1,47	109,2	35,3	1903190
A48	48		13,7	2,3	0,79	110,9	37,9	1903191
A110	110		73,4	1,0	0,31	107,8	34,1	1903192
A230	230		320	0,5	0,16	112,7	36,8	1903193

8 - DL3 DC OVERALL AND MOUNTING DIMENSIONS

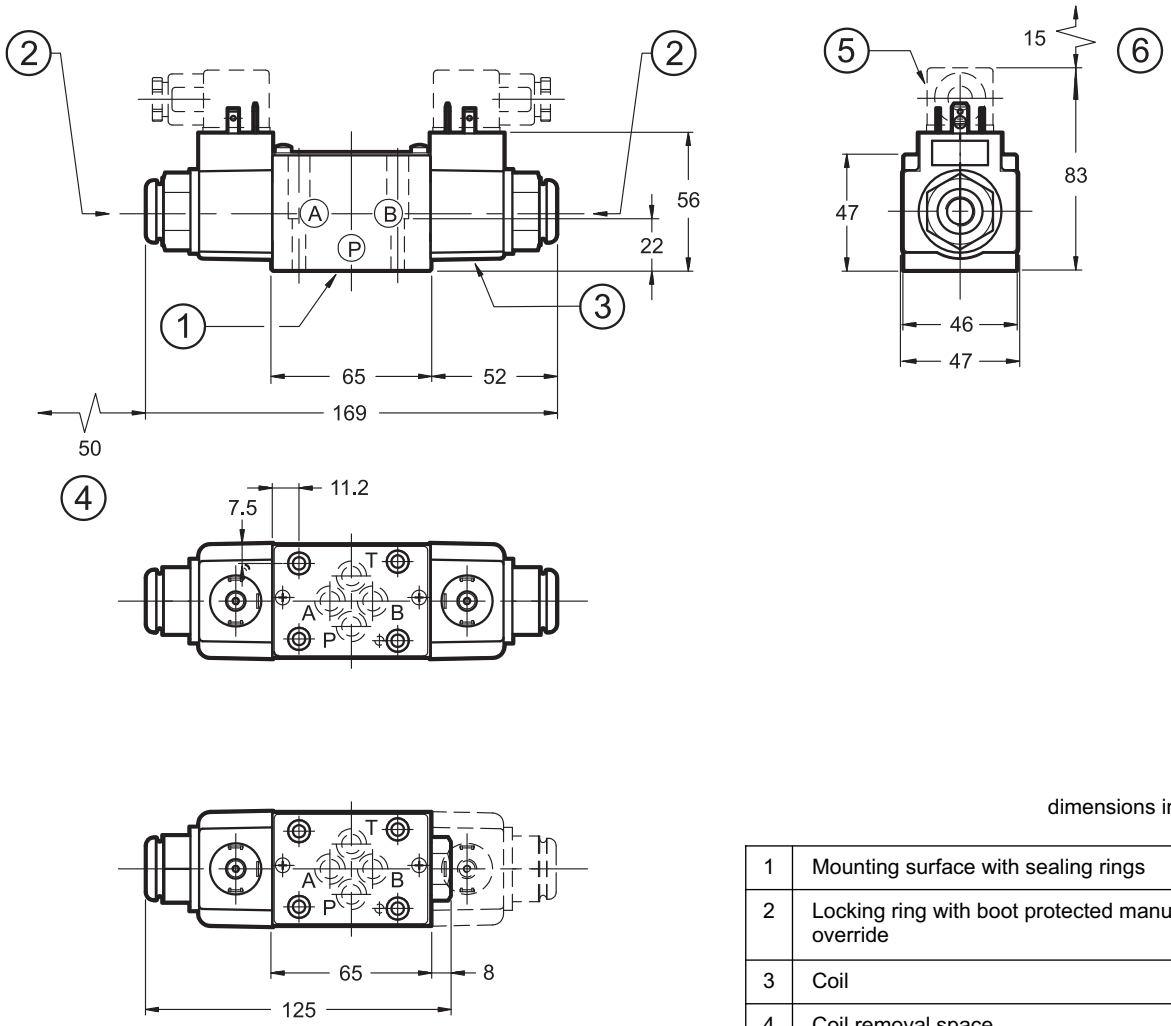


dimensions in mm

1	Mounting surface with sealing rings
2	Locking ring with boot protected manual override
3	Coil (90° revolving)
4	Coil removal space
5	DIN 43650 electrical connector (representation with K1 standard connection - see paragraph 12 for other connection types)
6	Connector removal space

See par. 16 for fastening bolts and sealing rings

9 - DL3 AC OVERALL AND MOUNTING DIMENSIONS



dimensions in mm

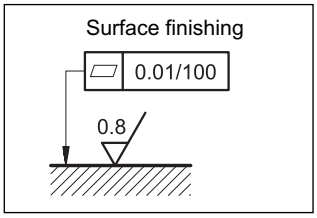
1	Mounting surface with sealing rings
2	Locking ring with boot protected manual override
3	Coil
4	Coil removal space
5	DIN 43650 electrical connector (representation with K1 standard connection)
5	Connector removal space

10 - INSTALLATION

Configurations with centering and return springs can be mounted in any position; type RK valves - without springs and with mechanical detent - must be mounted with the longitudinal axis horizontal.

Valve fitting takes place by means of screws or tie rods, fixing the valve on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing.

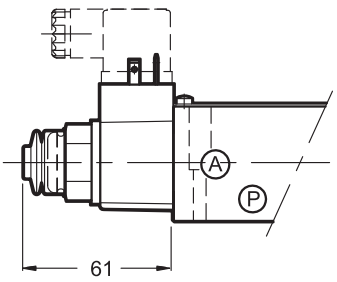
If the minimum values of planarity or smoothness are not met, fluid leakages between valve and mounting surface can easily occur.



11 - OPTIONAL MANUAL OVERRIDES

11.1 - **Boot protected manual override**
On the DC version the boot override is integrated in the coil locking ring, as standard.

On the AC version, however, the boot override can be ordered by entering the code **CM** in the identification code at par. 1, or is available as option to be ordered separately: code **3401210001.**



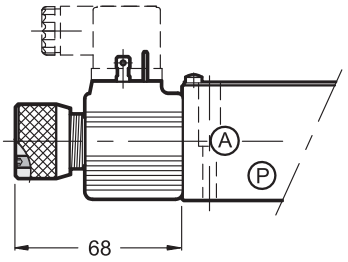
Code: 3401210001

11.2 - Knob manual override
Available only for DC version

When the set screw is screwed and its point is aligned with the edge of the knob, tighten the knob till it touches the spool: in this position the override is not engaged and the valve is de-energized. After adjusting the override, tighten the set screw in order to avoid the knob loosing.

Spanner: 2.5 mm

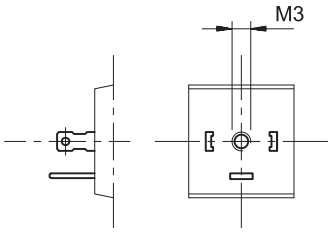
The knob override can be ordered by entering the code **CK** in the identification code at par. 1, or is available as option to be ordered separately: code **3401210002.**



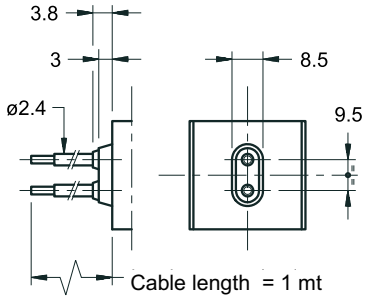
Code: 3401210002

12 - ELECTRIC CONNECTIONS

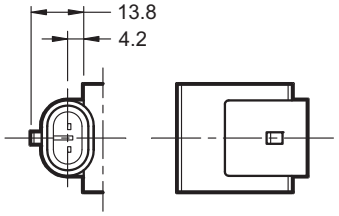
connection for DIN 43650 connector type
code **K1** (**standard**)



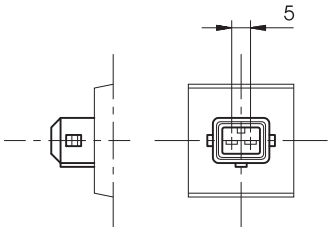
outgoing cable connections
code **K4**



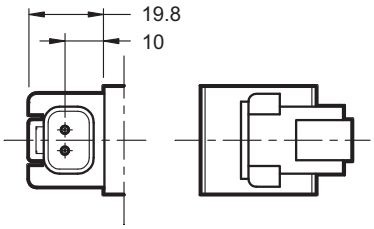
connection for AMP SUPER SEAL (two contacts)
connector type
code **K8**



connection for AMP JUNIOR connector type
code **K2**



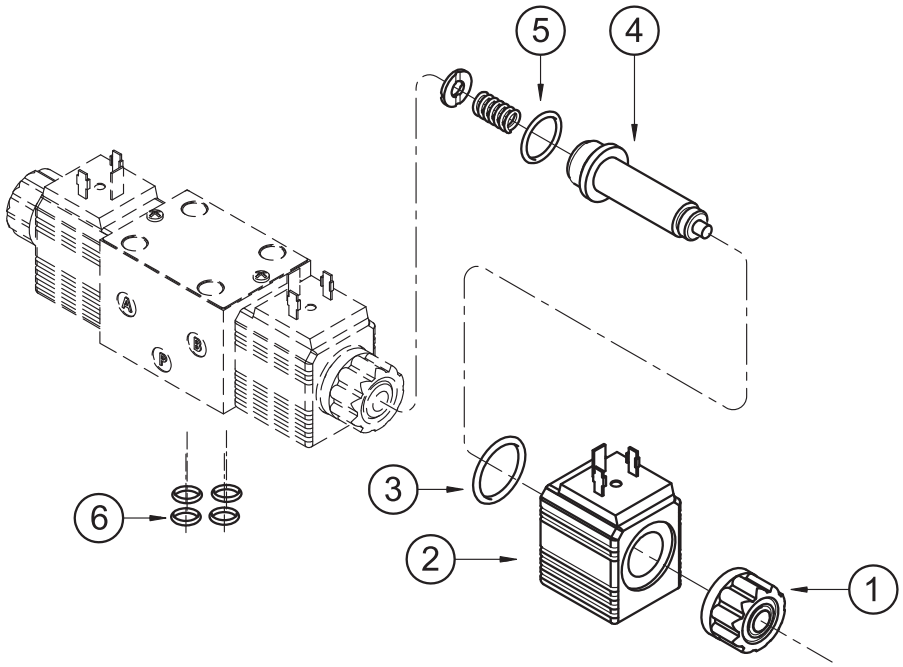
connection for DEUTSCH DT04-2P
for male connector type DEUTSCH DT06-2S
code **K7**



13 - ELECTRIC CONNECTORS

The solenoid operated valves are delivered without connector. For coils with standard electrical connections K1 type (DIN 43650) the connectors can be ordered separately. For the identification of the connector type to be ordered please see cat. 49 000. For K2, K7 and K8 connection type the relative connectors are not available.

14 - SPARE PARTS FOR DC SOLENOID VALVE



IDENTIFICATION CODE FOR DC AND RC COILS

C	14	L3	-			/	10

Supply voltage

D12 = 12 V
D24 = 24 V
D28 = 28 V
D48 = 48 V
} direct current

R110 = 110 V
R230 = 230 V
} rectified current

Series no.:
(the overall and mounting dimensions remain unchanged from 10 to 19)

Coil electrical connection:

K1 = plug for connector type DIN 43650 (**standard**)

K2 = plug for connector type AMP JUNIOR

K4 = outgoing cables

K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S

K8 = plug for connector type AMP SUPER SEAL

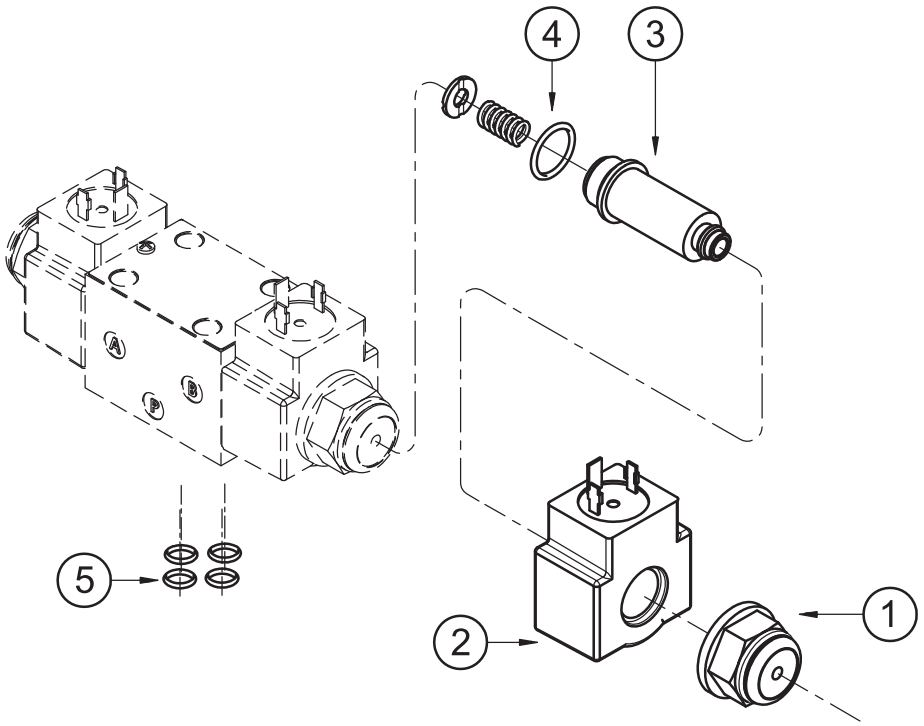
1	Coil locking ring - code 0119382 tightening torque: 3 Nm
2	Coil (see identification code)
3	OR type 2112 (28.3x1.78)
4	Solenoid tube: TD14-M18/11N (NBR seals) TD14-M18/11V (FPM seals) (OR n° 5 included)
5	OR type 2062 (15.6x1.78) - 70 Shore
6	N. 4 OR type 2037 (9.25x1.78) - 90 Shore

SEAL KIT

The codes included the OR n° 5 and 6.

Cod. 1984435 NBR seals
Cod. 1984436 FPM seals

15 - SPARE PARTS FOR AC SOLENOID VALVE



IDENTIFICATION CODE FOR AC COILS

C	18	L3	-		K1	/	11

Supply voltage
A24 = 24 V - 50 Hz
A48 = 48 V - 50 Hz
A110 = 110 V - 50 Hz
A230 = 230 V - 50 Hz

Coil electrical connection:
plug for connector type DIN 43650

Series no.:
(the overall and mounting dimensions remain unchanged from 10 to 19)

1	Coil locking ring - code. 0119469 tightening torque: 5 Nm
2	Coil (see identification code)
3	Solenoid tube: TA18-M18/11N (NBR seals) TA18-M18/11V (FPM seals) **NOTE**: OR n° 4 included.
4	OR type 2062 (15.6x1.78) - 70 Shore
5	N. 4 OR type 2037 (9.25x1.78) - 90 Shore

SEAL KIT

The codes included the OR n° 5 and 6.
Cod. 1984435 NBR seals
Cod. 1984436 FPM seals

16 - FASTENING BOLTS AND SEALING RINGS

Single valve fastening: 4 SHC screws M5x30 - ISO 4762
Tightening torque: 5 Nm
Threads of mounting holes: M5x10
Sealing rings: N. 4 OR type 2037 (9.25x1.78) - 90 Shore

17 - SUBPLATES (See catalogue 51 000)

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

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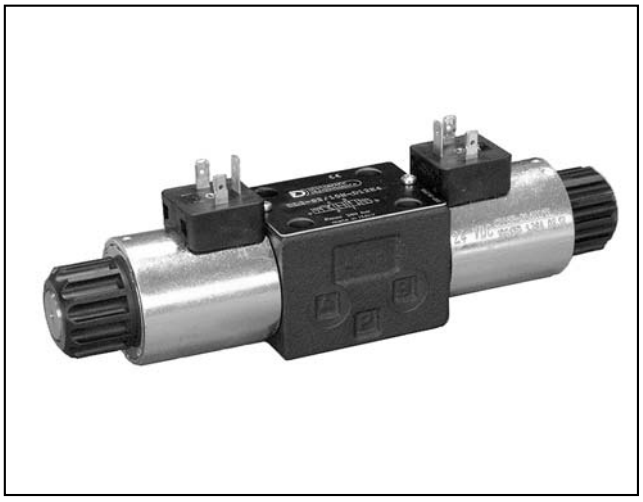
DUPLOMATIC OLEODINAMICA



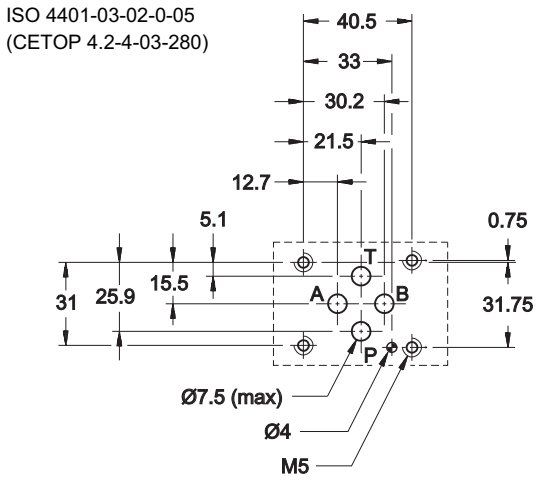
DL3B

8 WATT SOLENOID OPERATED DIRECTIONAL CONTROL VALVE SERIES 10

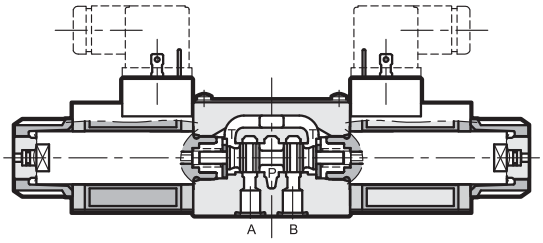
SUBPLATE MOUNTING
ISO 4401-03 (CETOP 03)

p max **280** bar
Q max **60** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



— 8 watt direct acting, subplate mounting directional control valve, with mounting surface according to ISO 4401-03 (CETOP RP 121H) standards.

— Compact design with reduced solenoid dimensions, suitable for mini-power packs and mobile and agricultural applications.

— The valve body is made with high strength iron castings provided with wide internal passages in order to minimize the flow pressure drop. Wet armature solenoids with interchangeable coils are used (for further information on solenoids see paragraph 7).

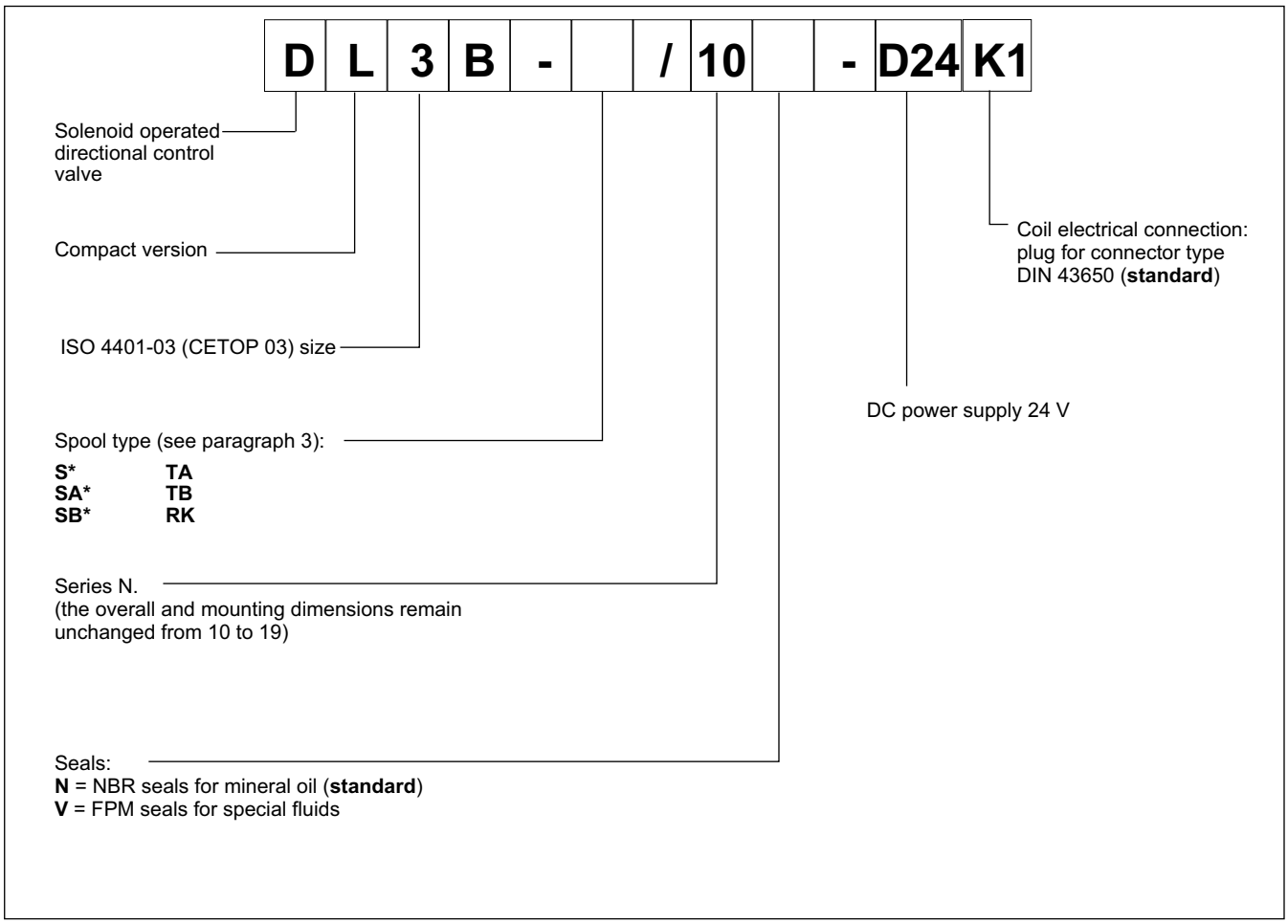
— The valve is supplied with 4 way designs and with several interchangeable spools with different porting arrangements.

— The valve is available with DC current solenoids with 24 V power supply.

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

Maximum operating pressure: - ports P - A - B - port T	bar	 280 210
Maximum flow rate	l/min	50
Pressure drop Δp-Q	see paragraph 4	
Operating limits	see paragraph 5	
Electrical features	see paragraph 7	
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	according to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass: single solenoid valve double solenoid valve	kg	1,5 2

1 - IDENTIFICATION CODE



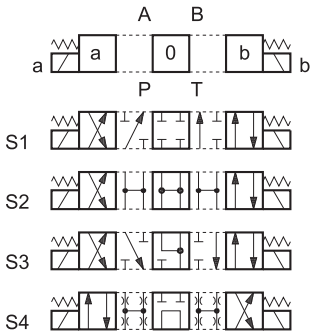
2 - HYDRAULIC FLUIDS

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

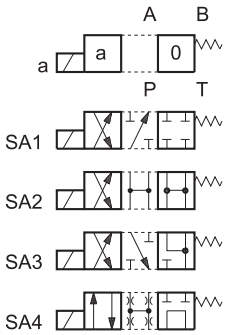
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

3 - SPOOL TYPE

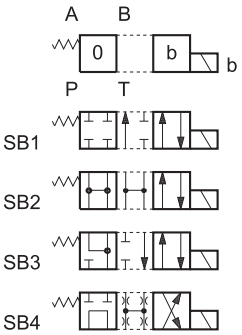
Type **S***:
2 solenoids - 3 positions
with spring centering



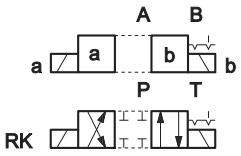
Type **SA***:
1 solenoid side A
2 positions (central + external)
with spring centering



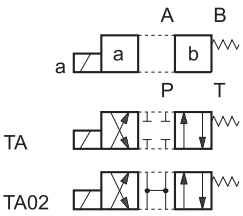
Type **SB***:
1 solenoid side B
2 positions (central + external)
with spring centering



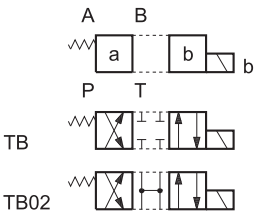
Type **RK**:
2 solenoids - 2 positions
with mechanical retention



Type **TA**:
1 solenoid side A
2 external positions
with return spring

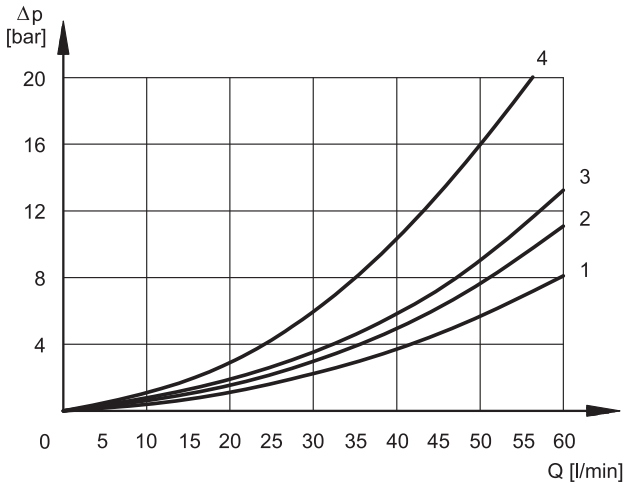


Type **TB**:
1 solenoid side B
2 external positions
with return spring



NOTE: Others spools available on request only.

4 - PRESSURE DROPS Δp-Q (obtained with viscosity of 36 cSt at 50 °C)



ENERGIZED VALVE

SPOOL	FLOW DIRECTIONS			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPH			
S1	2	3	3	2
S2	1	1	1	1
S3	3	3	1	1
S4	4	4	4	4
RK	3	3	3	3
TA, TB	3	3	3	3
TA02, TB02	1	1	1	1

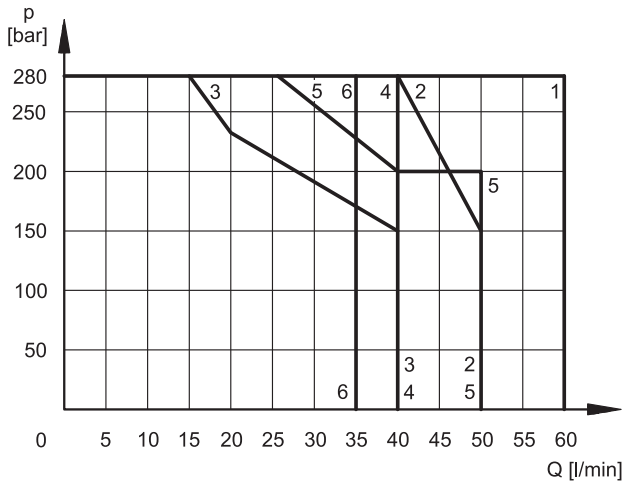
For the pressure drop with a de-energized valve P→T of the spools S2 and S4 refer to the curve 3; for the spool S4 refer to the curve 4.

5 - OPERATING LIMITS

The curves define the flow rate operating fields according to the valve pressure of the different versions.

The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage. The value have been obtained with mineral oil, viscosity 36 cSt, temperature 50 °C and filtration according to ISO 4406:1999 class 18/16/13.

The limits for TA02 and TA spools refer to the 4-way operation. The operating limits of a 4-way valve in 3-way operation or with port A or B plugged or without flow are shown in the chart on the next page.



SPOOL	CURVE
S1	1
S2	1
S3	3
S4	4
TA, TB	5
TA02, TB02	2
RK	6

6 - SWITCHING TIMES

The values indicated are obtained with spool S1, according to ISO 6403 standard, with mineral oil viscosity 36 cSt at 50°C.

TIMES (±10%) [ms]	
ENERGIZING	DE-ENERGIZING
25 ÷ 75	15 ÷ 25

7 - ELECTRICAL FEATURES

7.1 - Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation.

The coil is fastened to the tube by a threaded ring, and can be rotated 360°, to suit the available space.

SUPPLY VOLTAGE FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY	7.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	In compliance with 2004/108/EC
LOW VOLTAGE	In compliance with 2006/95 EC
CLASS OF PROTECTION : Atmospheric agents CEI EN 60529 Coil insulation (VDE 0580) Impregnation	 IP 65 (**NOTE**) class H class F

NOTE: The IP65 protection degree is guaranteed only with the connector correctly connected and installed.

7.2 - Current and absorbed power for solenoid valve

The table shows current and power consumption values relevant to the 24 VDC coil.

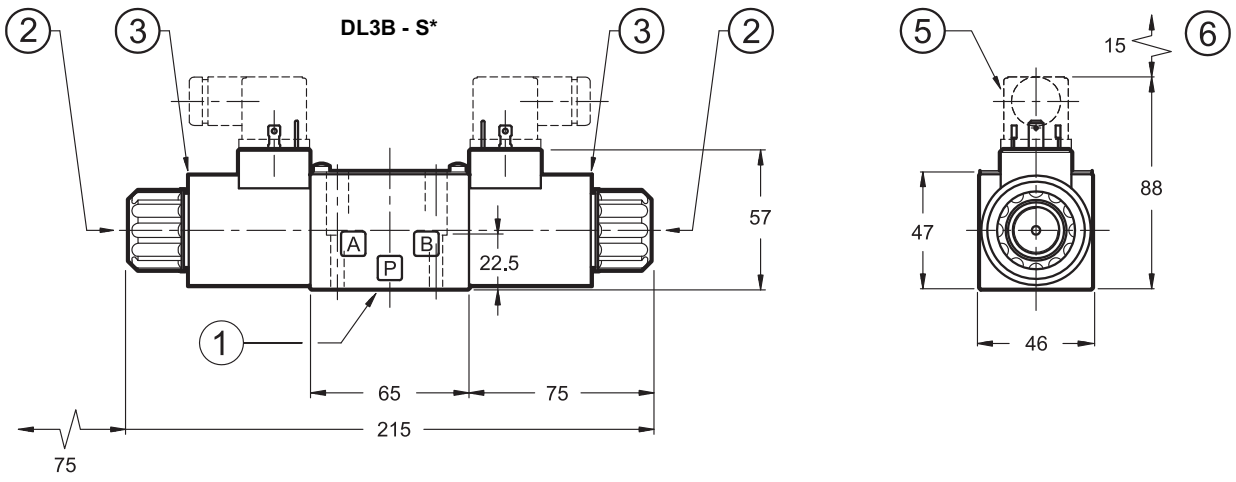
Coil for direct current (values ±5%)

	Nominal voltage [V]	Resistance at 20°C [Ω]	Current consumpt. [A]	Power consumpt [W]	Coil code
D24	24	64.6	0.37	8.92	1903291

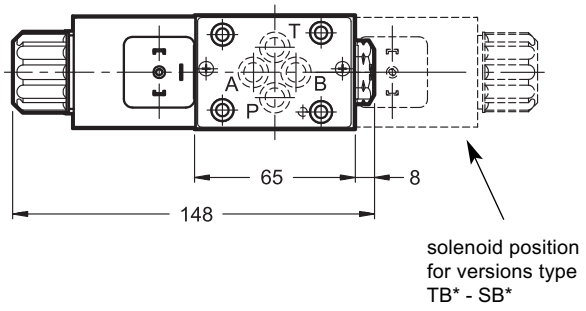
8 - ELECTRIC CONNECTORS

The solenoid valves are not supplied with connector. Connectors must be ordered separately.
For the identification of the connector type to be ordered, please see catalogue 49 000.

9 - DL3B OVERALL AND MOUNTING DIMENSIONS



DL3B - TA, DL3B-SA*



dimensions in mm

1	Mounting surface with sealing rings
2	Standard manual override included in the solenoid tube
3	Coil (360° revolving)
4	Coil removal space
5	DIN 43650 connector to be ordered separately (see cat. 49 000)
6	Connector removal space
7	Locking ring: tightening torque 5 ±0.5 Nm

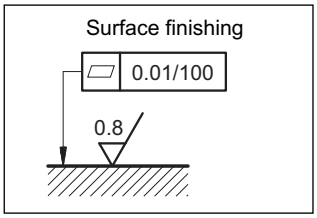
See par. 12 for fastening bolts and sealing rings

10 - INSTALLATION

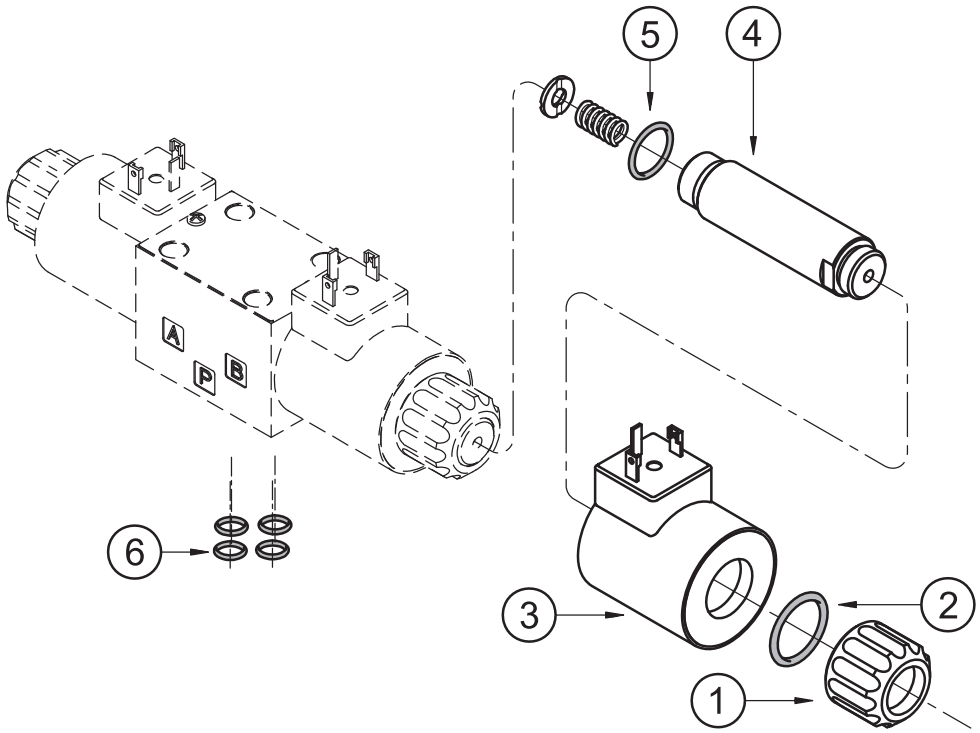
Configurations with centering and return springs can be mounted in any position; type RK valves - without springs and with mechanical detent - must be mounted with the longitudinal axis horizontal.

Valve fitting takes place by means of screws or tie rods, fixing the valve on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing.

If the minimum values of planarity or smoothness are not met, fluid leakages between valve and mounting surface can easily occur.



11 - SPARE PARTS FOR SOLENOID VALVE



COILS IDENTIFICATION CODE

C	22L3B	-	D24	K1	/	11

Supply voltage
24 VDC

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

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

1	Coil locking ring with seal included cod. 0119412 Tightening torque 5 ±0.5 Nm
2	ORM type 0220-20 (22x2) - 70 Shore
3	Coil (see identification code)
4	Solenoid tube for standard version: TD22-DL3B/10N (NBR seals) TD22-DL3B/10V (FPM seals) **NOTE:** OR n°5 included
5	OR type 2062 (15.6x1.78) - 70 Shore
6	N. 4 OR type 2037 (9.25x1.78) - 90 Shore

SEALS KIT

The codes include the O-Ring n° 2, 5 and 6.
Cod. 1985406 NBR seals
Cod. 1985410 FPM (viton) seals

12 - VALVE FASTENING BOLTS

4 fastening bolts SHC M5x30 - ISO 4762

Tightening torque 5 Nm (bolts A 8.8)

13 - SUBPLATES (see catalogue 51 000)

Type PMMD-AI3G with rear ports 3/8” BSP
Type PMMD-AL3G with side ports 3/8” BSP

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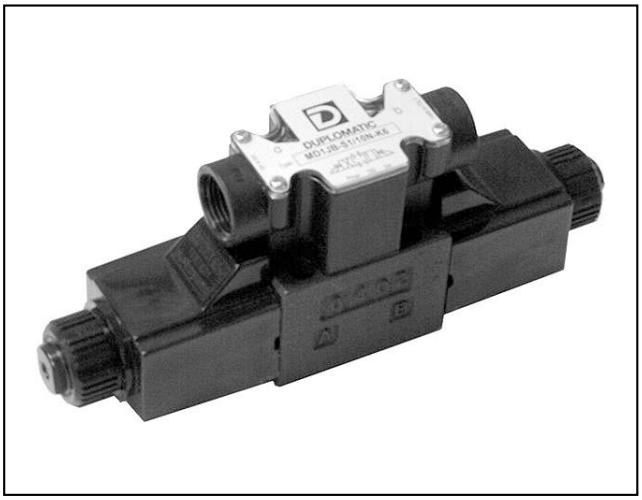


MD1JB

SOLENOID OPERATED DIRECTIONAL CONTROL VALVES

ALTERNATING CURRENT

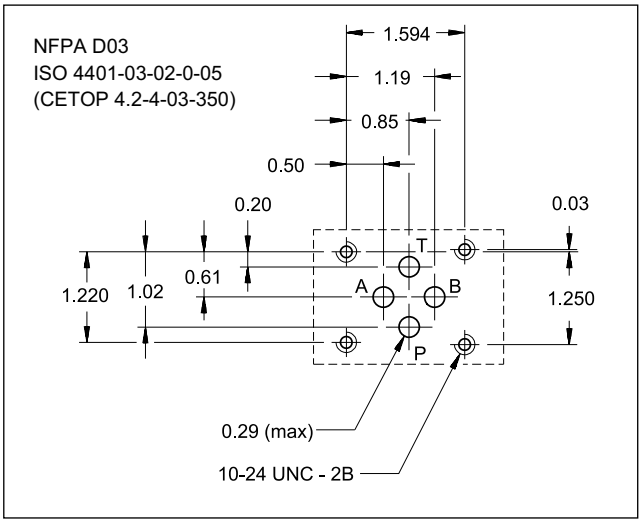
SERIES 10

NFPA D03 (ISO 4401-03 /CETOP 03)

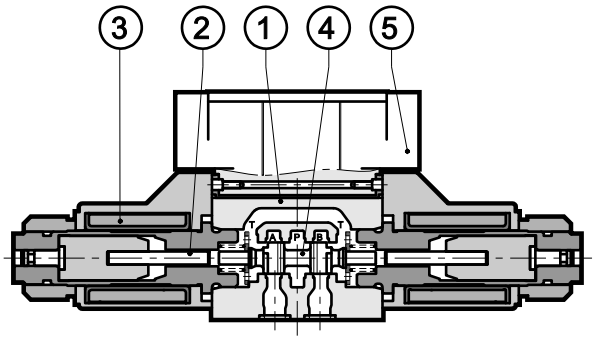
p max **5000** psi

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.

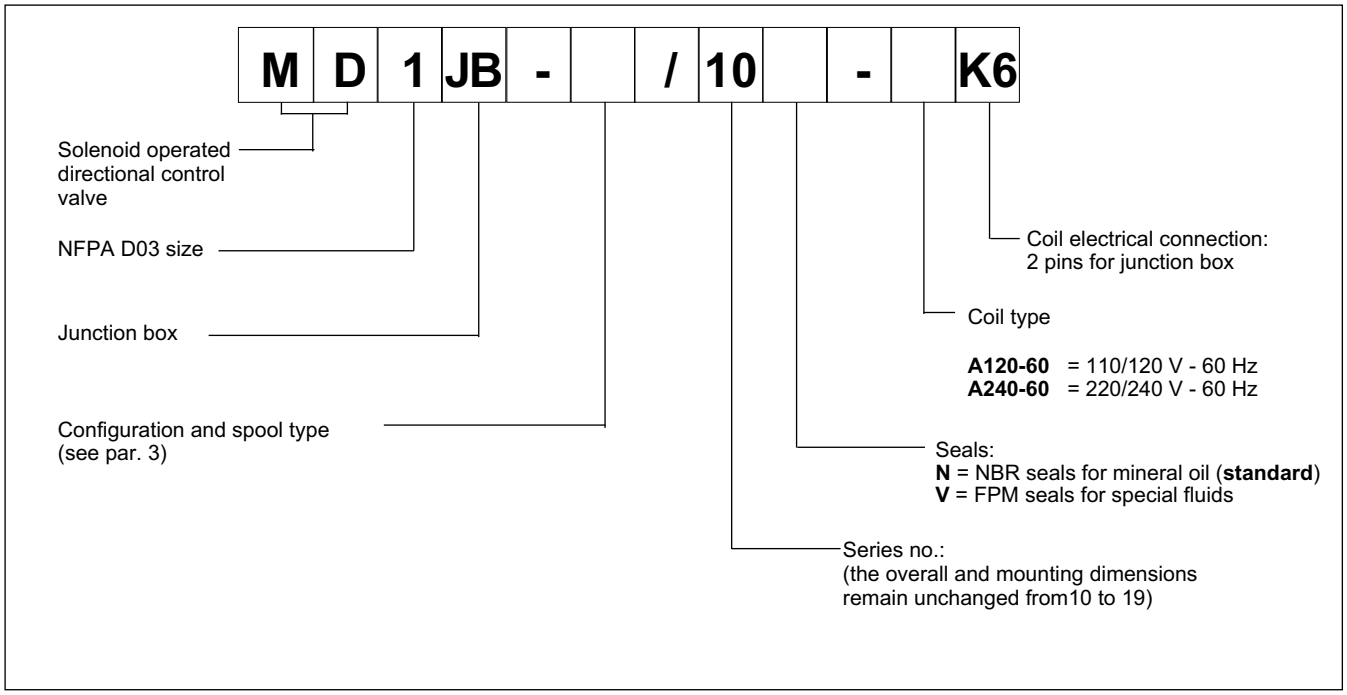
— The valve is supplied with 3 or 4 way designs and with several interchangeable spools (4) with different porting arrangements.

— 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 Δp-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



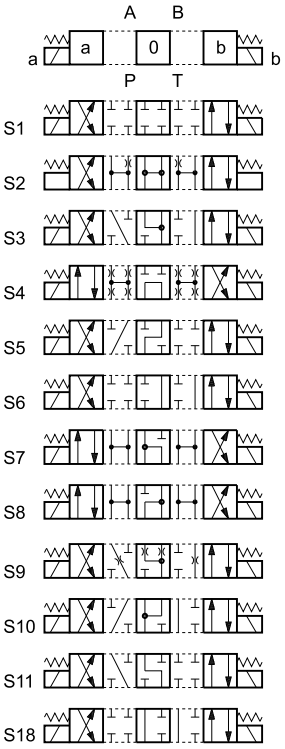
2 - HYDRAULIC FLUIDS

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.

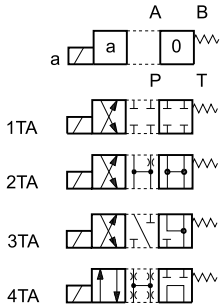
Using fluids at temperatures higher than 175 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

3 - CONFIGURATIONS

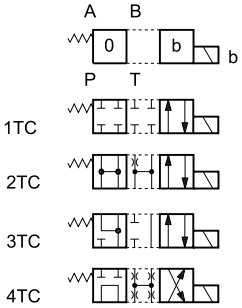
Type **S**:
3 positions with spring centering



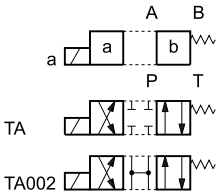
Type ***TA**:
2 positions with return spring



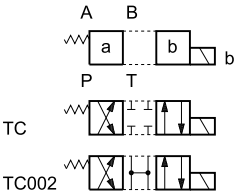
Type ***TC**:
2 positions with return spring



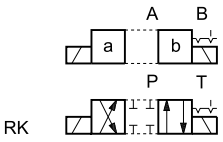
Type **TA**:
2 positions with return spring



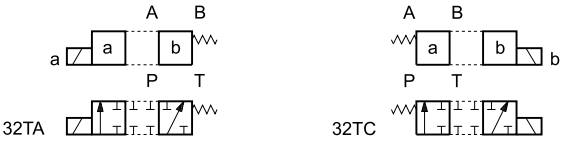
Type **TC**:
2 positions with return spring



Type **RK**:
2 positions with mechanical retention

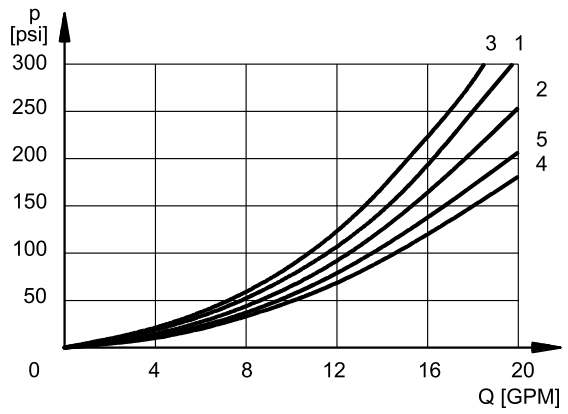


Model **32TA/32TC**:
3-way valve - 1 solenoid - 2 external position, return spring



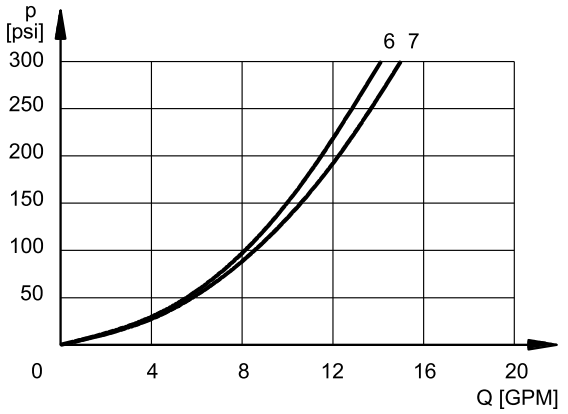
Besides the diagrams shown, which are the most frequently used, other special versions are available: consult our technical department for their identification, feasibility and operating limits.

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

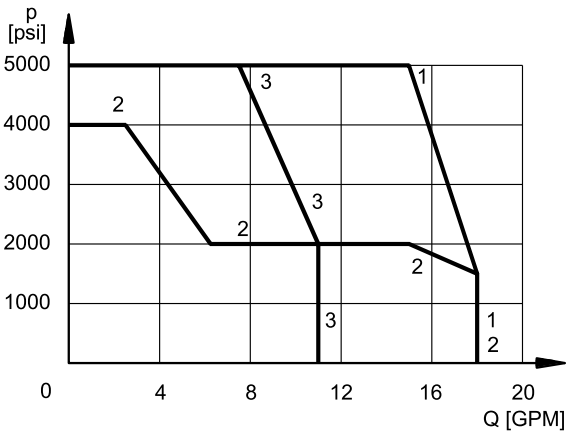
5 - SWITCHING TIMES

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 µm and with solenoids at rated temperature 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

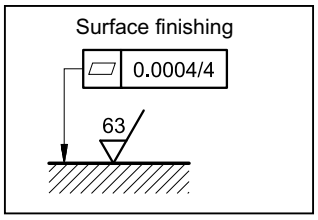
In alternating current energizing, an initial phase (maximum movement) is seen, during which the solenoid consumes elevated value currents (inrush current); the current values diminish during the plunger stroke until it reaches the minimum values (holding current) when the plunger reaches the stroke 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	

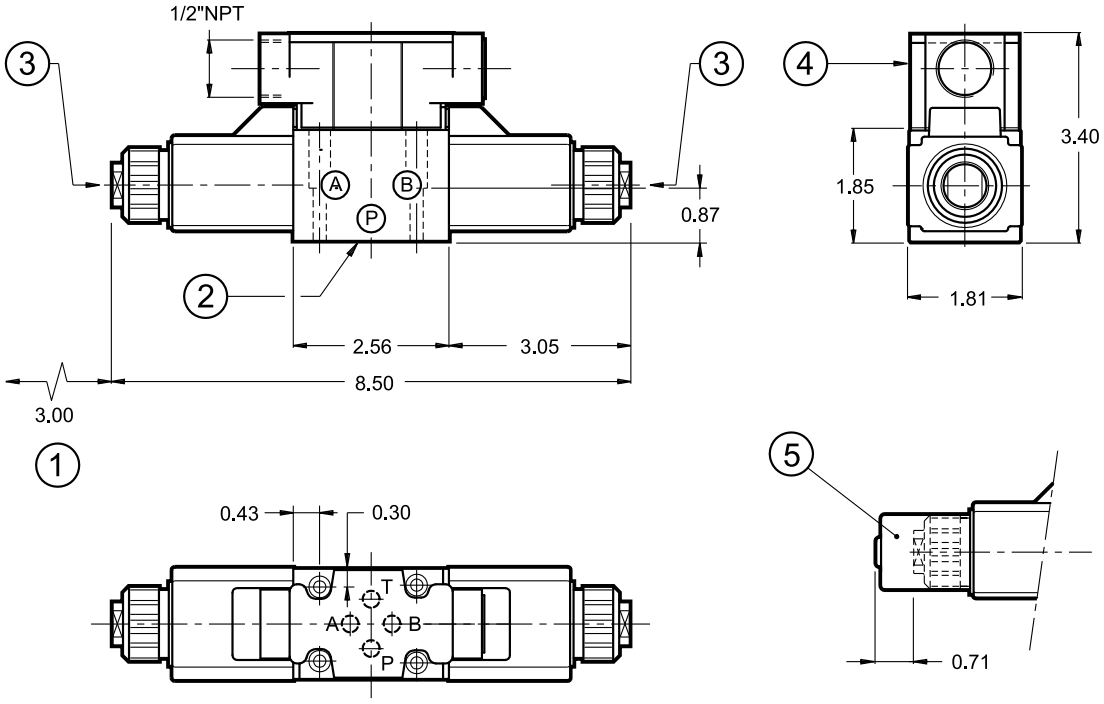
8 - INSTALLATION

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.

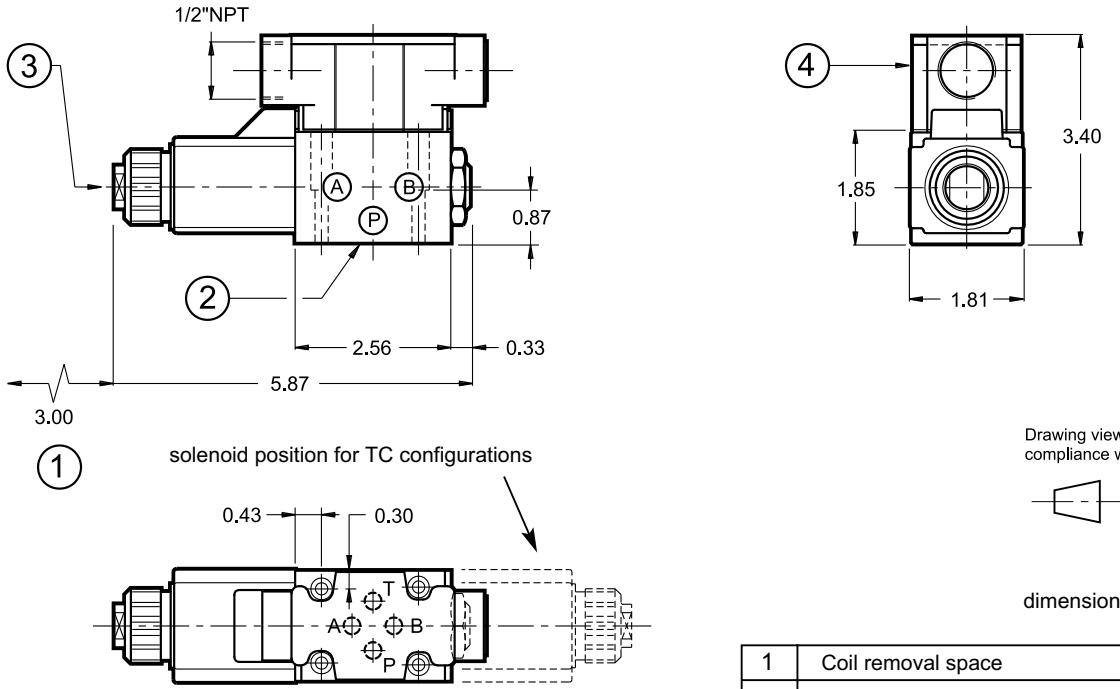


9 - OVERALL AND MOUNTING DIMENSIONS

MD1JB - S
MD1JB - RK



MD1JB - TA



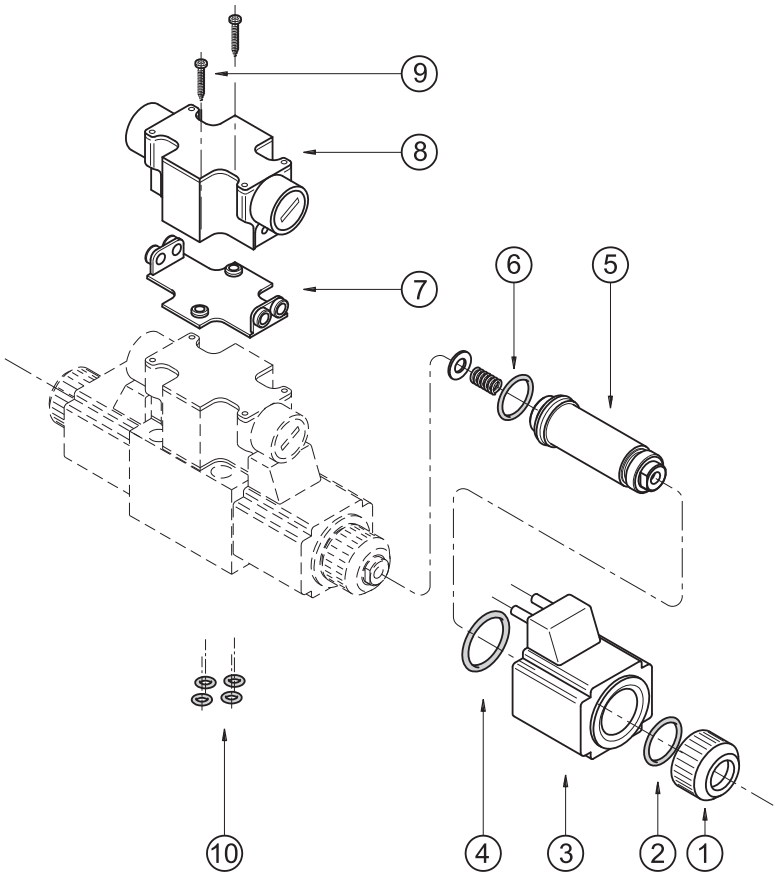
Drawing view in compliance with ISO 128

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

Coil electrical connection:
2 pins for junction box

Series no.
(the overall and mounting dimensions remain unchanged from 10 to 19)

SEALS KIT

The codes here below include O-Rings ref.2, 4, 6 and 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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www.duplomatic.com • e-mail: sales.exp@duplomatic.com

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9337 Ravenna Road, Unit G,
TWINSBURG, OHIO 44087
Phone +330-405-1800 - Fax +330-405-1801
E-mail: duplomatic@uhiltd.com

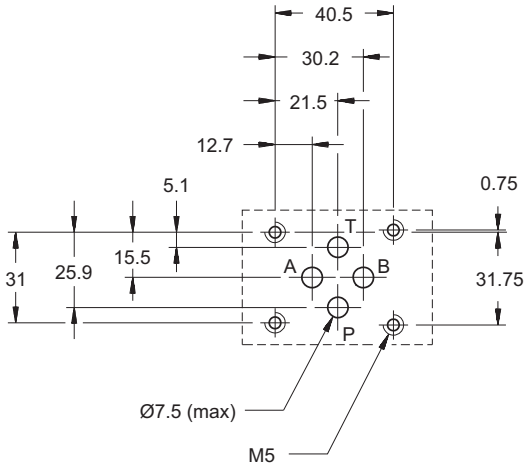
MDS3
SOLENOID OPERATED SWITCHING VALVE
SERIES 10

MODULAR VERSION
ISO 4401-03 (CETOP 03)

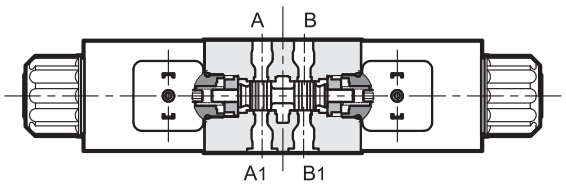
p max **350** bar
Q max **50** l/min

MOUNTING INTERFACE

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



OPERATING PRINCIPLE



— The MDS3 valve is used to switch multiple flow directions, or to select pressure values. Application examples can be seen at paragraph 15.

— The oil passage holes pass right through the entire valve body and due to this particular design feature, the MDS3 can be assembled with all ISO 4401-03 (CETOP 03) modular valves).

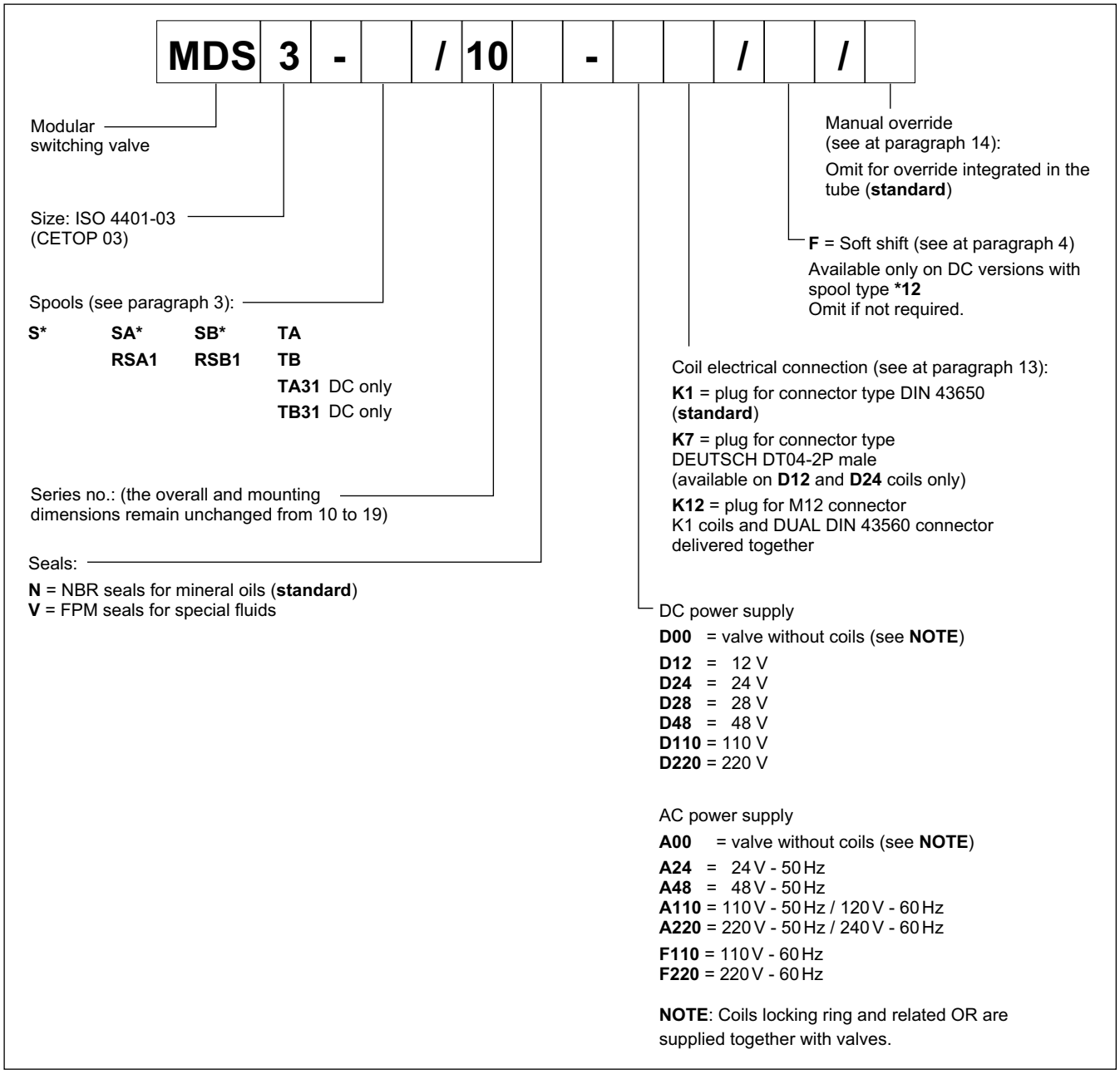
— The special connection of the valve in parallel to the P - T - A - B lines of the circuit allows easy construction of differents hydraulic configurations, reducing pressure drops to a minimum.

— Soft-shift feature available for some DC versions.

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

Max operating pressure: P - A - B ports T port (DC version) T port (AC version)	bar	 350 210 140
Maximum flow on P - A - B ports	l/min	50
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass: double solenoid single solenoid	kg	2 1,5

1 - IDENTIFICATION CODE

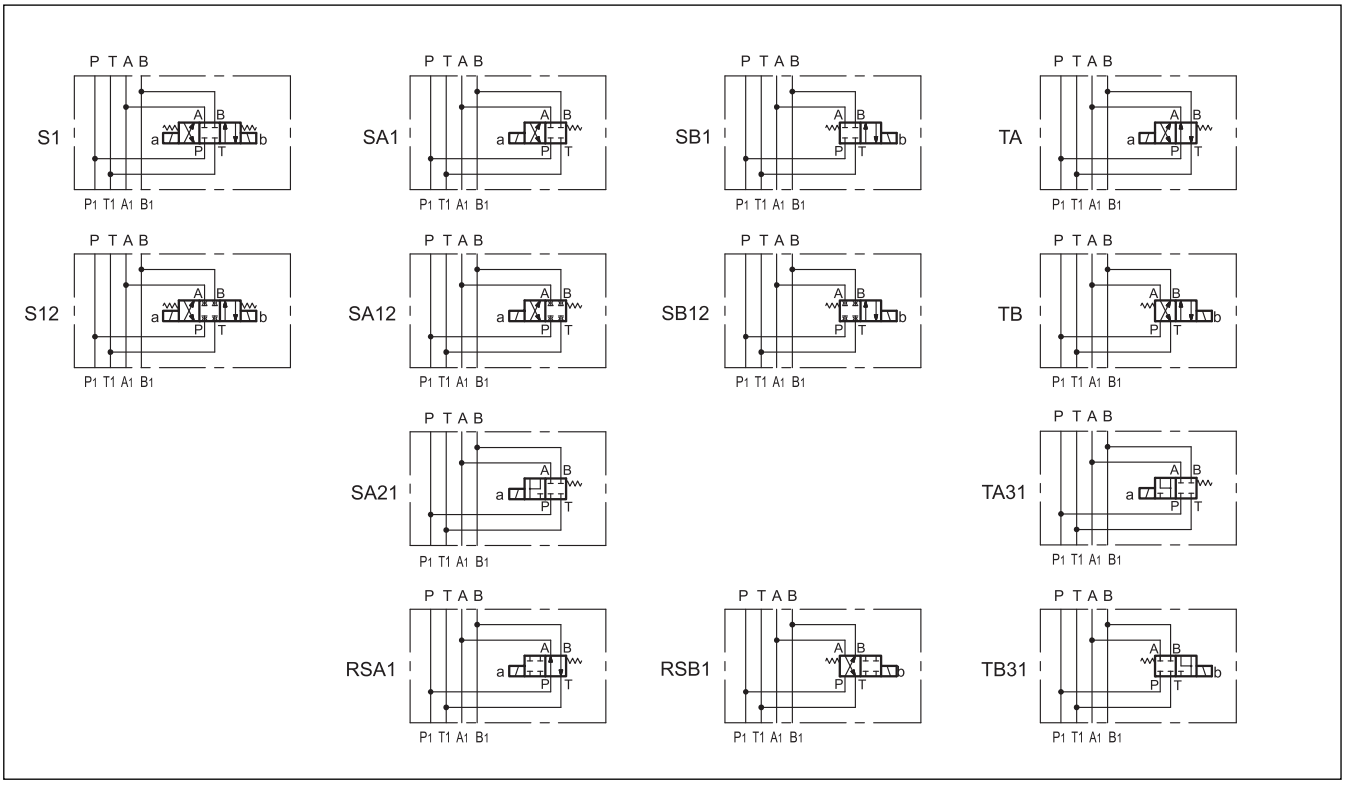


2 - HYDRAULIC FLUIDS

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

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

3 - SPOOL TYPE



4 - SOFT SHIFT

At now the soft shift feature is available only on DC valves with S12, SA12 and SB12 spools.

This feature enables hydraulic actuators to perform a smooth start and stop by reducing the speed of movement of the valve spool. The shifting time and characteristics curves, are influenced by the viscosity (and thus by the temperature) of the operating fluid. Moreover, times can vary according to the flow rate and operating pressure values of the valve.

For the correct work of the soft-shift device, ensure that the solenoid tubes are always filled with oil. For this purpose, we recommend to install a backpressure valve set at 1 ÷ 2 bar on T line.

5 - PRESSURE DROPS Δp-Q

SOON AVAILABLE

6 - OPERATING LIMITS

SOON AVAILABLE

7 - SWITCHING TIMES

SOON AVAILABLE

8 - ELECTRICAL FEATURES

8.1 Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation.

The coil is fastened to the tube by a threaded ring, and can be rotated to suit the available space.

Protection from atmospheric agents CEI EN 60529

Connector	IP 65	IP 67	IP 69 K
K1 DIN 43650	x (*)		
K7 DEUTSCH DT04 male	x	x	x (*)
K12 DUAL DIN 43650	x	x (*)	

(*) The protection degree is guaranteed only with the connector correctly connected and installed

SUPPLY VOLTAGE FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY DC valve AC valve	 18.000 ins/hr 10.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC) (NOTE)	In compliance with 2004/108/CE
LOW VOLTAGE	In compliance with 2006/95 CE
CLASS OF PROTECTION : Coil insulation (VDE 0580) Impregnation	 class H class F

NOTE: In order to further reduce the emissions is recommended the use of type H connectors. These prevent voltage peaks on opening of the coil supply electrical circuit (see cat. 49 000).

8.2 Current and absorbed power for DC solenoid valve

The table shows current and power consumption values relevant to the different coil types

The rectified current supply takes place by fitting the valve (with the exception of D12 coil) with an alternating current source (50 or 60 Hz), rectified by means of a bridge built-in to the “D” type connectors (see cat. 49 000), by considering a reduction of the operating limits.

Available DC coils (values ±5%)

	Nominal voltage [V]	Resistance at 20°C [Ω]	Current consumpt. [A]	Power consumpt [W]	Coil code K1	Coil code K7
D12	12	4,4	2,72	32,6	1903080	1902940
D24	24	18,6	1,29	31	1903081	1902941
D28	28	26	1,11	31	1903082	
D48	48	78,6	0,61	29,3	1903083	
D110	110	423	0,26	28,6	1903084	
D220	220	1692	0,13	28,6	1903085	

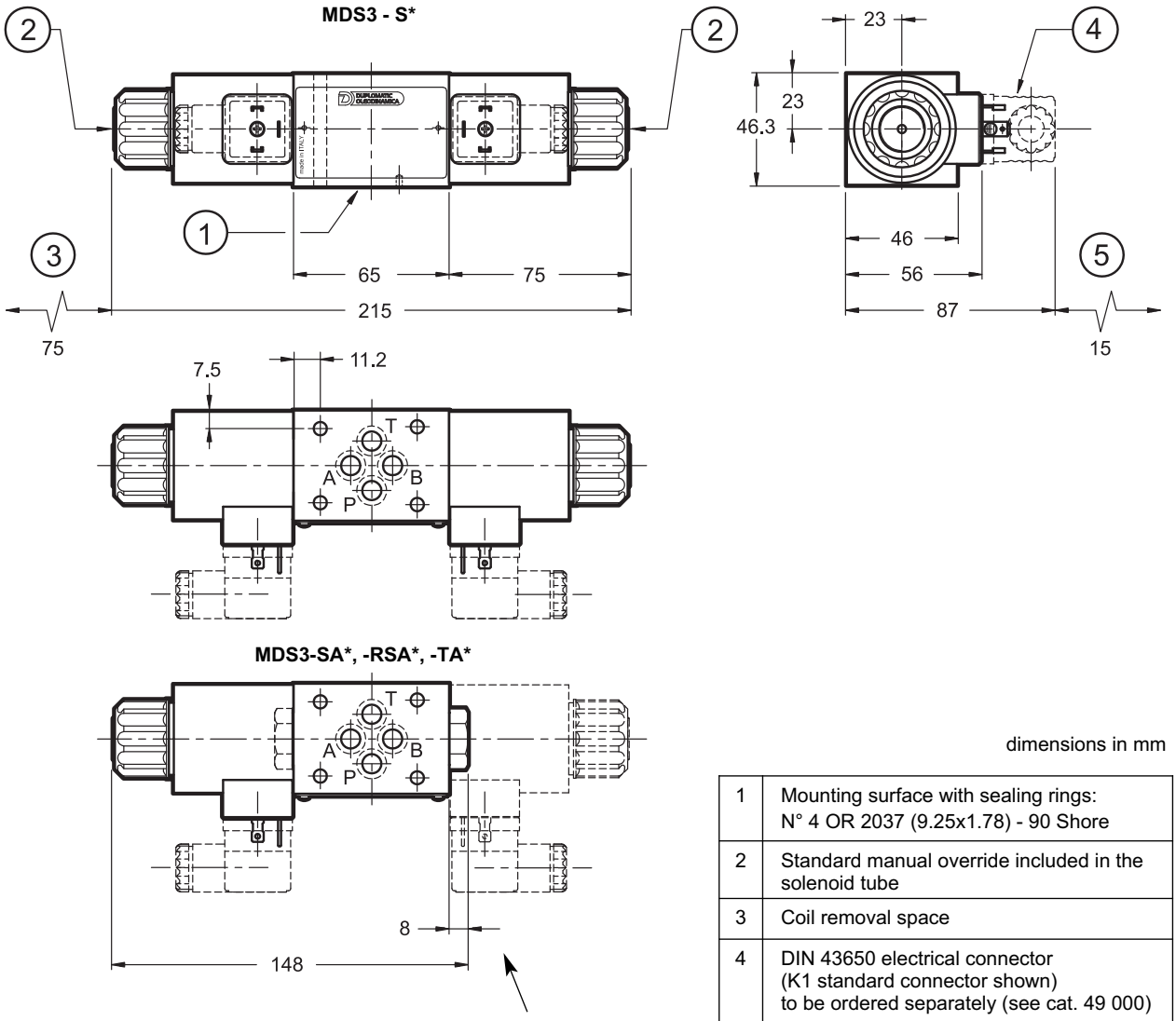
8.3 Current and absorbed power for AC solenoid valve

The table shows current and power consumption values at inrush and at holding, relevant to the different coil types for AC current.

Available AC coils (values ± 5%)

Suffix	Nominal Voltage [V]	Freq. [Hz]	Resistance at 20°C [Ω] (±1%)	Current consumption at inrush [A]	Current consumption at holding [A]	Power consumption at inrush [VA]	Power consumption at holding [VA]	Coil Code K1 and K12
A24	24	50	0.88	8.7	2.35	209	56.5	1902660
A48	48		3.2	4.5	1.25	216	60	1902661
A110	110V-50Hz	50/60	17.5	1.9	0.48	209	52.8	1902677
	120V-60Hz			1.8	0.45	216	54	
A220	220V-50Hz		70	0.95	0.23	209	50.6	1902678
	240V-60Hz			0.87	0.21		50.4	
F110	110	60	15	2	0.5	220	55	1902680
F220	220		60	1	0.26		57.2	1902681

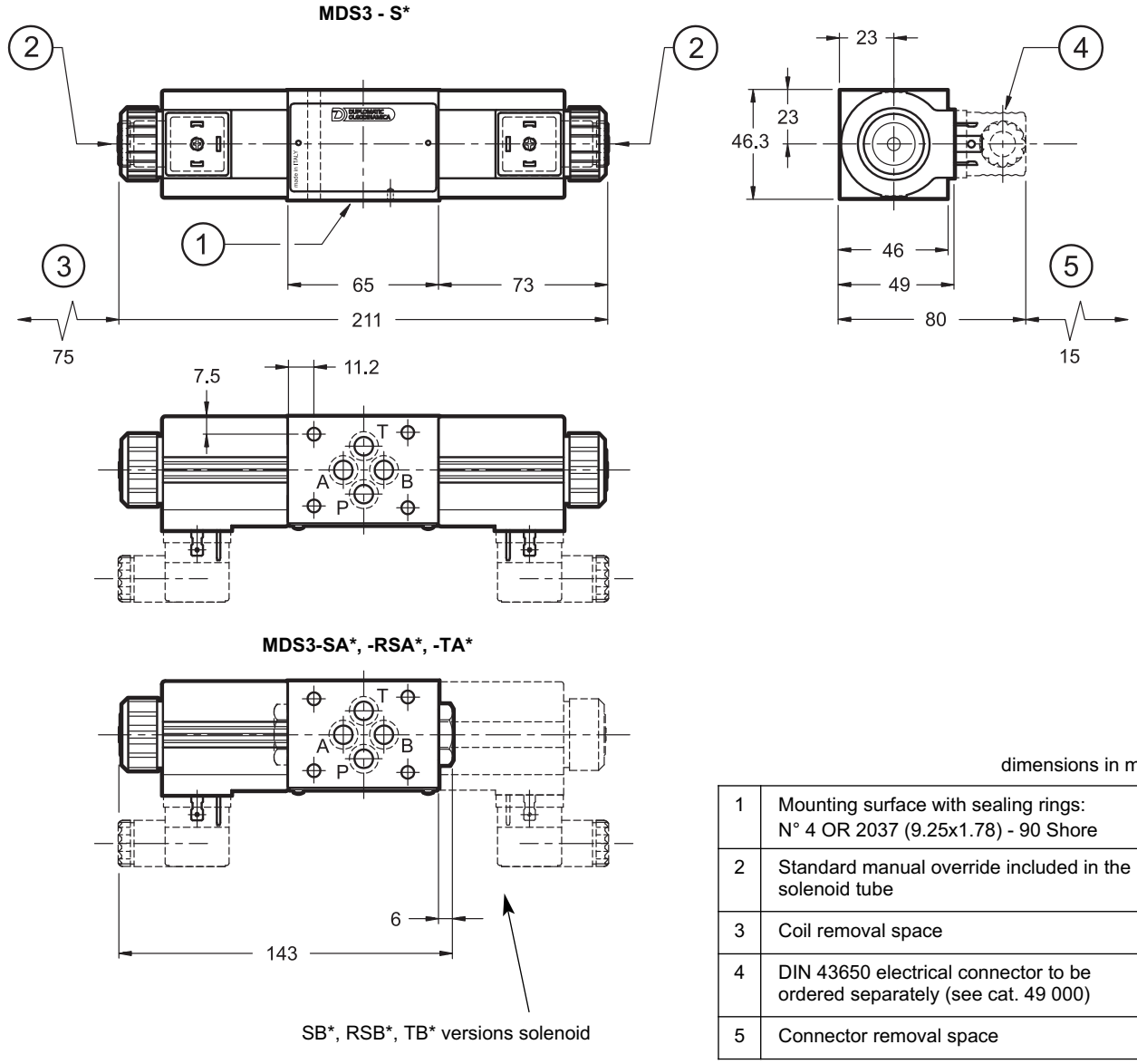
9 - DC VALVE - OVERALL AND MOUNTING DIMENSIONS



dimensions in mm

1	Mounting surface with sealing rings: N° 4 OR 2037 (9.25x1.78) - 90 Shore
2	Standard manual override included in the solenoid tube
3	Coil removal space
4	DIN 43650 electrical connector (K1 standard connector shown) to be ordered separately (see cat. 49 000)
5	Connector removal space

10 - AC VALVE - OVERALL AND MOUNTING DIMENSIONS



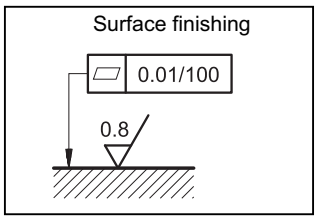
dimensions in mm

1	Mounting surface with sealing rings: N° 4 OR 2037 (9.25x1.78) - 90 Shore
2	Standard manual override included in the solenoid tube
3	Coil removal space
4	DIN 43650 electrical connector to be ordered separately (see cat. 49 000)
5	Connector removal space

11 - INSTALLATION

The valve can be mounted in any position. Valve fixing takes place by means of screws or tie rods, with the valve mounted on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing.

If the minimum values of planarity and/or smoothness are not met, fluid leakages between valve and mounting surface can easily occur.



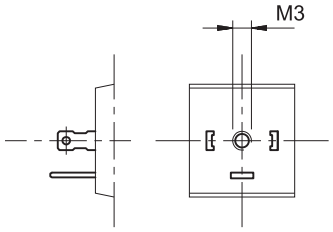
12 - ELECTRIC CONNECTORS

The solenoid operated valves are delivered without connector, except the version K12, where the connector is delivered together with the valve. For coils with standard electrical connections K1 type (DIN 43650) the connectors can be ordered separately. For the identification of the connector type to be ordered please see cat. 49 000.

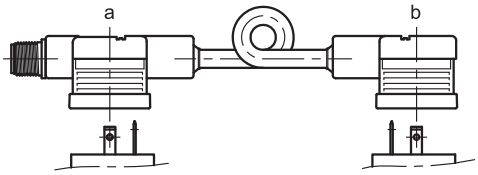
For the K7 connections the relative connectors are not available.

13 - ELECTRIC CONNECTIONS

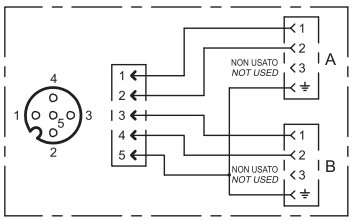
connection for DIN 43650 connector type
code **K1** (**standard**)



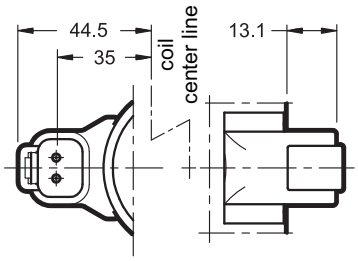
connection for DUAL DIN 43650
connector type
code **K12**



CONNECTOR M12x1 CONNECTION SCHEME



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



In K12 version the valve will be delivered together with the connector DUAL DIN 43650 with M12 connection already mounted on K1 coils. DUAL DIN connector allows you to power two solenoids with a single cable with socket M12.

NOTE: The mere connector type K12 (DUAL DIN) spare part can be ordered with the code 0672136.

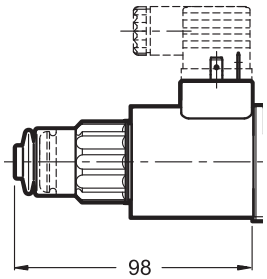
14 - MANUAL OVERRIDES

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

Three different manual override version are available upon request:

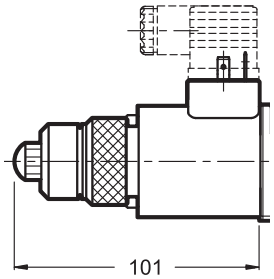
- **CM**: manual override boot protected
- **CP**: Push manual override (for DC valves only)
- **CPK**: Push manual override with mechanical retention (for DC valves only)

CM - direct current



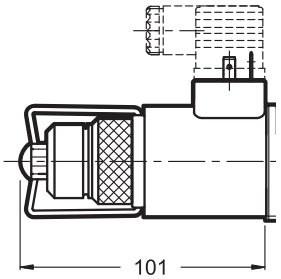
Code: 3401150006

CP



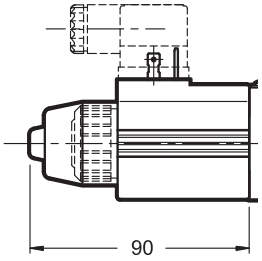
Code: 3401150005

CPK



Code: 3401150004

CM - alternating current



Code: 0269201

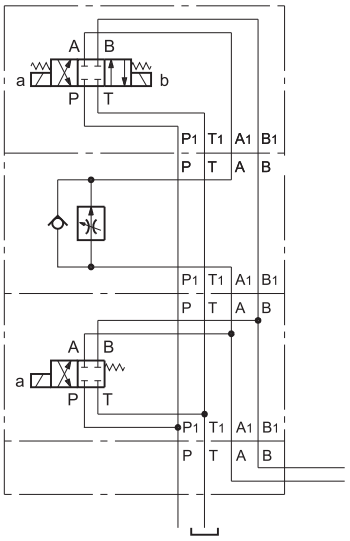
15 - APPLICATION EXAMPLES

Example of circuit used to drive working units with fast approach, adjustable working speed and fast return.

DS3-S1
(catalogue 41150)

RPC1-*/M/A
(catalogue 66200)

MDS3-SA1

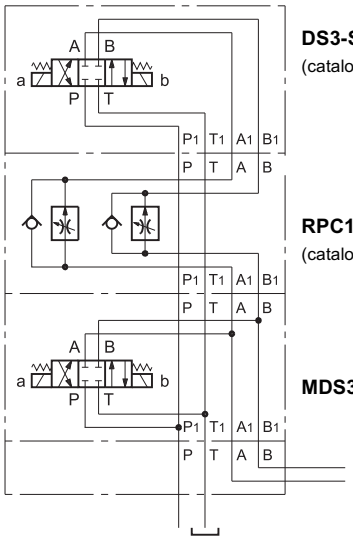


Example of circuit used to drive working units with fast approach and adjustable working speed in both directions.

DS3-S1
(catalogue 41150)

RPC1-*/M/D
(catalogue 66200)

MDS3-S1



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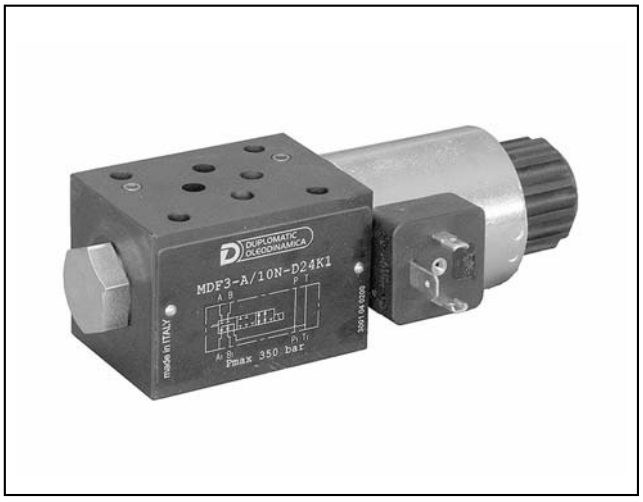
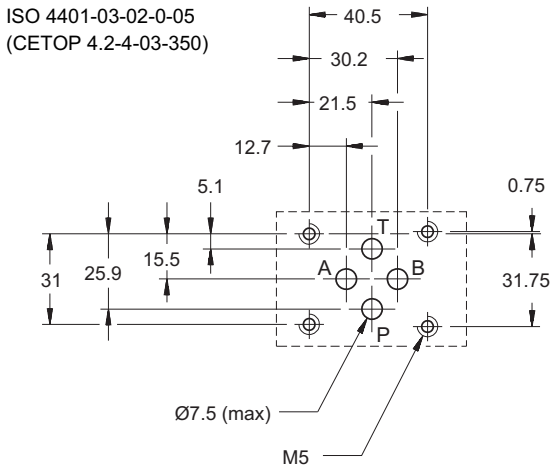


MDF3
SHUT-OFF SOLENOID VALVE
SERIES 10

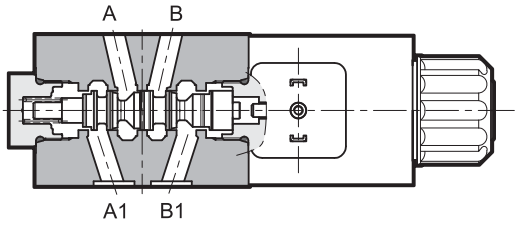
MODULAR VERSION
ISO 4401-03 (CETOP 03)

p max **350** bar
Q max **50** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



- Shut-off solenoid valve, direct-acting, available in two versions at rest: with lines blocked and with unloading lines.
- It is normally used with directional control servovalves to guarantee the circuit's safety if there is a power failure.
- Wet armature solenoids with interchangeable coils are used (for further information see par. 6).

SPOOL TYPE (see hydraulic symbols table)

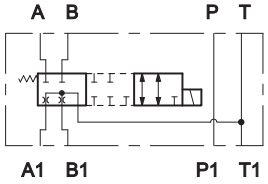
Type "A": it is used to unload the lines, with the valve at rest.
Type "C": it is used to block the lines, with the valve at rest.

PERFORMANCE RATINGS (working with mineral oil of viscosity of 36 cSt at 50°C)

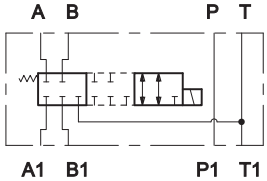
Maximum operating pressure	bar	350
Maximum flow rate	l/min	50
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass	kg	1,5

HYDRAULIC SYMBOLS

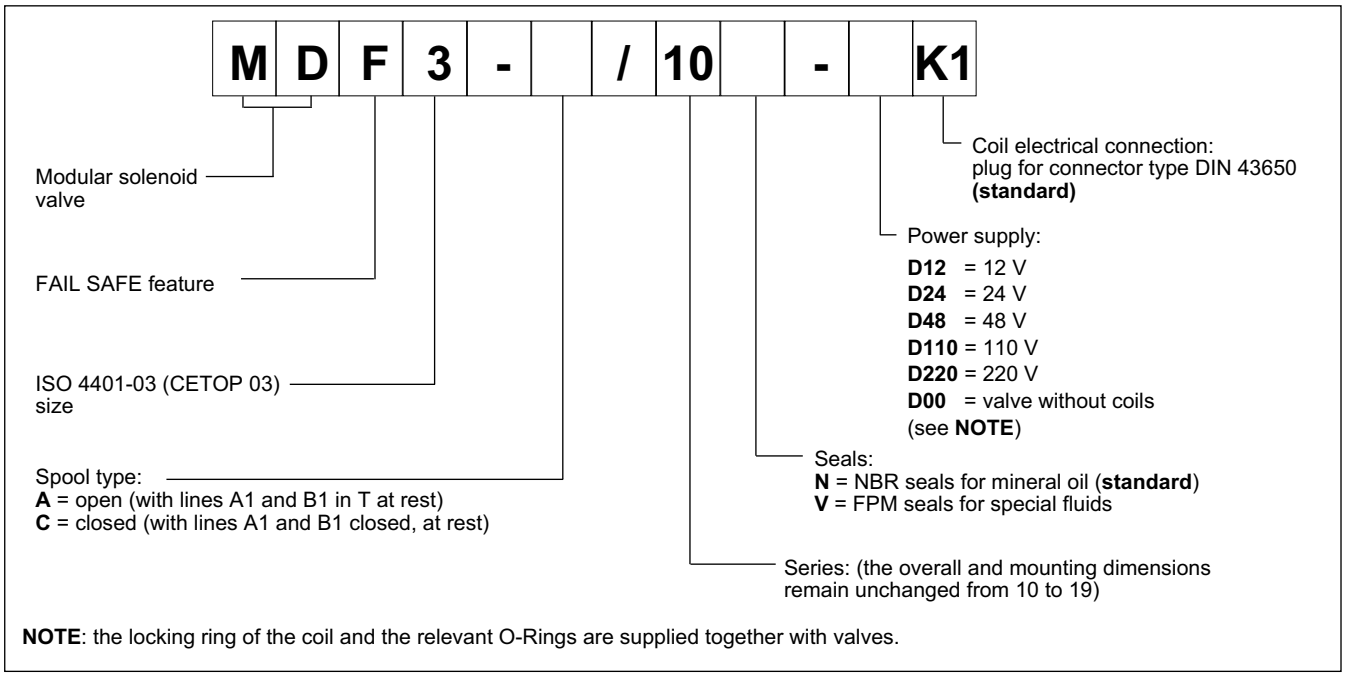
MDF3-A



MDF3-C



1 - IDENTIFICATION CODE



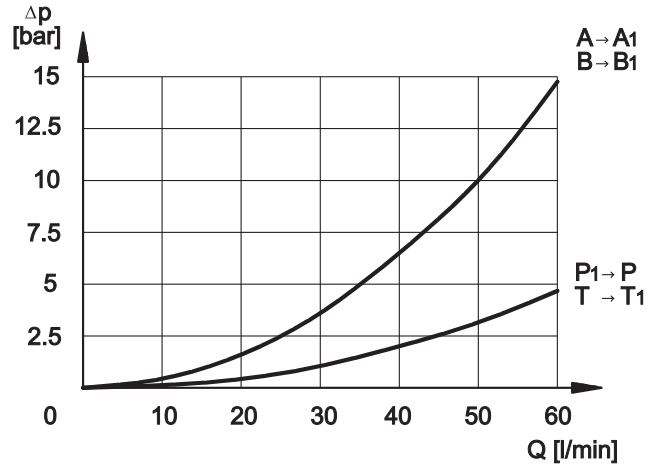
NOTE: the locking ring of the coil and the relevant O-Rings are supplied together with valves.

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 - PRESSURE DROPS Δp-Q (obtained with viscosity 36 cSt at 50 °C)



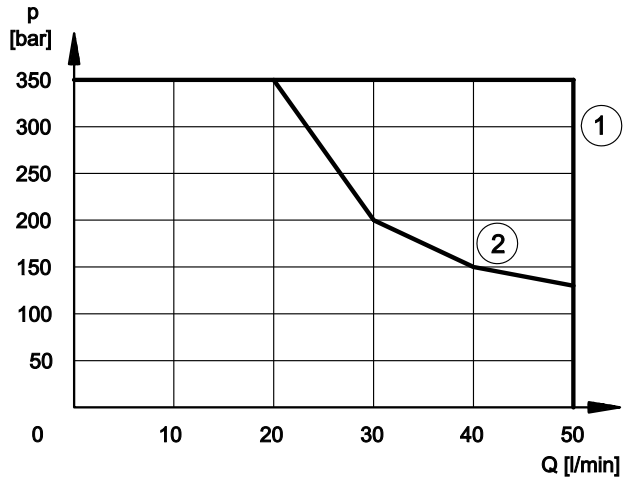
4 - SWITCHING TIMES

The values indicated are obtained according to ISO 6403 standard, with mineral oil viscosity 36 cSt at 50°C.

TIMES	
ENERGIZING	**DE-ENERGIZING**
60 ÷ 90 ms	20 ÷ 50 ms

5 - OPERATING LIMITS

The curves define the flow rate operating fields according to the valve pressure of the different versions.
The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage.
The values have been obtained with mineral oil, viscosity 36 cSt, temperature 50 °C and filtration according to ISO 4406:1999 class 18/16/15.



1) Curve related to the de-energizing of the solenoid valve
   Curve related to the energizing of the solenoid valve, without any flow in A and B lines

2) Curve related to the energizing of the solenoid valve, with flow in A and B lines

6 - ELECTRICAL FEATURES

6.1 - Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation.

The coil is fastened to the tube by a threaded ring, and can be rotated, to suit the available space.

NOTE 1: In order to further reduce the emissions, use of type H connectors is recommended. These prevent voltage peaks on opening of the coil supply electrical circuit (see cat. 49 000).

NOTE 2: The IP65 protection degree is guaranteed only with the connector correctly connected and installed.

VOLTAGE SUPPLY FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY	18.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC) (NOTE 1)	In compliance with 2004/108/CE
LOW VOLTAGE	In compliance with 2006/95/CE
CLASS OF PROTECTION: Atmospheric agents (CEI EN 60529) Coil insulation (VDE 0580) Impregnation	 IP 65 (**NOTE 2**) class H class F

6.2 - Current and absorbed power

The table shows current and power consumption values relevant to the different coil types for DC.

The rectified current supply takes place by fitting the valve (with the exception of D12 coil) with an alternating current source (50 or 60 Hz), rectified by means of a bridge built-in to the “D” type connectors (see cat. 49 000), by considering a reduction of the operating limits of about 5-10%.

Coils for direct current (values ± 5%)

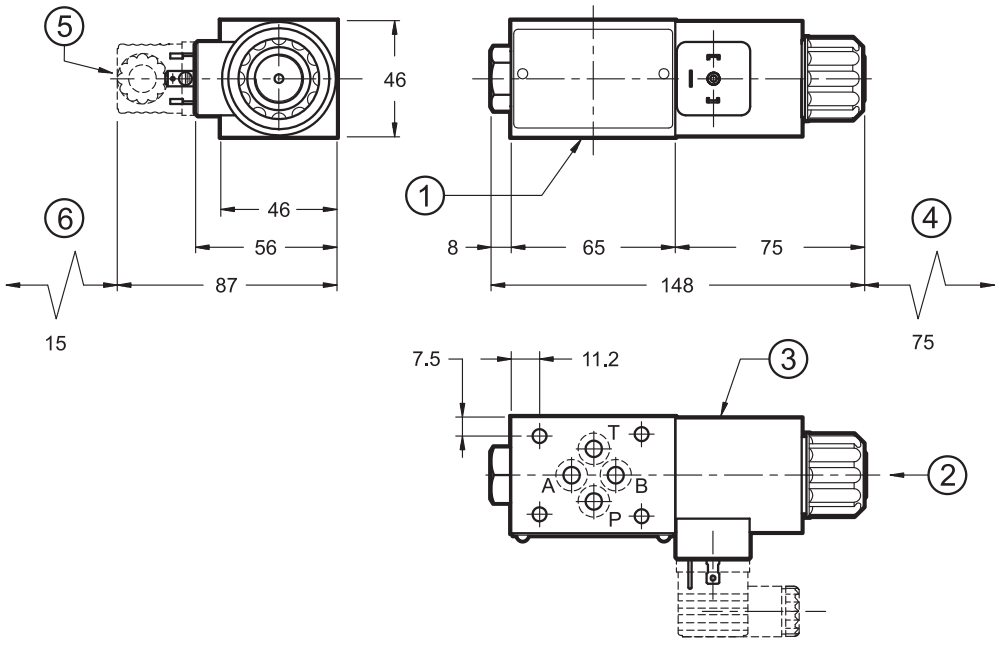
Suffix	Nominal voltage [V]	Resistance at 20°C [Ω]	Current consumpt. [A]	Power consumpt. [W]	Coil code
D12	12	4,4	2,72	32,6	1903080
D24	24	18,6	1,29	31	1903081
D48	48	78,6	0,61	29,3	1903083
D110	110	423	0,26	28,6	1903084
D220	220	1692	0,13	28,6	1903085

7 - ELECTRIC CONNECTORS

The solenoid operated valves are delivered without the connectors. They must be ordered separately.
For the identification of the connector type to be ordered, please see catalogue 49 000.

8 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) - 90 Shore
2	Standard manual override included in the solenoid tube
3	Coil 360° revolving (to suit the available space)
4	Coil removal space
5	DIN 43650 electrical connector to be ordered separately (see cat. 49 000)
6	Connector removal space

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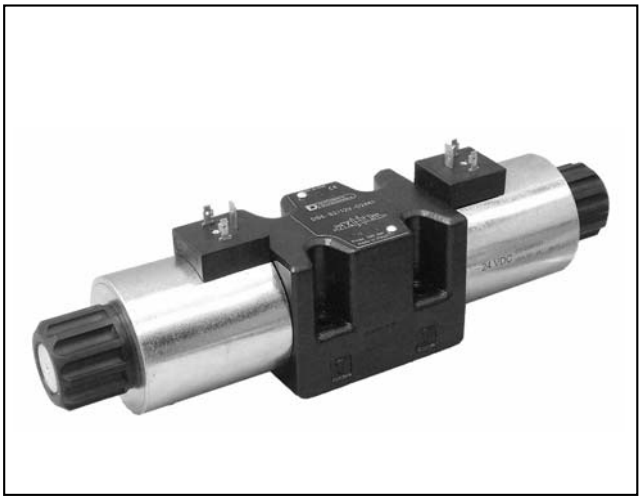


DS5

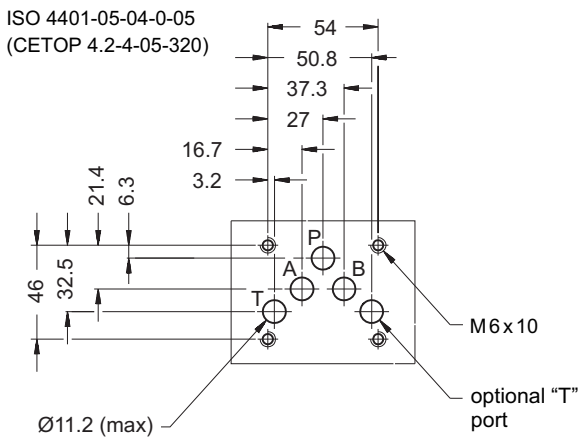
SOLENOID OPERATED DIRECTIONAL CONTROL VALVE

SERIES 12

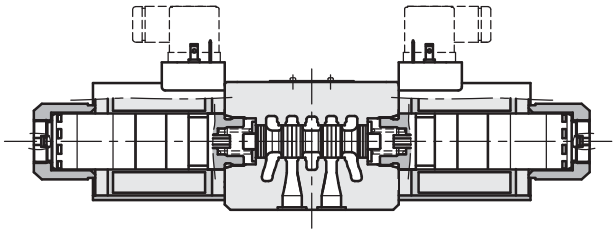
SUBPLATE MOUNTING
ISO 4401-05 (CETOP 05)

p max **320** bar
Q max **150** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



— Direct acting, subplate mounting directional control valve, with mounting surface according to ISO 4401 (CETOP RP121H).

— The valve is supplied with 3 or 4 way designs and with several interchangeable spools with different porting arrangements.

— The valve body is made with high strength iron castings provided with wide internal passages in order to minimize the flow pressure drop. Wet armature solenoids with interchangeable coils are used (see paragraph 7).

— The valve is available with DC or AC solenoids. DC solenoids can also be fed with AC power supply, by using connectors with a built-in rectifier bridge (see paragraph 7.2).

— The DC solenoids DS5 directional valve is available in the following special versions:

- version with Y external subplate drain port, (see paragraph 14.1).
- version with soft-shifting (see paragraph 14.4)
- version with adjustable "soft-shift" device (see paragraph 14.5)

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

		DC	AC
Maximum operating pressure P - A - B ports T port - standard version T port - version with Y port (ext.drain)	bar	320 210 320	 140 -
Maximum flow rate	l/min	150	120
Pressure drops Δp-Q		see paragraph 4	
Operating limits		see paragraph 6	
Electrical features		see paragraph 7	
Electrical connections		see paragraph 11	
Ambient temperature range	°C	-20 / +50	
Fluid temperature range	°C	-20 / +80	
Fluid viscosity range	cSt	10 ÷ 400	
Fluid contamination degree		according to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25	
Mass: single solenoid valve double solenoid valve	kg	4,5 6,1	3,6 4,3

1 - IDENTIFICATION CODE

D	S	5	-		/	12		-			/		

Solenoid operated directional control valve

ISO 4401-05 (CETOP 05) size

Spool type (see par. 3)

S*	**TA**
SA*	**TB**
SB*	**RK**

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

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

DC power supply
D12 = 12 V
D24 = 24 V
D28 = 28 V
D48 = 48 V
D110 = 110 V
D220 = 220 V
D00 = valve without coils (see **NOTE 1**)

AC power supply
A24 = 24 V - 50 Hz.
Not available for S4, SA4, SB4 spools
A48 = 48 V - 50 Hz
A110 = 110 V - 50 Hz / 120 V - 60 Hz
A230 = 230 V - 50 Hz / 240 V - 60 Hz
A00 = valve without coils (see **NOTE 1**)
F110 = 110 V - 60 Hz
F220 = 220 V - 60 Hz

Coil electrical connection (see par. 11):
K1 = plug for connector type DIN 43650 (**standard**)
K2 = plug for connector type AMP JUNIOR (available on **D12** and **D24** coils only)
K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S (available on **D12** and **D24** coils only)

Manual override: omit for override integrated in the tube (**standard**)
CM = manual override, boot protected (only for DC version)
CK = knob manual override (only for DC version)

Option: Surface treatment not standard. Omit if not required (see **NOTE 2**)

NOTE 1: Coils locking ring and related OR are supplied together with valves.

NOTE 2:The valve is supplied with standard surface treatment of phosphating 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 ÷ 40µ

W4 = Gas nitriding with oxidation process. Black colour.

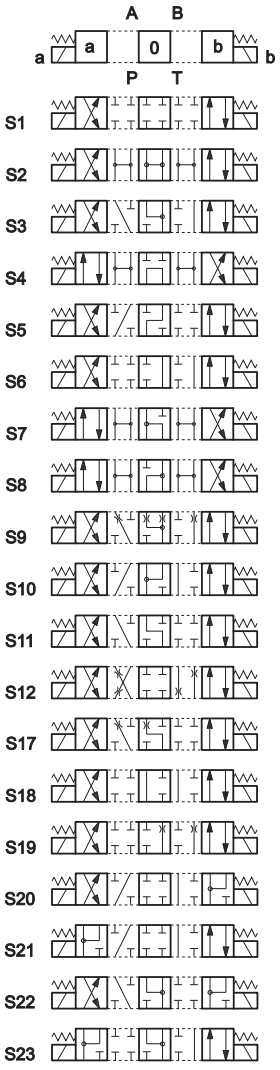
2 - HYDRAULIC FLUIDS

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

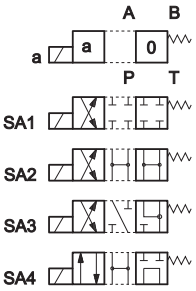
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

3 - SPOOL TYPE

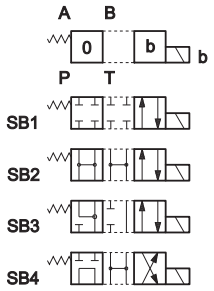
Type **S***:
2 solenoids - 3 positions
with spring centering



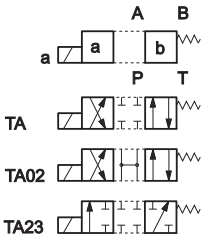
Type **SA***:
1 solenoid side A
2 positions (central + external)
with spring centering



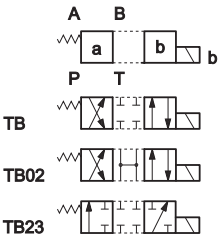
Type **SB***:
1 solenoid side B
2 positions (central + external)
with spring centering



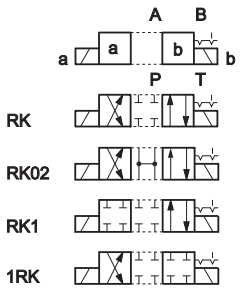
Type **TA**:
1 solenoid side A
2 external positions
with return spring



Type **TB**:
1 solenoid side B
2 external positions
with return spring

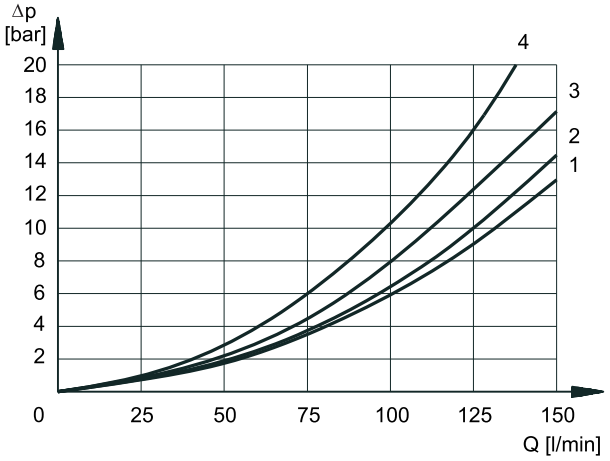


Type **RK**:
2 solenoids - 2 positions
with mechanical retention



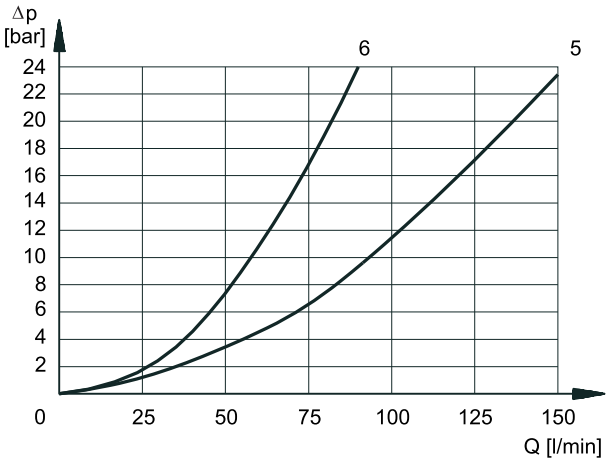
Besides the diagrams shown, which are the most frequently used, other special versions are available: consult our technical department for their identification, feasibility and operating limits.

4 - PRESSURE DROPS Δp-Q (obtained with viscosity 36 cSt at 50 °C)



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, S11	3	3	2	2
S7, S8	1	1	2	2
S9	3	3	2	2
S10	1	1	1	1
S12	2	2	1	1
S17, S19	2	2	1	1
S18	1	2	1	1
S20, S21				
S22, S23				
TA, TB	3	3	2	2
TA02, TB02	3	3	2	2
TA23, TB23	4	4		
RK	3	3	2	2
RK02	3	3	2	2
RK1, 1RK	3	3	2	2



PRESSURE DROPS WITH VALVE IN DE-ENERGIZED POSITION

SPOOL TYPE	FLOW DIRECTION				
	P-A	P-B	A-T	B-T	P-T
	CURVES ON GRAPH				
S2, SA2, SB2					5
S3, SA3, SB3			6	6	
S4, SA4, SB4					5
S5		3			
S6				6	
S7					5
S8					5
S10	3	3			
S11			6		
S18	3				
S22					
S23					

5 - SWITCHING TIMES

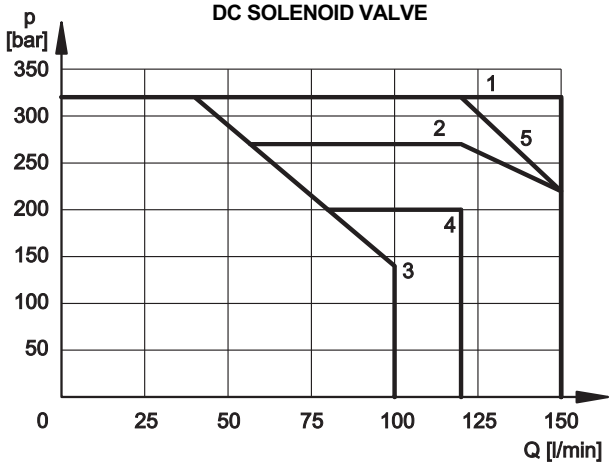
The values indicated are obtained according to ISO 6403 standard, with mineral oil viscosity 36 cSt at 50°C.

COIL TYPE	TIMES [ms]	
	ENERGIZING	-ENERGIZING
DC	100 ÷ 150 ms	20 ÷ 50 ms
AC	15 ÷ 30 ms	20 ÷ 50 ms

6 - OPERATING LIMITS

The curves define the flow rate operating fields according to the valve pressure of the different versions.
The values have been obtained according to ISO 64003 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage.
The values have been obtained with mineral oil, viscosity 36 cSt, temperature 50 °C and filtration according to ISO 4406:1999 class 18/16/13.

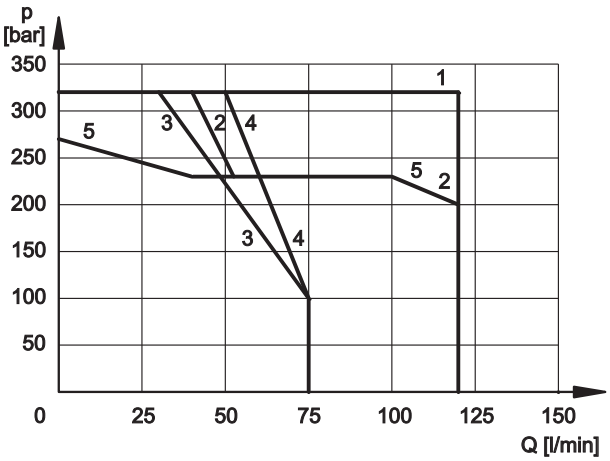
DC SOLENOID VALVE



SPOOL TYPE	CURVE	
	P-A	P-B
S1,SA1,SB1	1	1
S2, SA2, SB2	1	1
S3, SA3, SB3	2	2
S4, SA4, SB4	3	3
S5	1	1
S6	2	1
S7	3	3
S8	3	3
S9	1	1
S10	1	1
S11	1	2
S12	1	1

SPOOL TYPE	CURVE	
	P-A	P-B
S17	1	4
S18	1	1
S19	4	1
S20		
S21		
S22		
S23		
TA, TB	5	5
TA02, TB02	4	4
TA23, TB23	1	1
RK	1	1
RK02	1	1
RK1, 1RK	1	1

AC SOLENOID VALVE



SPOOL TYPE	CURVE	
	P-A	P-B
S1,SA1,SB1	1	1
S2, SA2, SB2	2	2
S3, SA3, SB3	2	2
S4, SA4, SB4	4	4
S5	1	1
S6	2	1
S7	3	3
S8	3	3
S9	2	2
S10	1	1
S11	1	2
S12	1	1

SPOOL TYPE	CURVE	
	P-A	P-B
S17	1	5
S18	1	1
S19	5	1
S20		
S21		
S22		
S23		
TA, TB	1	1
TA02, TB02	5	5
TA23, TB23	1	1
RK	1	1
RK02	1	1
RK1, 1RK	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 3-way valve with port A or B plugged or without flow.

For flow and pressure performances of soft-shifting configuration (options F) see par. 14.4

Flow and pressure performances of adjustable soft-shifting device configurations (options S) are influenced by the set shifting time.

7 - ELECTRICAL FEATURES

7.1 Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation.

The coil is fastened to the tube by a threaded ring, and can be rotated, to suit the available space.

Protection from atmospheric agents CEI EN 60529

Plug-in type	IP 65	IP 67	IP 69 K
K1 DIN 43650	x (*)		
K2 AMP JUNIOR	x	x (*)	
K7 DEUTSCH DT04 male	x	x	x (*)

(*) The protection degree is guaranteed only with the connector correctly connected and installed

VOLTAGE SUPPLY FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY	15.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC) (**NOTE 1**)	In compliance with 2004/108/EC
LOW VOLTAGE	In compliance with 2006/95/EC
CLASS OF PROTECTION: Coil insulation (VDE 0580) Impregnation:	 class H class F

NOTE 1: In order to further reduce the emissions, use of type H connectors is recommended. These prevent voltage peaks on opening of the coil supply electrical circuit (see CAT. 49 000).

7.2 Current and absorbed power for DC solenoid valve

The table shows current and power consumption values relevant to the different coil types for DC.

The rectified current supply takes place by fitting the valve with an alternating current source (50 or 60 Hz), rectified by means of a bridge built-in to the “D” type connectors (see cat. 49 000).

However, when supplying the valve with rectified current, it is necessary to consider a reduction of the operating limits by 15-20% approx.

Coils for direct current (values ± 5%)

Suffix	Nominal voltage [V]	Resistance at 20°C [Ω]	Current consumpt. [A]	Power consumpt. [W]	Coil code K1	Coil code K2	Coil code K7
D12	12	3,2	3,75	45	1903200	1903210	1903220
D24	24	12	2	48	1903201	1903211	1903221
D28	28	16,2	1,72	48	1903202		
D48	48	49	0,98	47	1903203		
D110	110	250	0,44	48	1903204		
D220	220	1050	0,21	47	1903205		

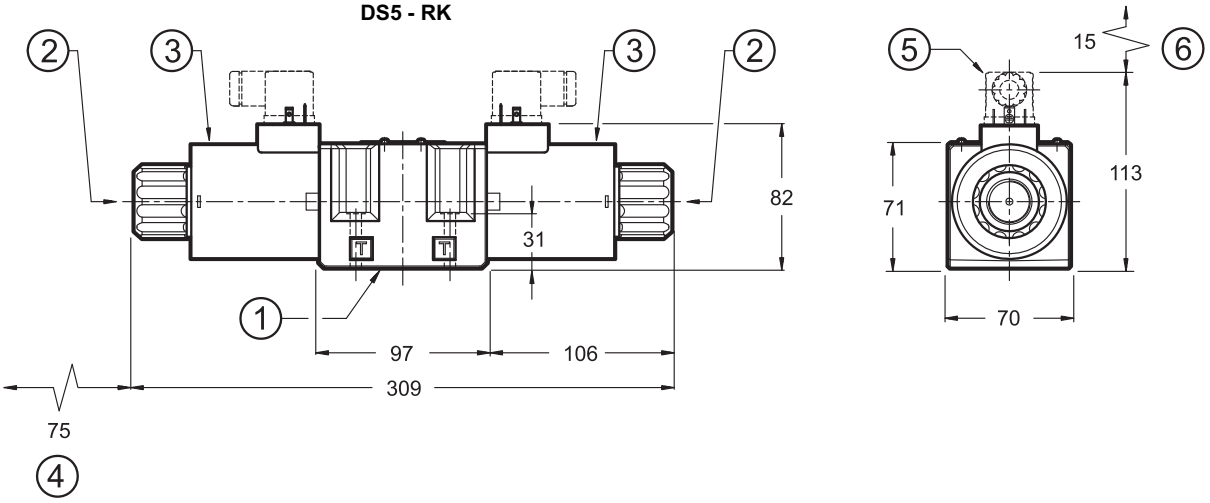
7.3 Current and absorbed power for AC solenoid valve

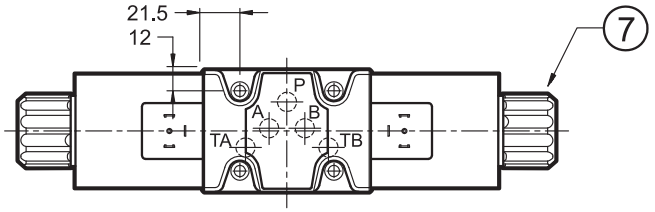
The table shows current and power consumption values at inrush and at holding, relevant to the different coil types for AC current.

Suffix	Nominal voltage [V]	Frequency [Hz]	Resistance at 20°C [ohm]	Current consumption at inrush [A]	Current consumption at holding [A]	Power consumption at inrush [VA]	Power consumption at holding [VA]	Coil code
A24	24	50	0,53	25	3,96	600	95	1902890
A48	48		2,09	12,5	2,3	600	110	1902891
A110	110V-50Hz	50/60	10,9	5,2	0,96	572	105	1902892
	120V-60Hz		10,9	5,2	0,89	572	105	
A230	230V-50Hz		52,7	2,8	0,46	644	105	1902893
	240V-60Hz		52,7	2,8	0,38	644	105	
F110	110	60	8,80	5,2	0,95	572	105	1902894
F220	220		35,2	2,7	0,48	594	105	1902895

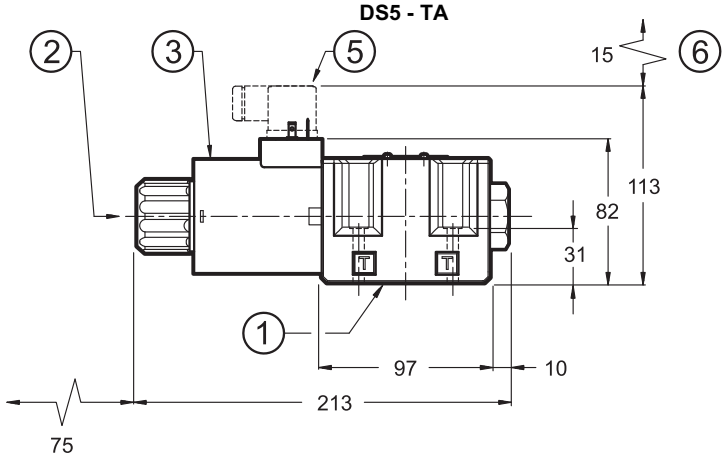
8 - OVERALL AND MOUNTING DIMENSIONS FOR DC SOLENOID VALVES

DS5 - S*
DS5 - RK

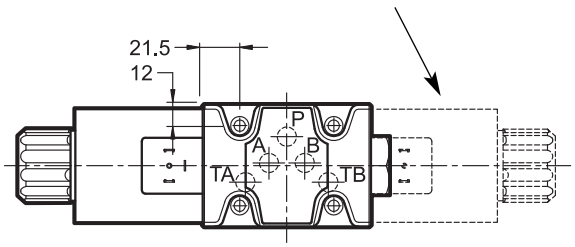




DS5 - SA*
DS5 - TA



solenoid position for SB* and TB configurations



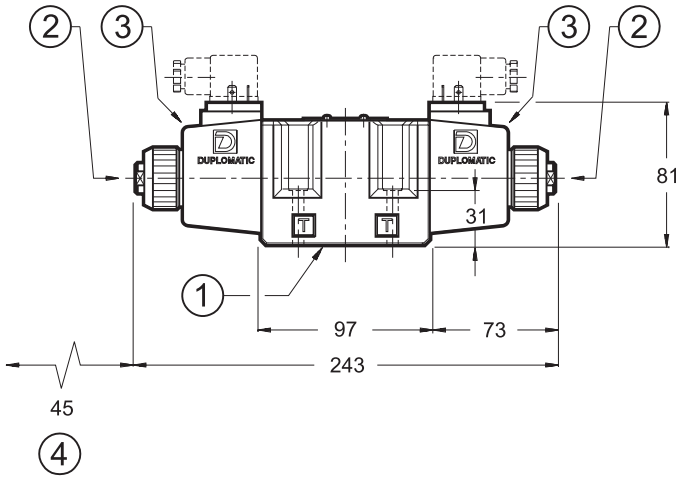
dimensions in mm

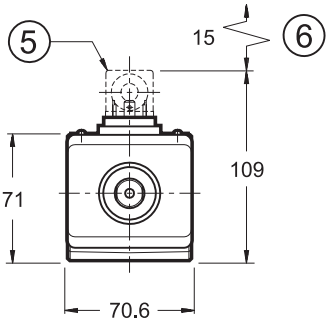
1	Mounting surface with sealing rings
2	Standard manual override included in the solenoid tube
3	Coil (360° revolving)
4	Coil removal space
5	DIN 43650 connector (standard K1 shown) to be ordered separately (see cat. 49 000)
6	Connector removal space
7	Locking ring: tightening torque: 6 Nm

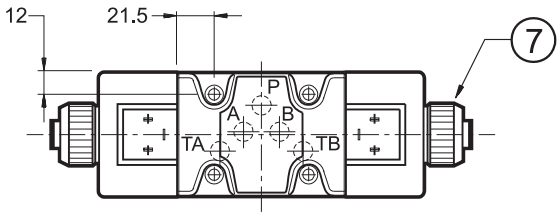
See par. 15 and 17 for fastening bolts and sealing rings

9 - OVERALL AND MOUNTING DIMENSIONS FOR AC SOLENOID VALVES

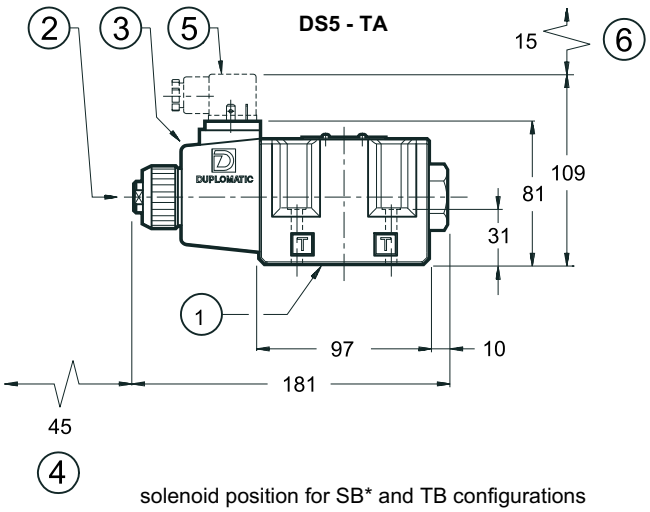
DS5 - S*
DS5 - RK



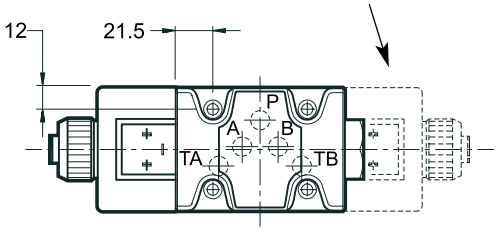




DS5 - SA*
DS5 - TA



solenoid position for SB* and TB configurations



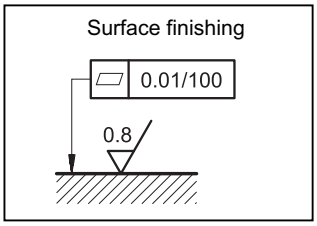
dimensions in mm

1	Mounting surface with sealing rings
2	Standard manual override included in the solenoid tube
3	Coil (360° revolving)
4	Coil removal space
5	DIN 43650 connector - to be ordered separately (see cat. 49 000)
6	Connector removal space
7	Locking ring: tightening torque: 4.5 - 5 Nm

See par. 16 and 17 for fastening bolts and sealing rings

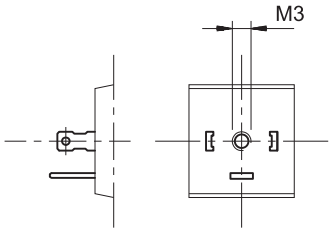
10 - INSTALLATION

Configurations with centering and return springs can be mounted in any position; type RK valves - without springs and with mechanical detent - must be mounted with the longitudinal axis horizontal. Valve fixing is by means of screws or tie rods, with the valve mounted on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing. If the minimum values of planarity and/or smoothness are not met, fluid leakage between valve and mounting surface can easily occur.

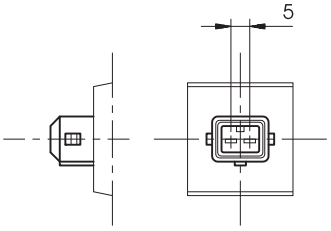


11 - ELECTRIC CONNECTIONS

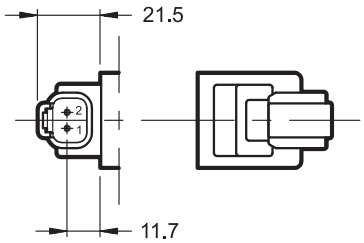
connection for DIN 43650 connector type code **K1** (**standard**)



connection for AMP JUNIOR connector type code **K2**



connection for
DEUTSCH DT06-2S male connector type code **K7**

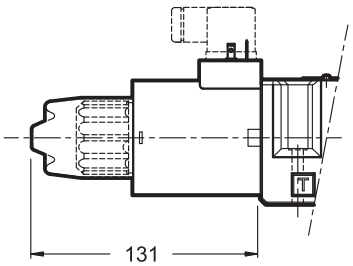


12 - ELECTRIC CONNECTORS

The solenoid operated valves are delivered without connectors. For coils with standard electrical connections K1 type (DIN 43650) the connectors can be ordered separately. For the identification of the connector type to be ordered please see cat. 49 000. For K2 and K7 connection type the related connectors are not available.

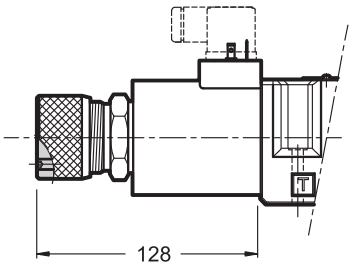
13 - MANUAL OVERRIDES FOR DC SOLENOID VALVES

13.1 - CM - Manual override, boot protected



Code: 0239050

13.2 - CK-DS5/10 Knob manual override



When the set screw is screwed and its point is aligned with the edge of the knob, tighten the knob till it touches the spool: in this position the override is not engaged and the valve is de-energized. After adjusting the override, tighten the set screw in order to avoid the knob loosing.

Spanner: 3 mm

Code: 3401150009

14 - SPECIAL VERSIONS FOR DC SOLENOID VALVE

14.1 - Identification code for external drain version

D	S	5	-		/	12		-		K1	/	Y		

Solenoid operated directional control valve

ISO 4401-05 (CETOP 05) size

Spool type (see par. 3)

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

Coil type

D12 = 12 V
D24 = 24 V
D28 = 28 V
D48 = 48 V
D110 = 110 V
D220 = 220 V

Option: Surface treatment not standard. Omit if not required (see **NOTE**)

Manual override:
omit for override integrated in the tube (**standard**)
CM = manual override, boot protected
CK = knob manual override

Port for subplate external drain

Coil electrical connection (see par. 11):
K1 = plug for connector type DIN 43650 (**standard**)
K2 = plug for connector type AMP JUNIOR (available on **D12** and **D24** coils only)
K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S (available on **D12** and **D24** coils only)

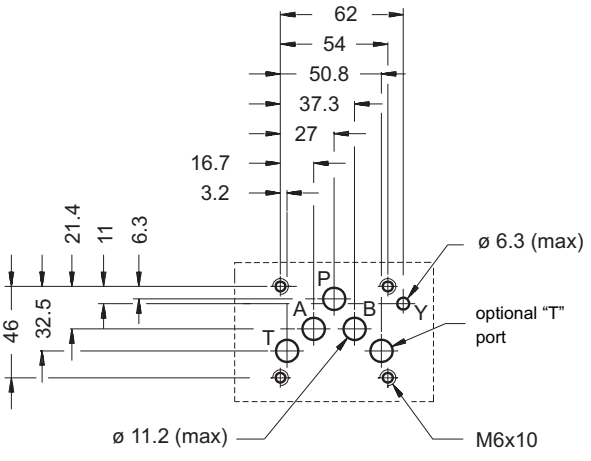
NOTE :The valve is supplied with standard surface treatment of phosphating black. On request we can supply these valves with other surface finishes. Add suffix **/ W *** at the end of the code.

W2 = mat epoxy painting black RAL 9005
thickness 20 ÷ 40µ

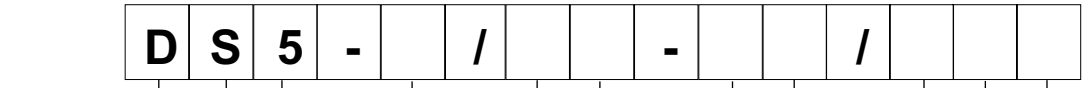
W4 = gas nitriding with oxidation process. Black colour.

14.2 - Subplate external drain port (option Y)

This version allows the operation with pressures up to 320 bar on the valve T port.
It is a drain port Y realized on the valve mounting interface in compliance with ISO 4401-05-05-0-05 (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.



14.3- Identification code for soft-shifting versions



Solenoid operated directional control valve

ISO 4401-05 (CETOP 05) size

Spool type (see par. 3)

S1	**S4**	**TA**
S2	**S7**	**TB**
S9	**S8**	**TA02**
S12		**TB02**

Series n.:

12 - for version **S**
13 - for version **F**
(the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:

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

Power supply

D12 = 12 V
D24 = 24 V
D28 = 28 V
D110 = 110 V
D220 = 220 V

Coil electrical connection (see par. 11):

K1 = plug for connector type DIN 43650 (**standard**)

K2 = plug for connector type AMP JUNIOR
(available on **D12** and **D24** coils only)

K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S
(available on **D12** and **D24** coils only)

Options:

F = soft-shifting (see par. 14.4)
S = adjustable soft-shifting device (see par 14.5)

Manual override:
omit for override integrated in the tube (**standard**)

CM = manual override, boot protected

CK = knob manual override

Option: Surface treatment not standard. Omit if not required
(see **NOTE**)

NOTE :The valve is supplied with standard surface treatment of phosphating 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 ÷ 40µ

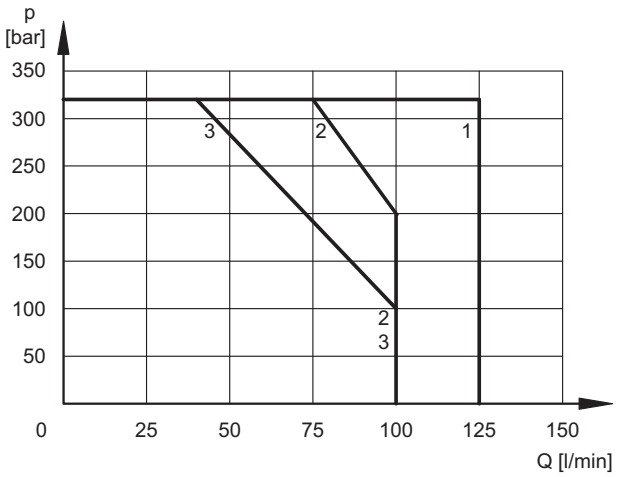
W4 = gas nitriding with oxidation process. Black colour.

14.4 - Fixed restrictor for soft-shifting (option F)

This version enables hydraulic actuators to perform a smooth start and stop by reducing the speed of movement of the valve spool.

The diagram on the side shows the operating limits of the spools available in the soft-shifting version (**NOTE**: for this version, the S9 spool must be used instead of the S3 one). The table on the side shows the switching times. The values indicated are obtained according to ISO 6403 standard, with mineral oil viscosity 36 cSt at 50°C.

The shifting time and characteristics curves are influenced by the viscosity (and thus by the temperature) of the operating fluid. Moreover, times can vary according to the flow rate and operating pressure values of the valve.

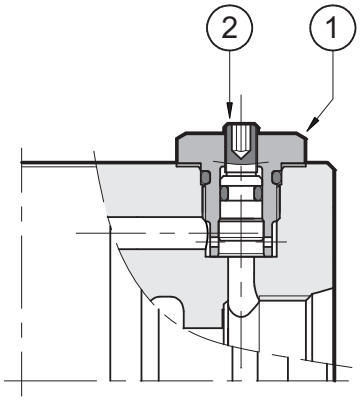


SPOOL TYPE	CURVE		TIMES	
	P-A	P-B	ENERGIZING	DE-ENERGIZING
S1, S12	1	1	300 ÷ 500	300 ÷ 500
S2	2	2	450	200 ÷ 300
S4, S7, S8	3	3	400	400 ÷ 200
S9	1	1	300 ÷ 500	300 ÷ 500
TA, TB	2	2	300 ÷ 400	300 ÷ 400
TA02, TB02	2	2	400	200 ÷ 300

14.5 - Directional solenoid valve with adjustable “soft-shifting” device (option S)

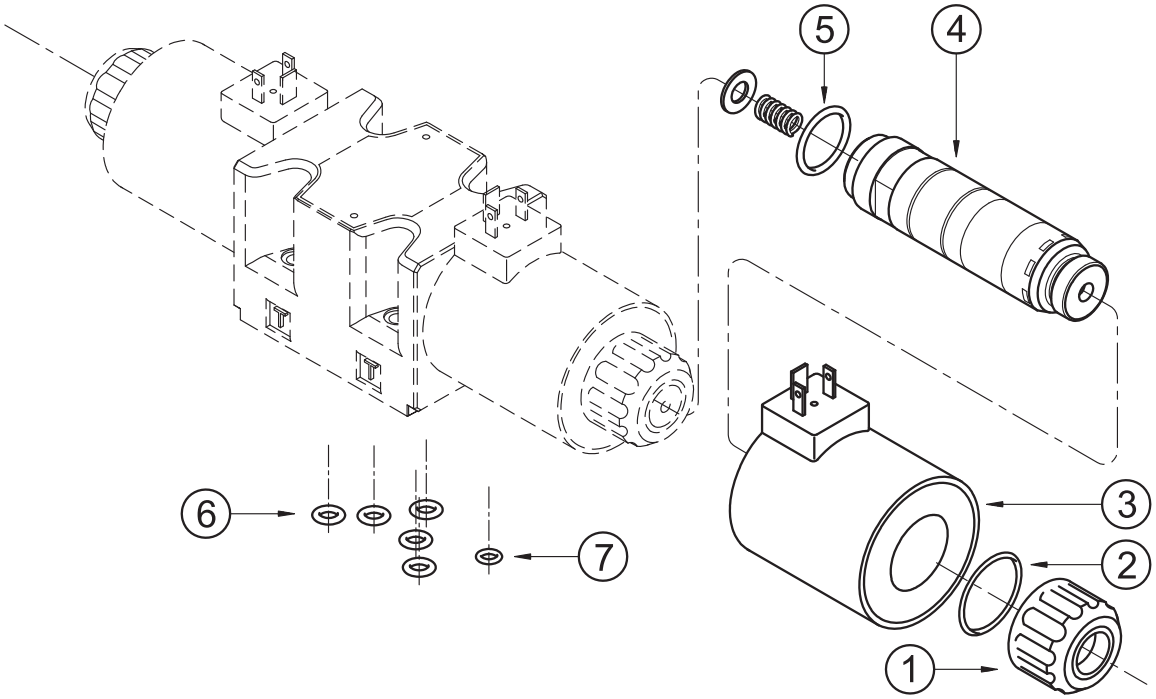
This solenoid valve is supplied with a suitable device, adjustable by the user, which enables the control of the valve spool shifting time.
In this way the hydraulic actuators can perform smooth movements, by controlling the valve switching time according to the machine cycle and the inertia of the moving parts.

NOTE: during the first start-up the valve body must be filled with the operating fluid through the tap (1) .



1	Spanner for plug: 17 mm - tightening torque 20 Nm
2	Shifting time adjustment screw countersunk hex spanner 2,5 mm

15 - SPARE PARTS FOR DC SOLENOID VALVE



DC COILS IDENTIFICATION CODE

C	31	-			/	21

Supply voltage

D12 = 12 V
D24 = 24 V
D28 = 28 V
D48 = 48 V
D110 = 110 V
D220 = 220 V

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

Coil electrical connection (see par. 11):

K1 = plug for connector type DIN 43650 (**standard**)

K2 = plug for connector type AMP JUNIOR
(available on **D12** and **D24** coils only)

K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S
(available on **D12** and **D24** coils only)

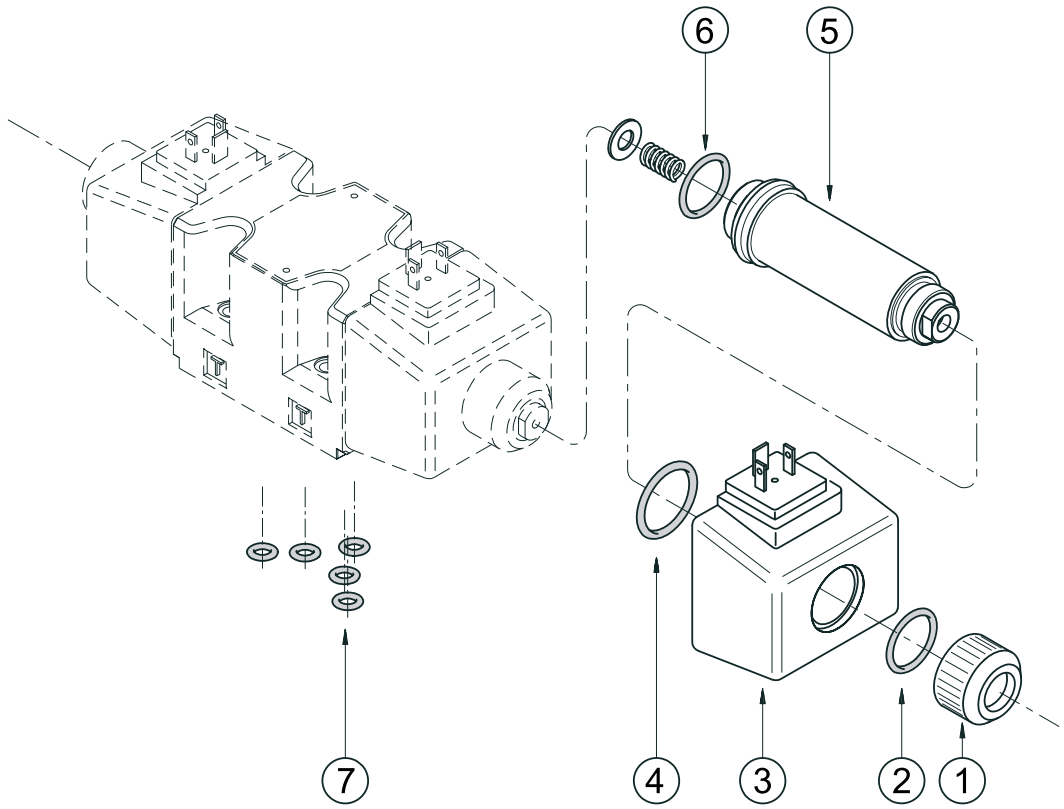
1	Coil locking ring with seal included cod. 0119383 tightening torque: 6 Nm
2	ORM type 0320 - 25 (32x2.5) - 70 Shore
3	Coil (see identification code)
4	Solenoid tube TD31-M27/20N (NBR seals) TD31-M27/20V (FPM seals) **NOTE**: the solenoid tube is supplied with OR n° 5.
5	OR type 3-912 (23.47x2.95) - 70 Shore
6	N. 5 OR type 2050 (12.42x1.78) - 90 Shore
7	For version with external subplate drain only (Y option): OR type 2037 (9.25x1.78) - 90 Shore

SEALS KIT

The codes here below include O-Rings ref. 2, 5, 6 and 7.

Cod. 1984418 NBR seals
Cod. 1984419 FPM (viton) seals

16 - SPARE PARTS FOR AC SOLENOID VALVE



AC COILS IDENTIFICATION CODE

C	25.4	-		K1	/	11

Supply voltage
A24 = 24 V - 50 Hz
A48 = 48 V - 50 Hz
A110 = 110 V - 50 Hz
120 V - 60 Hz
A230 = 230 V - 50 Hz
240 V - 60 Hz
F110 = 110 V - 60 Hz
F220 = 220 V - 60 Hz

plug for connector type DIN 43650 (**standard**)

Series no.:
(the overall and mounting dimensions remain unchanged from 10 to 19)

1	Coil locking ring cod. 0119402 tightening torque: 4.5 - 5 Nm
2	OR type 4100 (24.99x3.53) - 90 Shore
3	Coil (see identification code)
4	OR type 2112 (28.30x1.78) - 90 Shore
5	Solenoid tubes: TA25.4-M27/11N (NBR seals) TA25.4-M27/11V (FPM seals) **NOTE**: the tube is supplied with OR n° 6.
6	OR type 3-912 (23.47x2.95) - 70 Shore
7	N. 5 OR type 2050 (12.42x1.78) - 90 Shore

SEALS KIT

The codes here below include O-Rings ref. 2, 4, 6 and 7.

Cod. 1984420 NBR seals
Cod. 1984421 FPM (viton) seals

17 - FASTENING BOLTS

4 bolts SHC M6x40
Tightening torque 8 Nm

18 - SUBPLATES (See catalogue 51 000)

Type PMD4-AI4G with rear ports 1/2” BSP
Type PMD4-AL4G with side ports 1/2” BSP

DUPLOMATIC OLEODINAMICA

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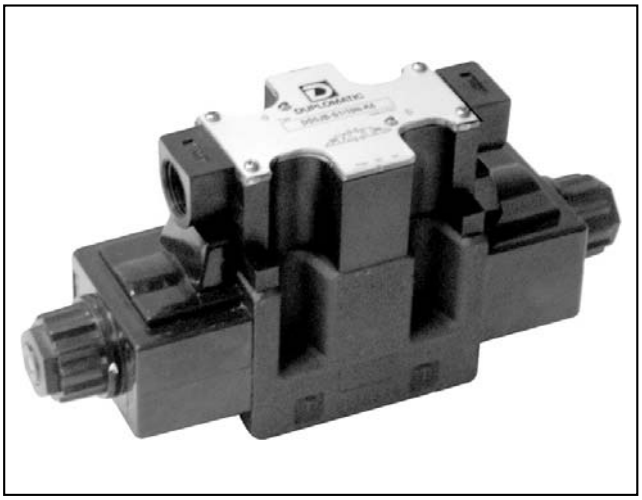


DS5JB

SOLENOID OPERATED DIRECTIONAL CONTROL VALVE

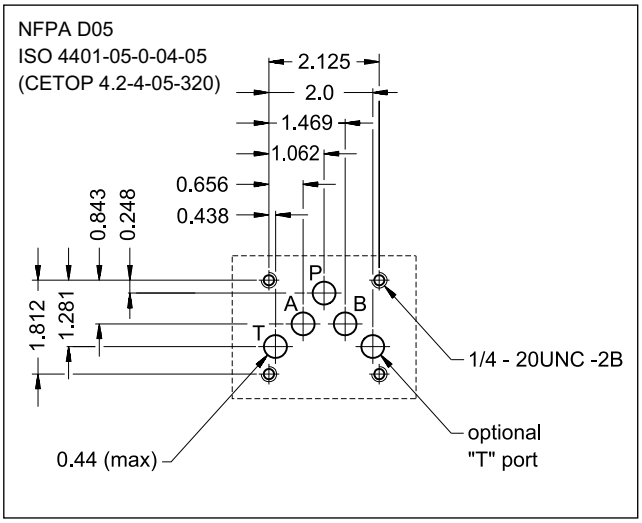
ALTERNATING CURRENT SERIES 10

NFPA D05 (ISO 4401-05 / CETOP 05)

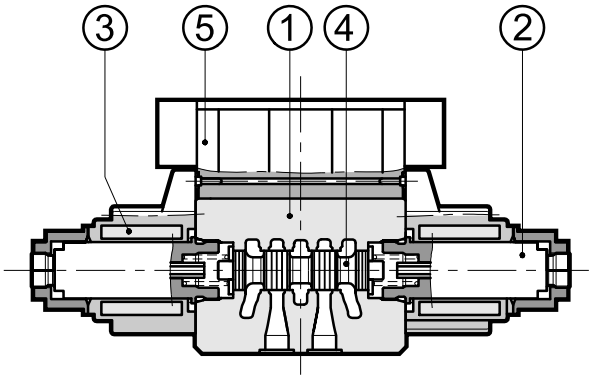
p max **4600** psi

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.

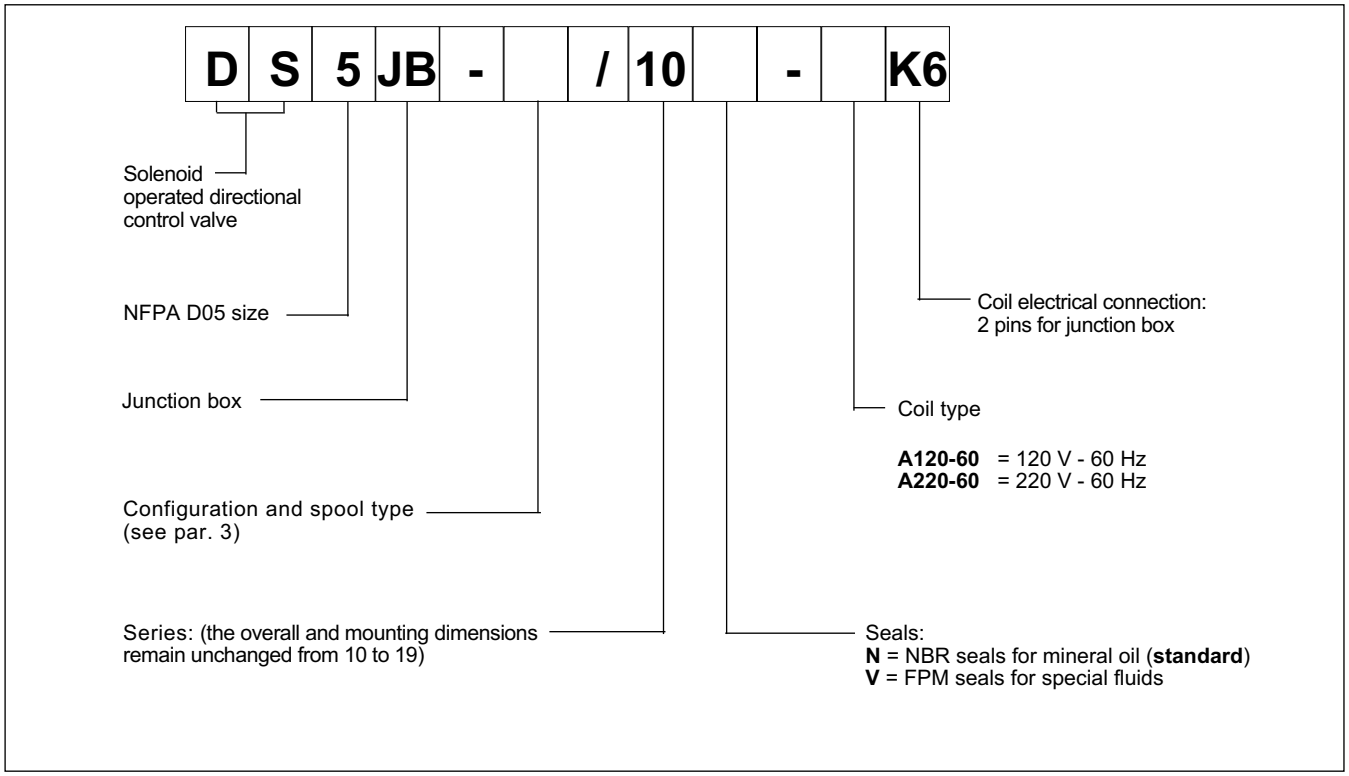
— The valve is supplied with 3 or 4 way designs and with several interchangeable spools (4) with different porting arrangements.

— 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 Δp-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



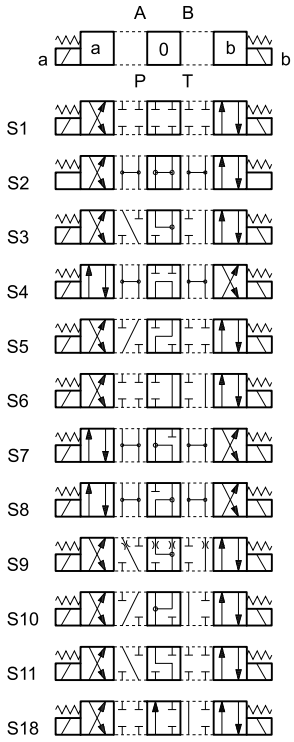
2 - HYDRAULIC FLUIDS

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.

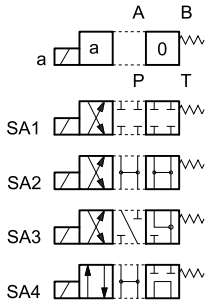
Using fluids at temperatures higher than 175 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

3 - CONFIGURATIONS

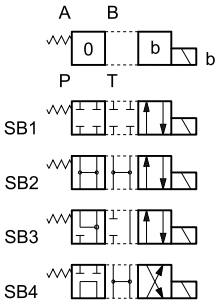
Type **S***:
2 solenoids - 3 positions
with spring centering



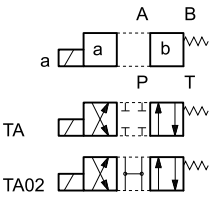
Type **SA***:
1 solenoid side A
2 positions (central + external)
with spring centering



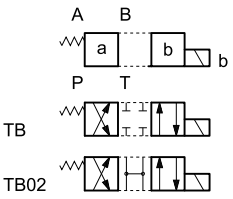
Type **SB***:
1 solenoid side B
2 positions (central + external)
with spring centering



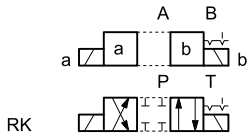
Type **TA**:
1 solenoid side A
2 external positions
with return spring



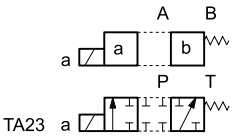
Type **TB**:
1 solenoid side B
2 external positions
with return spring

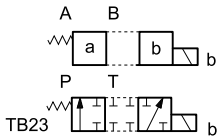


Type **RK**:
2 solenoids - 2 positions
with mechanical retention



Type **TA23 / TB23**
three-way valve - 1 solenoid - 2 external positions, return spring

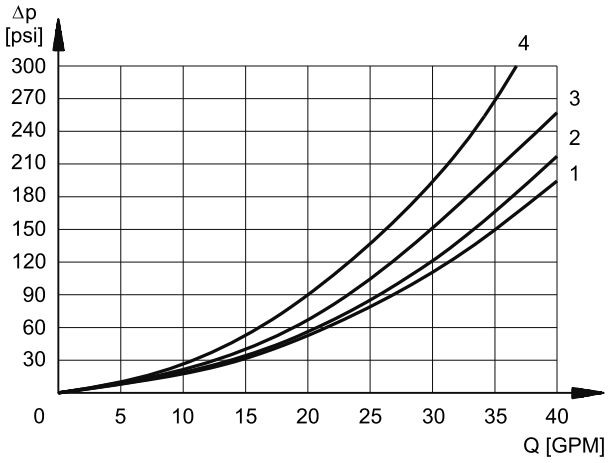




Note:Type TB23 corresponds to type 23TA of the old valve (D4D)

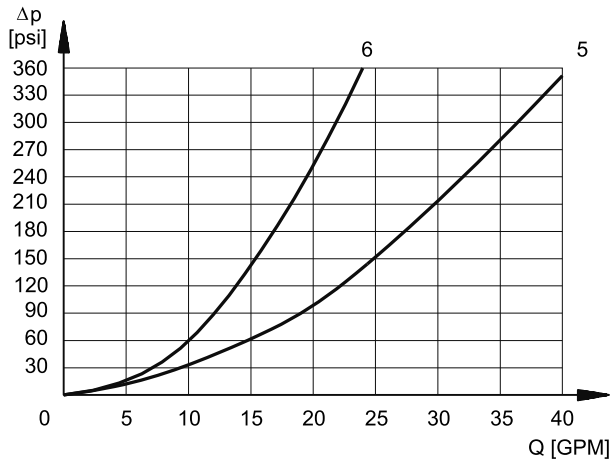
Besides the diagrams shown, which are the most frequently used, other special versions are available: consult our technical department for their identification, feasibility and operating limits.

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				

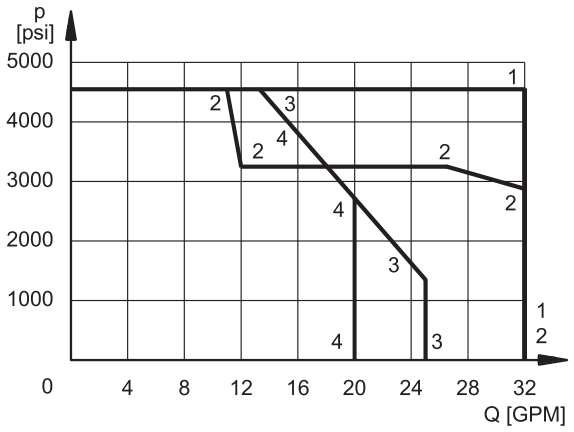
5 - SWITCHING TIMES

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

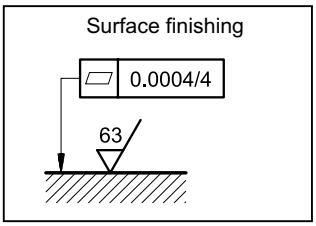
The table shows current and power consumption values at inrush and at holding, relevant to the different coil types for AC current.

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

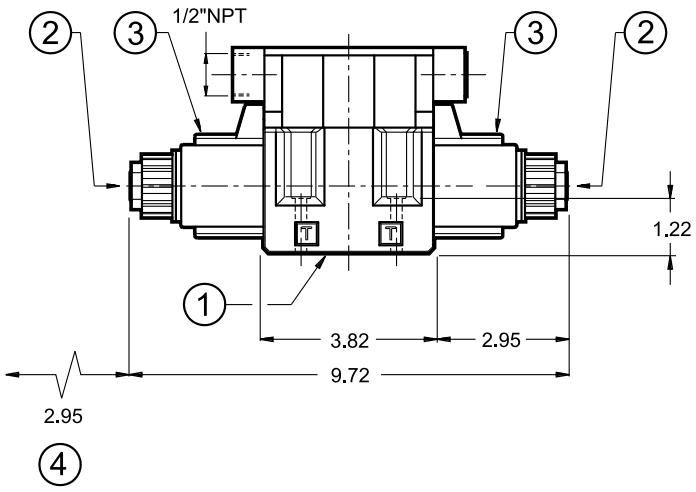
8 - INSTALLATION

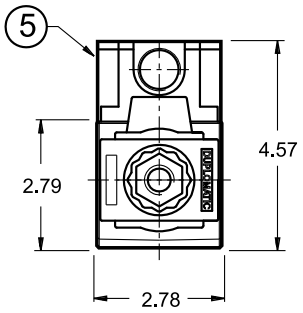
Configurations with centering and return springs can be mounted in any position; type RK valves - without springs and with mechanical detent - must be mounted with the longitudinal axis horizontal. Valve fixing is by means of screws or tie rods, with the valve mounted on a lapped surface, with values 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.

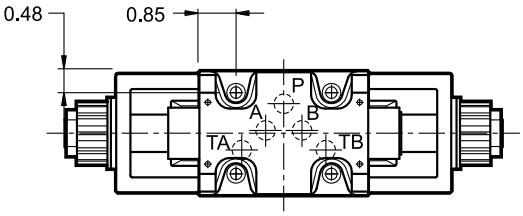


9 - OVERALL AND MOUNTING DIMENSIONS

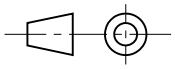
DS5JB - S*
DS5JB - RK



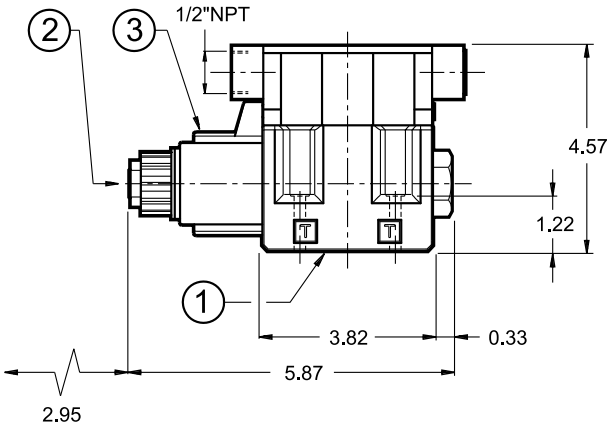


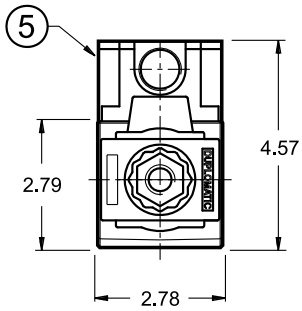


Drawing view in compliance with ISO 128

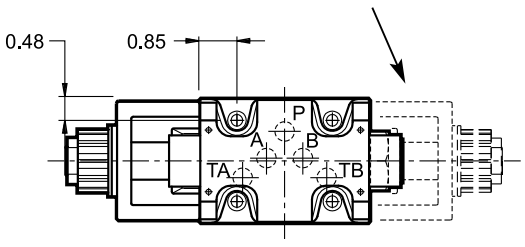


DS5JB - SA*
DS5JB - TA





solenoid position for SB* and TB configurations

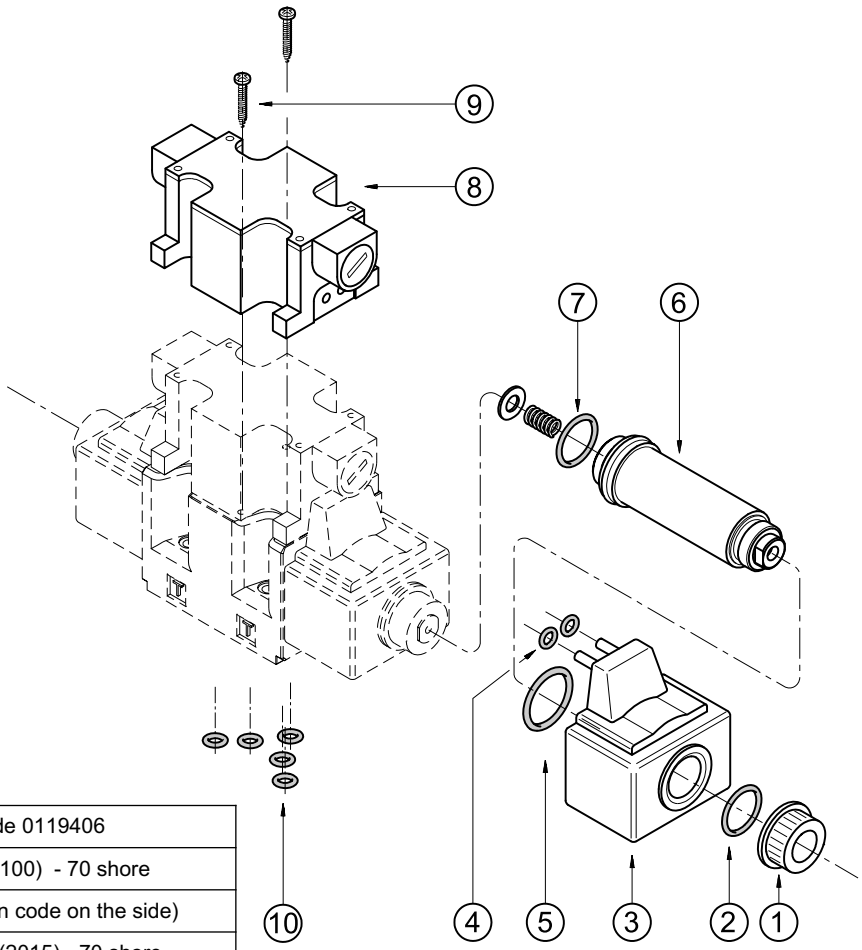


dimensions in inches

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

Series no.: (the overall and mounting dimensions remain unchanged from10 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. 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

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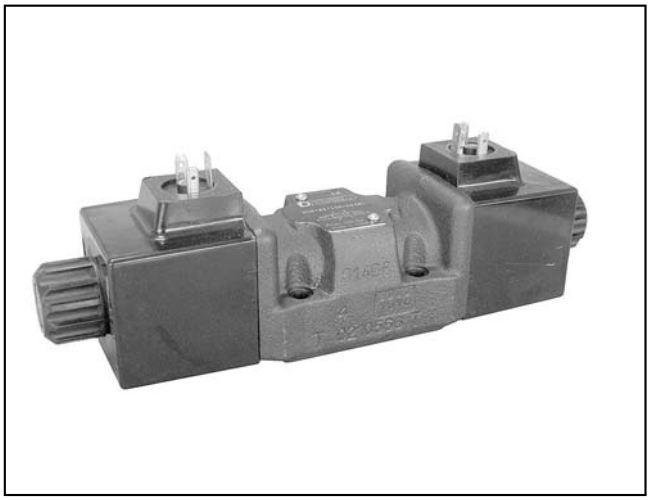
9337 Ravenna Road, Unit G,
TWINSBURG, OHIO 44087
Phone +330-405-1800 - Fax +330-405-1801
E-mail: duplomatic@uhiltd.com



DL5

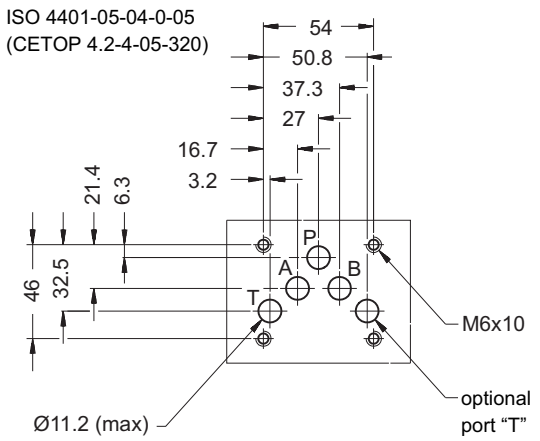
SOLENOID OPERATED DIRECTIONAL CONTROL VALVE COMPACT VERSION

SERIES 10

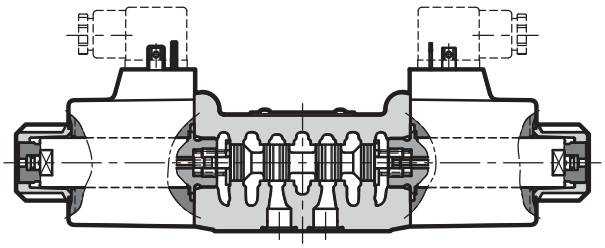
SUBPLATE MOUNTING
ISO 4401-05 (CETOP 05)

p max **320** bar
Q max **125** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



— Direct acting, subplate mounting directional control valve, with mounting surface according to ISO 4401 (CETOP RP 121H) standards.

— The valve is suitable for special applications, guaranteed by the reduced solenoid dimensions.

— The valve body is made with high strength iron castings provided with wide internal passages in order to minimize the flow pressure drop. Wet armature solenoids with interchangeable coils are used (for further information on solenoids see paragraph 7).

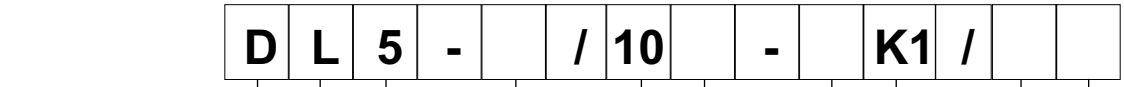
— The valve is supplied with 3 or 4 way designs and with several interchangeable spools with different porting arrangements.

— The valve is available with DC or AC current solenoids.

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

		CC	CA
Maximum operating pressure: - ports P - A - B - port T	bar	320 210	160
Maximum flow rate	l/min	125	100
Pressure drop Δp-Q	see paragraph 4		
Operating limits	see paragraph 5		
Electrical features	see paragraph 7		
Electrical connections	DIN 43650		
Ambient temperature range	°C	-20 / +50	
Fluid temperature range	°C	-20 / +80	
Fluid viscosity range	cSt	10 ÷ 400	
Fluid contamination degree	according to ISO 4406:1999 class 20/18/15		
Recommended viscosity	cSt	25	
Masse: single solenoid valve double solenoid valve	kg	2,8 3,7	

1 - IDENTIFICATION CODE



Solenoid operated directional control valve

Model in compact execution

ISO 4401-05 (CETOP 05) size

Spool type (see paragraph 3):

S* **TA***
SA* **TB***
SB* **RK**

Series no.: (the overall and mounting dimensions remain unchanged from 10 to 19)

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

Option:
Surface treatment not standard. Omit if not required
(see **NOTE 2**)

Manual override - see par. 12
Omit for override integrated in the tube (**standard**)
CM = boot protected.
For DC version only.
CK = knob.
For DC version only.

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

DC power supply
D12 = 12 V
D24 = 24 V
D28 = 28 V
D00 = valve without coils (see **NOTE 1**)

AC power supply
A24 = 24 V - 50 Hz
A48 = 48 V - 50 Hz
A110 = 110 V - 50 Hz
A230 = 230 V - 50 Hz
A00 = valve without coils (see **NOTE 1**)

NOTE 1: Coils locking ring and related OR are supplied together with valves.

NOTE 2:The valve is supplied with standard surface treatment of phosphating 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
W5 = semi-gloss epoxy painting black RAL 9005
thickness 80 ÷ 100µ
W6 = gloss polyurethane painting black RAL 9005
thickness140µ

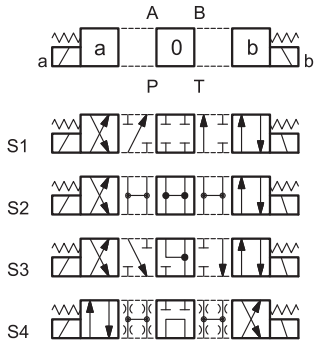
2 - HYDRAULIC FLUIDS

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

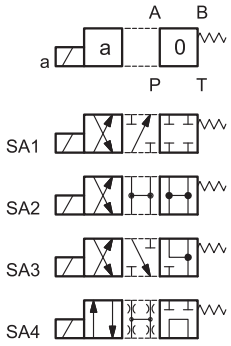
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

3 - SPOOL TYPE

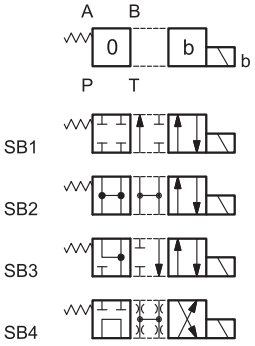
Type **S***:
2 solenoids - 3 positions
with spring centering



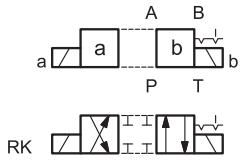
Type **SA***:
1 solenoid side A
2 positions (central + external)
with spring centering



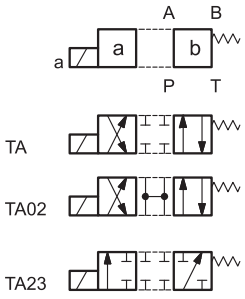
Type **SB***:
1 solenoid side B
2 positions (central + external)
with spring centering



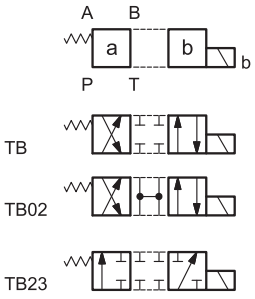
Type **RK**:
2 solenoids - 2 positions
with mechanical retention



Type **TA**:
1 solenoid side A
2 external positions
with return spring

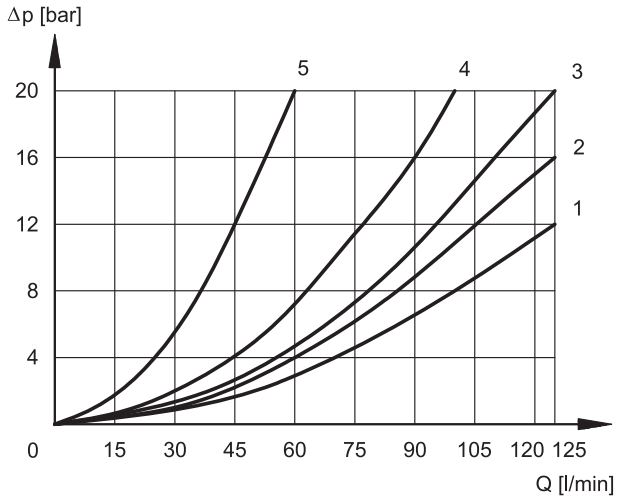


Type **TB**:
1 solenoid side B
2 external positions
with return spring



NOTE: Others spools available on request only.

4 - PRESSURE DROPS Δp-Q (obtained with viscosity of 36 cSt at 50 °C)



ENERGIZED VALVE

SPOOL	FLOW DIRECTIONS			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPHS			
S1	1	1	2	2
S2	1	1	1	1
S3	1	1	1	1
S4	4	4	4	4
RK	2	2	2	2
TA	2	2	3	3
TA02	2	2	1	1
TA23	3	3	-	-

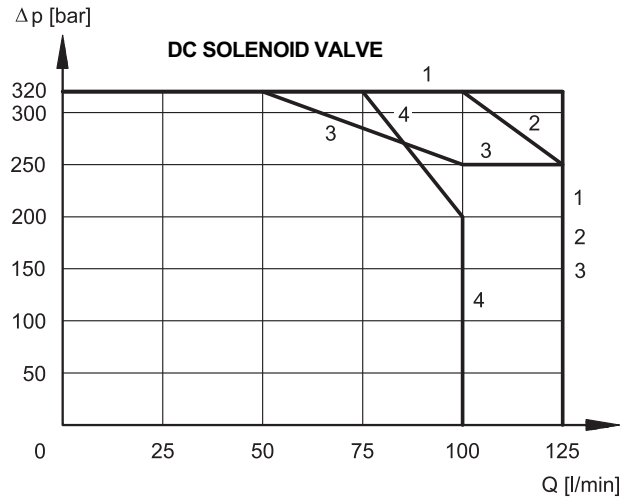
DE-ENERGIZED VALVE

SPOOL	FLOW DIRECTIONS		
	A→T	B→T	P→T
	CURVES ON GRAPHS		
S2	-	-	1
S3	5	5	-
S4	-	-	1

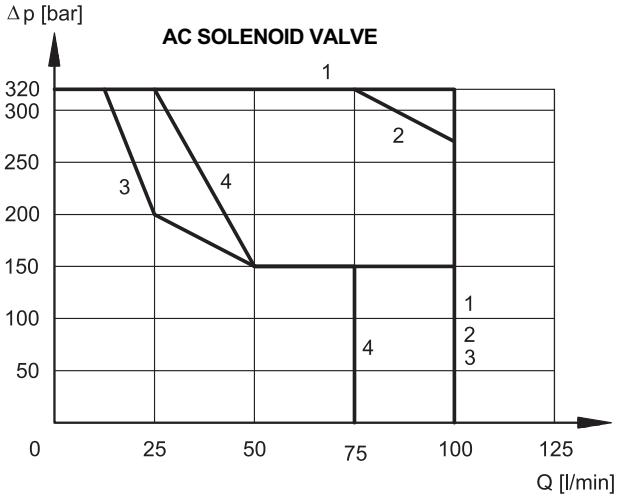
5 - OPERATING LIMITS

The curves define the flow rate operating fields according to the valve pressure of the different versions.The values indicated in the graphs are relevant to the standard solenoid valve. The operating limits can be considerably reduced if a 4-way valve is used as 3-way valve with port A or B plugged or without flow. The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage. The value have been obtained with mineral oil, viscosity 36 cSt, temperature 50 °C and filtration according to ISO 4406:1999 class 18/16/13.

5.1 - Standard operating limits



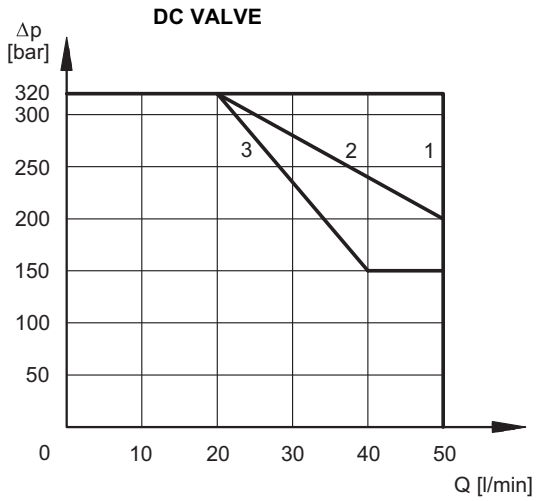
SPOOL	CURVE
S1, S2, RK, TA, TA23	1
S9, TA02	2
S3	3
S4	4

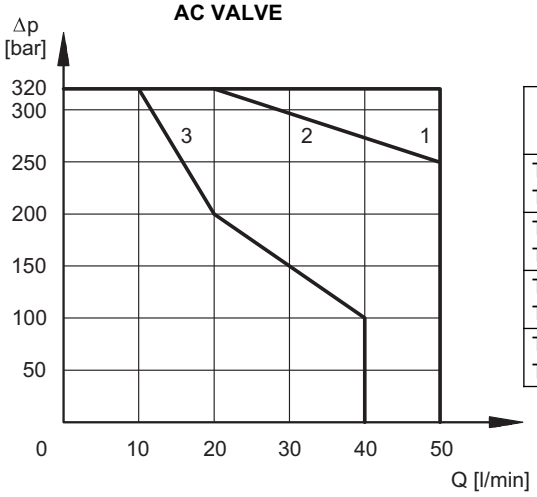


SPOOL	CURVE
S1, RK, TA, TA02, TA23	1
S2	2
S3, S9	3
S4	4

5.2 - 4-way valve in 3-way operation

Operating limits of a 4-way valve in 3-way operation or with port A or B plugged or without flow.





SPOOL	CURVE	
	DC	AC
TA backpr. A TB backpr. B	2	1
TA02 backpr. A TB02 backpr. B	1	1
TA backpr. B TB backpr. A	3	3
TA02 backpr. B TB02 backpr. A	2	2

6 - SWITCHING TIMES

The values indicated are obtained with spool S1, according to ISO 6403 standard, with mineral oil viscosity 36 cSt at 50°C.

SUPPLY	TIMES (±10%) [ms]	
	ENERGIZING	DE-ENERGIZING
DC	40 ÷ 90	20 ÷ 50
AC	15 ÷ 30	20 ÷ 50

7 - ELECTRICAL FEATURES

7.1 - Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation. The coil is fastened to the tube by a threaded ring, and can be rotated +/- 90°, to suit the available space.

The interchangeability of coils of different voltages is allowed within the same type of supply current, alternating or direct.

SUPPLY VOLTAGE FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY	10.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC) - NOTE	In compliance with 2004/108/EC
LOW VOLTAGE	In compliance with 2006/95/EC
CLASS OF PROTECTION : Atmospheric agents CEI EN 60529 Coil insulation (VDE 0580) Impregnation:	 IP 65 (*) class H class H

(*) The protection degree is guaranteed only with the connector correctly connected and installed

NOTE: In order to further reduce the emissions, with DC supply, use of type H connectors is recommended. These prevent voltage peaks on opening of the coil supply electrical circuit (see cat. 49 000).

7.2 - DC valve - Current and power consumption

In direct current energizing, current consumption stays at fairly constant values, essentially determined by Ohm's law: V = R x I

The table shows current and power consumption values for DC types.

	Resistance at 20°C [Ω] (±5%)	Current consumption [A] (±10%)	Power consumption [W] (±10%)	Coil code K1
C22L5-D12K1	2,9	4,14	50	1903150
C22L5-D24K1	12,3	1,95	47	1903151
C22L5-D28K1	16,8	1,67	47	1903152

7.3 - AC valve - Current and power consumption

In alternating current energizing, an initial phase (maximum movement) is seen, during which the solenoid consumes elevated value currents (inrush current); the current values diminish during the plunger stroke until it reaches the minimum values (holding current) when the plunger reaches the stroke end.

The table shows the values of absorption at the inrush and at holding.

	Freq. [VAC/Hz] (±10%)	Resistance at 20°C [Ω] (±5%)	Current consumption at inrush [A] (±10%)	Current consumption at holding [A] (±5%)	Power consumption at inrush (±10%) [VA]	Power consumption at holding (±10%) [VA]	Coil code K1
C26L5-A24K1/10	24/50	0,58	15,1	2,84	362,4	68,2	1931600
C26L5-A48K1/10	48/50	2,34	7,4	1,29	355,2	61,9	1931610
C26L5-A110K1/10	110/50-120/60	12,3	3,6 - 3,3	0,64 - 0,62	396	70,4 - 74,4	1931620
C26L5-A230K1/10	230/50-240/60	51,6	1,8 - 1,6	0,31 - 0,28	414 - 384	71,3 - 67,2	1931630

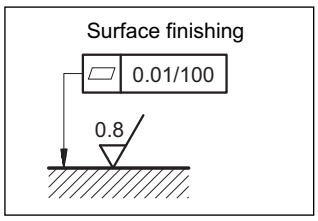
8 - ELECTRIC CONNECTORS

The solenoid valves are not supplied with connector. Connectors must be ordered separately.
For the identification of the connector type to be ordered, please see catalogue 49 000.

9 - INSTALLATION

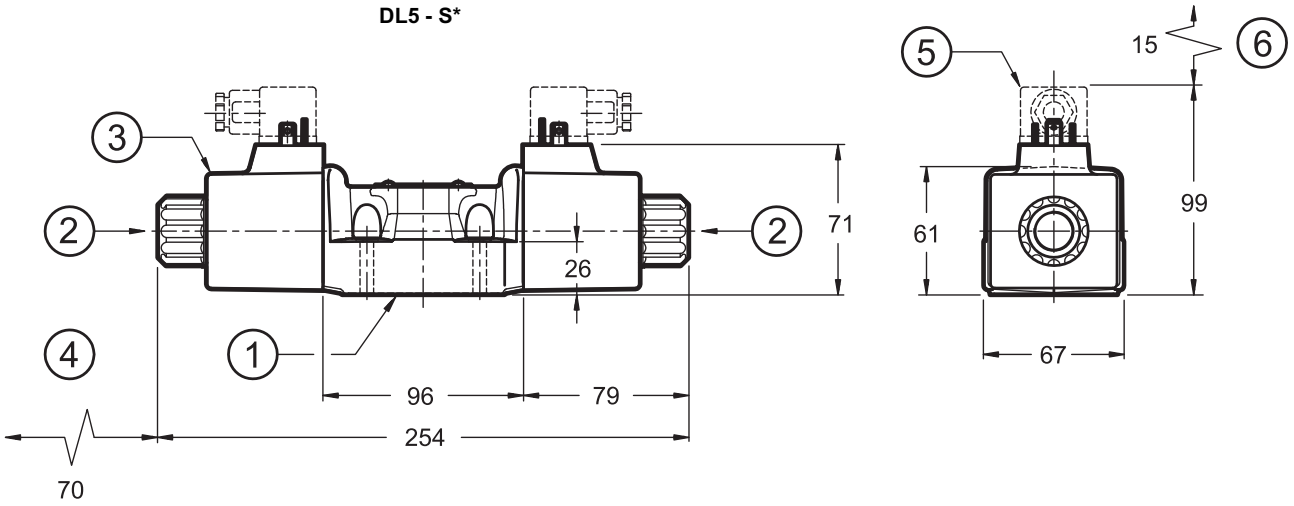
The configuration with centering and return springs can be mounted in any position.

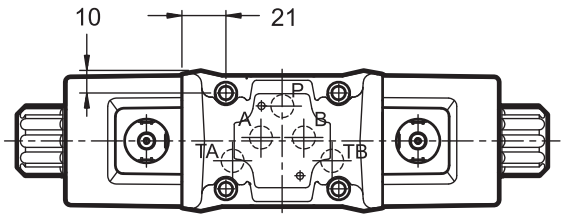
Valve fitting takes place by means of screws or tie rods, fixing the valve on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing. If the minimum values of planarity or smoothness are not met, fluid leakages between valve and mounting surface can easily occur.



10 - DL5 DC OVERALL AND MOUNTING DIMENSIONS

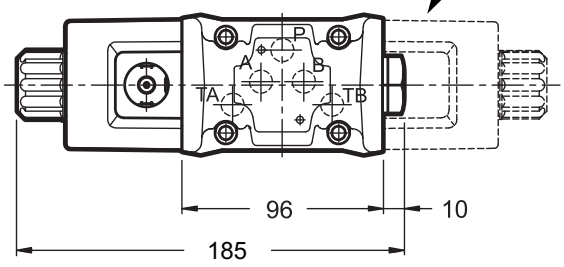
DL5 - S*





DL5 - TA, DL5-SA*

solenoid position for execution type TB* - SB*



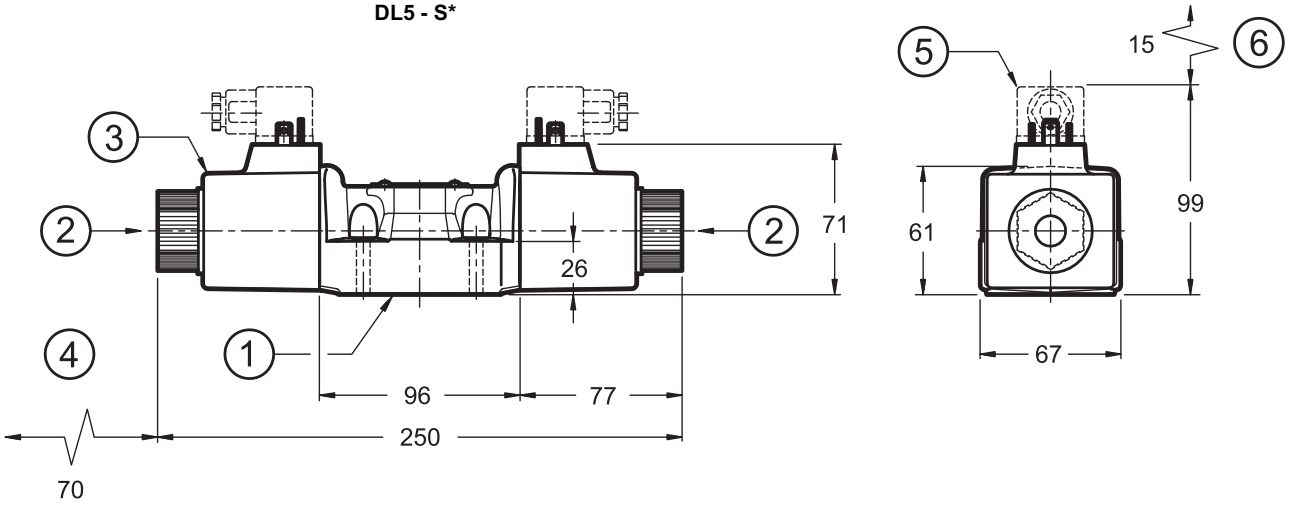
dimensions in mm

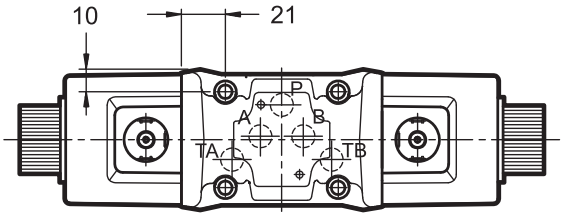
1	Mounting surface with sealing rings
2	Locking ring with standard manual override integrated in the tube
3	Coil
4	Coil removal space
5	DIN 43650 electrical connector
6	Connector removal space

See par. 15 for fastening bolts and sealing rings

11 - DL5 AC OVERALL AND MOUNTING DIMENSIONS

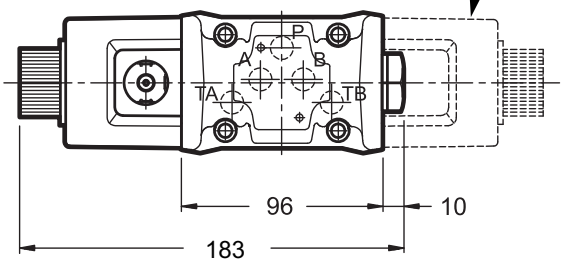
DL5 - S*





DL5 - TA*, DL5-SA*

solenoid position for execution type TB* - SB*



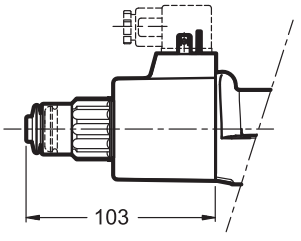
dimensions in mm

1	Mounting surface with sealing rings
2	Locking ring with standard manual override integrated in the tube
3	Coil
4	Coil removal space
5	DIN 43650 electrical connector
6	Connector removal space

See par. 15 for fastening bolts and sealing rings

12 - OPTIONAL MANUAL OVERRIDES

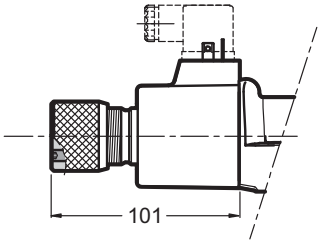
12.1 - Boot protected manual override (only for DC solenoid valve)
It can be ordered by entering the code **CM** in the identification code at par. 1, or is available as option to be ordered separately: code **3401150006.**



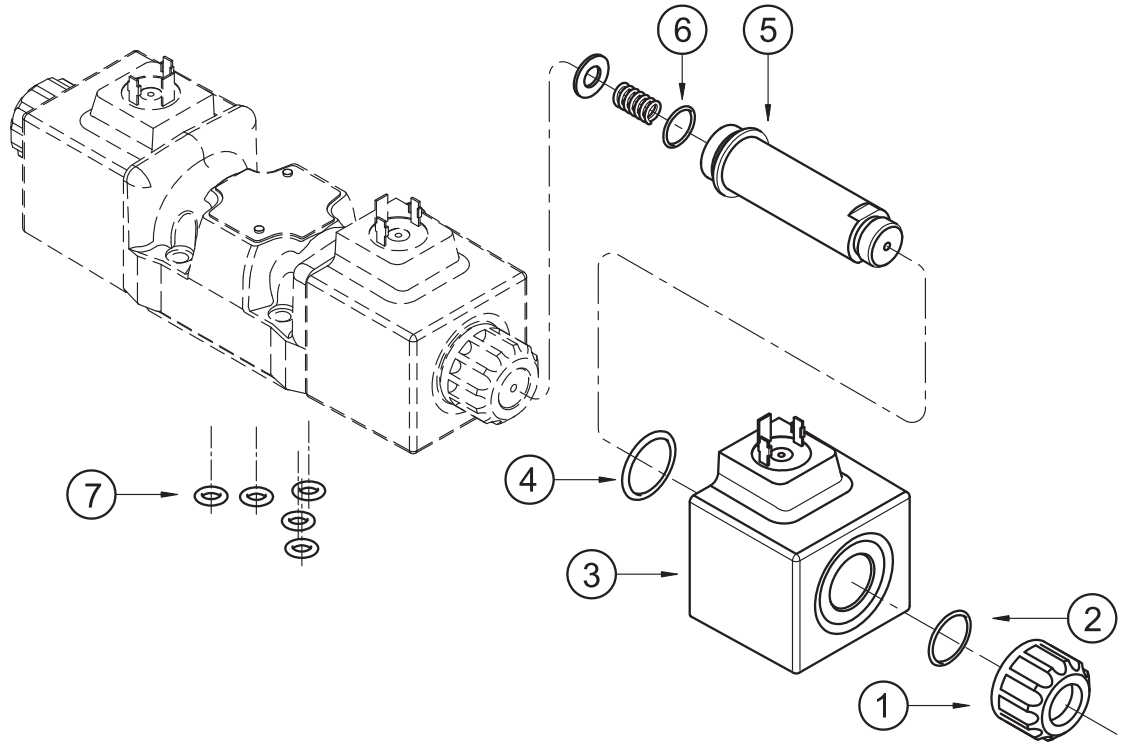
12.2 - Knob manual override (only for DC solenoid valve)
When the set screw is screwed and its point is aligned with the edge of the knob, tighten the knob till it touches the spool: in this position the override is not engaged and the valve is de-energized. After adjusting the override, tighten the set screw in order to avoid the knob loosing.

Spanner: 3 mm

The knob override can be ordered by entering the code **CK** in the identification code at par. 1, or is available as option to be ordered separately: code **3401150009.**



13 - SPARE PARTS FOR DC SOLENOID VALVE



IDENTIFICATION CODE FOR DC AND RC COILS

C	22	L5	-		K1	/	10

Supply voltage
D12 = 12 V
D24 = 24 V
D28 = 28 V

Series no.:
(the overall and mounting dimensions remain unchanged from 10 to 19)

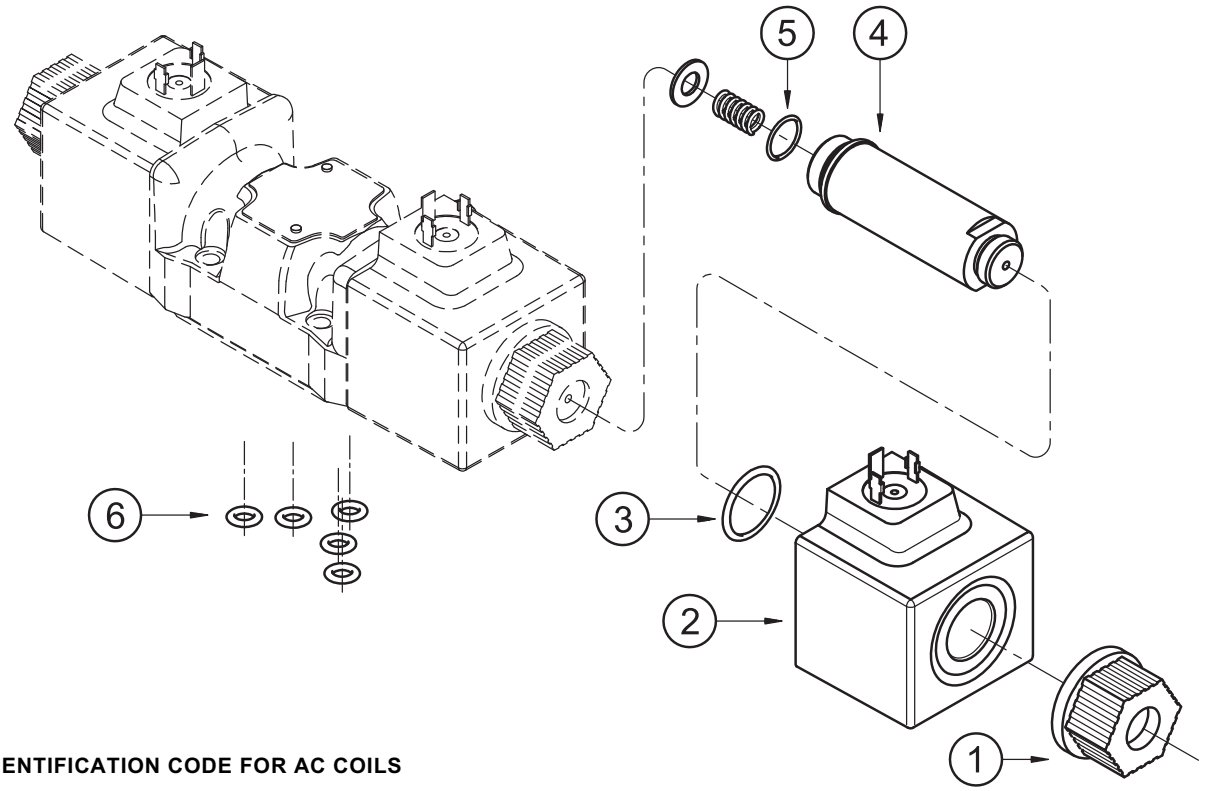
Coil electrical connection:
plug for connector type DIN 43650 (**standard**)

1	Coil locking ring - code 0119412
2	ORM-0220-20 - 70 shore
3	Coil (see identification code)
4	ORM-0296-24 (29.6x2.4) - 70 shore
5	Solenoid tube: TD22-DL5/10N (NBR seals) TD22-DL5/10V (FPM seals) (OR n° 6 included)
6	OR type 3.910 (19.18x2.46) - 70 shore
7	N. 5 OR type 2050 (12.42x1.78) - 90 Shore

SEAL KIT

The codes included the OR n° 2, 4, 6 and 7.
Cod. 1985447 NBR seals
Cod. 1985448 FPM seals

14 - SPARE PARTS FOR AC SOLENOID VALVE



IDENTIFICATION CODE FOR AC COILS

C	26	L5	-		K1	/	10

Series no.:
(the overall and mounting dimensions remain unchanged from 10 to 19)

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

Supply voltage
A24 = 24 V - 50 Hz
A48 = 48 V - 50 Hz
A110 = 110 V - 50 Hz / 120 V - 60 Hz
A230 = 230 V - 50 Hz / 240 V - 60 Hz

1	Coil locking ring - code. 0119480
2	Coil (see identification code)
3	ORM-0296-24 (29.6x2.4) - 70 shore
4	Solenoid tube: TA26-DL5/10N (NBR seals) TA26-DL5/10V (FPM seals) (OR n° 5 included)
5	OR type 3.910 (19.18x2.46) - 70 shore
6	N. 5 OR type 2050 (12.42x1.78) - 90 Shore

SEAL KIT

The codes included the OR n° 3, 5 and 6.
Cod. 1985449 NBR seals
Cod. 1985450 FPM seals

15 - FASTENING BOLTS AND SEALING RINGS

Single valve fastening: 4 SHC screws ISO 4762 M6x35
Tightening torque: 8 Nm
Sealing rings: N. 5 OR type 2050 (12.42x1.78) - 90 Shore

16 - SUBPLATES (see catalogue 51 000)

Type PMD4-AI4G with rear ports - port threading: 3/4” BSP
Type PMD4-AL4G with side ports - port threading: 1/2” BSP

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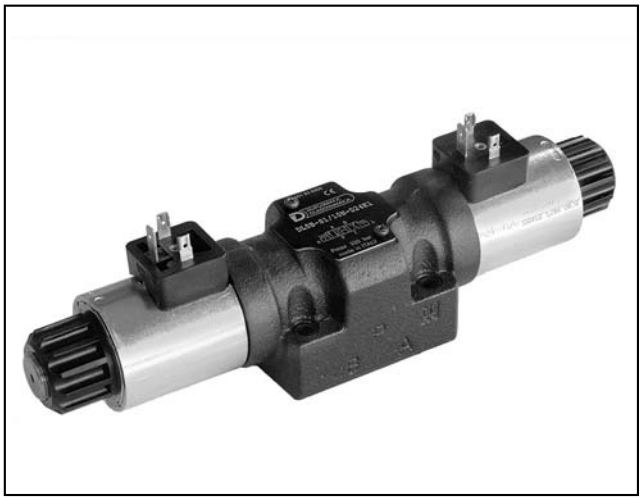


DL5B

SOLENOID OPERATED DIRECTIONAL CONTROL VALVE COMPACT VERSION

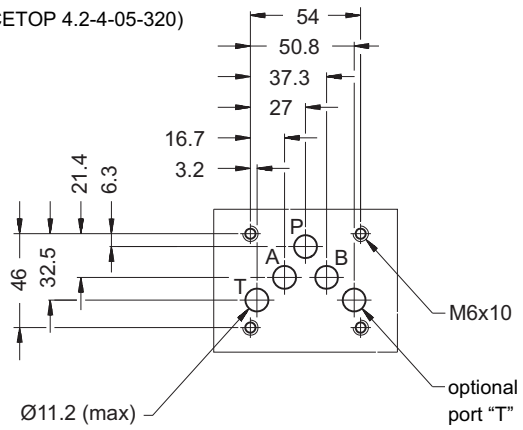
SERIES 10

SUBPLATE MOUNTING
ISO 4401-05 (CETOP 05)

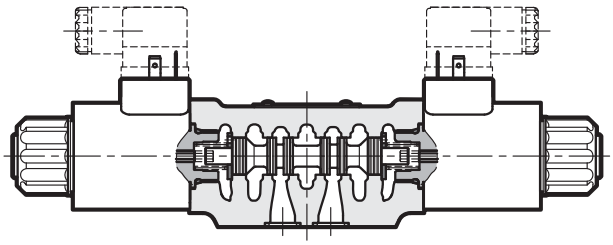
p max **320** bar
Q max **125** l/min

MOUNTING INTERFACE

ISO 4401-05-04-0-05
(CETOP 4.2-4-05-320)



OPERATING PRINCIPLE



— Direct acting, subplate mounting directional control valve, with mounting surface according to ISO 4401 (CETOP RP 121H) standards.

— The valve is suitable for special applications, guaranteed by the reduced solenoid dimensions.

— The valve body is made with high strength iron castings provided with wide internal passages in order to minimize the flow pressure drop. Wet armature solenoids with interchangeable coils are used (for further information on solenoids see paragraph 7).

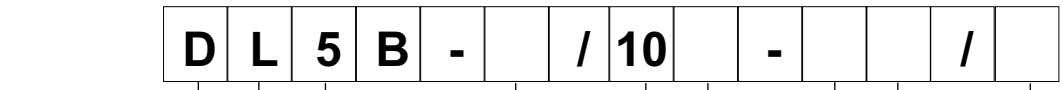
— The valve is supplied with 3 or 4 way designs and with several interchangeable spools with different porting arrangements.

— The valve is available with DC current solenoids only.

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

Maximum operating pressure: - ports P - A - B - port T	bar	 320 210
Maximum flow rate	l/min	125
Pressure drop Δp-Q	see paragraph 4	
Operating limits	see paragraph 5	
Electrical features	see paragraph 7	
Electrical connections	see paragraph 8	
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	according to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Masse: single solenoid valve double solenoid valve	kg	2,4 3

1 - IDENTIFICATION CODE



Solenoid operated directional control valve

Compact version

ISO 4401-05 (CETOP 05) size

Spool type (see paragraph 3):

S* **TA***
SA* **TB***
SB* **RK**

Series no.: (the overall and mounting dimensions remain unchanged from 10 to 19)

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

DC power supply
D12 = 12 V
D24 = 24 V
D28 = 28 V
D00 = valve without coils (see **NOTE 1**)

Coil electrical connection: (see paragraph 9)
K1 = plug for connector type DIN 43650 (**standard**)
K2 = plug for connector type AMP JUNIOR (available on D12 and D24 coils only)
K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S (available on D12 and D24 coils only)

Option: Surface treatment not standard. Omit if not required (see **NOTE 2**)

NOTE 1: Coils locking ring and related OR are supplied together with valves.

NOTE 2:The valve is supplied with standard surface treatment of phosphating 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 ÷ 40µ

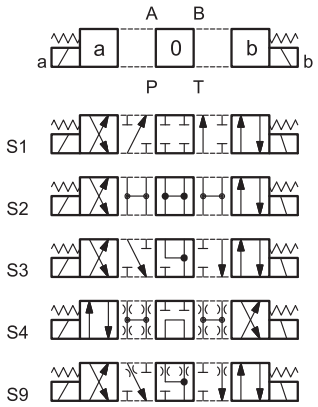
2 - HYDRAULIC FLUIDS

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

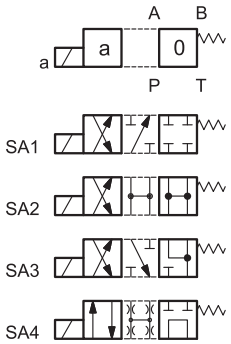
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

3 - SPOOL TYPE

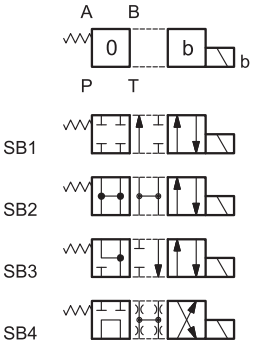
Type **S***:
2 solenoids - 3 positions
with spring centering



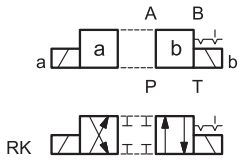
Type **SA***:
1 solenoid side A
2 positions (central + external)
with spring centering



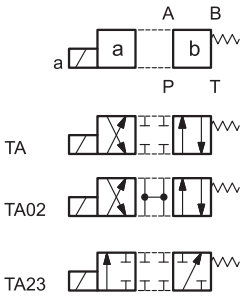
Type **SB***:
1 solenoid side B
2 positions (central + external)
with spring centering



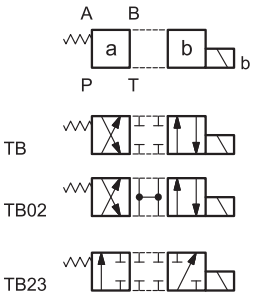
Type **RK**:
2 solenoids - 2 positions
with mechanical retention



Type **TA**:
1 solenoid side A
2 external positions
with return spring

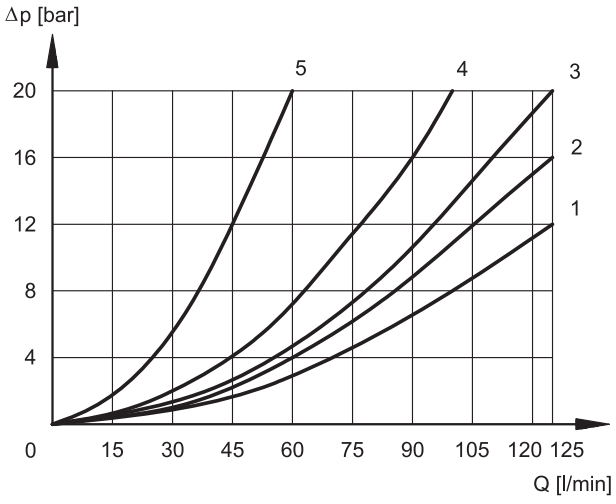


Type **TB**:
1 solenoid side B
2 external positions
with return spring



NOTE: Others spools available on request only.

4 - PRESSURE DROPS Δp-Q (obtained with viscosity of 36 cSt at 50 °C)



ENERGIZED VALVE

SPOOL	FLOW DIRECTIONS			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPHS			
S1	1	1	2	2
S2	1	1	1	1
S3	1	1	1	1
S4	4	4	4	4
S9	1	1	1	1
RK	2	2	2	2
TA	2	2	3	3
TA02	2	2	1	1
TA23	3	3	-	-

DE-ENERGIZED VALVE

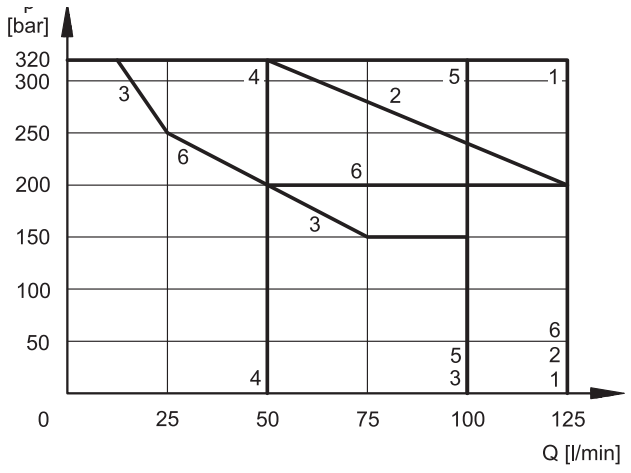
SPOOL	FLOW DIRECTIONS		
	A→T	B→T	P→T
	CURVES ON GRAPHS		
S2	-	-	1
S3	5	5	-
S4	-	-	1

5 - OPERATING LIMITS

The curves define the flow rate operating fields according to the valve pressure of the different versions. The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage. The value have been obtained with mineral oil, viscosity 36 cSt, temperature 50 °C and filtration according to ISO 4406:1999 class 18/16/13.

The limits for TA02 and TA spools refer to the 4-way operation. The operating limits of a 4-way valve in 3-way operation or with port A or B plugged or without flow are shown in the chart on the next page.

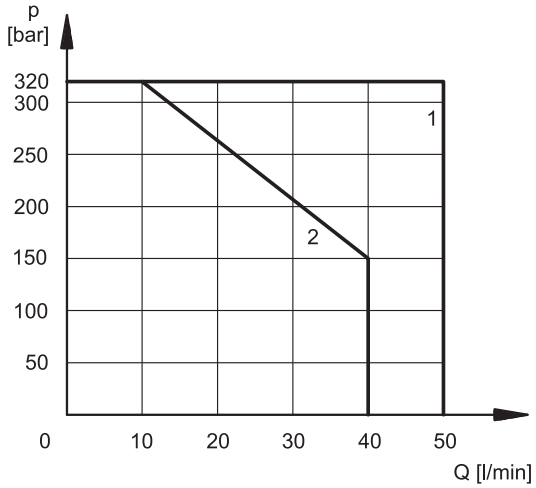
DC SOLENOID VALVE



SPOOL	CURVE
S1, S2, RK	1
TA02	2
S3	3
S4	4
TA, TA23	5
S9	6

5.1 - 4-way valve in 3-way operation

Operating limits of a 4-way valve in 3-way operation or with port A or B plugged or without flow.



SPOOL	CURVE
TA	1
TA02	2

6 - SWITCHING TIMES

The values indicated are obtained with spool S1, according to ISO 6403 standard, with mineral oil viscosity 36 cSt at 50°C.

SUPPLY	TIMES (±10%) [ms]	
	ENERGIZING	DE-ENERGIZING
DC	70 ÷ 100	15 ÷ 20

7 - ELECTRICAL FEATURES

7.1 Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation.
The coil is fastened to the tube by a threaded ring, and can be rotated +/- 90°, to suit the available space
The coils are interchangeabile.

Protection from atmospheric agents CEI EN 60529

Plug-in type	IP 65	IP 67	IP 69 K
K1 DIN 43650	x (*)		
K2 AMP JUNIOR	x	x (*)	
K7 DEUTSCH DT04 male	x	x	x (*)

(*) The protection degree is guaranteed only with the connector correctly connected and installed

NOTE: In order to further reduce the emissions, use of type H connectors is recommended. These prevent voltage peaks on opening of the coil supply electrical circuit (see cat. 49 000).

SUPPLY VOLTAGE FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY	10.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	In compliance with 2004/108/CE
LOW VOLTAGE	In compliance with 2006/95 CE
CLASS OF PROTECTION : Coil insulation (VDE 0580) Impregnation:	 class H class F

7.2 DC valve - Current and power consumption

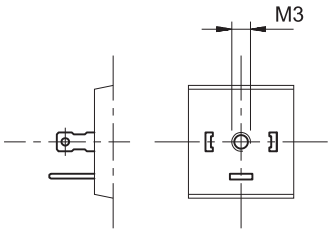
In direct current energizing, current consumption stays at fairly constant values, essentially determined by Ohm's law: V = R x I

The table shows current and power consumption values for DC types.

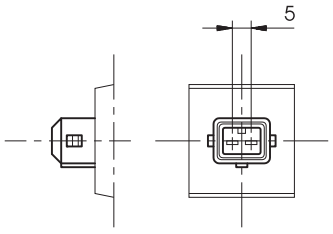
	Resistance at 20°C [Ω] (±5%)	Current consumption [A] (±10%)	Power consumption [W] (±10%)	Coil code K1	K2	K7
C22S3-D12	4,4	2,72	32,7	1903080	1903100	1902940
C22S3-D24	18,6	1,29	31	1903081	1903101	1902941
C22S3-D28	26	1,11	31	1903082		-

8 - ELECTRIC CONNECTIONS

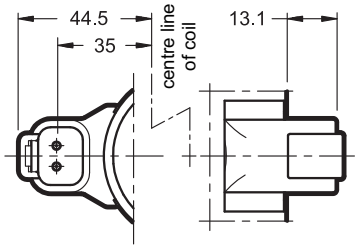
connection for DIN 43650 connector type code **K1** (**standard**)



connection for AMP JUNIOR connector type code **K2**



connection DEUTSCH DT04-2P for DEUTSCH DT06-2S male connector type code **K7**

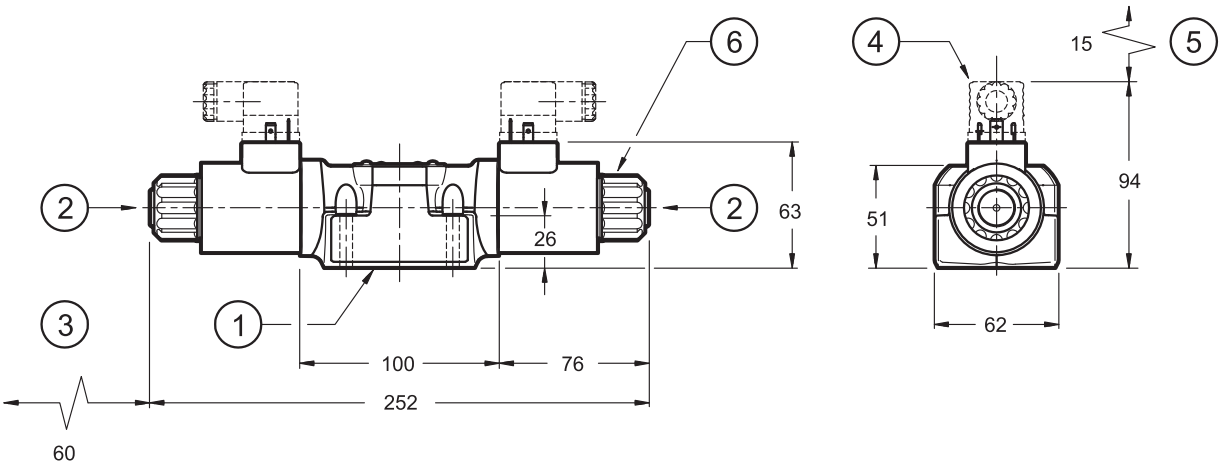


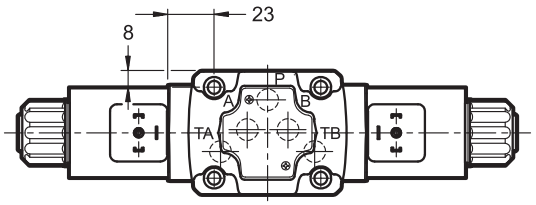
9 - ELECTRIC CONNECTORS

The solenoid operated valves with K1 connection are not supplied with connector. Connectors must be ordered separately (see catalogue 49 000). K2 and K7 connectors are not available.

10 - DL5B DC OVERALL AND MOUNTING DIMENSIONS

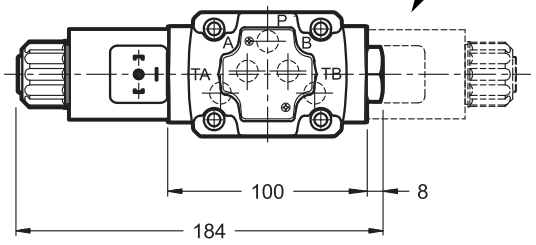
DL5B-S*





DL5B-TA, DL5B-SA*

solenoid position for versions type TB* - SB*



dimensions in mm

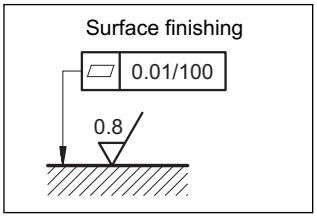
1	Mounting surface with sealing rings
2	Locking ring with standard manual override integrated in the tube
3	Coil removal space
4	DIN 43650 electrical connector (representation with K1 standard connection)
5	Connector removal space
6	Locking ring: tightening torque: 5 ± 0.5 Nm

See par. 13 for fastening bolts and sealing rings

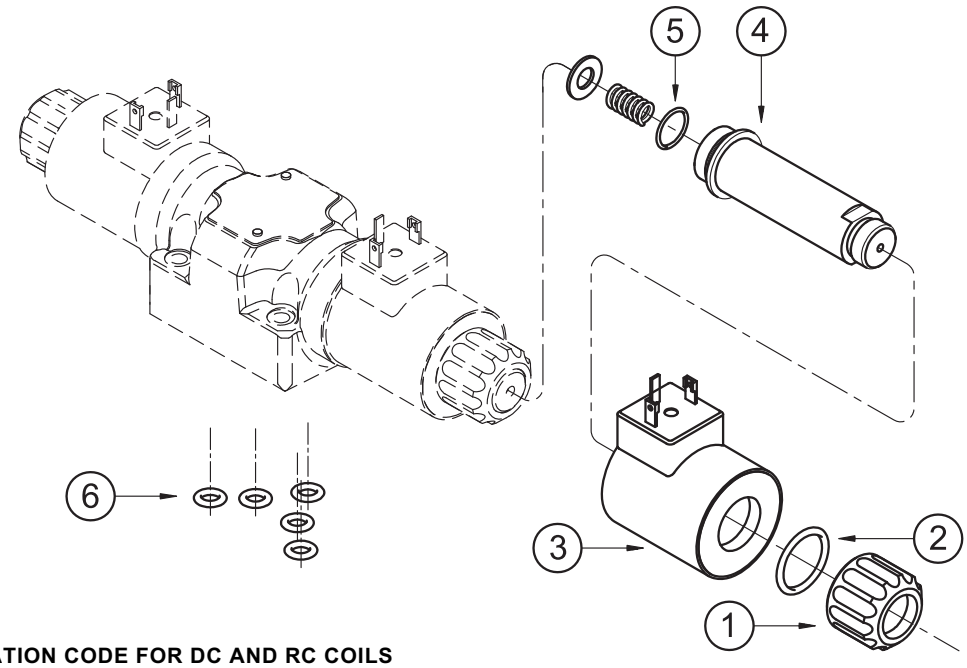
11 - INSTALLATION

The configuration with centering and return springs can be mounted in any position.

Valve fitting takes place by means of screws or tie rods, fixing the valve on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing. If the minimum values of planarity or smoothness are not met, fluid leakages between valve and mounting surface can easily occur.



12 - SPARE PARTS FOR DC SOLENOID VALVE



IDENTIFICATION CODE FOR DC AND RC COILS

C	22	S3	-			/	

Supply voltage
D12 = 12 V
D24 = 24 V
D28 = 28 V

Series no.:
10 = for K7
11 = for K1and K2
(the overall and mounting dimensions remain unchanged from 10 to 19)

Coil electrical connection:
K1 = plug for connector type DIN 43650 (**standard**)
K2 = plug for connector type AMP JUNIOR (available on D12 and D24 coils only)
K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S (available on D12 and D24 coils only)

1	Coil locking ring - code 0119412 tightening torque: 5 ±0.5 Nm
2	ORM-0220-20 - 70 shore
3	Coil (see identification code)
4	Solenoid tube: TD22-DL5/10N (NBR seals) TD22-DL5/10V (FPM seals) (OR n° 6 included)
5	OR type 3.910 (19.18x2.46) - 70 shore
6	N. 5 OR type 2050 (12.42x1.78) - 90 Shore

SEAL KIT

The codes included the OR n° 2, 5, and 6.
Cod. 1985461 NBR seals
Cod. 1985462 FPM seals

13 - FASTENING BOLTS AND SEALING RINGS

Single valve fastening: 4 SHC screws M6x35
Tightening torque: 8 Nm
Sealing rings: N. 5 OR type 2050 (12.42x1.78) - 90 Shore

14 - SUBPLATES (See catalogue 51 000)

Type PMD4-AI4G with rear ports - threading: 3/4” BSP
Type PMD4-AL4G with side ports - threading: 1/2” BSP

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DD44

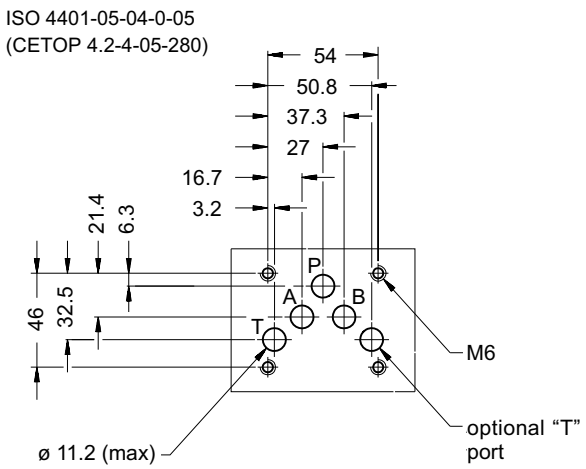
SOLENOID OPERATED DIRECTIONAL CONTROL VALVE

DIRECT CURRENT - SERIES 50
ALTERNATING CURRENT - SERIES 62

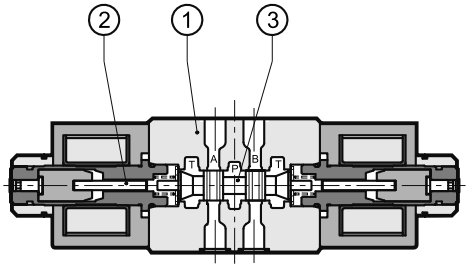
MODULAR VERSION
ISO 4401-05 (CETOP 05)

p max **280** bar
Q max **75** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



— DD44 is used to switch multiple flow directions, or to select pressure values. Application examples can be seen in paragraph 11.

— The oil passage holes pass right through the entire valve body and due to this particular design feature, the DD44 can be assembled with all ISO 4401-05 (CETOP 05) modular valves.

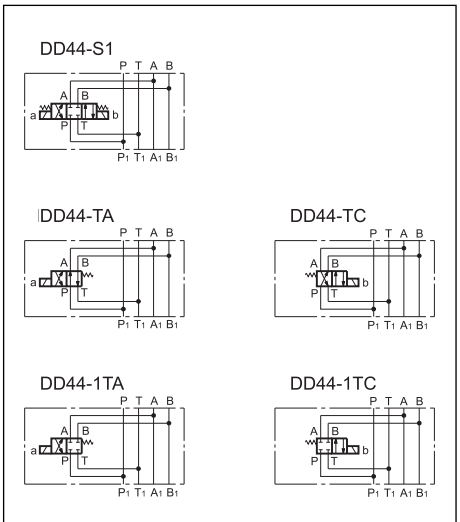
— The special connection of the valve in parallel to the P, T, A and B lines of the circuit allows easy construction of different hydraulic configurations, reducing pressure drops to a minimum.

CONFIGURATIONS (see Hydraulic symbols table)

— Type "S": a 4-way, 3-position, 2-solenoid directional valve; positioning of the spool at rest is obtained by centering springs.

— Type "TA/TC": a 4-way, 2-position, one solenoid directional valve; positioning of the spool at rest is obtained by a return spring.

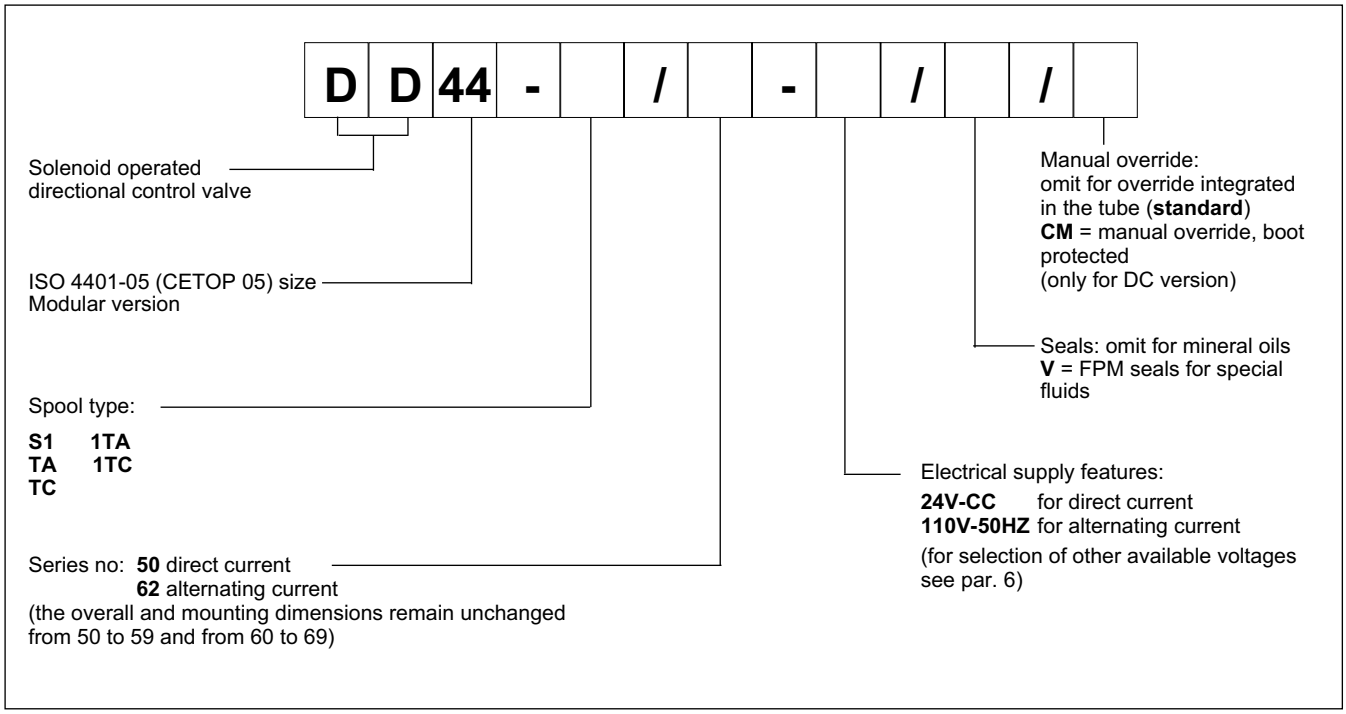
HYDRAULIC SYMBOLS



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

Maximum operating pressure - ports P - A - B - port T	bar	 280 140
Maximum flow rate on ports P - A - B - T	l/min	75
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	according to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass: DD44-S DD44-TA/TC	kg	4,5 3,6

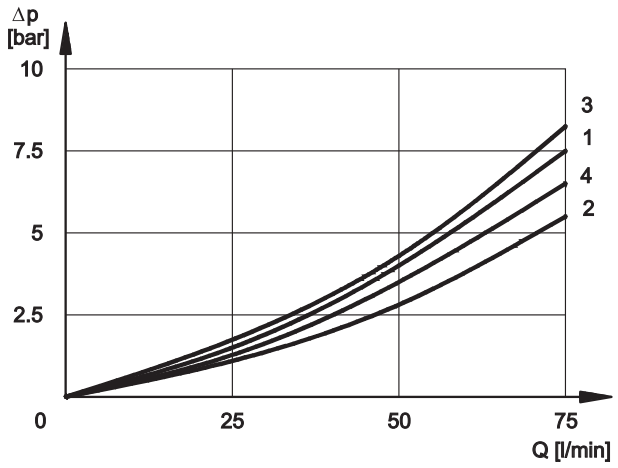
1 - IDENTIFICATION CODE



2 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

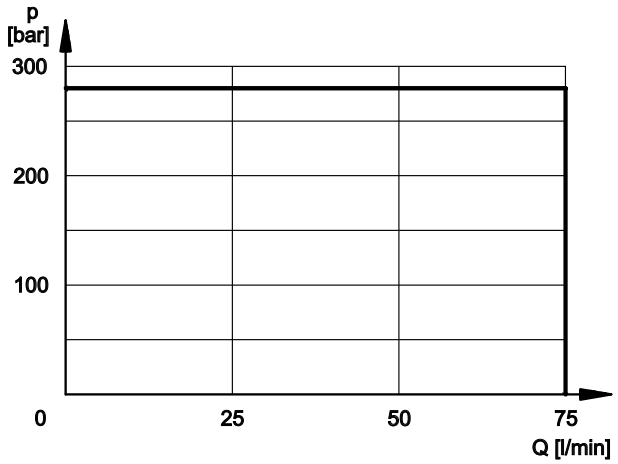
3 - PRESSURE DROPS Δp-Q (obtained with viscosity 36 cSt at 50 °C)



SPOOL	SPOOL POSITION	CONNECTIONS			
		P→A	P→B	A→T	B→T
		CURVES ON GRAPH			
S1, 1TA, 1TC	Energized	1	1	2	2
TA, TC	De-energized Energized	3	3	4	4

4 - OPERATING LIMITS

The curves define the flow rate operating fields according to the valve pressure of the different versions.
The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage.
The values have been obtained with mineral oil, viscosity 36 cSt, temperature 50°C and filtration according to ISO 4406:1999 clalss 18/16/13.



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 3-way valve with port A or B plugged or without flow.

5 - SWITCHING TIMES

The values indicated are obtained according to ISO 6403 standard, with mineral oil viscosity 36 cSt at 50°C.

SPOOL TYPE	TIMES	
	ENERGIZING	DE-ENERGIZING
CC	60 ms	50 ms
CA	15 ÷ 30 ms	20 ÷ 50 ms

6 - ELECTRICAL FEATURES

6.1 Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation.
The coil is fastened to the tube by a threaded ring, and can be rotated 360°, to suit the available space.
NOTE 1: In order to further reduce the emissions, use of type H connectors is recommended. These prevent voltage peaks on opening of the coil supply electrical circuit (see CAT. 49 000).

VOLTAGE SUPPLY FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY	10.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC) (**NOTE 1**)	In compliance with 2004/108/CE
LOW VOLTAGE	In compliance with 2006/95/CE
CLASS OF PROTECTION: Atmospheric agents (CEI EN 60529) Coil insulation (VDE 0580) Impregnation:	IP 65 (**NOTE 2**) class H class F

NOTE 2: The IP65 protection degree is guaranteed only with the connector correctly connected and installed.

6.2 Current and absorbed power for DC solenoid valve

The table shows current and power consumption values relevant to the different coil types for DC.

Coils for direct current (values ± 5%)

Nominal voltage [V]	Resistance at 20°C [ohm]	Current consumpt. [A]	Power consumpt. [W]	Code
12	3 - 3,4	3,7	44,4	1901691
24	12 - 14	1,83	43,9	1901692

6.3 Current and absorbed power for AC solenoid valve

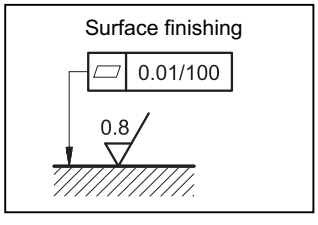
The table shows current and power consumption values at inrush and at holding, relevant to the different coil types for AC current.

Coils for alternating current (values ± 5%)

Suffix	Nominal voltage [V]	Frequence [Hz]	Resistance at 20°C [ohm]	Current consumption at inrush [A]	Current consumption at holding [A]	Power consumption at inrush [VA]	Power consumption at holding [VA]	Coil code
A24	24	50	0,53	25	3,96	600	95	1902890
A48	48		2,09	12,5	2,3	600	110	1902891
A110	110V-50Hz	50/60	10,9	5,2	0,96	572	105	1902892
	120V-60Hz		10,9	5,2	0,89	572	105	
A230	230V-50Hz		52,7	2,8	0,46	644	105	1902893
	240V-60Hz		52,7	2,8	0,38	644	105	
F110	110	60	8,80	5,2	0,95	572	105	1902894
F220	220		35,2	2,7	0,48	594	105	1902895

7 - INSTALLATION

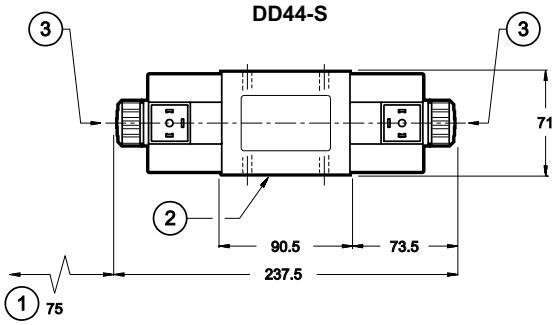
Configurations with centering and return springs can be mounted in any position; type RK valves - without springs and with mechanical detent - must be mounted with the longitudinal axis horizontal. Valve fixing takes place by means of screws or tie rods, with the valve mounted on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing. If the minimum values of planarity and/or smoothness are not met, fluid leakages between valve and mounting surface can easily occur.

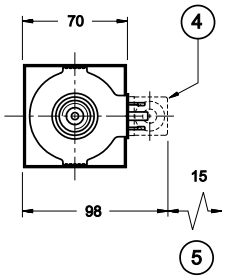


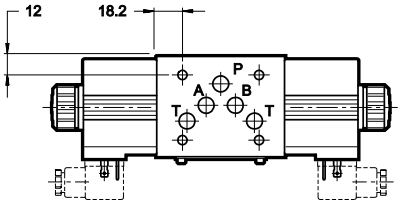
8 - ELECTRIC CONNECTORS

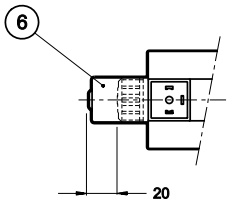
The solenoid operated valves are delivered without the connectors. They must be ordered separately.
For the identification of the connector type to be ordered, please see catalogue 49 000.

9 - OVERALL AND MOUNTING DIMENSIONS OF DIRECT CURRENT SOLENOID VALVE

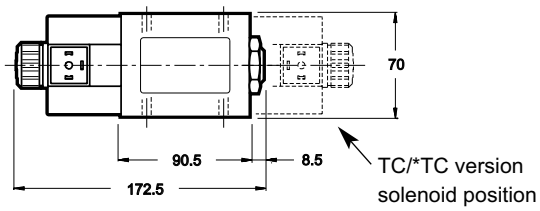






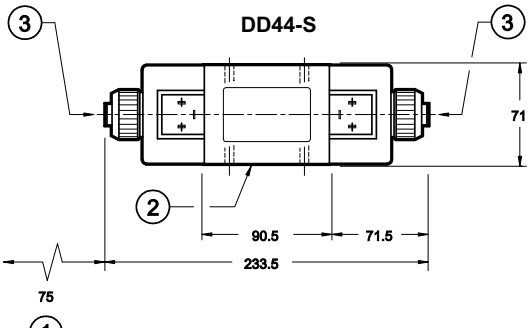


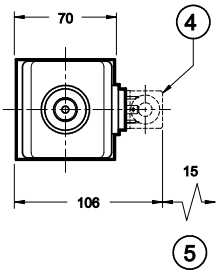
dimensions in mm

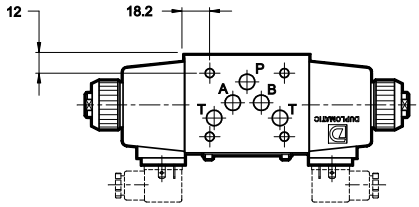


1	Coil removal space
2	Mounting surface with sealing rings 5 OR type 2050 - 90 Shore (12.42x1.78)
3	Manual override
4	Electric connector to be ordered separately (see cat. 49 000)
5	Connector removal space
6	CM manual override, boot protected

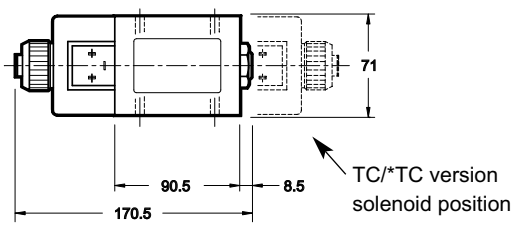
10 - OVERALL AND MOUNTING DIMENSIONS OF ALTERNATING CURRENT SOLENOID VALVE







dimensions in mm



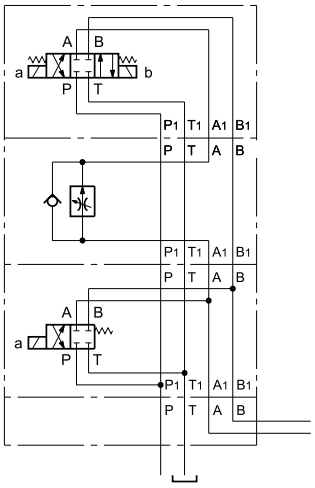
1	Coil removal space
2	Mounting surface with sealing rings 5 OR type 2050 - 90 Shore (12.42x1.78)
3	Manual override
4	Electric connector to be ordered separately (see cat. 49 000)
5	Connector removal space

11 - APPLICATION EXAMPLES

DS5-S1

RPC1-*/4M/A

DD44-1TA

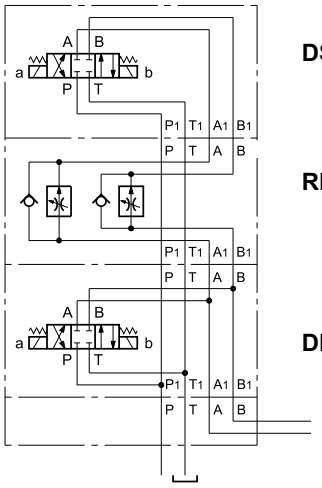


Example of circuit used to drive working units with fast approach, adjustable working speed and fast return.

DS5-S1

RPC1-*/4M/D

DD44-S1



Example of circuit used to drive working units with fast approach and adjustable working speed in both directions.

DUPLOMATIC OLEODINAMICA

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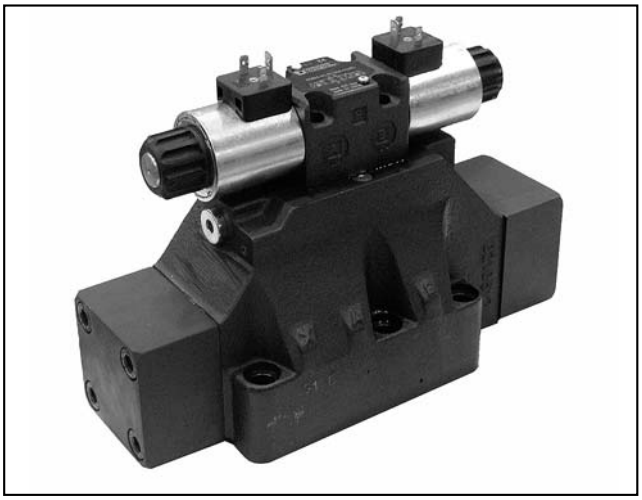
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com



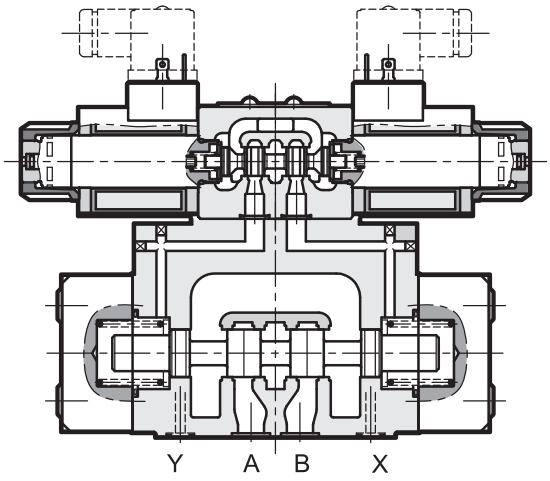
E*P4

PILOT OPERATED DISTRIBUTOR SOLENOID OR HYDRAULIC (C*P4) CONTROLLED

E4P4 CETOP P05
E4R4 ISO 4401-05 (CETOP R05)
E5 ISO 4401-08 (CETOP 08)

p max (see table of performances)
Q max (see table of performances)

OPERATING PRINCIPLE



— The E*P4 piloted valves are constituted of a 4-way hydropiloted distributor with a mounting surface in accordance with the ISO 4401 (CETOP RP121H) standards, operated by a ISO 4401-03 (CETOP 03) solenoid directional valve.

— They are made in CETOP P05 and ISO 4401-05 (CETOP R05) sizes with flow rates up to 150 l/min, and in ISO 4401-08 (CETOP 08) size with flow rates up to 600 l/min.

— They are available with different spool types (see par. 2) and with some options for the opening control.

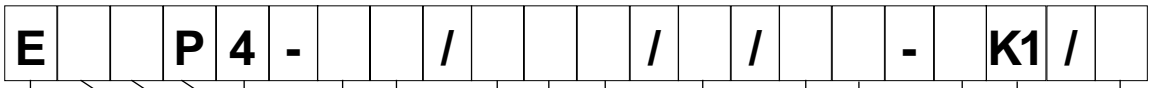
— They are available with both the solenoid and the hydraulic control from the X and Y ways.

— A version for high pressures (H) is available.

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

		E4*4	E4HP4	E5P4	E5HP4
Maximum operating pressure - ports P - A - B - port T (external drainage) - port T (internal drainage)	bar	 320 210 140	 420 350 140	 280 210 140	 420 350 140
Maximum flow rate from port P to A - B - T	l/min	150		600	
Ambient temperature range	°C	-20 / +50			
Fluid temperature range	°C	-20 / +80			
Fluid viscosity range	cSt	10 ÷ 400			
Fluid contamination degree	according to ISO 4406:1999 class 20/18/15				
Recommended viscosity	cSt	25			
Mass: E*P4-S, RK E*P4-TA/TC	kg	7 6,4		15,6 15,0	

1 - IDENTIFICATION CODE FOR SOLENOID CONTROLLED DISTRIBUTOR



Directional valve, solenoid controlled, pilot operated

Size:
4 = CETOP P05
5 = ISO 4401-08 (CETOP 08)

Option
H = high pressure version pmax = 420 bar not available with S4 spool. (Omit for standard version)

P = Subplate mounting

R = Mounting interface ISO 4401-05-05-0-05 (CETOP R05) (not available for version H high pressure)

Number of ways

Spool type (see par. 3):

S*	**TA***
***TA**	**TC***
***TC**	**RK***

Options - see par. 12 (omit if not required):
C = main spool stroke control
D = main spool shifting speed control
G = main spool stroke and shifting speed control
PF = subplate with restrictor Ø0,8 on port P placed under solenoid valve

Piloting: omit for internal piloting
E = external piloting
Mandatory for spools type:
S2 - S4 - S7 - S8 - TA002 - TC002 - RK002.
With these spools the internal piloting is possible only with E5 valve with C3 option.

C3 = Check valve incorporated on line P Setting 5 bar - see paragraph 8.1 **Option available only for E5 standard valve**

Drainage:
I = internal drainage (omit for external drainage, which is recommended when the valve is used with backpressure on the outlet)

Series No.:
50 - for valve E4
40 - for valve E5
(the overall and mounting dimensions within the same ten remain unchanged)

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

DC power supply
D12 = 12 V
D24 = 24 V
D48 = 48 V
D110 = 110 V
D220 = 220 V
D00 = valve without coils (see **NOTE**)

AC power supply
A24 = 24 V - 50 Hz
A48 = 48 V - 50 Hz
A110 = 110 V - 50 Hz / 120 V - 60 Hz
A230 = 230 V - 50 Hz / 240 V - 60 Hz
A00 = valve without coils (see **NOTE**)

F110 = 110 V - 60 Hz
F220 = 220 V - 60 Hz

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

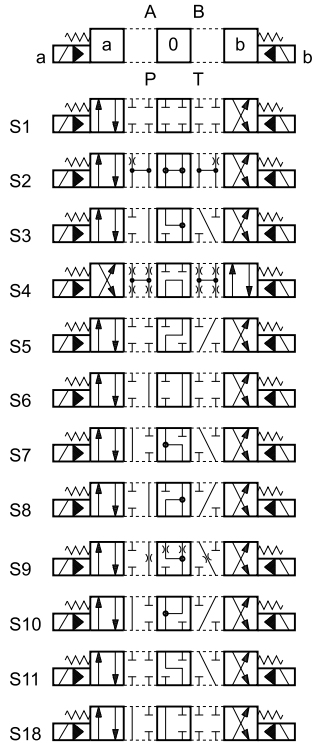
Manual override: omit for override integrated in the tube (**standard**)
CM = manual override, boot protected

NOTE: The locking rings of the coils and the relevant O-Rings are supplied together with valves

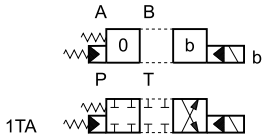
2 - SPOOL TYPE

Symbols are referred to the solenoid valve **E***. For the hydraulic control version **C*** please verify the connection scheme (see par. 4).

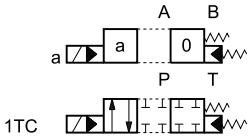
Type **S:**
3 positions with spring centering



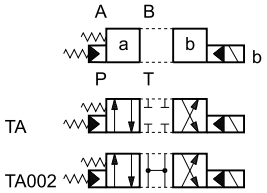
Type ***TA:**
2 positions (central + external) with spring centering



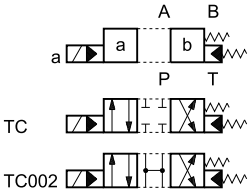
Type ***TC:**
2 positions (central + external) with spring centering



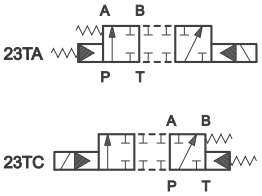
Type **TA:**
2 external positions with return spring



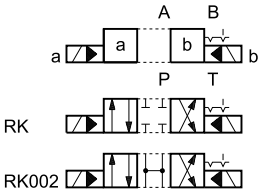
Type **TC:**
2 external positions with return spring



Type **23 (TA/TC)**:
3-way, 2 external positions with return spring



Type **RK:**
2 positions with mechanical detent on pilot valve



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.

3 - IDENTIFICATION CODE FOR HYDRAULIC CONTROLLED DISTRIBUTOR C*P4

C			P	4	-			/	E	/		

Hydraulic operated directional valve through X and Y lines

Size:
4 = CETOP P05
5 = ISO 4401-08 (CETOP 08)

Option (Omit for standard version)
H = high pressure version pmax = 420 bar not available with S4 spool.

Mounting:
P = Subplate mounting
R = Mounting interface ISO 4401-05-05-0-05 (CETOP R05) only for C4 standard valve.

Number of ways

Spool type (see paragraph 2)
S* **TA***
TA** **TC
***TC**

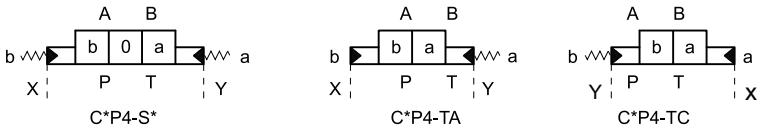
External piloting
External drainage
(see paragraph 8)

Series No.:
43 - for valve C4
34 - for valve C5
(the overall and mounting dimensions within the same ten remain unchanged)

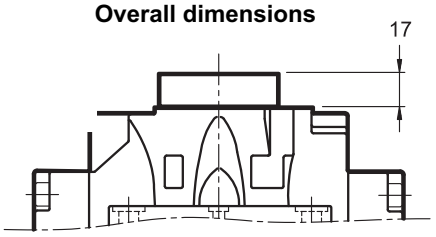
Seals:
omit for mineral oils (**standard**)
V = FPM seals for special fluids

Spool type

The distributor is delivered with short-circuit subplate. The X and Y ports are used for the hydraulic control of the valve.



Overall dimensions



4 - HYDRAULIC FLUIDS

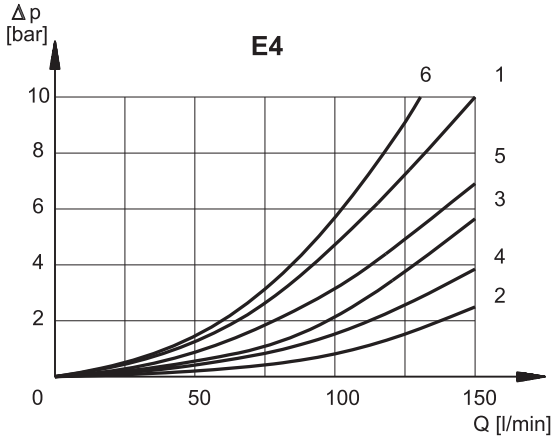
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N for solenoid controlled distributors, omit for hydraulic controlled). For fluids HFDR type (phosphate esters) use FPM seals (code V).

For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

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

5 - PRESSURE DROPS Δp-Q (values obtained with viscosity 36 cSt at 50 °C)

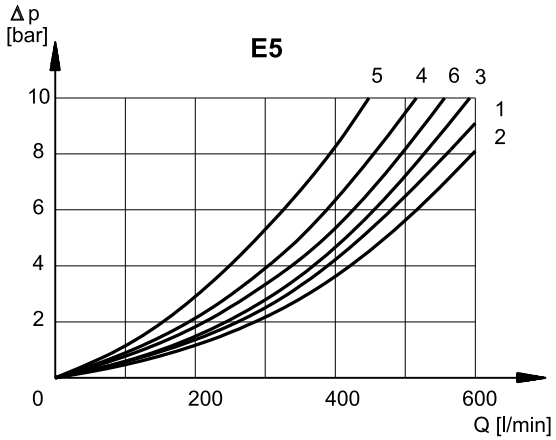
5.1 - Pressure drops E4P4



SPOOL TYPE	SPOOL POSITION	E4				
		CONNECTIONS				
		P → A	P → B	A → T	B → T	P → T
		CURVES ON GRAPH				
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	3	5	6•
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	
RK	Energized	1	1	4	3	

* A-B blocked • B blocked ° A blocked

5.2 - Pressure drops E5P4



SPOOL TYPE	SPOOL POSITION	E5				
		CONNECTIONS				
		P → A	P → B	A → T	B → T	P → T
		CURVES ON GRAPH				
S1	Energized	1	1	2	3	
S2	De-energized Energized	2	2	1	2	6*
S3	De-energized Energized	1	1	4• 1	4° 2	
S4	De-energized Energized	6	6	3	4	5
S5	De-energized Energized	1	4 2	2	3	
S6	De-energized Energized	1	1	2	4 2	
S7	De-energized Energized	6	6	3	4	5°
S8	De-energized Energized	6	6	4	3	5•
S9	Energized	1	1	2	3	
S10	De-energized Energized	4• 2	4° 2	2	3	
S11	De-energized Energized	1	1	3 1	3	
S18	De-energized Energized	4 2	1	2	3	
TA	De-energized Energized	1	1	2	3	
RK	Energized	1	1	2	3	

* A-B blocked • B blocked ° A blocked

6 - SWITCHING TIMES

6.1 Switching times E4P4

The values indicated refer to a solenoid valve working with piloting pressure of 100 bar, with mineral oil at a temperature of 50°C, at viscosity of 36 cSt and with PA and BT connections.

The energizing and de-energizing times are obtained at the pressure variation which occurs on the lines.

E4				
TIMES (± 10%) [ms]	ENERGIZED		DE-ENERGIZED	
	2 Pos.	3 Pos.	2 Pos.	3 Pos.
CA solenoid	35	25	35	25
DC solenoid	60	50	50	40

6.2 Switching times E5P4

The values indicated refer to a solenoid valve working with piloting pressure of 100 bar, with mineral oil at a temperature of 50°C, at viscosity of 36 cSt and with PA and BT connections.

The energizing and de-energizing times are obtained at the pressure variation which occurs on the lines.

E5				
TIMES (± 10%) [ms]	ENERGIZED		DE-ENERGIZED	
	2 Pos.	3 Pos.	2 Pos.	3 Pos.
CA solenoid	70	40	70	40
DC solenoid	100	70	80	50

7 - PERFORMANCE CHARACTERISTICS

E4 - PRESSURES [bar]		**E4*4**	**E4HP4**	**C4*4**	**C4HP4**
	MIN	MAX			
Pressure in P, A, B ports		320	420	320	420
Piloting pressure (X port and / or Y port)	5	210	350	210	350
Pressure in T line with internal drainage	-	140	140	-	-
Pressure in T line with external drainage	-	210	350	210	350

E5 - PRESSURES [bar]		**E5P4**	**E5HP4**	**C5P4**	**C5HP4**
	MIN	MAX			
Pressure in P, A, B ports		280	420	280	420
Piloting pressure (X port and / or Y port)	5	210	350	210	350
Pressure in T line with internal drainage	-	140	140	-	-
Pressure in T line with external drainage	-	210	350	210	350

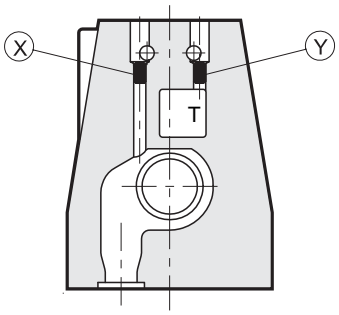
MAXIMUM FLOW RATES [l/min]	**E4**		**E5**	
	PRESSURES			
Spool type	at 210 bar	at 320 bar	at 210 bar	at 280 bar
S4, S7, S8	120	100	500	450
All other spools	150	120	600	500

8 - PILOTING AND DRAINAGE

The E*P4 valves are available with piloting and drainage, both internal and external.

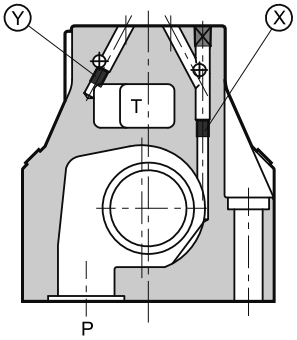
The version with external drainage allows for a higher back pressure on the outlet.

E4P4



X: plug M5x6 for external pilot
Y: plug M5x6 for external drain

E5P4



X: plug M6x8 for external pilot
Y: plug M6x8 for external drain

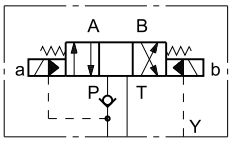
TYPE OF VALVE		Plug assembly	
		X	Y
E*P4-**	INTERNAL PILOT AND EXTERNAL DRAIN	NO	YES
E*P4-**/**I**	INTERNAL PILOT AND INTERNAL DRAIN	NO	NO
E*P4-**/**E**	EXTERNAL PILOT AND EXTERNAL DRAIN	YES	YES
E*P4-**/**EI**	EXTERNAL PILOT AND INTERNAL DRAIN	YES	NO

8.1 - Backpressure valve incorporated on line P available for E5 valve only)

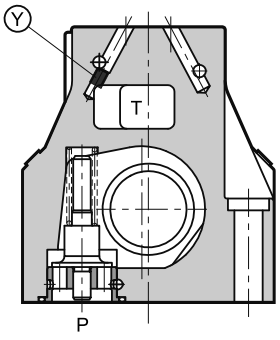
Valve E5 is available upon request with backpressure valve incorporated on line P. This is necessary to obtain the piloting pressure when the control valve, in the rest position, has the line P connected to the T outlet (spools S2 - S4 - S7 - S8 - TA002 - TC002 - RK002). The cracking pressure is of 5 bar.

Add **C3** to the identification code for this request (see paragraph 1). **In the C3 version the piloting is always internal.**

E5P4/C3



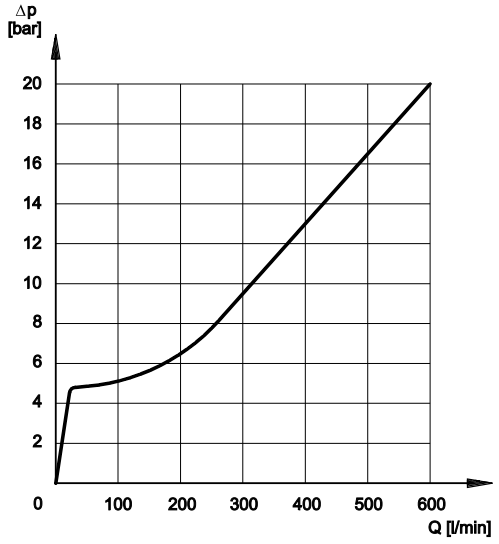
E5P4 (with C3 option)



pilot always internal

Y: plug M6x8 for external drain

NOTE: the backpressure valve can't be used as direct check valve because it doesn't assure the seal.



The curve refers to the pressure drop (body part only) with backpressure valve energized to which the pressure drop of the reference spool must be added. (see paragraph 5)

9 - ELECTRICAL FEATURES

9.1 Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation.

The coil is fastened to the tube by a threaded ring, and can be rotated 360°, to suit the available space.

NOTE 1: In order to further reduce the emissions, use of type H connectors is recommended. These prevent voltage peaks on opening of the coil supply electrical circuit (see catalogue. 49 000).

NOTE 2: The IP65 protection degree is guaranteed only with the connector correctly connected and installed.

VOLTAGE SUPPLY FLUCTUATION	±10% Vnom
MAX SWITCH ON FREQUENCY E4 E5	 10.000 ins/hr 8.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC) (**NOTE 1**)	According to 2004/108/CE
LOW VOLTAGE	According to 2006/95/CE
CLASS OF PROTECTION: Atmospheric agents (CEI EN 60529) Coil insulation (VDE 0580) Impregnation: DC valve AC valve	 IP 65 (**NOTE 2**) class H class F class H

9.2 Current and absorbed power for DC solenoid valve

The table shows current and power consumption values relevant to the different coil types for DC.

The rectified current supply takes place by fitting the valve (with the exception of D12 coil) with an alternating current source (50 or 60 Hz), rectified by means of a bridge built-in to the “D” type connectors (see cat. 49 000), by considering a reduction of the operating limits by 5 ÷ 10% approx.

Coils for direct current (values ± 5%)

Suffix	Nominal voltage [V]	Resistance at 20°C [ohm]	Current consumpt. [A]	Power consumpt. [W]	Coil code
D12	12	4,4	2,72	32,7	1903080
D24	24	18,6	1,29	31	1903081
D48	48	78,6	0,61	29,5	1903083
D110	110	423	0,26	28,2	1903084
D220	220	1692	0,13	28,2	1903085

9.3 Current and absorbed power for AC solenoid valve

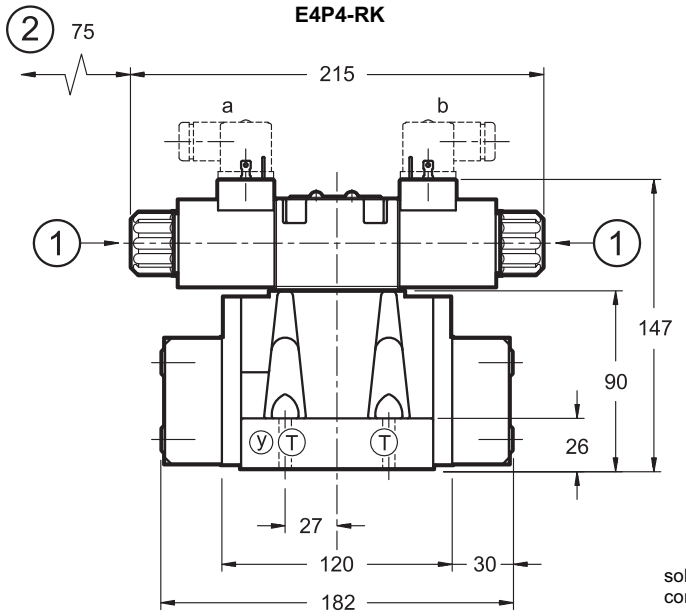
The table shows current and power consumption values at inrush and at holding, relevant to the different coil types for AC current.

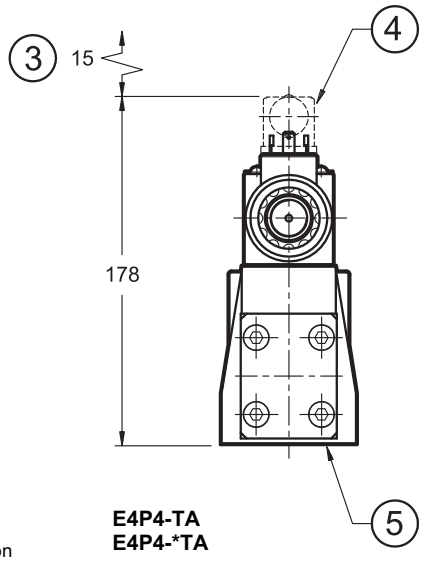
Coils for alternating current (values ± 5%)

Suffix	Nominal voltage [V]	Frequency [Hz]	Resistance at 20°C [Ω]	Current consumption at inrush [A]	Current consumption at holding [A]	Power consumption at inrush [VA]	Power consumption at holding [VA]	Coil code
A24	24	50	1,46	8	2	192	48	1902830
A48	48	50	5,84	4,4	1,1	204	51	1902831
A110	110V-50Hz	50/60	32	1,84	0,46	192	48	1902832
	120V-60Hz			1,56	0,39	188	47	
A230	230V-50Hz		140	0,76	0,19	176	44	1902833
	240V-60Hz			0,6	0,15	144	36	
F110	110	60	26	1,6	0,4	176	44	1902834
F220	220		106	0,8	0,2	180	45	1902835

10 - E4 OVERALL AND MOUNTING DIMENSIONS

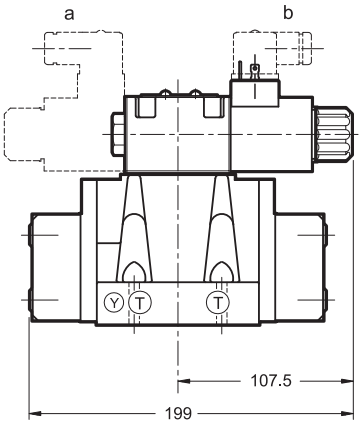
E4P4-S
E4P4-RK

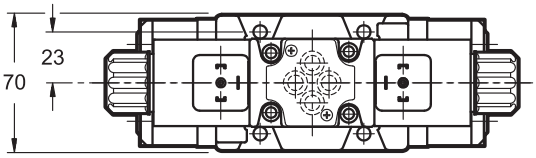




E4P4-TA
E4P4-*TA

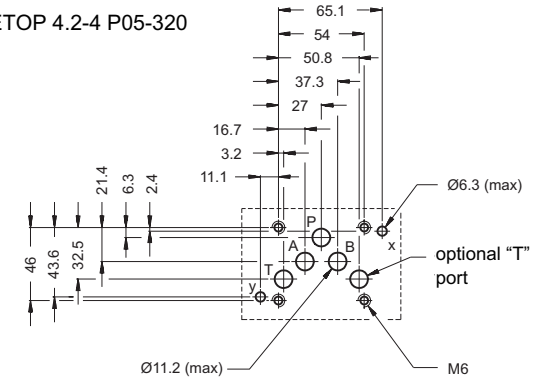
solenoid position
configuration TC/*TC





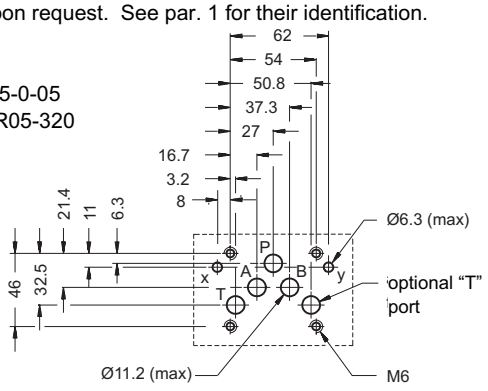
MOUNTING SURFACE (STANDARD)

CETOP 4.2-4 P05-320



Valves with ISO 4401-05-05-0-05 (CETOP R05) mounting interface are available upon request. See par. 1 for their identification.

ISO 4401-05-05-0-05
CETOP 4.2-4 R05-320



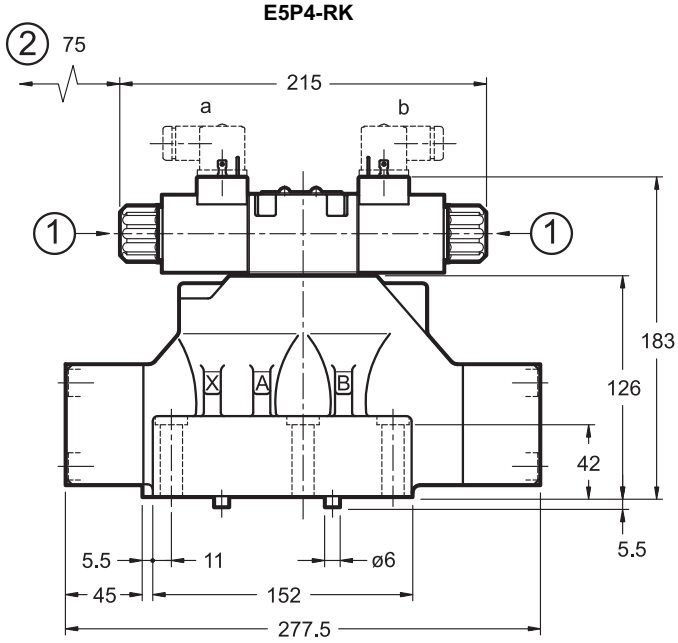
dimensions in mm

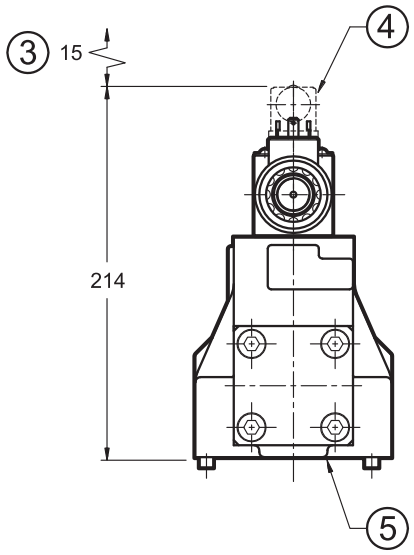
Fastening of single valve: 4 bolts M6x35 (see par. 15, **NOTE**)	
Tightening torque: 8 Nm (bolts A 8.8) 14 Nm (bolts A 12.9)	
Threads of mounting holes: M6x10	
Sealing rings: 5 OR type 2050 (12.42x1.78) - 90 Shore 2 OR type 2037 (9.25x1.78) - 90 Shore	

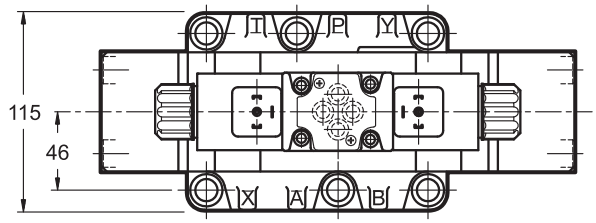
1	Manual override
2	Coil removal space
3	Connector removal space
4	Electric connector to be ordered separately (see cat.49 000)
5	Mounting surface with sealing rings

11 - E5 OVERALL AND MOUNTING DIMENSIONS

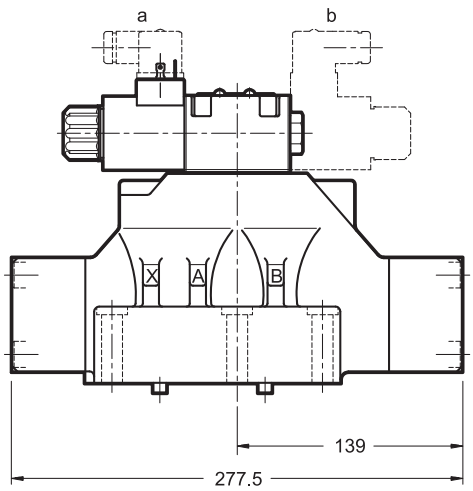
E5P4-S
E5P4-RK



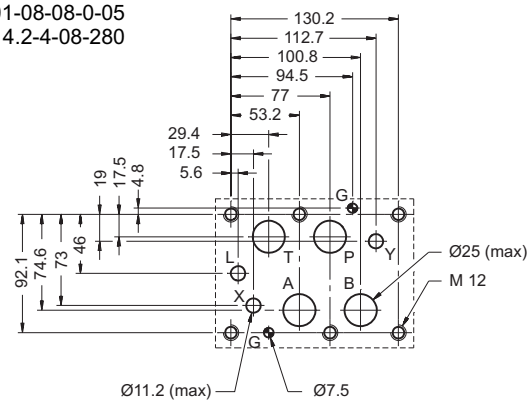




E5P4-TC
E5P4-*TC



MOUNTING SURFACE
ISO 4401-08-08-0-05
CETOP 4.2-4-08-280



dimensions in mm

Fastening of single valve: 6 bolts M12x60 (see par. 15, **NOTE**)	
Tightening torque: 69 Nm (bolts A 8.8) 115 Nm (bolts A 12.9)	
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	Manual override
2	Coil removal space
3	Connector removal space
4	Electric connector to be ordered separately (see cat.49 000)
5	Mounting surface with sealing rings

12 - OPTIONS

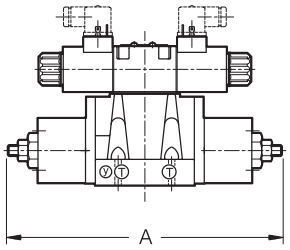
12.1 Control of the main spool stroke: C

It is possible to introduce special stroke controls in the heads of the hydropiloted valve so as to vary the maximum spool clearance opening.

This solution allows control of the flow rate from the pump to the actuator and from the actuator to the outlet, obtaining a double adjustable control on the actuator.

Add the letter **C** to the identification code to request this device (see paragraph 1).

E*P4-S*/C

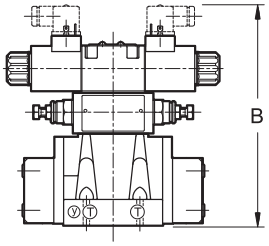


12.2 Control of the main spool shifting speed: D

By placing a MERS type double flow control valve between the pilot solenoid valve and the hydropiloted valve, the piloted flow rate can be controlled and therefore the changeover smoothness can be varied.

Add the letter **D** to the identification code to request this device (see paragraph 1).

E*P4-S*/D



12.3 Subplate with throttle on line P

It is possible to introduce a subplate with a restrictor of Ø0,8 on line P between the pilot solenoid valve and the main distributor.

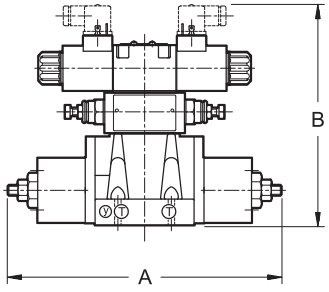
Add **PF** to the identification code to request this option (see paragraph 1).

12.4 Control of the main spool stroke and shifting speed: G

It is possible to have the valve fitted with both the spool stroke device and the piloting flow rate control device.

Add the letter **G** to the identification code to request this solution (see paragraph 1).

E*P4-S*/G



dimensions in mm

	E4	E5
A	280	401,5
C	218	254

13 - MANUAL OVERRIDE, BOOT PROTECTED: CM

Whenever the solenoid valve installation may involve exposure to atmospheric agents or use in tropical climates, the manual override, boot protection is recommended.

Add the suffix **CM** to request this device (see paragraph 1).

For overall dimensions see cat. 41 150.

14 - ELECTRIC CONNECTORS

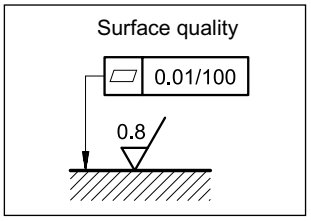
The solenoid valves are never supplied with connector. Connectors must be ordered separately.
To identify the connector type to be ordered, please see catalogue 49 000.

15 - INSTALLATION

Configurations with centering and recall springs can be mounted in any position; type RK valves - without springs and with mechanical detent - must be mounted with the longitudinal axis horizontal.

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

NOTE: Use of class 12.9 fastening screws is recommended for valves in version H (high pressure).



16 - SUBPLATES (see catalogue 51 000)

These plates are for the standard valves only. They are not suitable for high pressure (H) versions.

	E4	E5
Type with rear ports	PME4-AI5G	
Type with side ports	PME4-AL5G	PME5-AL8G
P, T, A, B, port dimensions	3/4”	1½” BSP
X, Y port dimensions	1/4” BSP	1/4” BSP

DUPLOMATIC OLEODINAMICA

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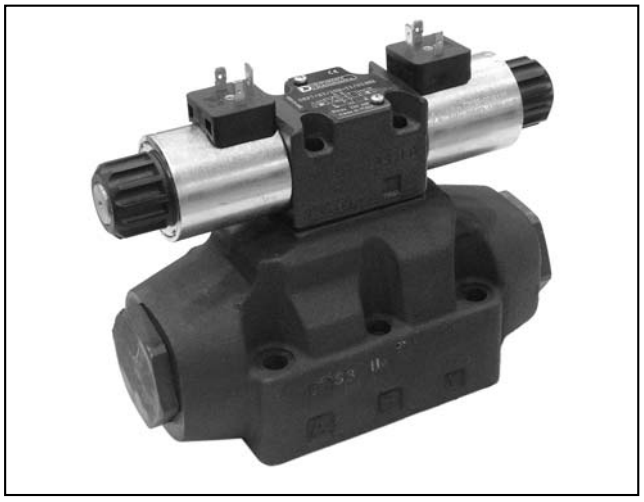


DSP7

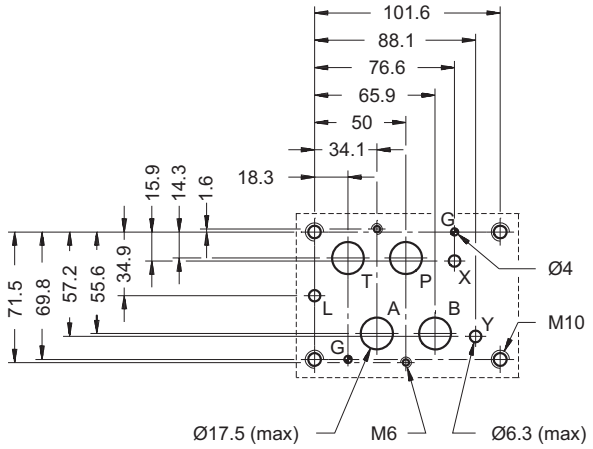
PILOT OPERATED DISTRIBUTOR SOLENOID OR HYDRAULIC (DSC7) CONTROLLED

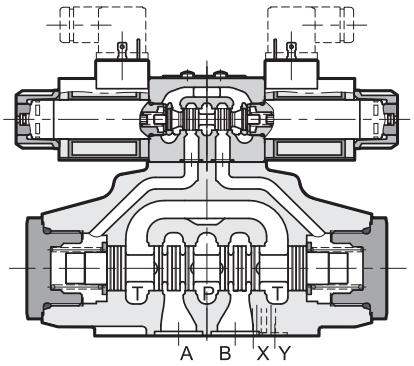
SUBPLATE MOUNTING
ISO 4401-07 (CETOP 07)

p max **350** bar
Q max **300** l/min

MOUNTING INTERFACE

ISO 4401-07-07-0-05
(CETOP 4.2-4-07-350)





— The DSP7 piloted valve is made up of a 4-way hydro-piloted distributor with mounting surface according to ISO 4401-07 (CETOP 07) (CETOP RP121H) standards, operated by an ISO 4401-03 (CETOP 03) solenoid directional valve.

— It is available with different spool types (see par. 2), with some options for the opening control.

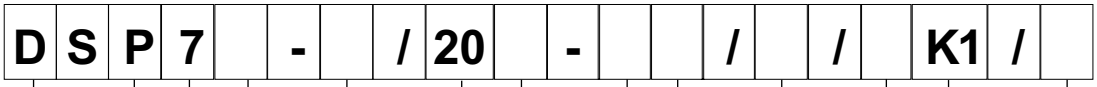
— It is available with both the solenoid and the hydraulic control from the X and Y ways

— A version for high pressures (H) is available.

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

		DSP7	DSP7H
Maximum operating pressure - ports P - A - B - port T (external drainage) - port T (internal drainage)	bar	 350 210 140	 420 350 140
Maximum flow rate from port P to A - B - T	l/min	300	
Ambient temperature range	°C	-20 / +50	
Fluid temperature range	°C	-20 / +80	
Fluid viscosity range	cSt	10 ÷ 400	
Fluid contamination degree		according to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25	
Mass: DSP7-S, RK DSP7-T*, SA*, SB* DSC7	kg	8,6 8,0 6,6	

1 - IDENTIFICATION CODE FOR SOLENOID DISTRIBUTOR DSP7



Directional valve,
Solenoid controlled,
Pilot operated

Size:
ISO 4401-07 (CETOP 07)

Option: (omit for standard version)
H = high pressure version
pmax = 420 bar
not available with S4, SA4, SB4 spools.

Spool type (see paragraph 2)

S*	**TA**
SA*	**TB**
SB*	**RK**

Series: (the overall and mounting dimensions remain unchanged from 20 to 29)

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

Piloting (see paragraph 9):
I = internal (not available for spools S2 - S4 - S7 - S8 - TA02 TB02 -RK02 - S*2 - S*4. If internal pilot is required, choose pilot type C)
C = internal piloting with backpressure valve
Z = internal piloting with 30 bar fixes adjustment pressure reducing valve (see paragraph 8)
E = external

Drainage (see paragraph 9):
I = Internal
E = External

Controls:
C = Main spool stroke control (see paragraph 13.1)
D = Main spool switching speed control (see paragraph 13.2)
P08 = Subplate placed under solenoid valve with restrictor of Ø0.8 on port P (see paragraph 13.3)
S2 = Distributor delivered with pilot solenoid valve in configuration S2 (see paragraph 13.4)

DC power supply
D12 = 12 V
D24 = 24 V
D48 = 48 V
D110 = 110 V
D220 = 220 V
D00 = valve without coils (see **NOTE**)

AC power supply
A24 = 24 V - 50 Hz
A48 = 48 V - 50 Hz
A110 = 110 V - 50 Hz / 120 V - 60 Hz
A230 = 230 V - 50 Hz / 240 V - 60 Hz
A00 = valve without coils (see **NOTE**)
F110 = 110 V - 60 Hz
F220 = 220 V - 60 Hz

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

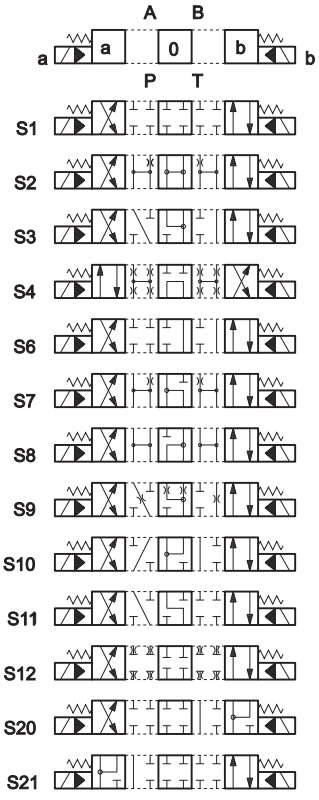
Manual override:
omit for override integrated in the tube (**standard**)
CM = manual override, boot protected (see paragraph 14)

NOTE: The locking rings of the coils and the relevant O-Rings are supplied together with valves

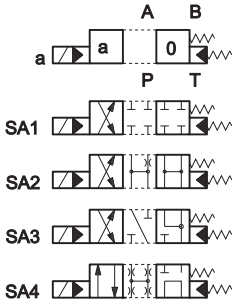
2 - SPOOL TYPE

NOTE: Symbols refers to the **DSP7** solenoid valve.
For the **DSC7** hydraulic control version, please verify the connection scheme at paragraph 3.

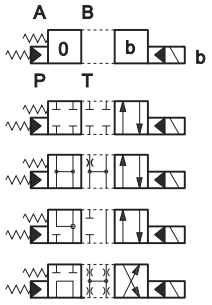
Type **S***:
2 solenoids - 3 positions
with spring centering



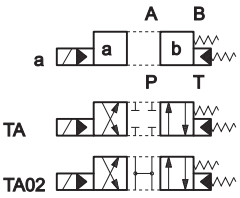
Type **SA***:
1 solenoid side A
2 positions (central + external)
with spring centering



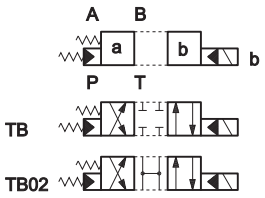
Type **SB***:
1 solenoid side B
2 positions (central + external)
with spring centering



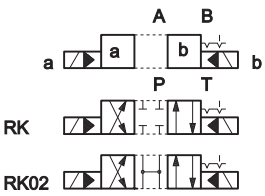
Type **TA**:
1 solenoid side A
2 external positions
with return spring



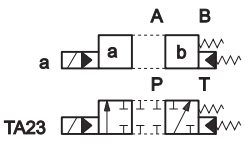
Type **TB**:
1 solenoid side B
2 external positions
with return spring

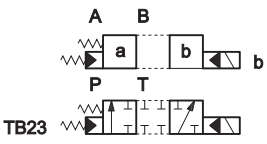


Type **RK**:
2 solenoids - 2 positions
with mechanical retention



Type **TA23 / TB23**
three-way valve - 1 solenoid - 2 external positions, return spring





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.

3 - IDENTIFICATION CODE FOR HYDRAULIC DISTRIBUTOR DSC7

D	S	C	7		-		/	10		-	E	E

External drain (see par. 9)

External pilot (see par. 9)

Directional valve, hydraulic controlled pilot operated through X and Y ports.

Size: ISO 4401-07 (CETOP 07)

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

Option: (omit for standard version)
H = high pressure version
pmax = 420 bar
not available with S4, SA4, SB4 spools.

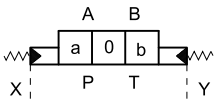
Series: (the overall and mounting dimensions remain unchanged from 10 to 19)

Spool type (see paragraph 2)

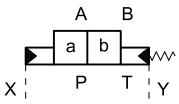
S*	**TA**
SA*	**TB**
SB*	**R**

Spool type

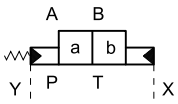
The distributor is delivered with short-circuit subplate. The X and Y ports are used for the hydraulic control of the valve.



DSC7-S*



DSC7-TA



DSC7-TB

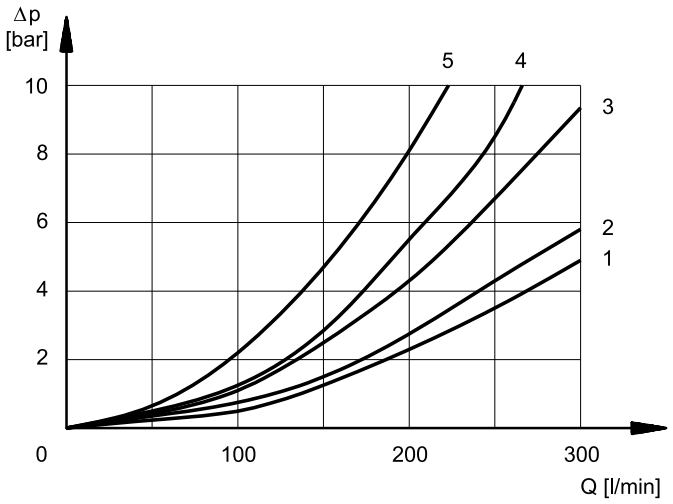
4 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V).

For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

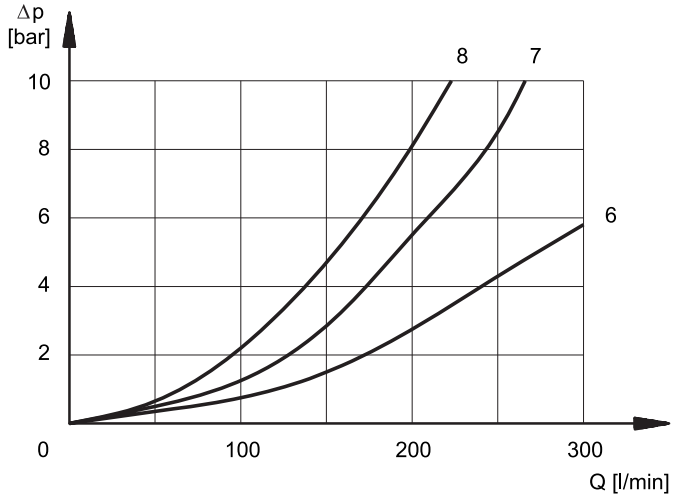
The fluid must be preserved in its physical and chemical characteristics.

5 - PRESSURE DROPS Δp-Q (values obtained with viscosity 36 cSt at 50 °C)



PRESSURE DROPS WITH VALVE ENERGIZED

SPOOL TYPE	FLOW DIRECTION			
	P-A	P-B	A-T	B-T
	CURVES ON GRAPH			
S1, SA1, SB1	1	1	3	4
S2, SA2, SB2	1	1	4	4
S3, SA3, SB3	1	1	4	4
S4, SA4, SB4	2	2	4	5
S6	1	1	3	4
S7	1	1	4	4
S8	1	1	3	4
S9	1	1	3	4
S10	1	1	3	4
S11	1	1	3	4
S12	1	1	3	4
S20	1	1	3	4
S21	1	1	4	4
TA, TB	1	1	3	4
TA02, TB 02	1	1	4	4
RK	1	1	3	4



PRESSURE DROPS WITH VALVE IN DE-ENERGIZED POSITION

SPOOL TYPE	FLOW DIRECTION				
	P-A	P-B	A-T	B-T	P-T
	CURVES ON GRAPH				
S2, SA2, SB2					6
S3, SA3, SB3			7	7	
S4, SA4, SB4					7
S6				7	
S7					8
S8					8
S10			7	7	
S11			7		

6 - SWITCHING TIMES

The values indicated refer to a solenoid valve working with piloting pressure of 100 bar, with mineral oil at a temperature of 50°C, at viscosity of 36 cSt and with PA and BT connections. The energizing and de-energizing times are obtained at the pressure variation which occurs on the lines.

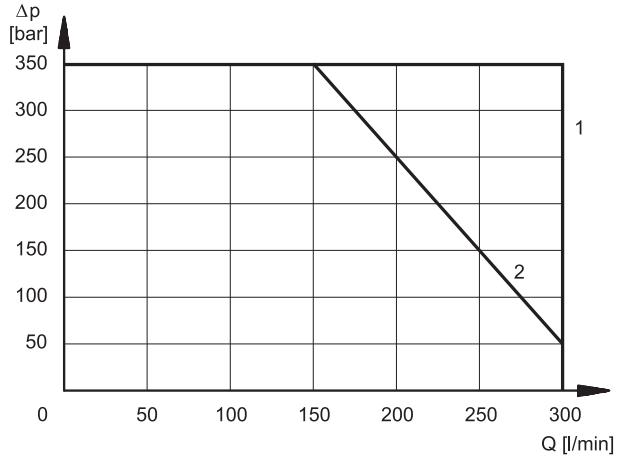
TIMES (± 10%) [ms]	ENERGIZED		DE-ENERGIZED	
	2 Pos.	3 Pos.	2 Pos.	3 Pos.
AC solenoid	45	30	45	30
DC solenoid	75	60	60	45

7 - OPERATING LIMITS

The curves define the flow rate operating fields according to the valve pressure for the different spool types.

The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage.

The values have been obtained with mineral oil, viscosity 36 cSt at 50 °C, and filtration ISO 4406:1999 class 18/16/13.



SPOOL TYPE	CURVE	
	P-A	P-B
S1,SA1,SB1	1	1
S2, SA2, SB2	1	1
S3, SA3, SB3	1	1
S4, SA4, SB4	2	2
S6	1	1
S7	2	2
S8	2	2

SPOOL TYPE	CURVE	
	P-A	P-B
S9	1	1
S10	1	1
S11	1	1
S12	1	1
S20	1	1
S21	1	1
TA, TB	1	1
TA02, TB02	1	1
TA23, TB23	1	1
RK	1	1

8 - PERFORMANCE CHARACTERISTICS

PRESSURES [bar]		**DSP7**	**DSP7H**	**DSC7**	**DSC7H**
	MIN	MAX			
Pressure in P, A, B ports		350	420	350	420
Piloting pressure (X port and / or Y port)	12 (**a**)	210 (**b**)	350	210	350
Pressure in T line with internal drainage	-	140	140	-	-
Pressure in T line with external drainage	-	210	350	210	350

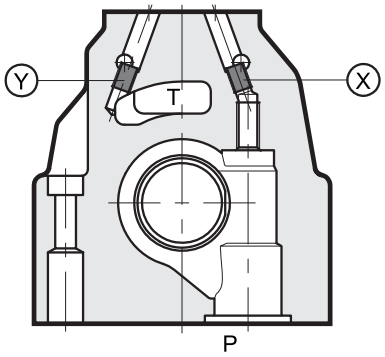
NOTES:

a) The minimum piloting pressure can be of 6 bar at low flows rates, but with higher flow rates a pressure of 12 bar is needed.

b) 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.

9 - PILOTING AND DRAINAGE

The DSP7 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.



X: plug M6x8 for external pilot
Y: plug M6x8 for external drain

TYPE OF VALVE		Plug assembly	
		X	Y
IE	INTERNAL PILOT AND EXTERNAL DRAIN	NO	YES
II	INTERNAL PILOT AND INTERNAL DRAIN	NO	NO
EE	EXTERNAL PILOT AND EXTERNAL DRAIN	YES	YES
EI	EXTERNAL PILOT AND INTERNAL DRAIN	YES	NO

9.1 - Backpressure valve incorporated on line P

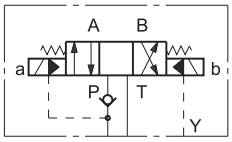
Valves DSP7 are available upon request with backpressure valve incorporated on line P. This is necessary to obtain the piloting pressure when the control valve, in rest position, has the line P connected to the T port (spools S2, S4, S7, S8, S*2, S*4, TA02, TB02, RK02). The cracking pressure is of 5 bar with a minimum flow rate of 15 l/min.

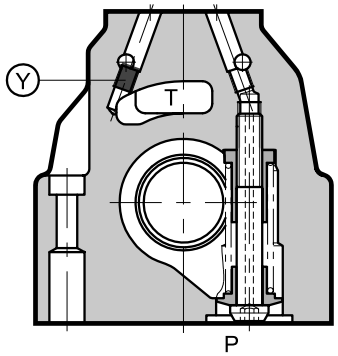
Add **C** to the identification code for this request (see paragraph 1).

In the C version the piloting is always internal.

The backpressure valve can be also delivered separately and it can be easily mounted on line P of the main control valve. Specify the code **0266577** to order the backpressure valve separately.

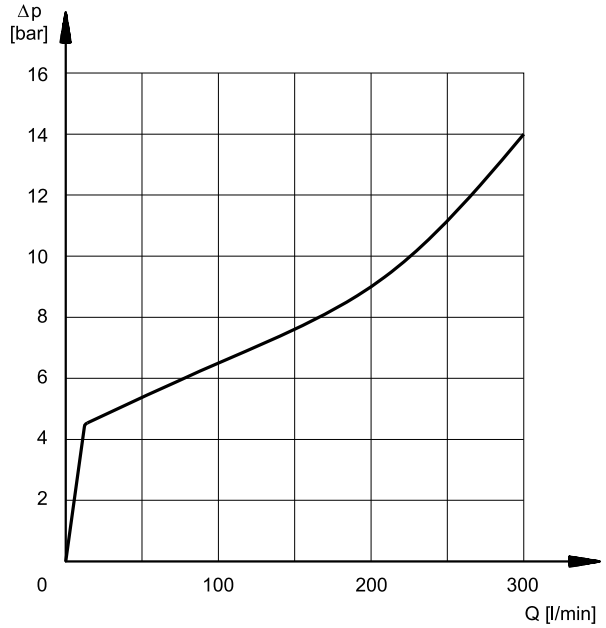
DSP7-C





pilot always internal
Y: plug M6x8 for external drain

NOTE: the backpressure valve can't be used as check valve because it doesn't assure the seal.



The curve refers to the pressure drop (body part only) with backpressure valve energized to which the pressure drop of the reference spool must be added. (see paragraph 5)

10 - ELECTRICAL FEATURES

10.1 Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation.

The coil is fastened to the tube by a threaded ring, and can be rotated 360°, to suit the available space.

NOTE 1: In order to further reduce the emissions, use of type H connectors is recommended. These prevent voltage peaks on opening of the coil supply electrical circuit (see CAT. 49 000).

NOTE 2: The IP65 protection degree is guaranteed only with the connector correctly connected and installed.

VOLTAGE SUPPLY FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY	10.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC) (**NOTE 1**)	In compliance with 2004/108/CE
LOW VOLTAGE	In compliance with 2006/95/CE
CLASS OF PROTECTION: Atmospheric agents (CEI EN 60529) Coil insulation (VDE 0580) Impregnation: CC valve CA valve	 IP 65 (**NOTE 2**) class H class F class H

10.2 Current and absorbed power for DC solenoid valve

The table shows current and power consumption values relevant to the different coil types for DC.
The rectified current supply takes place by fitting the valve (with the exception of D12 coil) with an alternating current source (50 or 60 Hz), rectified by means of a bridge built-in to the "D" type connectors (see cat. 49 000), by considering a reduction of the operating limits by 5 ÷ 10% approx.

Coils for direct current (values ± 5%)

Suffix	Nominal voltage [V]	Resistance at 20°C [ohm]	Current consumpt. [A]	Power consumpt. [W]	Coil code
D12	12	4,4	2,72	32,7	1903080
D24	24	18,6	1,29	31	1903081
D48	48	78,6	0,61	29,5	1903083
D110	110	423	0,26	28,2	1903084
D220	220	1692	0,13	28,2	1903085

10.3 Current and absorbed power for AC solenoid valve

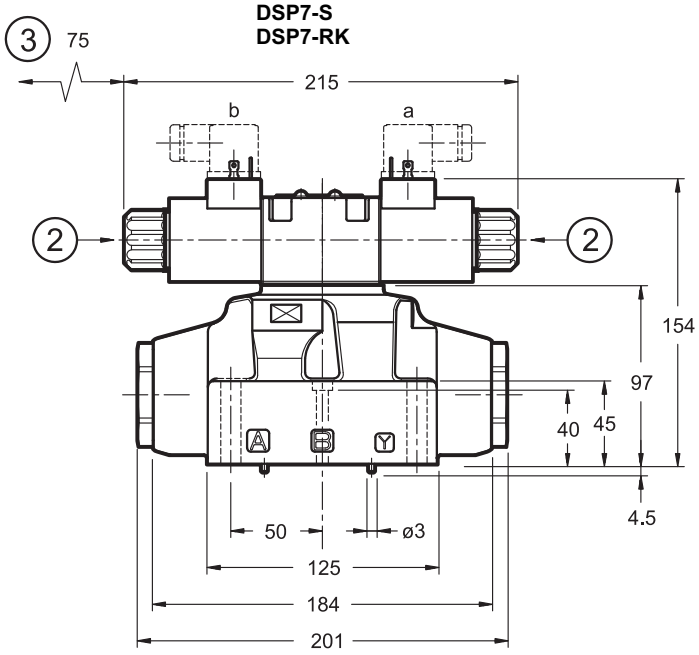
The table shows current and power consumption values at inrush and at holding, relevant to the different coil types for AC current.

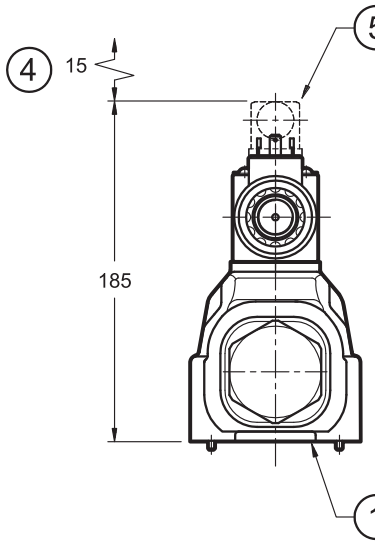
Coils for alternating current (values ± 5%)

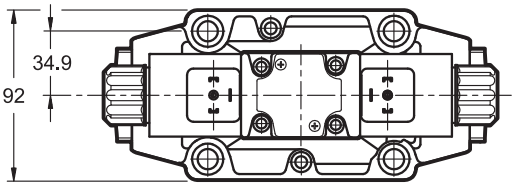
Suffix	Nominal voltage [V]	Frequency [Hz]	Resistance at 20°C [ohm]	Current consumption at inrush [A]	Current consumption at holding [A]	Power consumption at inrush [VA]	Power consumption at holding [VA]	Coil code
A24	24	50	1,46	8	2	192	48	1902830
A48	48	50	5,84	4,4	1,1	204	51	1902831
A110	110V-50Hz	50/60	32	1,84	0,46	192	48	1902832
	120V-60Hz			1,56	0,39	188	47	
A230	230V-50Hz		140	0,76	0,19	176	44	1902833
	240V-60Hz			0,6	0,15	144	36	
F110	110	60	26	1,6	0,4	176	44	1902834
F220	220		106	0,8	0,2	180	45	1902835

11 - OVERALL AND MOUNTING DIMENSIONS FOR SOLENOID DISTRIBUTOR DSP7

DSP7-S
DSP7-RK

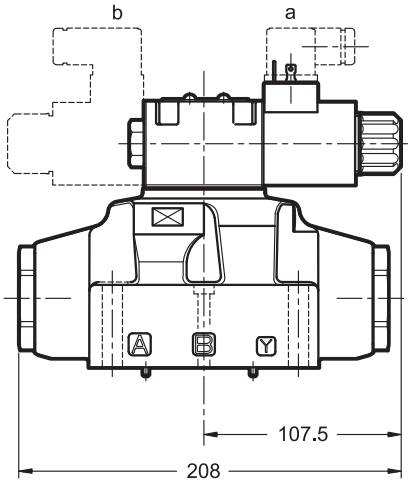




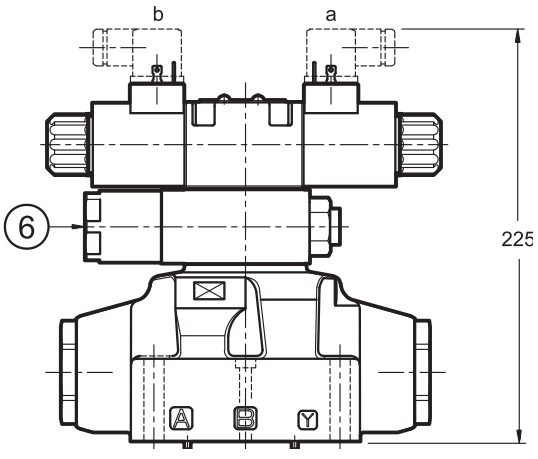


DSP7-TA
DSP7-SA*

solenoid position
configuration TB/SB*



DSP7-*/20*-Z*



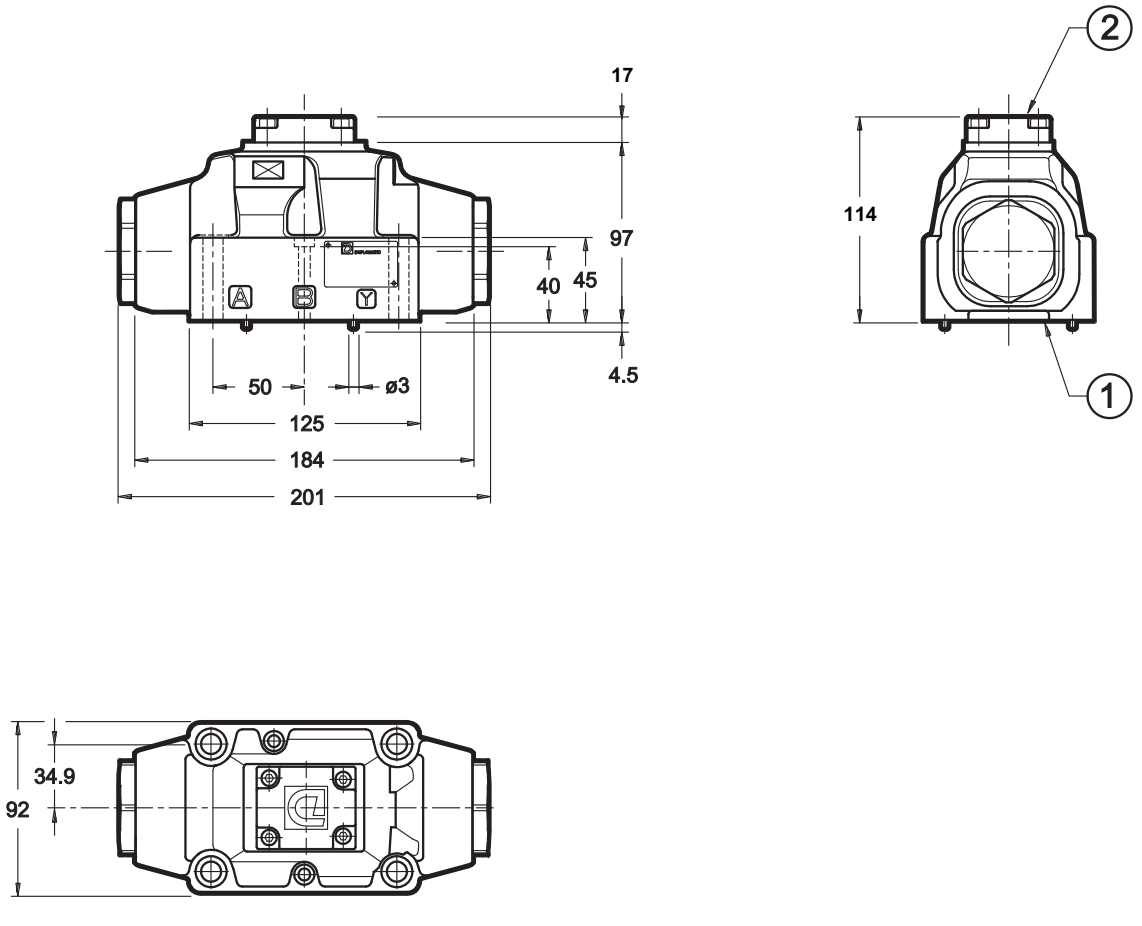
dimensions in mm

Fastening of single valve: (see par. 16)	4 SHC screws ISO 4762 M10x60 2 SHC screws ISO 4762 M6x50
Tightening torque:	M10x60: 40 Nm (A 8.8 screws) - 67 Nm (A 12.9 screws) M6x50: 8 Nm (A 8.8 screws) - 14 Nm (A 12.9 screws)
Threads of mounting holes: M6x12; 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	Manual override
3	Coil removal space
4	Connector removal space
5	Electric connector to be ordered separately (see cat. 49 000)
6	Reducing valve with fixed adjustment 30 bar

NOTE: Use of class 12.9 fastening screws is recommended for valves in version **H** (high pressure).

12 - OVERALL AND MOUNTING DIMENSIONS FOR HYDRAULIC DISTRIBUTOR DSC7



dimensions in mm

Fastening of single valve: (see par. 16)	4 SHC screws ISO 4762 M10x60 2 SHC screws ISO 4762 M6x50
Tightening torque:	M10x60: 40 Nm (A 8.8 screws) - 67 Nm (A 12.9 screws) M6x50: 8 Nm (A 8.8 screws) - 14 Nm (A 12.9 screws)
Threads of mounting holes: M6x12; 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	Short-circuit subplate

NOTE: Use of class 12.9 fastening screws is recommended for valves in version **H** (high pressure).

13 - OPTIONS

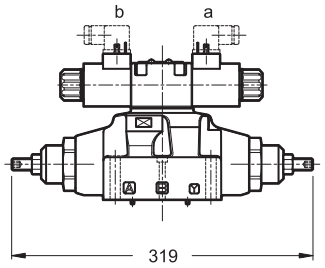
13.1 Control of the main spool stroke: C

With the help of special side plugs, it is possible to introduce stroke controls in the heads of the piloted valve so as to vary the maximum spool clearance opening.

This solution allows control of the flow rate from the pump to the actuator and from the actuator to the outlet, obtaining a double adjustable control on the actuator.

Add the letter **C** to the identification code to request this device (see paragraph 1).

DSP7-S*/C

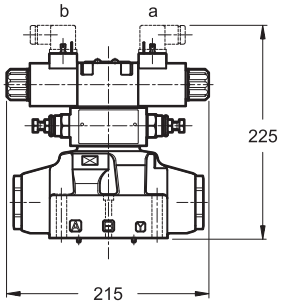


13.2 Control of the main spool shifting speed: D

By placing a MERS type double flow control valve between the pilot solenoid valve and the main distributor, the piloted flow rate can be controlled and therefore the changeover smoothness can be varied.

Add the letter **D** to the identification code to request this device (see paragraph 1).

DSP7-S*/D

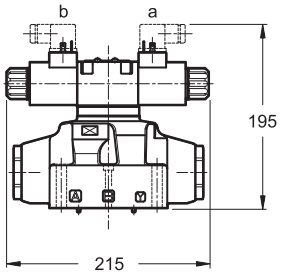


13.3 Subplate with throttle on line P

It is possible to introduce a subplate with a restrictor of Ø0,8 on line P between the pilot solenoid valve and the main distributor.

Add **P08** to the identification code to request this option (see paragraph 1).

DSP7-S*/P08



13.4 Solenoid operated distributor with pilot valve in configuration S2

It is possible to deliver the solenoid operated distributor with pilot valve in configuration S2 (all the ports at outlet). With this option the piloting is necessarily external.

Add **S2** to the identification code to request this option (see paragraph 1).

This configuration is used with external piloting in order to allow the unloading of the piloting line when the solenoid operated valve is in rest position.

14 - MANUAL OVERRIDE, BOOT PROTECTED: CM

Whenever the solenoid valve installation may involve exposure to atmospheric agents or use in tropical climates, the manual override, boot protection is recommended.

Add the suffix **CM** to request this device (see paragraph 1).

For overall dimensions see cat. 41 150.

15 - ELECTRIC CONNECTORS

The solenoid operated valves are delivered without the connectors. They must be ordered separately.

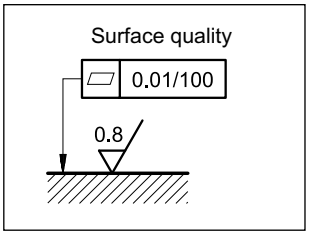
For the identification of the connector type to be ordered, please see catalogue 49 000.

16 - INSTALLATION

Configurations with centering and recall springs can be mounted in any position; type RK valves - without springs and with mechanical detent - must be mounted with the longitudinal axis horizontal.

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

NOTE: Use of class 12.9 fastening screws is recommended for valves in version **H** (high pressure).



17 - SUBPLATES (see catalogue 51 000)

These plates are for the standard valves only. They are not suitable for high pressure (H) versions .

Type with rear ports	PME07-AI6G
Type with side ports	PME07-AL6G
P, T, A, B, port dimensions X, Y; L port dimensions	1” BSP 1/4” BSP

DUPLOMATIC OLEODINAMICA

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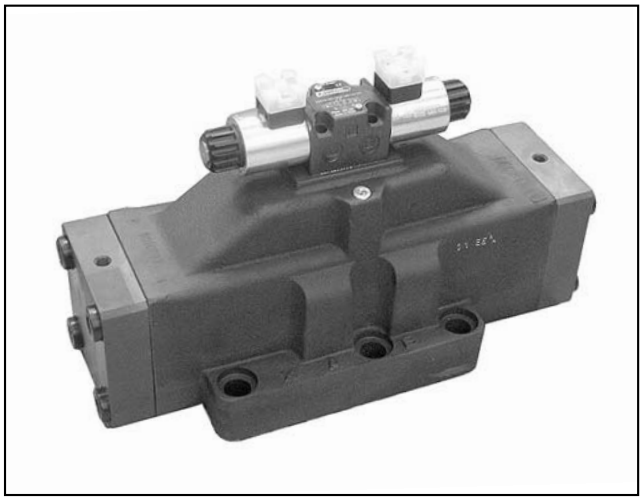


DSP10

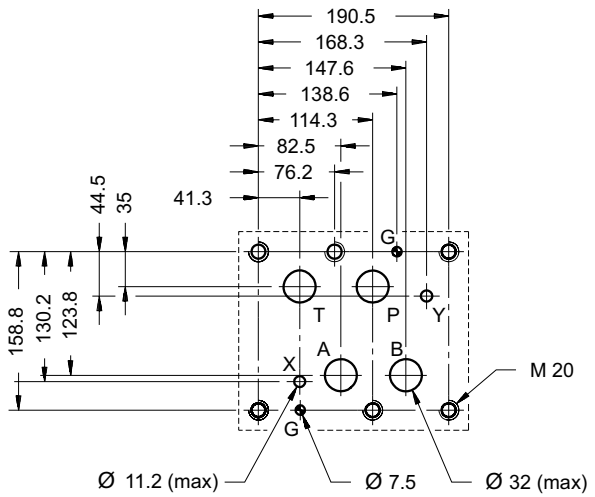
PILOT OPERATED DISTRIBUTOR SOLENOID OR HYDRAULIC (DSC10) CONTROLLED

SUBPLATE MOUNTING
ISO 4401-10 (CETOP 10)

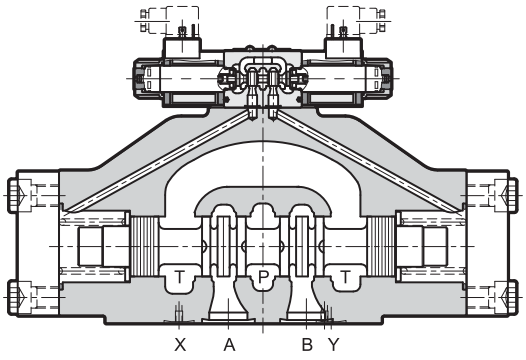
p max **350** bar
Q max **1100** l/min

MOUNTING INTERFACE

ISO 4401-10-09-0-05
(CETOP 4.2-4-10-350)



OPERATING PRINCIPLE



— The DSP10 piloted valve is a 4-way hydropiloted distributor with a connection surface in accordance with the ISO 4401-10 (CETOP RP121H) standards, operated by a ISO 4401-03 (CETOP 03) solenoid directional valve.

— It is available with different spool types (see par. 2) and with some options for the opening control.

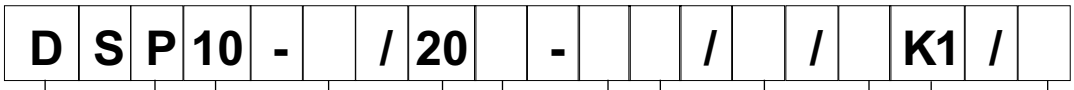
— It is available with both the solenoid and the hydraulic control from the X and Y ways.

— The piloting and the drainage can be made inside or outside the valve by inserting or removing the proper threaded plugs located in the main directional control valve (see paragraph 9).

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

Maximum operating pressure - ports P - A - B (**standard** version) - port T (external drainage)	bar	 350 210
Maximum flow rate from port P to A - B - T	l/min	1100
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	according to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass: DSP10 DSC10	kg	50 48

1 - IDENTIFICATION CODE FOR SOLENOID DISTRIBUTOR DSP10



Solenoid operated directional valve

ISO 4401-10 (CETOP 10) size

Spool type (see paragraph 2)

S*	**TA**
SA*	**TB**
SB*	**RK***

Series: (the overall and mounting dimensions remain unchanged from 20 to 29)

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

Piloting (see paragraph 9):

I = internal (not available for spools S2 - S4 - TA02 - TB02 - RK02 S*2 - S*4)
E = external
Z = internal piloting with 30 bar fixes adjustment pressure reducing valve

Drainage (see paragraph 9):

I = Internal
E = External

Controls:

D = Main spool switching speed control (see paragraph13.1)
P15 = Subplate placed under solenoid valve with restrictor of Ø1.5 on port P (see paragraph 13.2)

Manual override:
mit for override integrated in the tube (**standard**)
CM = manual override, boot protected

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

DC power supply

D12 = 12 V
D24 = 24 V
D48 = 48 V
D110 = 110 V
D220 = 220 V
D00 = valve without coils (see **NOTE**)

AC power supply

A24 = 24 V - 50 Hz
A48 = 48 V - 50 Hz
A110 = 110 V - 50 Hz / 120 V - 60 Hz
A230 = 230 V - 50 Hz / 240 V - 60 Hz
A00 = valve without coils (see **NOTE**)

F110 = 110 V - 60 Hz
F220 = 220 V - 60 Hz

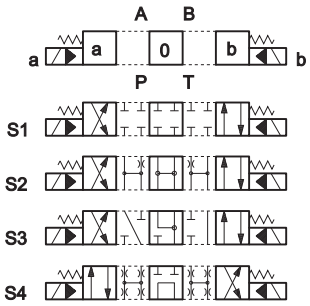
(For electrical characteristics see par. 10)

NOTE: The locking rings of the coils and the relevant O-Rings are supplied together with valves

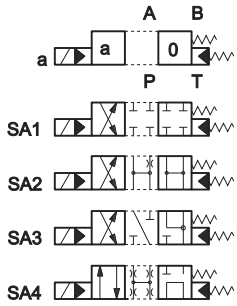
2 - SPOOL TYPE

NOTE: Symbols refers to the **DSP10** solenoid valve. For the **DSC10** hydraulic control version, please verify the connection scheme (see par. 3).

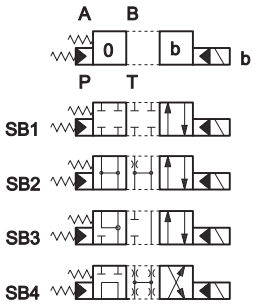
Type **S***:
2 solenoids - 3 positions
with spring centering



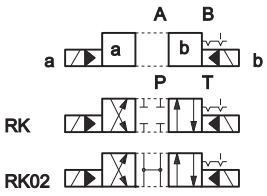
Type **SA***:
1 solenoid side A
2 positions (central + external)
with spring centering



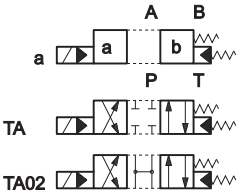
Type **SB***:
1 solenoid side B
2 positions (central + external)
with spring centering



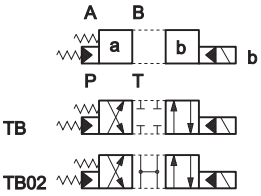
Type **RK**:
2 solenoids - 2 positions
with mechanical retention



Type **TA**:
1 solenoid side A
2 external positions
with return spring

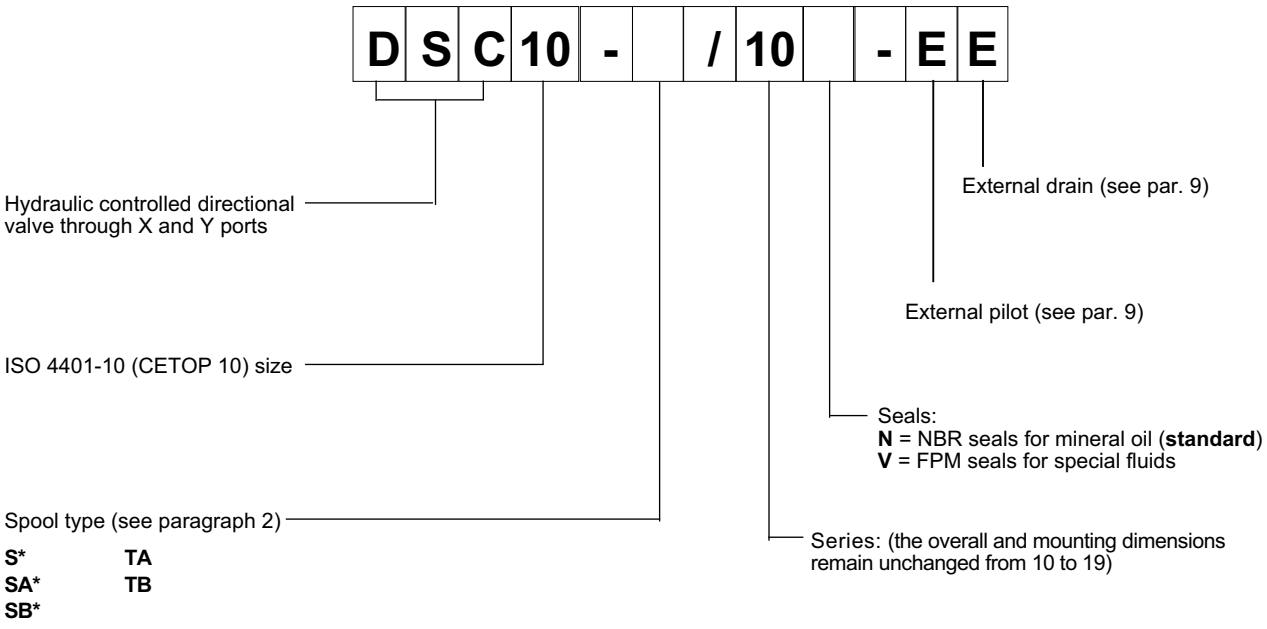


Type **TB**:
1 solenoid side B
2 external positions
with return spring



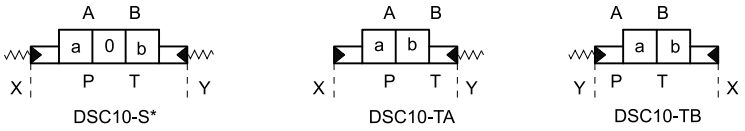
If other spool types are necessary please consult our Technical Department

3 - IDENTIFICATION CODE FOR HYDRAULIC DISTRIBUTOR DSC10



Spool type

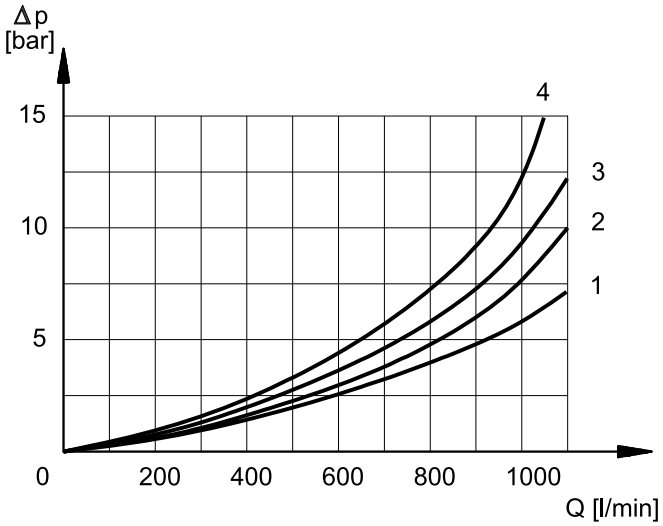
The distributor is delivered with short-circuit subplate. The X and Y ports are used for the hydraulic control of the valve.



4 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code V). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

5 - PRESSURE DROPS Δp-Q (values obtained with viscosity 36 cSt at 50 °C)



PRESSURE DROPS WITH VALVE ENERGIZED

SPOOL TYPE	FLOW DIRECTION			
	P-A	P-B	A-T	B-T
	CURVES ON GRAPH			
S1, SA1, SB1	1	1	1	1
S2, SA2, SB2	2	2	2	2
S3, SA3, SB3	1	1	4	4
S4, SA4, SB4	2	2	2	2
TA, TB	1	1	1	1
TA02, TB 02	1	1	1	1
RK	1	1	1	1

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			4	4	
S4, SA4, SB4					4

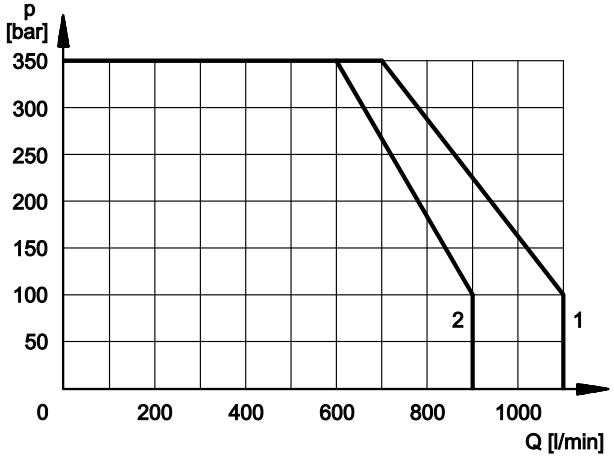
6 - SWITCHING TIMES

The values indicated refer to a solenoid valve working with piloting pressure of 100 bar, with mineral oil at a temperature of 50°C, at viscosity of 36 cSt and with PA and BT connections. The energizing and de-energizing times are obtained at the pressure variation which occurs on the lines.

TIMES (± 10%) [ms]	ENERGIZED		DE-ENERGIZED	
	2 Pos.	3 Pos.	2 Pos.	3 Pos.
AC solenoid	90	60	90	60
DC solenoid	130	100	90	60

7 - OPERATING LIMITS

The curves define the flow rate operating fields according to the valve pressure of the different versions.
The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage.
The value have been obtained with mineral oil, viscosity 36 cSt, temperature 50 °C and filtration according to ISO 4406.1999 class 18/16/13.



SPOOL TYPE	CURVE	
	P-A	P-B
S1,SA1,SB1	1	1
S2, SA2, SB2	2	2
S3, SA3, SB3	1	1
S4, SA4, SB4	2	2
TA, TB	1	1
TA02, TB02	1	1
TA23, TB23	1	1
RK	1	1

8 - PERFORMANCE CHARACTERISTICS

PRESSURES [bar]		
	MIN	MAX
Piloting pressure	12 (**NOTE a**)	280 (**NOTE b**)
Pressure on line T with internal drainage	-	140
Pressure on line T with external drainage	-	210

NOTES:

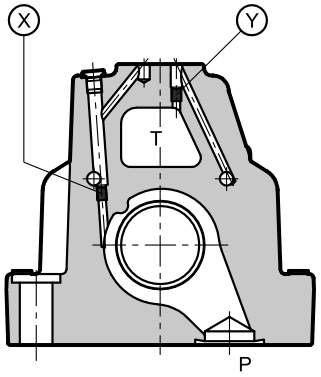
a) The minimum piloting pressure can be of 6 bar at low flows rates, but with higher flow rates a pressure of 12 bar is needed.

b) 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, inserting the letter **Z** in the code identification at piloting entry.

9 - PILOTING AND DRAINAGE

The DSP10 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.

VALVE TYPE		Plug assembly	
		X	Y
IE	INTERNAL PILOT AND EXTERNAL DRAINAGE	NO	YES
II	INTERNAL PILOT AND INTERNAL DRAINAGE	NO	NO
EE	EXTERNAL PILOT AND EXTERNAL DRAINAGE	YES	YES
EI	EXTERNAL PILOT AND INTERNAL DRAINAGE	YES	NO



X: plug M6x8 for external pilot

Y: plug M6x8 for external drain

10 - ELECTRICAL FEATURES

10.1 - Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation.

The coil is fastened to the tube by a threaded ring, and can be rotated 360°, to suit the available space.

NOTE 1: In order to further reduce the emissions, use of type H connectors is recommended. These prevent voltage peaks on opening of the coil supply electrical circuit (see CAT. 49 000).

NOTE 2: The IP65 protection degree is guaranteed only with the connector correctly connected and installed.

VOLTAGE SUPPLY FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY	6.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC) (**NOTE 1**)	In compliance with 2004/108/CE
LOW VOLTAGE	In compliance with 2006/95/CE
CLASS OF PROTECTION: Atmospheric agents (CEI EN 60529) Coil insulation (VDE 0580) Impregnation: DC valve AC valve	 IP 65 (**NOTE 2**) class H class F class H

10.2 - Current and absorbed power for DC solenoid valve

The table shows current and power consumption values relevant to the different coil types for DC.
The rectified current supply takes place by fitting the valve (with the exception of D12 coil) with an alternating current source (50 or 60 Hz), rectified by means of a bridge built-in to the "D" type connectors (see cat.49 000), by considering a reduction of the operating limits by 5 ÷ 10% approx.

Coils for direct current (values ± 5%)

Suffix	Nominal voltage [V]	Resistance at 20°C [Ω]	Current consumpt. [A]	Power consumpt. [W]	Coil code
D12	12	4,4	2,72	32,6	1902860
D24	24	18,6	1,29	31	1902861
D48	48	78,6	0,61	29,3	1902863
D110	110	423	0,26	28,6	1902864
D220	220	1692	0,13	28,6	1902865

10.3 - Current and absorbed power for AC solenoid valve

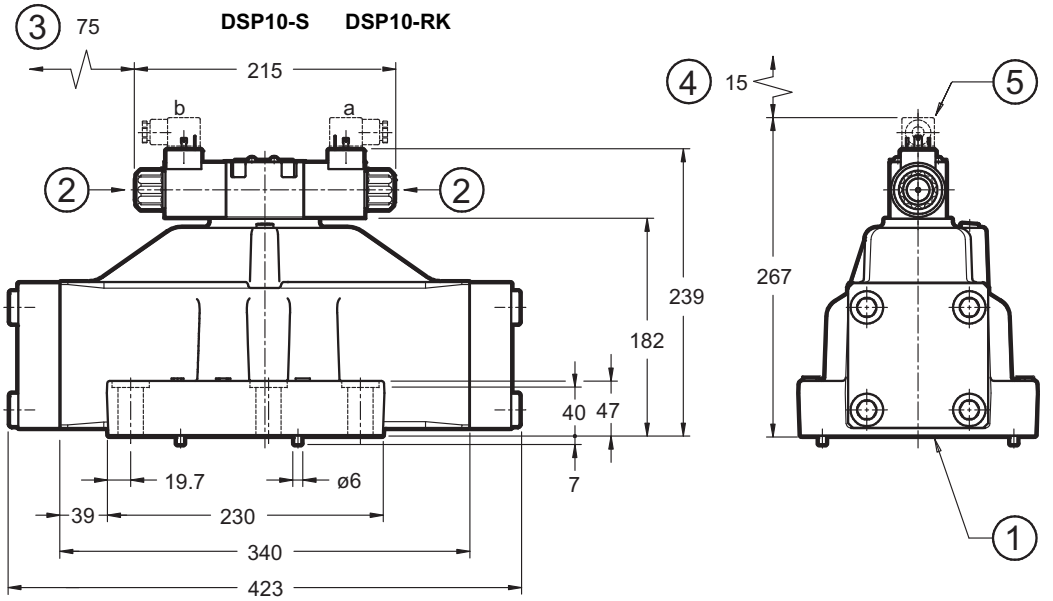
The table shows current and power consumption values at inrush and at holding, relevant to the different coil types for AC current.

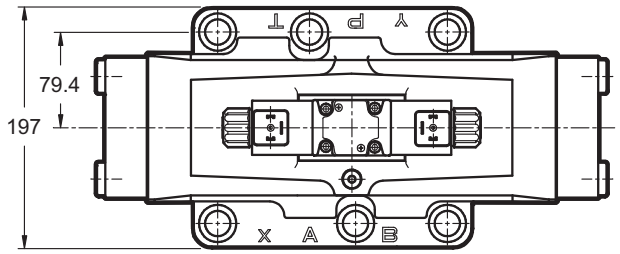
Coils for alternating current (values ± 5%)

Suffix	Nominal voltage [V]	Frequency [Hz]	Resistance at 20°C [ohm]	Current consumption at inrush [A]	Current consumption at holding [A]	Power consumption at inrush [VA]	Power consumption at holding [VA]	Coil code
A24	24	50	1,46	8	2	192	48	1902830
A48	48	50	5,84	4,4	1,1	204	51	1902831
A110	110V-50Hz	50/60	32	1,84	0,46	192	48	1902832
	120V-60Hz			1,56	0,39	188	47	
A230	230V-50Hz		140	0,76	0,19	176	44	1902833
	240V-60Hz			0,6	0,15	144	36	
F110	110	60	26	1,6	0,4	176	44	1902834
F220	220		106	0,8	0,2	180	45	1902835

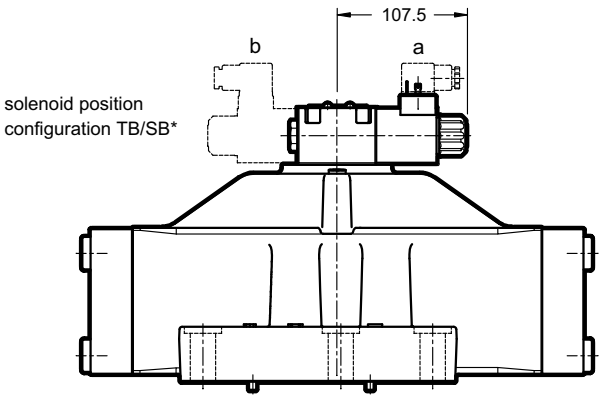
11 - OVERALL AND MOUNTING DIMENSIONS FOR SOLENOID DISTRIBUTOR DSP10

DSP10-S DSP10-RK

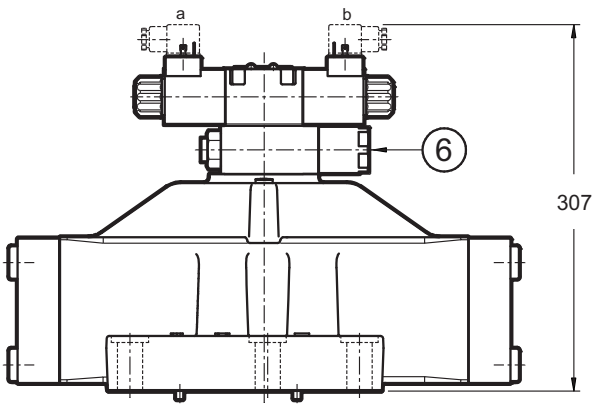




DSP10-TA DSP10-SA*



DSP10-*/20*-2

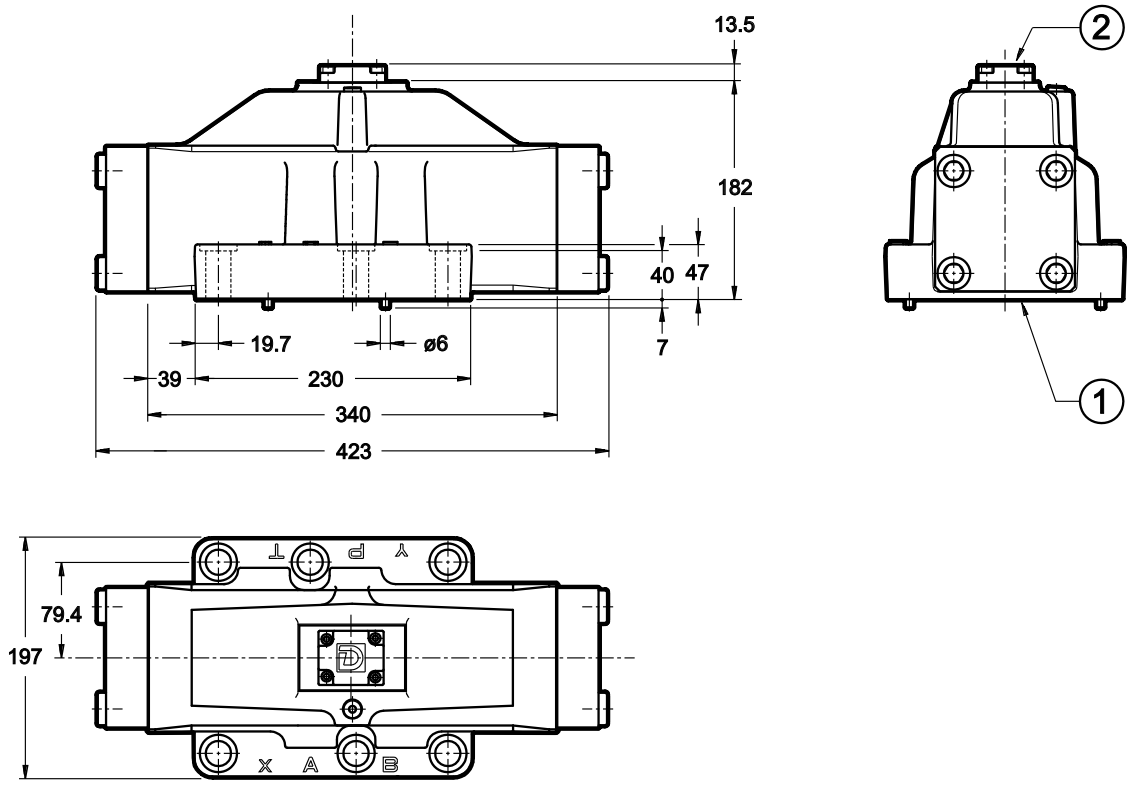


dimensions in mm

Fastening of single valve: 6 bolts M20x70	
Tightening torque: 330 Nm (bolt A 8.8) - 560 Nm (bolt A 12.9)	
Threads of mounting holes: M20x40	
Sealing rings: 4 OR type 4150 - 90 shore (37.59 x 3.53) 2 OR type 3081 - 90 shore (20.24 x 2.62)	

1	Mounting surface with sealing rings
2	Manual override
3	Coil removal space
4	Connector removal space
5	Electric connector to be ordered separately (see cat. 49 000)
6	Reducing valve with fixed adjustment 30 bar

12 - OVERALL AND MOUNTING DIMENSIONS FOR HYDRAULIC DISTRIBUTOR DSC10



dimensions in mm

Fastening of single valve: 6 bolts M20x70	
Tightening torque: 330 Nm (bolt A 8.8) - 560 Nm (bolt A 12.9)	
Threads of mounting holes: M20x40	
Sealing rings: 4 OR type 4150 - 90 shore (37.59 x 3.53) 2 OR type 4075 - 90 shore (20.24 x 2.62)	

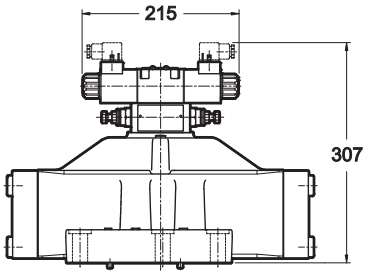
1	Mounting surface with sealing rings
2	Short-circuit subplate

13 - OPTIONS

13.1 - Control of the main spool shifting speed: D

By placing a MERS type double flow control valve between the pilot solenoid valve and the main distributor, the piloted flow rate can be controlled and therefore the changeover smoothness can be varied.
Add the letter **D** to the identification code to request this device (see paragraph 1).

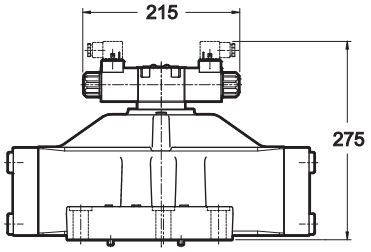
DSP10-S*/D



13.2 - Subplate with throttle on line P

It is possible to introduce a subplate with a restrictor of Ø1,5 on line P between the pilot solenoid valve and the main distributor.
Add **P15** to the identification code to request this option (see paragraph 1).

DSP10-S*/P15



14 - MANUAL OVERRIDE, BOOT PROTECTED: CM

Whenever the solenoid valve installation may involve exposure to atmospheric agents or use in tropical climates, the manual override, boot protection is recommended.
Add the suffix **CM** to request this device (see paragraph 1).
For overall dimensions see cat. 41 150.

15 - ELECTRIC CONNECTORS

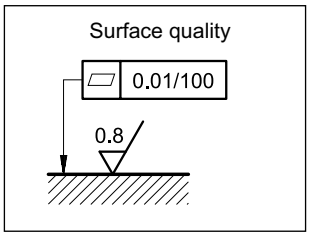
The solenoid operated valves are delivered without the connectors. They must be ordered separately.
For the identification of the connector type to be ordered, please see catalogue 49 000.

16 - INSTALLATION

Configurations with centering and recall springs can be mounted in any position; type RK valves - without springs and with mechanical detent - must be mounted with the longitudinal axis horizontal.

Valve fastening takes place by means of screws or tie rods, laying the valve on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing.

If the minimum values of planarity or smoothness are not met, fluid leakages between valve and mounting surface can easily occur.



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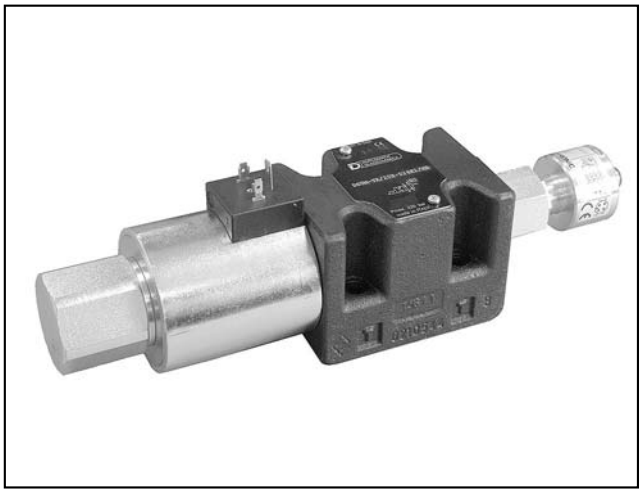


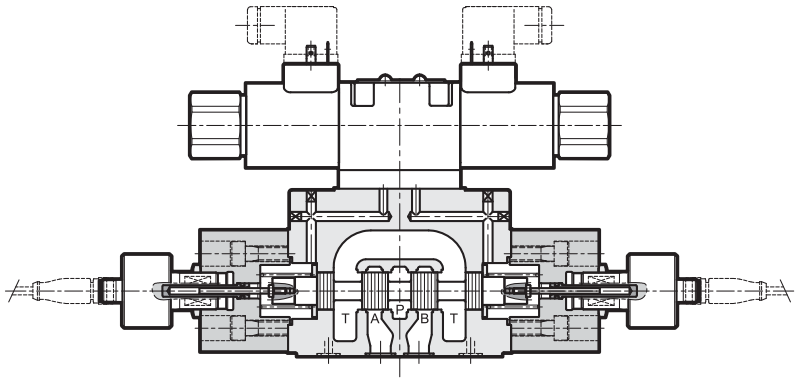
DS(P)*M

DIRECTIONAL VALVES WITH SPOOL POSITION MONITORING

DS3M **ISO 4401-03** (CETOP 03)
DS5M **ISO 4401-05** (CETOP 05)

DSP5M **CETOP P05**
DSP5RM **ISO 4401-05** (CETOP R05)
DSP7M **ISO 4401-07** (CETOP 07)
DSP8M **ISO 4401-08** (CETOP 08)

OPERATING PRINCIPLE



— Solenoid operated directional control valves with monitored spools are supplied with a positioning sensor monitoring the valve spool position (in case of pilot operated directional control valves, the main spool is monitored). The switching position is indicated with a binary signal.

— The valves of sizes ISO 4401-03 (CETOP 03) and ISO 4401-05 (CETOP 05) are direct operated while sizes CETOP P05, ISO 4401-05 (CETOP R05), ISO 4401-07 (CETOP 07) and ISO 4401-08 (CETOP 08) are pilot operated.

— They are supplied with oil bath solenoids and only in direct current versions (see paragraph 14 for available voltages).

— These valves have no manual override, according to EN 693:2011.

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

		DS3M	DS5M	DSP5M DSP5RM	DSP7M	DSP8M
Maximum operating pressure: P - A - B ports	bar	350	320	320	350	350
T port		210		see performance limits at paragraph 6.2		
Maximum flow rate from P to A - B - T	l/min	see performance limits at paragraph 2.3		150	300	600
Ambient temperature range	°C	-20 / +50				
Fluid temperature range	°C	-20 / +80				
Fluid viscosity range	cSt	10 ÷ 400				
Fluid contamination degree		According to ISO 4406:1999 class 20/18/15				
Recommended viscosity	cSt	25				
Mass: single solenoid valve	kg	1,8	5	7,1	8,7	15,6
double solenoid valve		2,2	-	8	9,6	16,6

1 - IDENTIFICATION OF SOLENOID VALVES DIRECT OPERATED

1.1 - Identification code

D	S		M	-		/			-		K1	/	

Directional control valve solenoid operated

3 = ISO 4401-03 (CETOP 03) size
5 = ISO 4401-05 (CETOP 05) size

Monitoring of the spool position

Spool type (see par. 1.2)

S*	**TA**	**TB**
SA*	**TA02**	**TB02**
	TA100	**TB100**

Series No.
20 = for DS5M
21 = for DS3M
(the overall and mounting dimensions remain unchanged from 20 to 29)

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

DC power supply

D12 = 12 V **D110** = 110 V
D24 = 24 V **D220** = 220 V

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

Monitored position: (see par. 17 for switching logic)
R0 = monitored rest position
MA = monitored position 'a'
MB = monitored position 'b'

NOTE: Verify spool and sensor type availability in the tables below

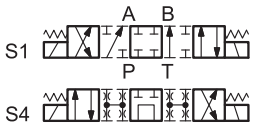
DS3		SPOOLS			
		S*	**SA***	**TA TB**	**TA100 TB100**
SENSOR TYPE	**R0**	x			
	MA		x	x	x
	MB		x	x	x

DS5		SPOOLS		
		TA TB	**TA02 TB02**	**TA100 TB100**
SENSOR TYPE	**R0**			
	MA	x	x	x
	MB	x	x	x

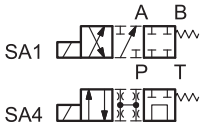
NOTE: To be compliant with the EN 693:2011 standard, the valves have no manual override.

1.2 - Spool types for DS3M and DS5M

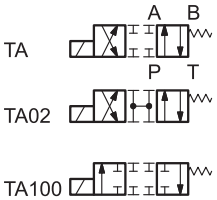
Type **S***:
2 solenoids - 3 positions
with spring centering



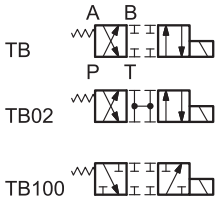
Type **SA***:
1 solenoid side A
2 positions (central + external)
with spring centering



Type **TA**:
1 solenoid side A
2 external positions with return spring

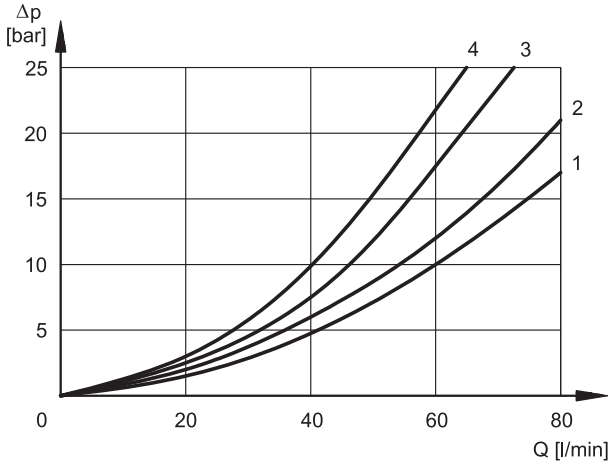


Type **TB**:
1 solenoid side B
2 external positions with return spring



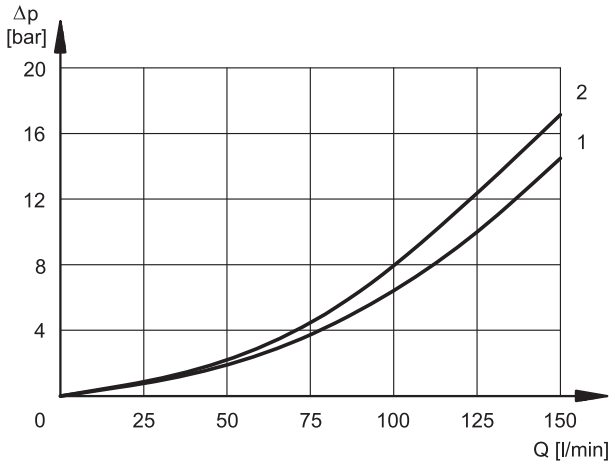
2 - CHARACTERISTIC CURVES OF SOLENOID VALVES DIRECT OPERATED

2.1 - Pressure drops Δp-Q for DS3M solenoid valves (obtained with viscosity 36 cSt at 50 °C)



SPOOL TYPE	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S1, SA1	1	1	2	2	-
S4, SA4	4	4	4	4	2
TA, TB	1	1	1	1	-
TA100, TB100	3	3	3	3	-

2.2 - Pressure drops Δp-Q for DS5M solenoid valves (obtained with viscosity 36 cSt at 50 °C)

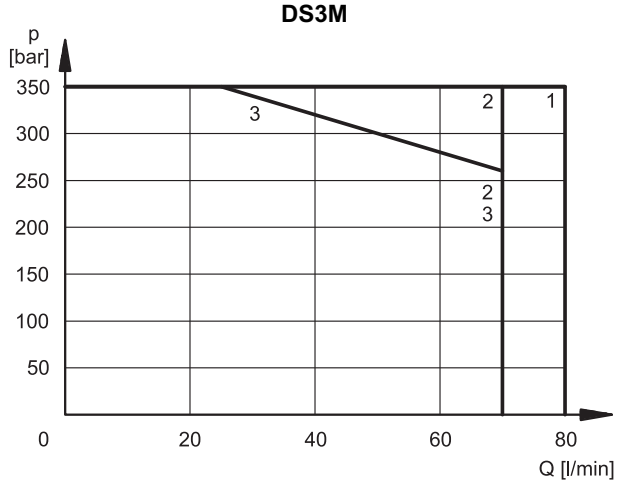


SPOOL TYPE	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
TA, TB, TA02, TB02	2	2	1	1	-
TA100, TB100	1	1	1	1	-

2.3 - Performance limits for DS3M and DS5M solenoid valves

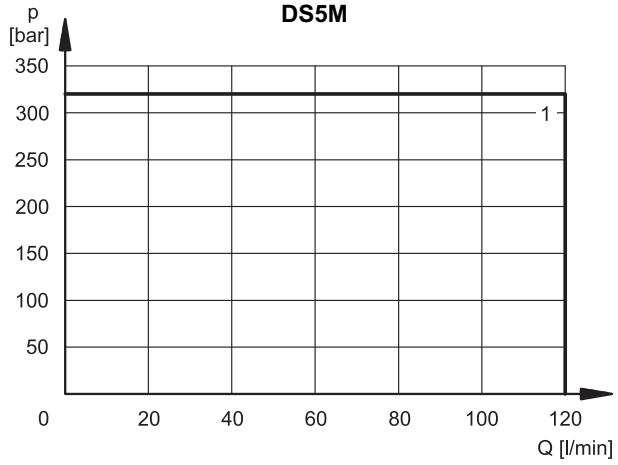
The curves define the flow rate operating fields according to the valve pressure of the different versions.
The values have been obtained according to ISO 64003 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage. The values have been obtained with mineral oil, viscosity 36 cSt, temperature 50 °C and filtration according to ISO 4406:1999 class 18/16/13.
The operating limits can be considerably reduced if a 4-way valve is used as 3-way valve with port A or B plugged or without flow.

DS3M



SPOOL	CURVE	
	P→A	P→B
S1,SA1	1	1
S4, SA4	2	2
TA, TB	1	1
TA100, TB100	3	3

DS5M



SPOOL	CURVE	
	P→A	P→B
TA	1	1
TA02	1	1
TA100	1	1

2.4 - Switching times

The indicated values had obtained according to ISO 6403 standards, using mineral oil with viscosity 36 cSt at 50 °C.

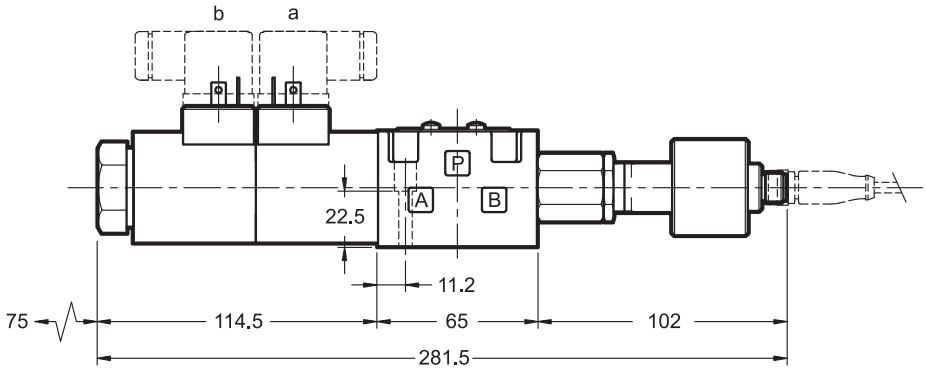
TIMES [ms]	ENERGIZING	DE-ENERGIZING
DS3M	25 ÷ 75	15 ÷ 25

TIMES [ms]	ENERGIZING	DE-ENERGIZING
DS5M	100 ÷ 150	20 ÷ 50

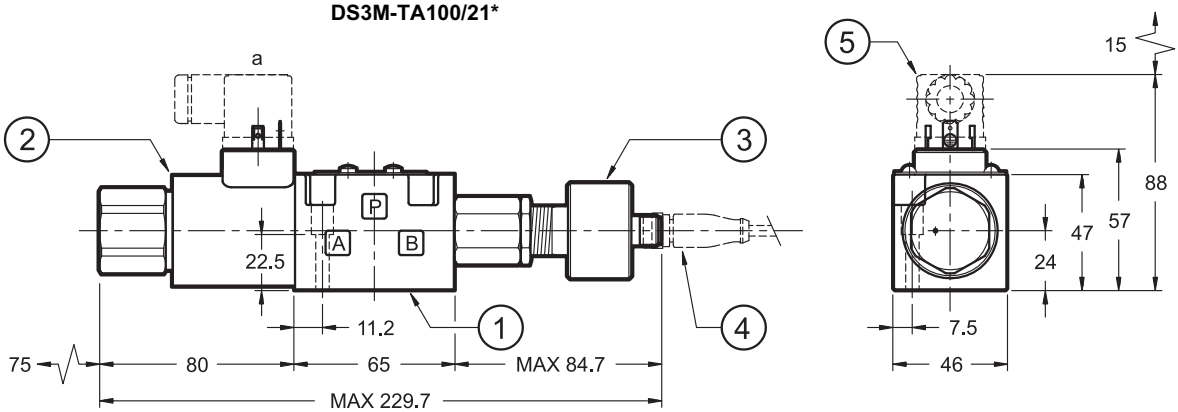
3 - OVERALL AND MOUNTING DIMENSIONS FOR DS3M

dimensions in mm

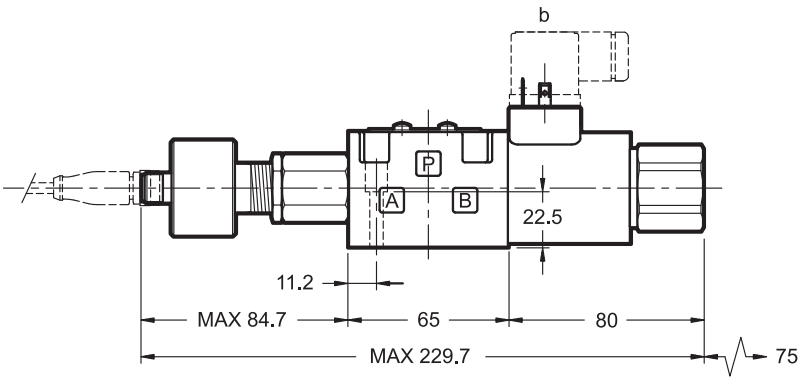
DS3M-S*/21*



DS3M-TA/21*
DS3M-TA100/21*



DS3M-TB/21*
DS3M-TB100/21*



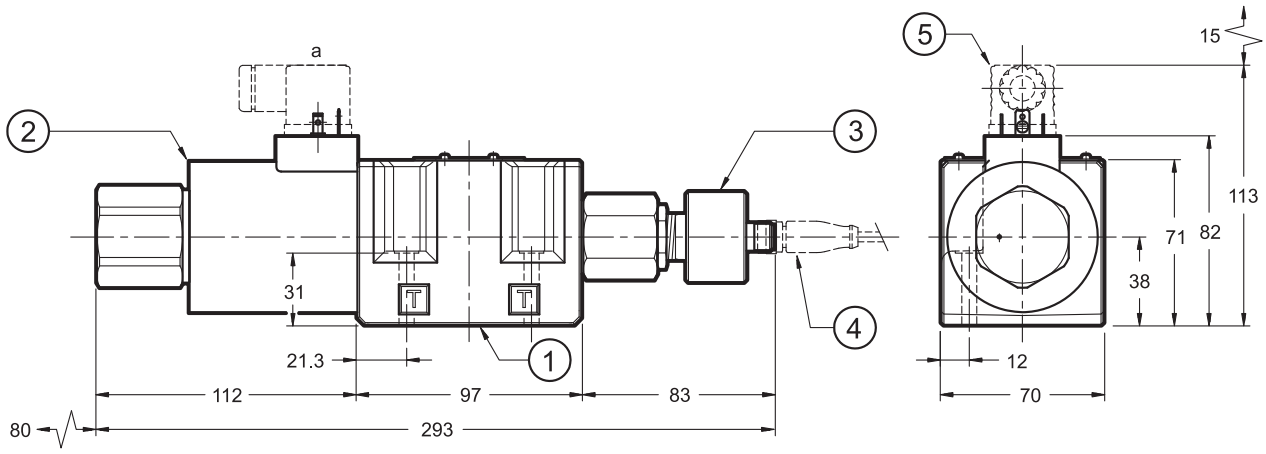
1	Mounting surface with sealing rings
2	Coil rotating 360°
3	Positioning sensor: setting sealed at factory, do not unscrew.
4	Connector for positioning sensor type straight, molded. To be ordered separately, see paragraph 20
5	Coil electric connector DIN 43650 type to be ordered separately - cat. 49 000

Fastening of single valve: 4 SHC screws ISO 4762 M5x30
Tightening torque: 5 Nm
Threads of mounting holes: M5x10
Sealing rings: 4 OR type 2037 (9.25x1.78) - 90 Shore

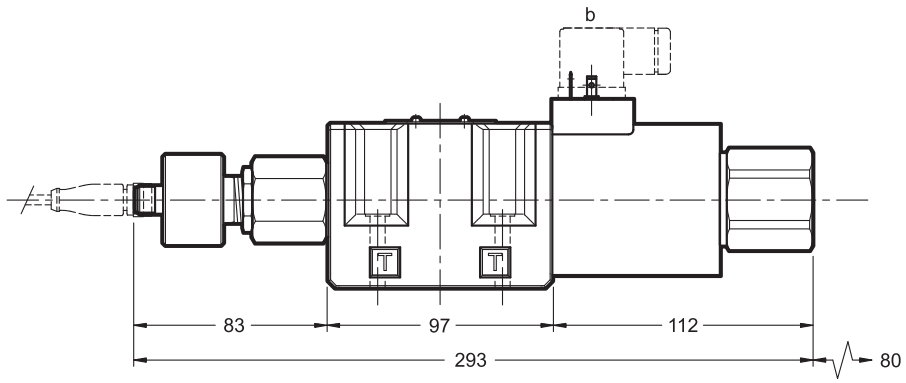
4 - OVERALL AND MOUNTING DIMENSIONS FOR DS5M

dimensions in mm

DS5M-TA/20*
DS5M-TA02/20*
DS5M-TA100/20*



DS5M-TB/20*
DS5M-TB02/20*
DS5M-TB100/20*

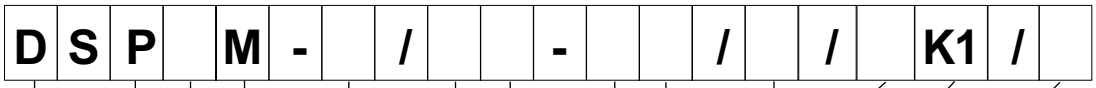


1	Mounting surface with sealing rings
2	Coil rotating 360°
3	Positioning sensor: setting sealed at factory, do not unscrew.
4	Connector for positioning sensor type straight, molded. To be ordered separately, see paragraph 20
5	Coil electric connector DIN 43650 type to be ordered separately - cat. 49 000

Fastening of single valve: 4 SHC screws ISO 4762 M6x40
Tightening torque: 8 Nm
Threads of mounting holes: M6x10
Sealing rings: 5 OR type 2050 (12.42x1.78) - 90 Shore

5 - IDENTIFICATION OF SOLENOID VALVES PILOT OPERATED

5.1 - Identification code



Directional valve,
Solenoid controlled
Pilot operated

Size:
5 = CETOP P05
5R = ISO 4401-05 (CETOP R05)
7 = ISO 4401-07 (CETOP 07)
8 = ISO 4401-08 (CETOP 08)

Monitoring of the spool position

Spool type (see paragraph 5.2)

S1	**SA1**	**SB1**	**TA**	**TB**
S3			**TA100**	**TB100**
S4				
RK				

Series:
10 = for DSP5M, DSP5RM and DSP8M
20 = for DSP7M
(the overall and mounting dimensions within the same ten remain unchanged)

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

Piloting (see paragraph 7):
I = internal (not available for S4 spool)
E = external
C = internal piloting with backpressure valve (available on DSP7 and DSP8 only)
Z = internal piloting with 30 bar fixes adjustment pressure reducing valve (see par. 6.2)

Monitored position:
(see par. 17 for switching logic)

1 positioning sensor
R0 = rest position monitored
MA = position 'a' monitored
MB = position 'b' monitored

2 positioning sensor
M0 = rest position monitored
MAB = 'a' and 'b' positions monitored

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

DC power supply
D12 = 12 V **D110** = 110 V
D24 = 24 V **D220** = 220 V

P = Subplate with restrictor on port P placed under pilot operated solenoid valve (omit only for valves with fixed adjustment reducing valve - version Z - and for flow control valves for the control of the main spool shifting - version D)
D = main spool shifting speed control (see par. 8)

Drainage (see paragraph 7):
I = Internal
E = External

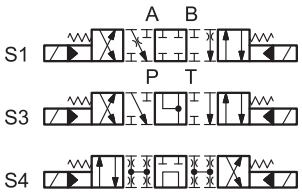
NOTE: Verify spool and sensor type availability in the table below

		SPOOLS				
		S*	**SA* SB***	**TA TB**	**TA100 TB100**	**RK**
SENSOR TYPE	**R0**	x				
	MA		x	x	x	x
	MB		x	x	x	x
	M0	x				
	MAB	x	x	x	x	

NOTE: To be compliant with the EN 693:2011 standard, the valves have no manual override.

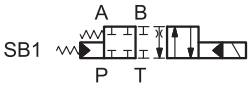
5.2 - Spool types for DSP5M, DSP5RM, DSP7M and DSP8M

Type **S***:
2 solenoids - 3 positions
with spring centering

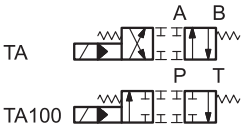


Type **SA***:
1 solenoid side A
2 positions (central + external)
with spring centering

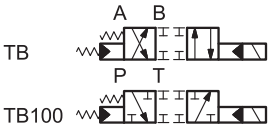
Type **SB***:
1 solenoid side B
2 positions (central + external)
with spring centering



Type **TA**:
1 solenoid side A
2 external positions with
return spring



Type **TB**:
1 solenoid side B
2 external positions with
return spring

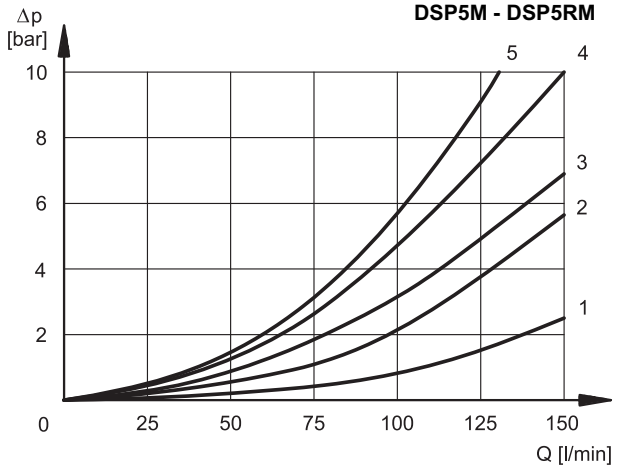


Type **RK**:
2 solenoids - 2 positions
with mechanical retention

6 - CHARACTERISTIC CURVES (values obtained with viscosity 36 cSt at 50 °C)

6.1 - Pressure drops for pilot operated valves

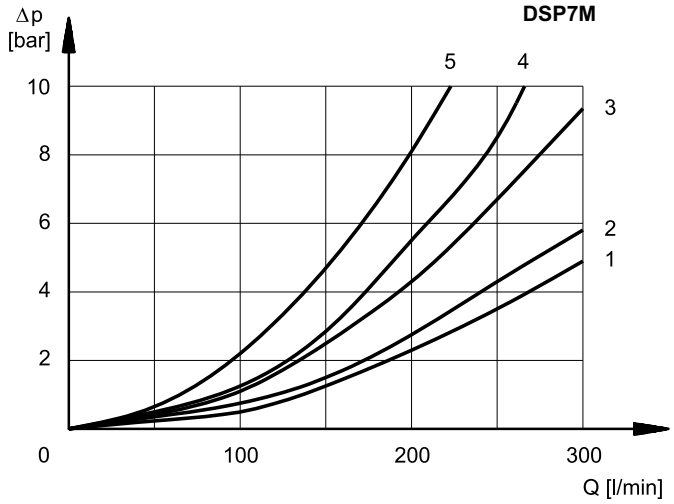
DSP5M - DSP5RM



SPOOL TYPE	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S1, SA1	4	4	1	1	-
S3	4	4	1	1	-
S4	5	5	2	3	5
TA, TB	4	4	1	1	-
TA100, TB100	3	3	1	1	-
RK	4	4	1	1	-

For pressure drops of the S3 spool between A-T and B-T ports in central position refer to the curve 4.

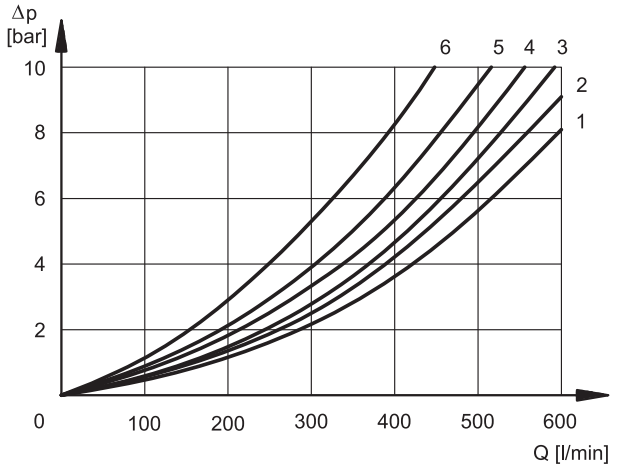
DSP7M



SPOOL TYPE	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S1, SA1	1	1	3	4	-
S3	1	1	4	4	-
S4	2	2	4	5	4
TA, TB	1	1	3	4	-
TA100, TB100					-
RK	1	1	3	4	-

For pressure drops of the S3 spool between A-T and B-T ports in central position refer to the curve 4.

DSP8M



SPOOL TYPE	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S1, SA1	2	2	3	3	-
S3	2	2	2	1	-
S4	4	4	3	5	6
TA, TB	2	2	3	3	-
TA100, TB100	5	5	5	5	-
RK	2	2	3	3	-

For pressure drops of the S3 spool between A-T and B-T ports in central position refer to the curve 4.

6.2 - Performance limits for DSP5M - DSP7M - DSP8M pilot operated directional valves

PRESSURES	DSP5M DSP5RM	DSP7M	DSP8M
Max pressure in P, A, B ports	320	350	350
Max pressure in T line with internal drainage	140	140	140
Max pressure in T line with external drainage	210	210	210
Min piloting pressure (X port and / or Y port) **NOTE 1**	5 ÷ 10	5 ÷ 12	7 ÷ 14
Max piloting pressure (X port and / or Y port) **NOTE 2**	210	210	210

NOTE 1: minimum piloting pressure can be the lower range value at low flows rates, but with higher flow rates the higher value is needed.

NOTE 2: if the 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. 5.1).

MAXIMUM FLOW RATES		DSP5M DSP5RM		DSP7M		DSP8M	
		PRESSURES					
Spool type		at 210 bar	at 320 bar	at 210 bar	at 350 bar	at 210 bar	at 350 bar
S4 - TA100	[l/min]	120	100	200	150	500	450
S1 - S3 - TA - RK		150	120	300	300	600	500

6.3 - Switching times

The values indicated refer to a solenoid valve working with piloting pressure of 100 bar, with mineral oil at a temperature of 50°C, at viscosity of 36 cSt and with PA and BT connections.

The energizing and de-energizing times are obtained at the pressure variation which occurs on the lines.

TIMES (± 10%) [ms]	ENERGIZING		DE-ENERGIZING	
	2 Pos.	3 Pos.	2 Pos.	3 Pos.
DSP5M - DSP5RM	60	50	50	40
DSP7M	75	60	60	45
DSP8M	100	70	80	50

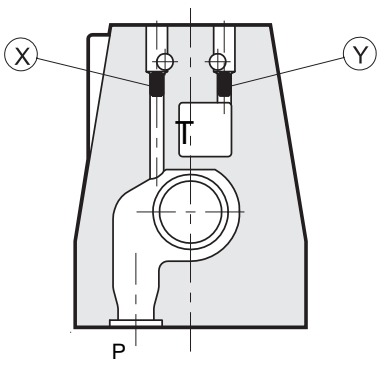
7 - PILOTING AND DRAINAGE

These 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.

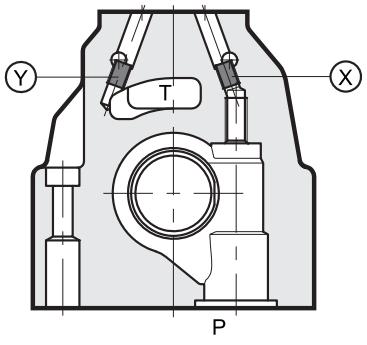
TYPE OF VALVE		Plug assembly	
		X	Y
IE	INTERNAL PILOT AND EXTERNAL DRAIN	NO	YES
II	INTERNAL PILOT AND INTERNAL DRAIN	NO	NO
EE	EXTERNAL PILOT AND EXTERNAL DRAIN	YES	YES
EI	EXTERNAL PILOT AND INTERNAL DRAIN	YES	NO

X: plug M5x6 for external pilot
Y: plug M5x6 for external drain



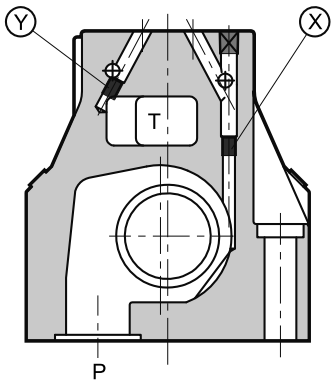
DSP5M
DSP5RM

X: plug M6x8 for external pilot
Y: plug M6x8 for external drain



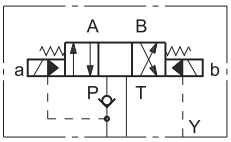
DSP7M

X: plug M6x8 for external pilot
Y: plug M6x8 for external drain



DSP8M

7.1 - Backpressure valve incorporated on line P (C option)



DSP7M and DSP8M valves are available upon request with backpressure valve incorporated on line P. This is necessary to obtain the piloting pressure when the control valve, in rest position, has the line P connected to the T port (spools S4). The cracking pressure is of 5 bar with a minimum flow rate of 15 l/min.

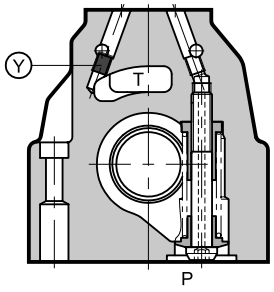
In the C version the piloting is always internal.

NOTE: the backpressure valve can't be used as check valve because it doesn't assure the seal.

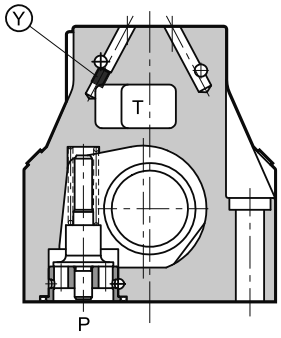
Add **C** to the identification code for this request (see paragraph 5.1).

For DSP7M only, the backpressure valve can be also delivered separately and it can be easily mounted on line P of the main control valve. Ask for code **0266577** to order the backpressure valve.

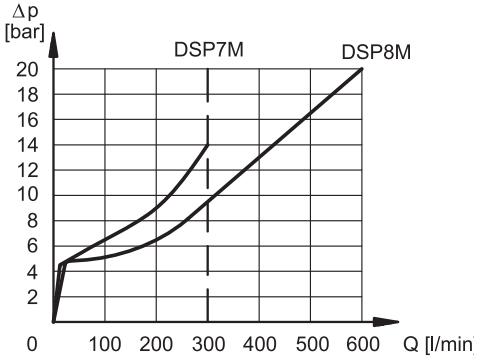
DSP7M



DSP8M



pilot always internal
Y: plug M6x8 for external drain

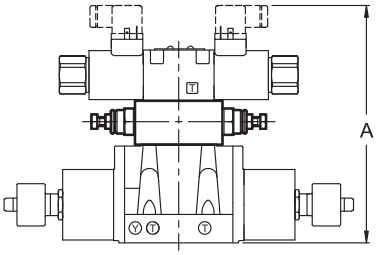


The curve refers to the pressure drop (body part only) with backpressure valve energized to which the pressure drop of the reference spool must be added. (see paragraph 6)

8 - OPTIONS: CONTROL OF THE MAIN SPOOL SHIFTING SPEED

By placing a MERS type double flow control valve between the pilot solenoid valve and the hydropiloted valve, the piloted flow rate can be controlled and therefore the change over smoothness can be varied.

Add the letter **D** to the identification code to request this device (see paragraph 5.1).



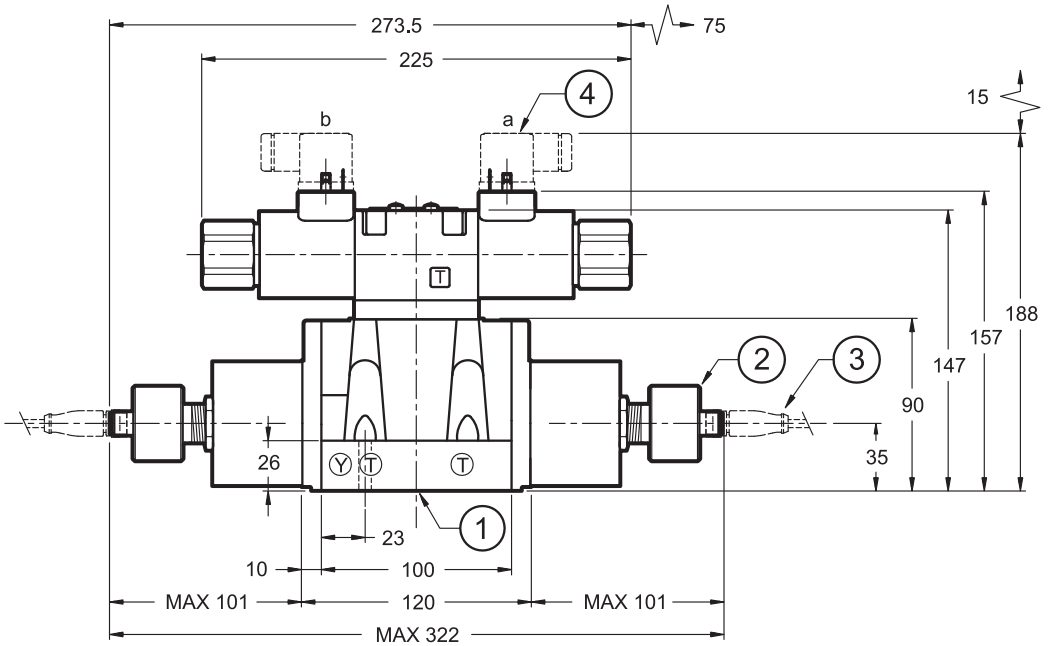
dimensions in mm

	DSP5	DSP7	DSP8
A	218	225	254

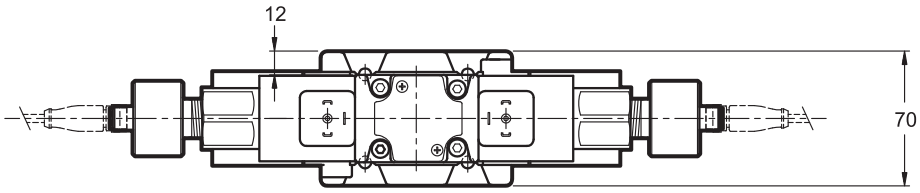
9 - DSP5M and DSP5RM OVERALL AND MOUNTING DIMENSIONS

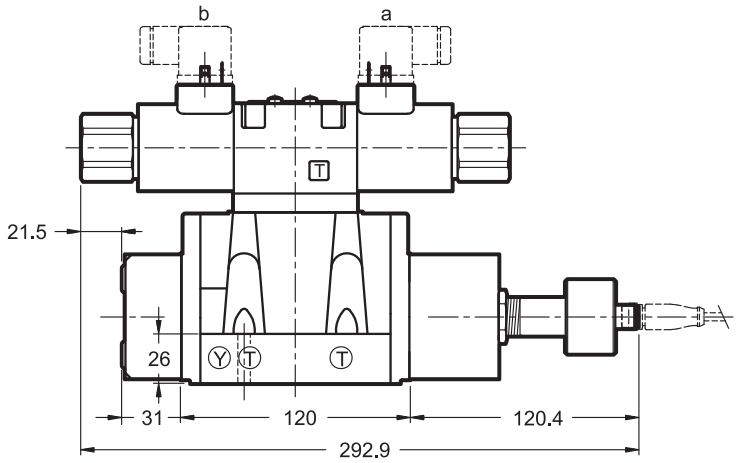
DSP5M-S*
DSP5RM-S*

dimensions in mm



sensor type:
M0
MAB





sensor type:
R0

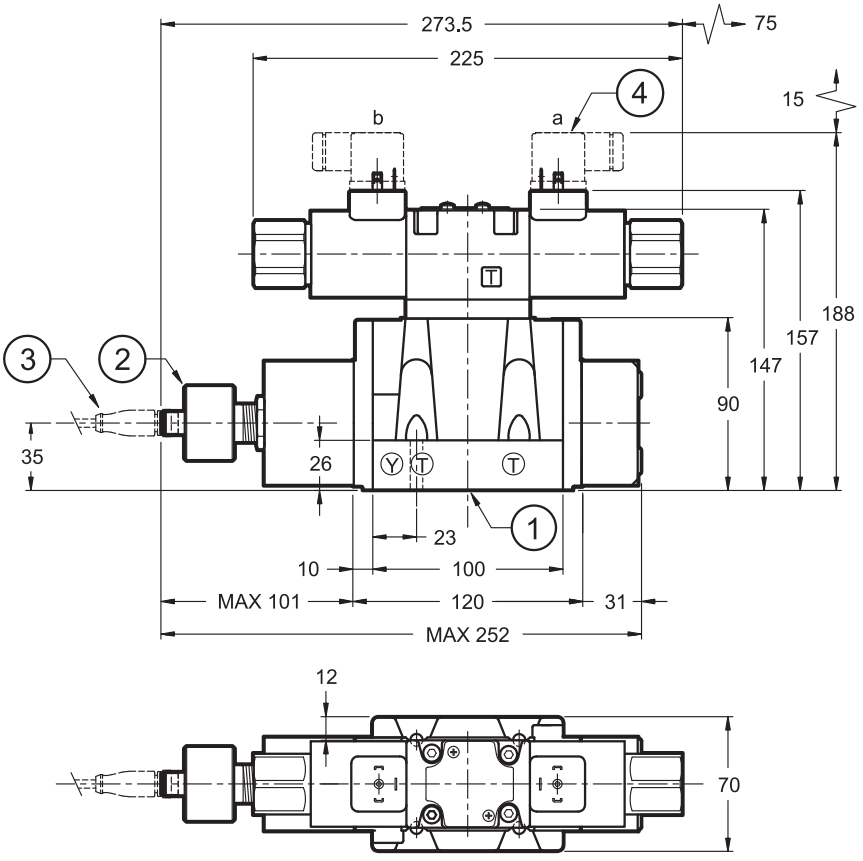
NOTE: for overall dimensions with Z option (fixed adjustment pressure reducing valve) see par. 12.

1	Mounting surface with sealing rings
2	Positioning sensor : setting sealed at factory, do not unscrew.
3	Connector for positioning sensor type straight, molded. To be ordered separately, see paragraph 20
4	Coil electric connector DIN 43650 type - to be ordered separately cat. 49 000

Fastening of single valve: 4 SHC screws ISO 4762 M6x35
Tightening torque: 8 Nm (screws A 8.8)
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

dimensions in mm

DSP5M-RK
DSP5RM-RK



sensor type:
MA
MB

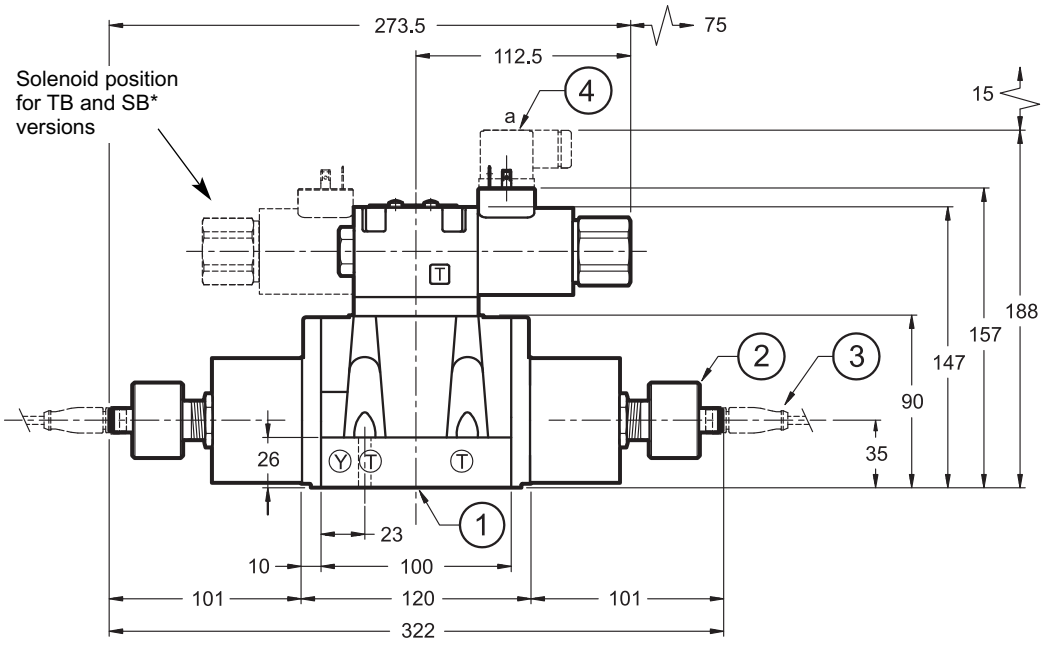
NOTE: for overall dimensions with Z option (fixed adjustment pressure reducing valve) see par. 12.

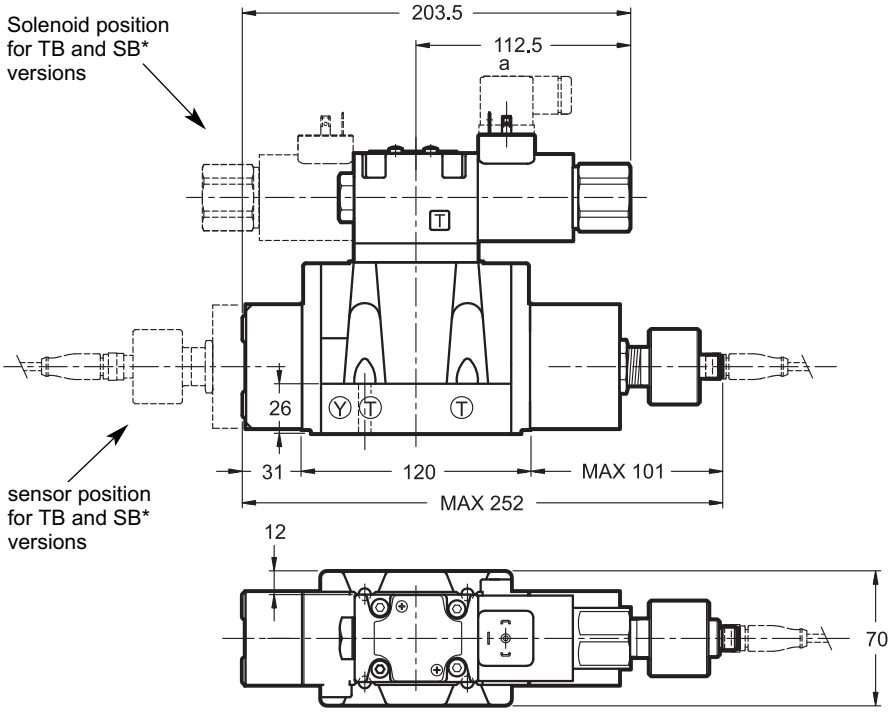
Fastening of single valve: 4 SHC screws ISO 4762 M6x35
Tightening torque: 8 Nm (screws A 8.8)
Threads of mounting holes: M6x10
Sealing rings: 5 OR type 2050 (12.42x1.78) - 90 Shore 2 OR type 2037 (9.25x1.78) - 90 Shore

1	Mounting surface with sealing rings
2	Positioning sensor : setting sealed at factory, do not unscrew.
3	Connector for positioning sensor type straight, molded. To be ordered separately, see paragraph 20
4	Coil electric connector DIN 43650 type - to be ordered separately cat. 49 000

DSP5M-TA, TA100, SA1
DSP5RM-TA, TA100, SA1

dimensions in mm





NOTE: for overall dimensions with Z option (fixed adjustment pressure reducing valve) see par. 12.

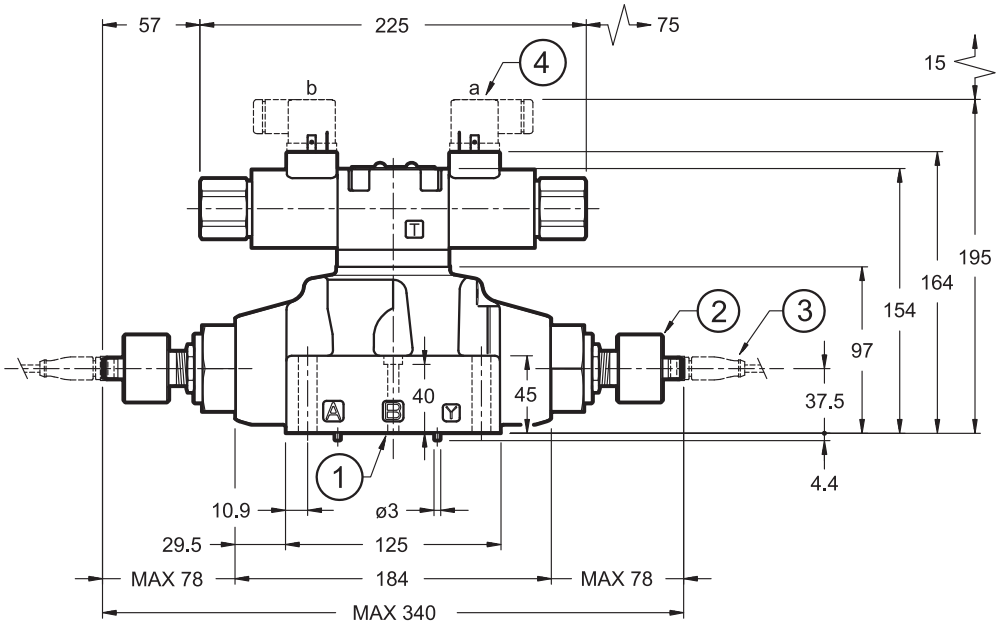
Fastening of single valve: 4 SHC screws ISO 4762 M6x35
Tightening torque: 8 Nm (screws A 8.8)
Threads of mounting holes: M6x10
Sealing rings: 5 OR type 2050 (12.42x1.78) - 90 Shore 2 OR type 2037 (9.25x1.78) - 90 Shore

1	Mounting surface with sealing rings
2	Positioning sensor : setting sealed at factory, do not unscrew.
3	Connector for positioning sensor type straight, molded. To be ordered separately, see paragraph 20
4	Coil electric connector DIN 43650 type - to be ordered separately cat. 49 000

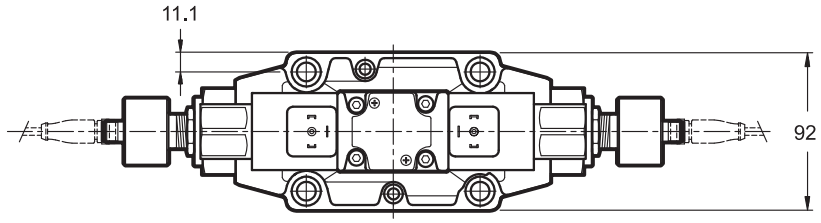
10 - DSP7M OVERALL AND MOUNTING DIMENSIONS

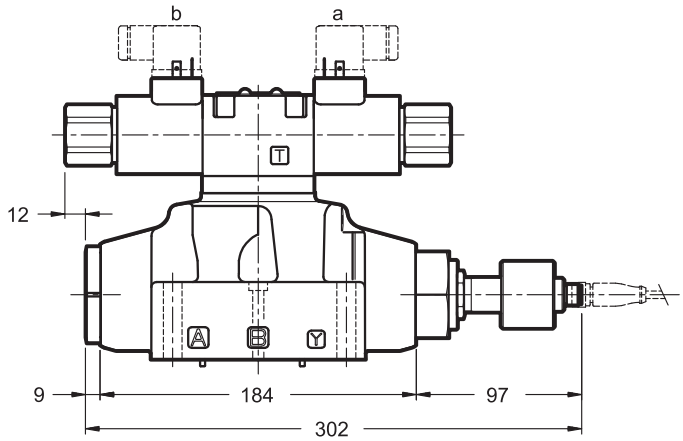
DSP7M-S*

dimensions in mm



sensor type:
M0
MAB





sensor type:
R0

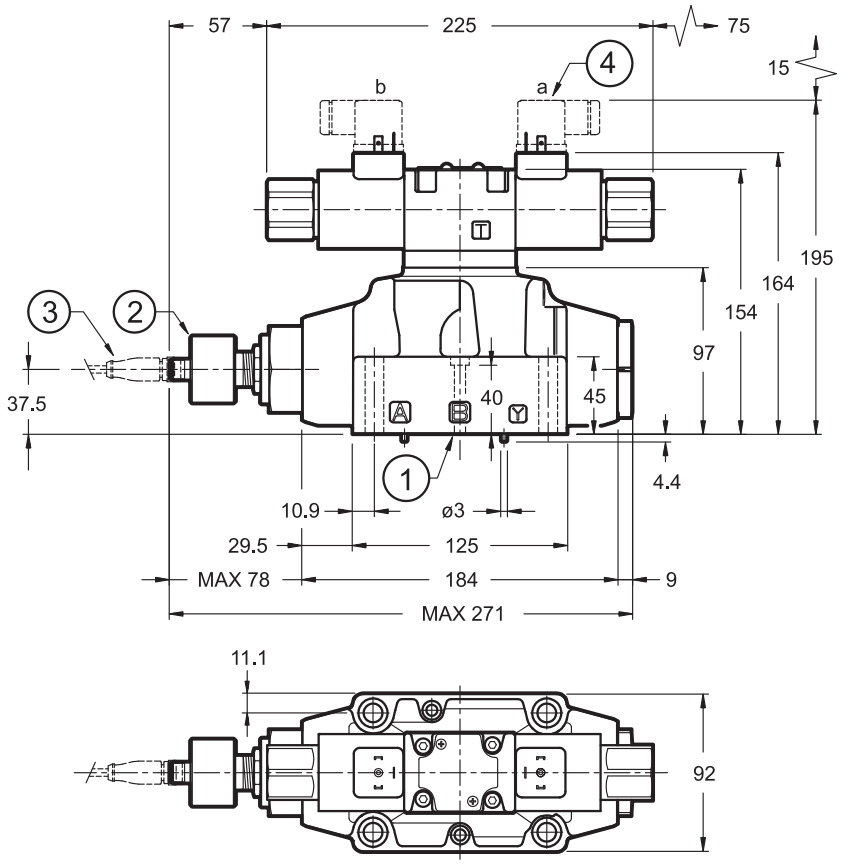
NOTE: for overall dimensions with Z option (fixed adjustment pressure reducing valve) see par. 12.

Fastening of single valve: 4 SHC screws ISO 4762 M10x60 2 SHC screws ISO 4762 M6x50
Tightening torque: M10x60: 40 Nm M6x50: 8 Nm
Threads of mounting holes: M6x18; M10x18
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	Positioning sensor : setting sealed at factory, do not unscrew.
3	Connector for positioning sensor type straight, molded. To be ordered separately, see paragraph 20
4	Coil electric connector DIN 43650 type - to be ordered separately cat. 49 000

dimensions in mm

DSP7M-RK



sensor type:
MA
MB

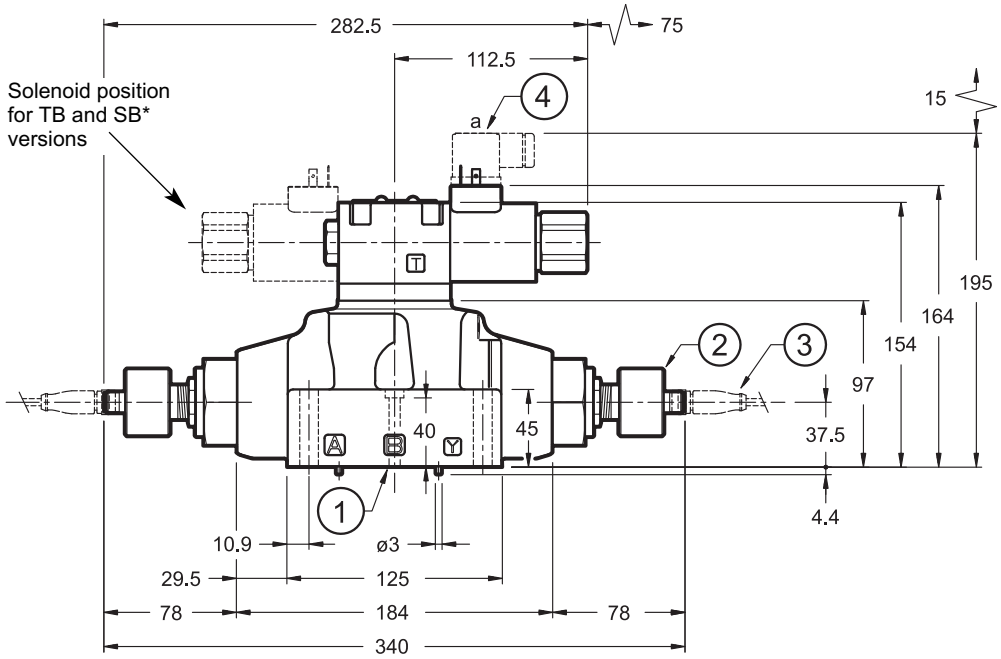
NOTE: for overall dimensions with Z option (fixed adjustment pressure reducing valve) see par. 12.

Fastening of single valve: 4 SHC screws ISO 4762 M10x60 2 SHC screws ISO 4762 M6x50
Tightening torque: M10x60: 40 Nm M6x50: 8 Nm
Threads of mounting holes: M6x18; M10x18
Sealing rings: 4 OR type 130 (22.22X2.62) - 90 Shore 2 OR type 2043 (10.82x1.78) - 90 Shore

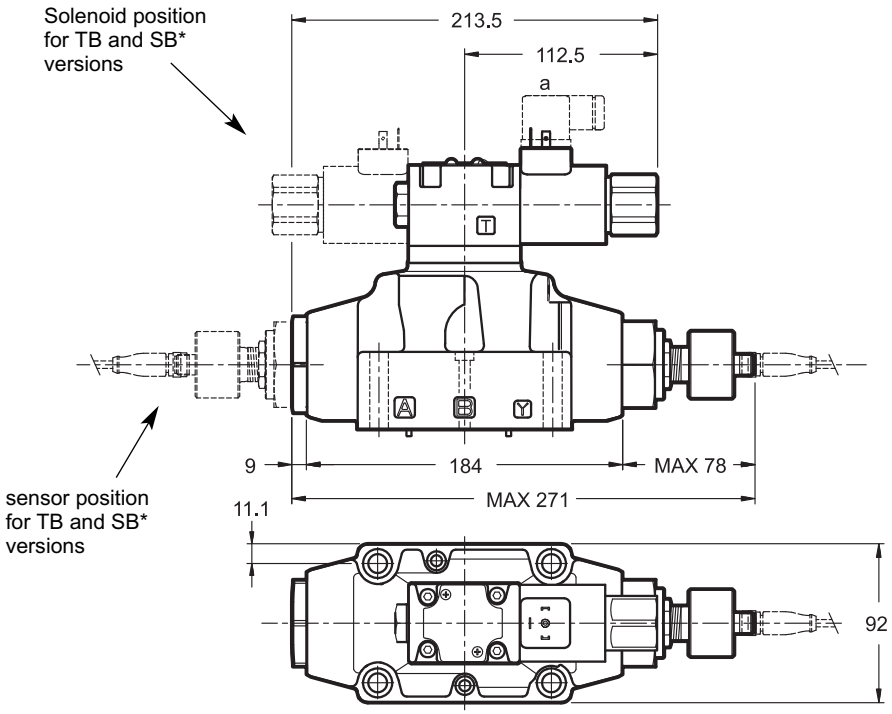
1	Mounting surface with sealing rings
2	Positioning sensor : setting sealed at factory, do not unscrew.
3	Connector for positioning sensor type straight, molded. To be ordered separately, see paragraph 20
4	Coil electric connector DIN 43650 type - to be ordered separately cat. 49 000

DSP7M-TA, TA100, SA1

dimensions in mm



sensor type:
MAB



sensor type:
MA
MB

NOTE: for overall dimensions with Z option (fixed adjustment pressure reducing valve) see par. 12.

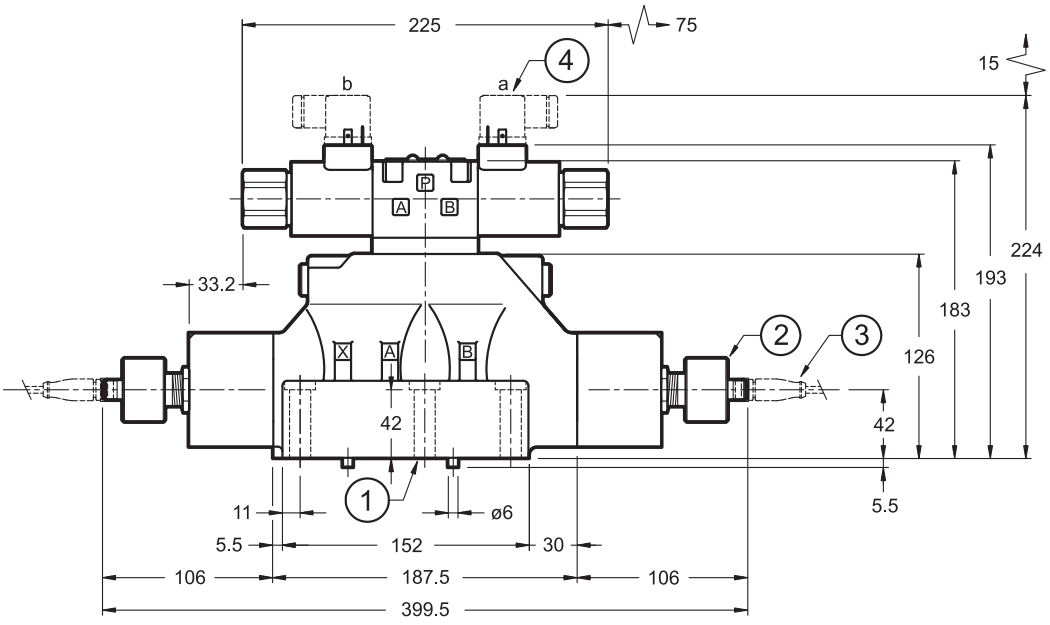
Fastening of single valve: 4 SHC screws ISO 4762 M10x60 2 SHC screws ISO 4762 M6x50
Tightening torque: M10x60: 40 Nm M6x50: 8 Nm
Threads of mounting holes: M6x18; M10x18
Sealing rings: 4 OR type 130 (22.22X2.62) - 90 Shore 2 OR type 2043 (10.82x1.78) - 90 Shore

1	Mounting surface with sealing rings
2	Positioning sensor : setting sealed at factory, do not unscrew.
3	Connector for positioning sensor type straight, molded. To be ordered separately, see paragraph 20
4	Coil electric connector DIN 43650 type - to be ordered separately cat. 49 000

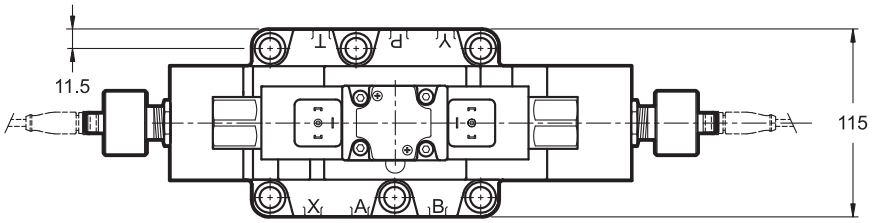
11 - DSP8M OVERALL AND MOUNTING DIMENSIONS

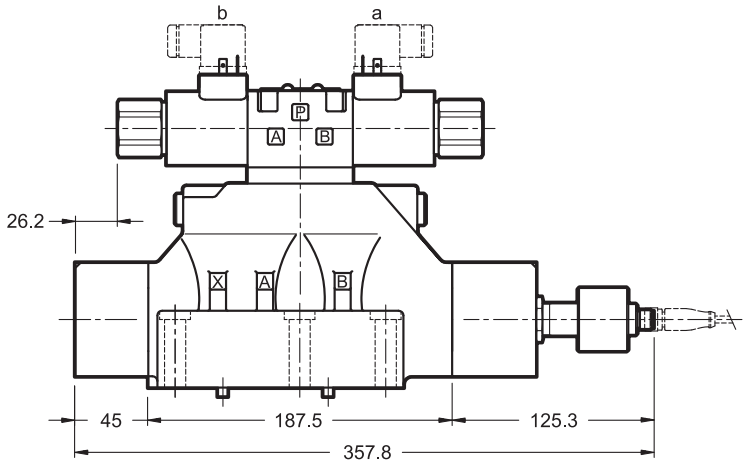
dimensions in mm

DSP8M-S*



sensor type:
M0
MAB





sensor type:
R0

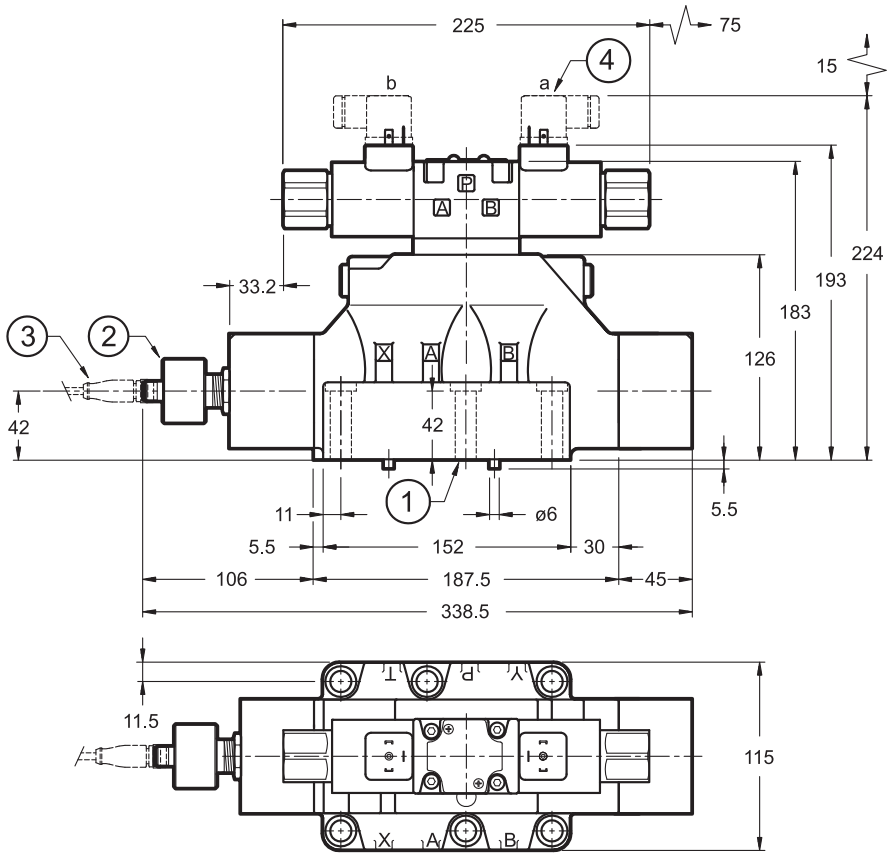
NOTE: for overall dimensions with Z option (fixed adjustment pressure reducing valve) see par. 12.

Fastening of single valve: 6 SHC screws ISO 4762 M12x60
Tightening torque: 69 Nm
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	Positioning sensor : setting sealed at factory, do not unscrew.
3	Connector for positioning sensor type straight, molded. To be ordered separately, see paragraph 20
4	Coil electric connector DIN 43650 type - to be ordered separately cat. 49 000

DSP8M-RK

dimensions in mm



sensor type:
M0
MAB

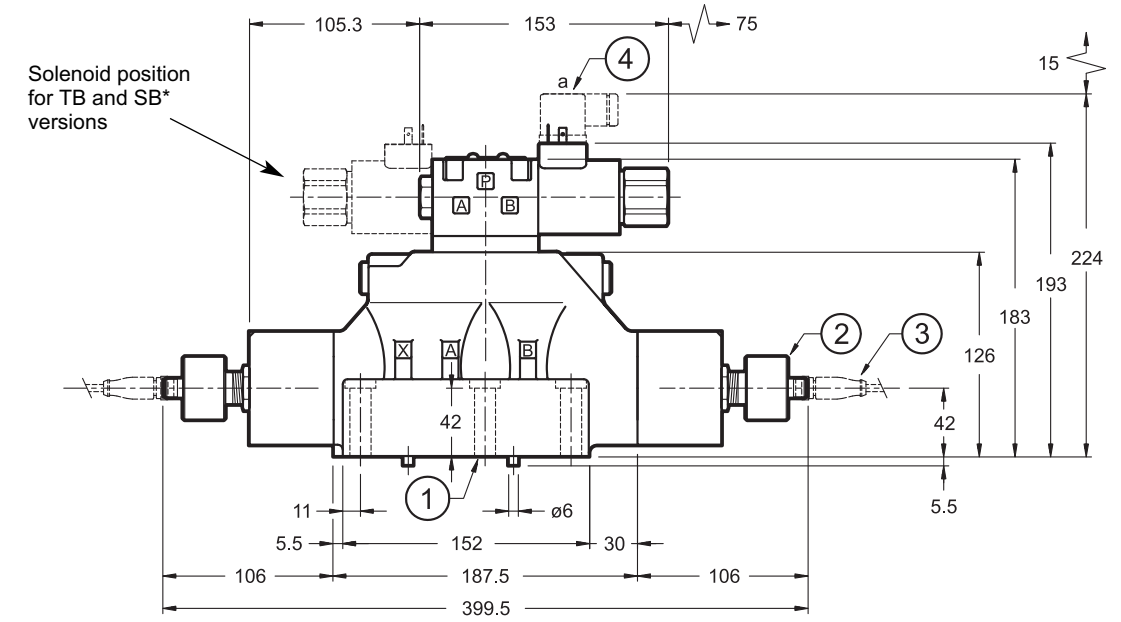
NOTE: for overall dimensions with Z option (fixed adjustment pressure reducing valve) see par. 12.

Fastening of single valve: 6 SHC screws ISO 4762 M12x60
Tightening torque: 69 Nm
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

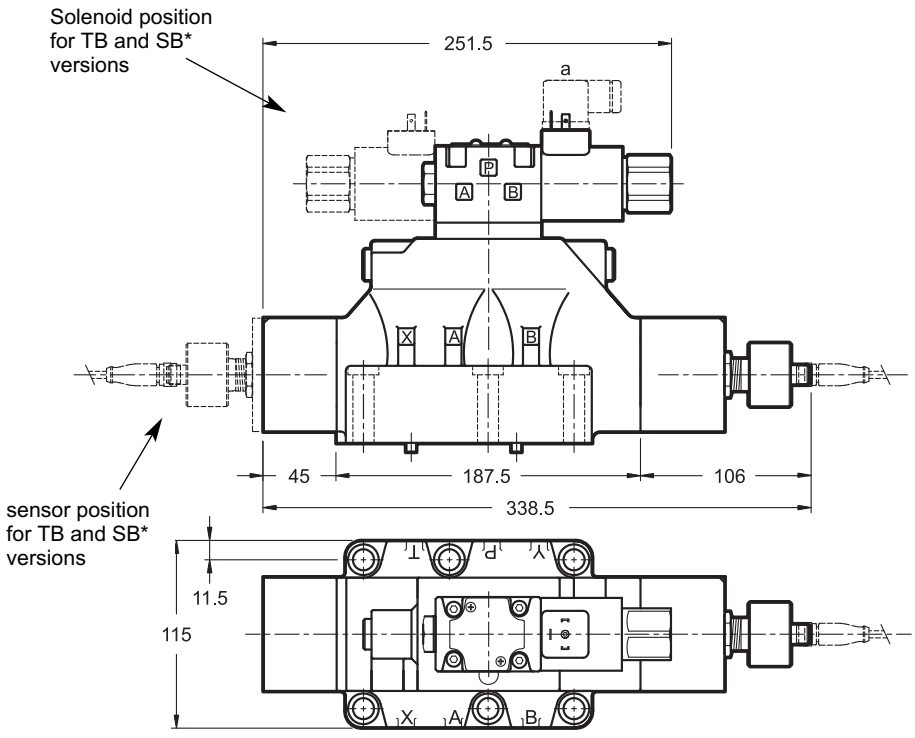
1	Mounting surface with sealing rings
2	Positioning sensor : setting sealed at factory, do not unscrew.
3	Connector for positioning sensor type straight, molded. To be ordered separately, see paragraph 20
4	Coil electric connector DIN 43650 type - to be ordered separately cat. 49 000

dimensions in mm

DSP8M-TA, TA100, SA1



sensor type:
MAB



sensor type:
MA
MB

NOTE: for overall dimensions with Z option (fixed adjustment pressure reducing valve) see par. 12.

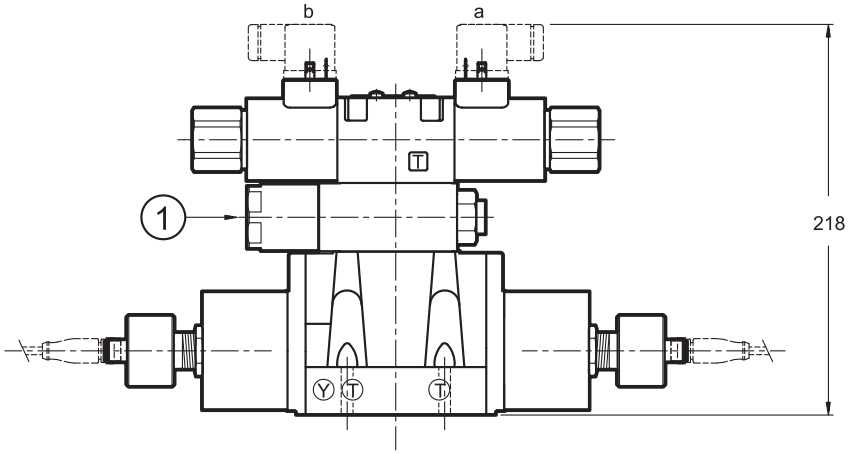
1	Mounting surface with sealing rings
2	Positioning sensor : setting sealed at factory, do not unscrew.
3	Connector for positioning sensor type straight, molded. To be ordered separately, see paragraph 20
4	Coil electric connector DIN 43650 type - to be ordered separately cat. 49 000

Fastening of single valve: 6 SHC screws ISO 4762 M12x60
Tightening torque: 69 Nm
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

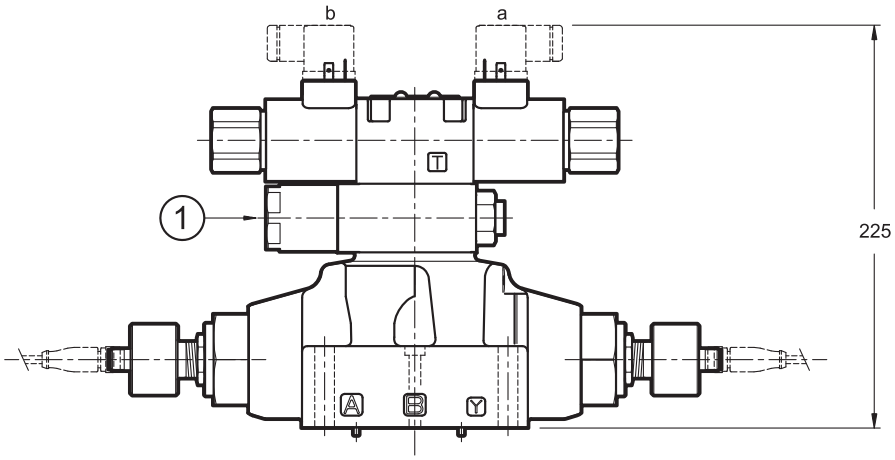
12 - DSP*M-*/*-Z*/* OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

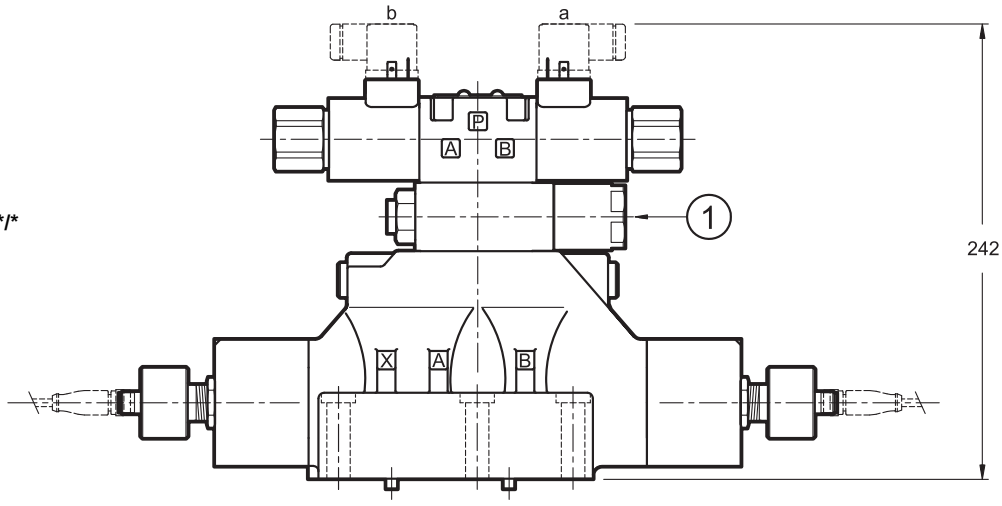
DSP5M-*/10*-Z*/*
DSP5RM-*/10*-Z*/*



DSP7M-*/20*-Z*/*



DSP8M-*/10*-Z*/*



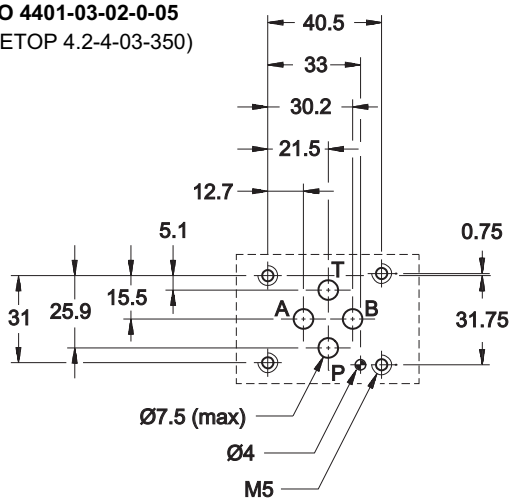
NOTE: for missing overall dimensions and characteristics see par. 9 - 10 - 11

1	30 bar fixed adjustment pressure reducing valve

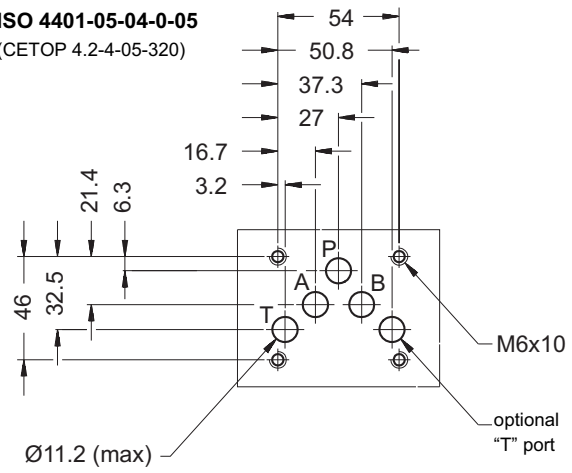
13 - MOUNTING SURFACES

13.1 - Direct operated valves

DS3M
ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)

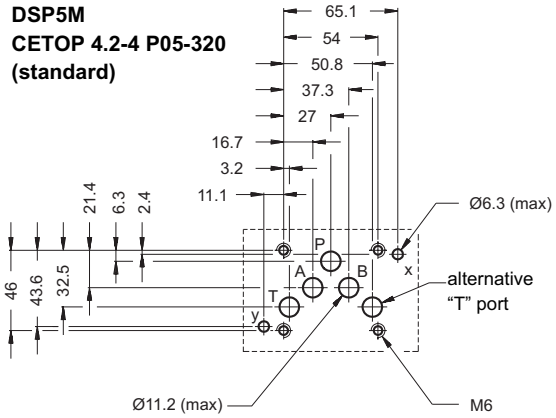


DS5M
ISO 4401-05-04-0-05
(CETOP 4.2-4-05-320)

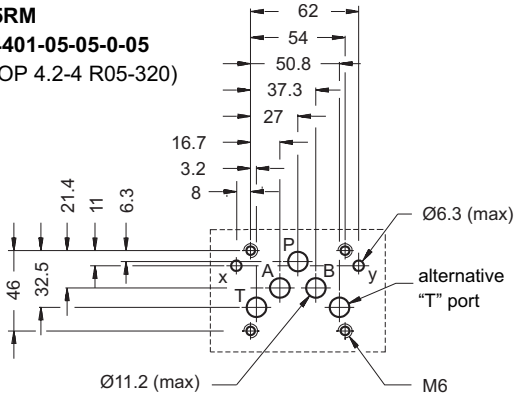


13.2 - Pilot operated valves

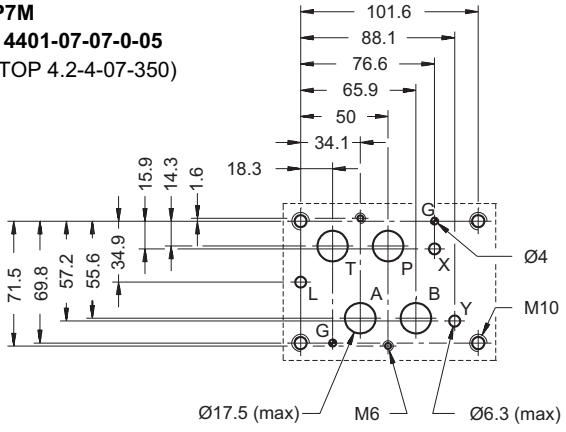
DSP5M
CETOP 4.2-4 P05-320
(standard)



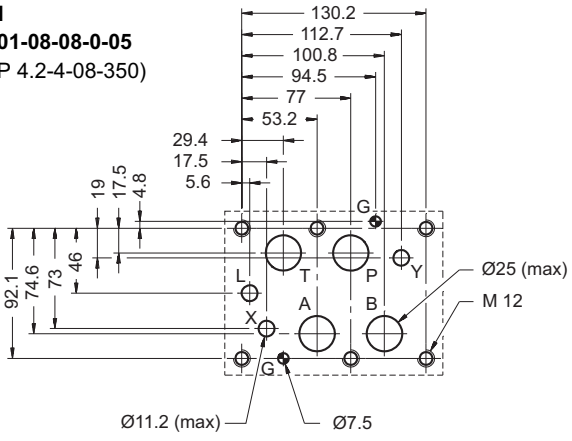
DSP5RM
ISO 4401-05-05-0-05
(CETOP 4.2-4 R05-320)



DSP7M
ISO 4401-07-07-0-05
(CETOP 4.2-4-07-350)



DSP8M
ISO 4401-08-08-0-05
(CETOP 4.2-4-08-350)



14 - ELECTRICAL FEATURES

14.1 - Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation.

The coil is fastened to the tube by a threaded ring, and can be rotated and locked to suit the available space.

NOTE 1 : In order to further reduce the emissions, use of type H connectors is recommended. These prevent voltage peaks on opening of the coil supply electrical circuit (see catalogue 49 000).

NOTE 2: The IP65 protection degree is guaranteed only with the connector correctly connected and installed.

VOLTAGE SUPPLY FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY DS3M DS5M DSP5M - DSP5RM DSP7M DSP8M	 15.000 ins/hr 13.000 ins/hr 5.000 ins/hr 5.000 ins/hr 4.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC) (NOTE 1)	In compliance with 2004/108/EC
LOW VOLTAGE	In compliance with 2006/95/EC
CLASS OF PROTECTION: Atmospheric agents (CEI EN 60529) Coil insulation (VDE 0580) Impregnation	 IP 65 (**NOTE 2**) class H class F

14.2 - Current and absorbed power

The tables shows current and power consumption values relevant to the different coil types for DC.

DS3M, DSP5M, DSP5RM, DSP7M and DSP8M (values ± 5%)

Suffix	Nominal voltage [V]	Resistance at 20°C [Ω]	Current consumpt. [A]	Power consumpt [W]	Coil code
D12	12	4,4	2,72	32,7	1903080
D24	24	18,6	1,29	31	1903081
D110	110	423	0,26	28,2	1903084
D220	220	1692	0,13	28,2	1903085

DS5M (values ± 5%)

Suffix	Nominal voltage [V]	Resistance at 20°C [Ω]	Current consumpt. [A]	Power consumpt [W]	Coil code
D12	12	3,2	3,75	45	1903200
D24	24	12	2	48	1903201
D110	110	250	0,44	48	1903204
D220	220	1050	0,21	47	1903205

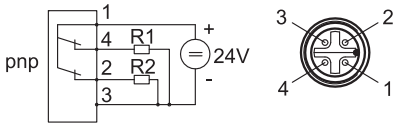
15 - COIL CONNECTORS

The solenoid operated valves are delivered without the connectors. They must be ordered separately.

For the identification of the connector type to be ordered, please see catalogue 49 000.

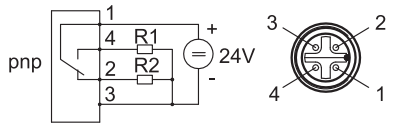
16 - POSITIONING SENSORS

R0 CONNECTION SCHEME



Pin	Values	Function
1	+24 V	Supply
2	NC	Normal Closed -
3	0 V	-
4	NC	Normal Closed +

M* CONNECTION SCHEME



Pin	Values	Function
1	+24 V	Supply
2	NC	Normal Closed
3	0 V	-
4	NO	Normal Open

NOTE: The M0 and MAB versions have two positioning sensors; consider that the connection scheme shown must be done for each sensor.

ELECTRICAL CHARACTERISTICS		
Operating voltage range	V DC	20 ÷ 32
Absorbed current	A	0.4
Max output load	mA	400
Output		2 PNP
Electric protections		polarity inversion short circuit
Hysteresis	mm	≤ 0.1
Operating temperature range	°C	-25 ÷ +80
Class of protection according to CEI EN 60529 standards (atmospheric agents)		IP65
EMC Electromagnetic compatibility		DIN EN 61000-6-1/2/3/4

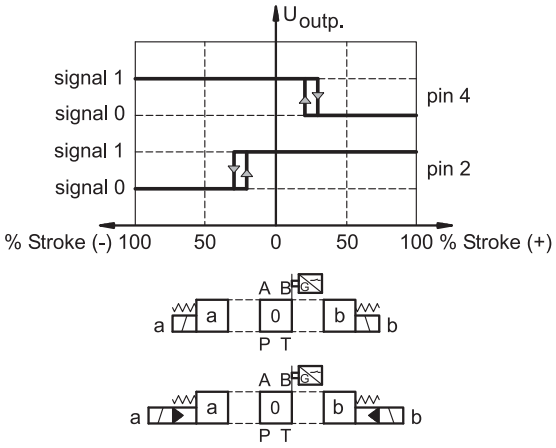
17 - SWITCHING LOGICS

Duplomatic offers a wide range of available positions to be monitored, and for the pilot operated valve there are even monitorning with redundant signal.

17.1 - R0 monitoring

Rest (middle) position monitored with one positioning sensor.

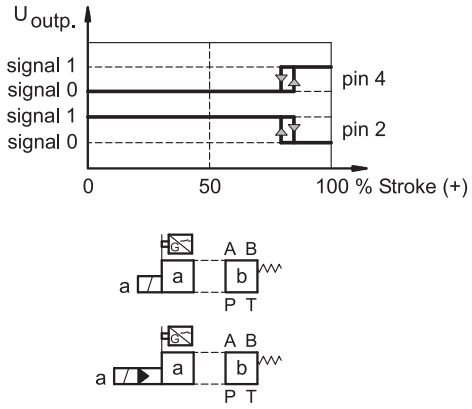
Available on both direct and pilot operated valves;
spool type S*



17.2 - MA monitoring

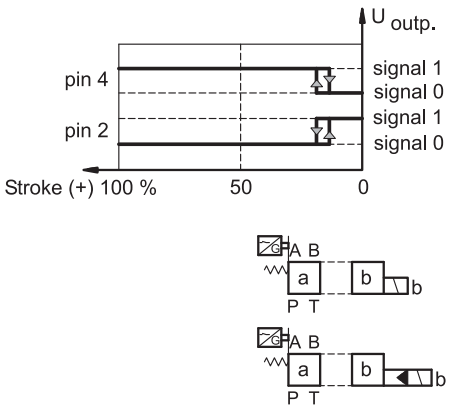
Energized position monitored with one positioning sensor.

Available on both direct and pilot operated valves;
spool type SA*, TA, TA02, TA100



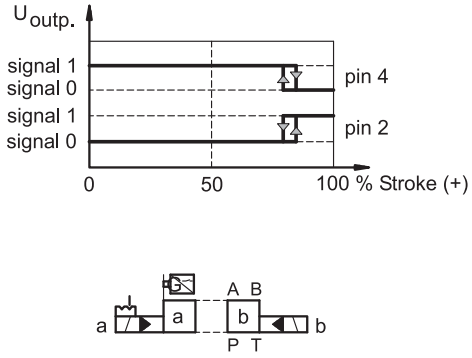
De-energized position monitored with one positioning sensor.

Available on both direct and pilot operated valves;
spool type SB*, TB, TB02, TB100



Position ‘a’ monitored with one positioning sensor.

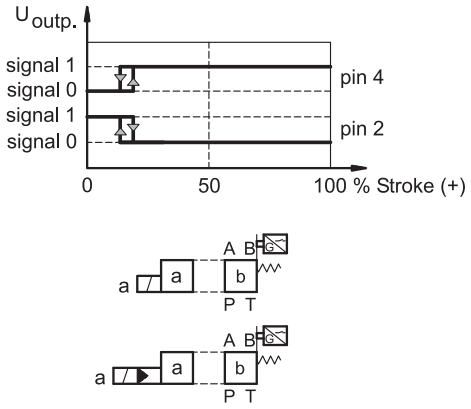
Available on pilot operated valves only;
spool type RK



17.3 - MB monitoring

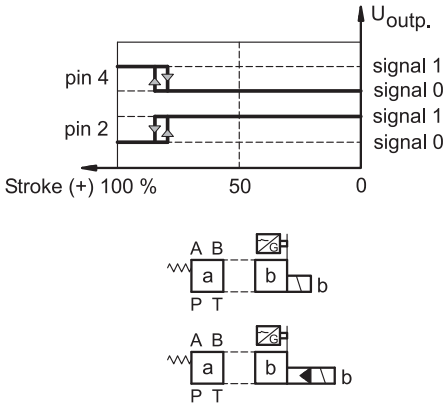
De-energized position monitored with one positioning sensor.

Available on both direct and pilot operated valves;
spool type SA*, TA, TA02, TA100



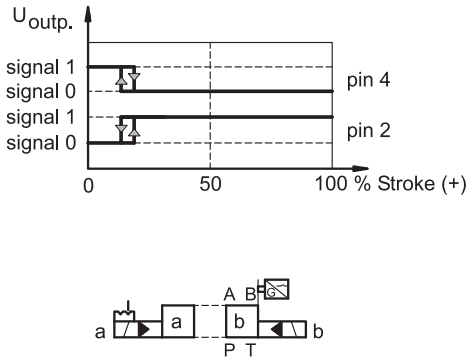
Energized position monitored with one positioning sensor.

Available on both direct and pilot operated valves;
spool type SB*, TB, TB02, TB100



Position 'b' monitored with one positioning sensor.

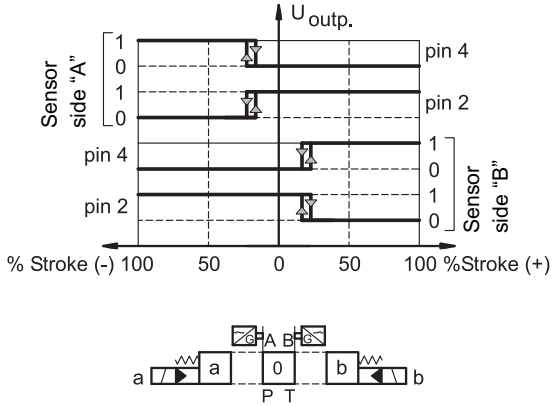
Available on pilot operated valves only;
spool type RK



17.4 - M0 monitoring

Rest (middle) position monitored by two separate positioning sensors.

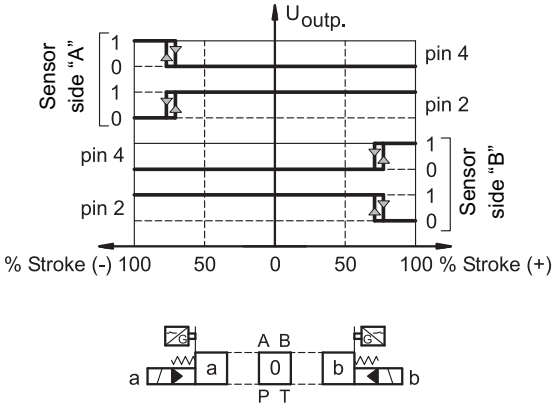
Available on pilot operated valves only;
spool type S*



17.5 - MAB monitoring

Both external positions monitored by two separate positioning sensors.

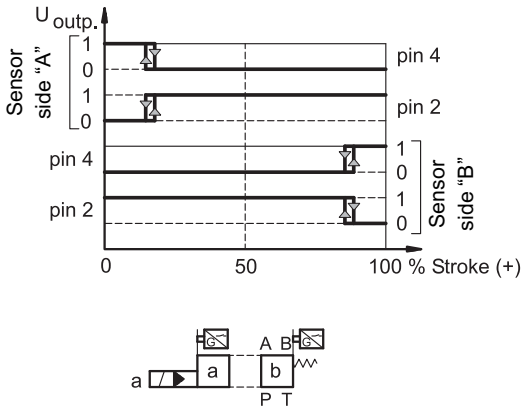
Available on pilot operated valves only;
spool type S*



De-energized position monitored on side A.

Energized position monitored on side B.

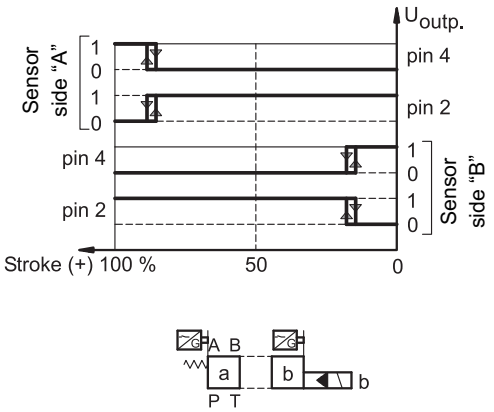
Available on pilot operated valves only;
spool type SA1, TA, TA100



Energized position monitored on side A.

De-energized position monitored on side B.

Available on pilot operated valves only;
spool type SB1, TB, TB100



18 - HYDRAULIC FLUIDS

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

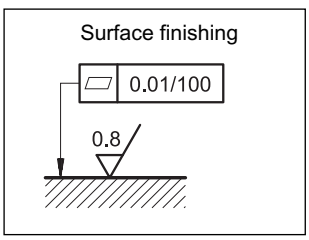
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

19 - INSTALLATION

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.

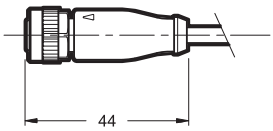


20 - SENSOR CONNECTORS

The female connectors for position switches can be ordered separately, by specifying the descriptions here below, depending on the desired type.

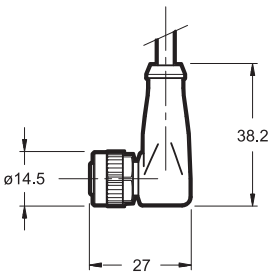
STRAIGHT CONNECTOR, MOLDED CABLE, PRE-WIRED
description: ECM4S/M12L/10

Protection class: IP68
Cable: with 4 conductors 0.34 mm^2 - length 5 mt - Ø 4.7 mm
Cable material: polyurethane resin (oil resistant)
Without LED.



ANGLED CONNECTOR, MOLDED CABLE, PRE-WIRED
description: ECM4S/M12S/10

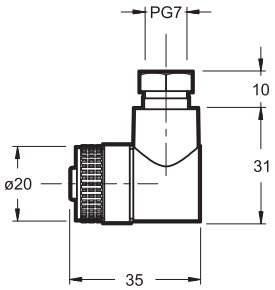
Protection class: IP68
Cable: with 4 conductors 0.34 mm^2 - length 5 mt - Ø 4.7 mm
Cable material: polyurethane resin (oil resistant)
Without LED.



ANGLED CONNECTOR, UNASSEMBLED
Circular connector with screw locking; strain relief by means of clamping cage.

description: EC4S/M12S/10

Protection class: IP67
IEC 61076-2-101 (Ed. 1)/ IEC 60947-5-2
Conductor size: max 0.75 mm^2
Cable gland: PG7 - suitable cables: 4 ÷ 6 mm^2
Case material: polyamide (nylon)
Without LED.



21 - SUBPLATES (see catalogue 51 000)

	DS3M	DS5M	DSP5M	DSP7M	DSP8M
Type with rear ports	PMMD-AI3G	PMD4-AI4G	PME4-AI5G	PME07-AI6G	
Type with side ports	PMMD-AL3G	PMD4-AL4G	PME4-AL5G	PME07-AL6G	PME5-AL8G
P, T, A, B ports dimensions	3/8" BSP	3/4" BSP (PMD4-AI4G) 1/2" BSP (PMD4-AL4G)	3/4" BSP	1" BSP	1 ½" BSP
X, Y ports dimensions	-	-	1/4" BSP	1/4" BSP	1/4" BSP

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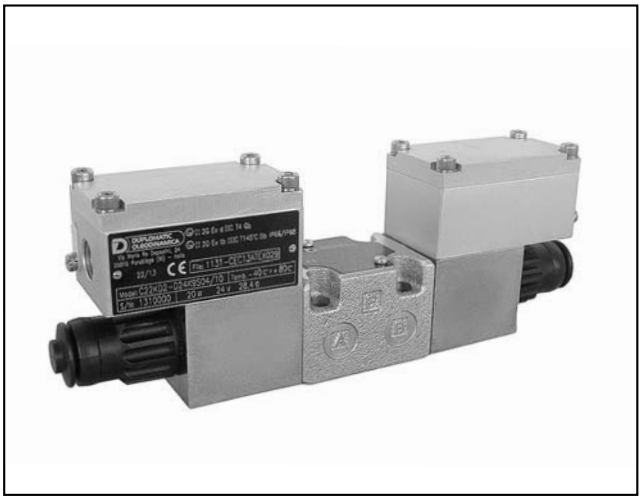


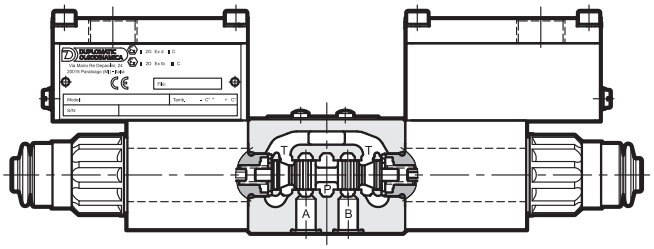
DS(P)*KD2

EXPLOSION-PROOF SOLENOID OPERATED DIRECTIONAL CONTROL VALVES in compliance with ATEX 94/9/EC

DS3KD2 **ISO 4401-03** (CETOP 03)

DSP5KD2 **CETOP P05**
DSP5RKD2 **ISO 4401-05** (CETOP R05)
DSP7KD2 **ISO 4401-07** (CETOP 07)
DSP8KD2 **ISO 4401-08** (CETOP 08)
DSP10KD2 **ISO 4401-10** (CETOP 10)

OPERATING PRINCIPLE



TYPE EXAMINATION CERTIFICATE NUMBER: 1131-CEC 13 ATEX 030

— The solenoid operated directional control valves 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 upmentioned standards is always supplied.

— The DS3KD2 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 DSP*KD2 valves, this treatment is available upon request.

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

		DS3KD2	DSP5KD2 DSP5RKD2	DSP7KD2	DSP8KD2	DSP10KD2
Maximum operating pressure P - A - B ports T port	bar	350 210	320 see operating limits at paragraph 7.2	350	350	350
Maximum flow from P port to A - B - T	l/min	see operating limits at paragraph 2.2	150	300	600	1100
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 20/18/15				
Recommended viscosity	cSt	25				
Mass single solenoid valve double solenoid valve	kg	1,8 2,8	6,8 7,8	8,6 9,6	15,5 16,5	52 53

1 - IDENTIFICATION OF DIRECT OPERATED SOLENOID VALVES DS3KD2

1.1 - Identification code

D	S	3	KD2	-		/	10		-		K9		/	

Direct operated solenoid valve

Size ISO 4401-03 (CETOP 03)

Explosion-proof version, according to ATEX - II 2GD for gas or for dust (protection type of the coil: “d”)

Spool type (see par. 1.2)

S*	**TA**	**TB**	**RK**
SA*	**TA02**	**TB02**	
SB*	**TA23**	**TB23**	

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)

Power supply

D12 = 12 V
D24 = 24 V
D48 = 48 V
D110 = 110 V
} continuous current (DC)

R120 = 120 V
R240 = 240 V
} rectified current (RAC)

Coil electrical connection:
electrical connection by terminal block

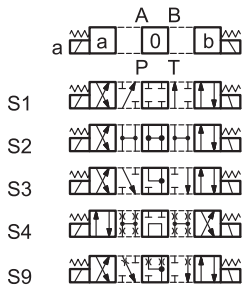
Connection type for cable gland
Available for upper connection:
T01 = M20x1.5 - ISO 261
T02 = Gk 1/2 - UNI EN 10226-2
T03 = 1/2” NPT - ANSI B1.20.1 (ex ANSI B2.1)
Available for side connection:
S04 = M16x1.5 - ISO 261 (only for power supply D24)
S01 = M20x1.5 - ISO 261 (available upon request only)

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)
CH = lever manual override
For dimension details of CB and CH versions, see paragraph 16

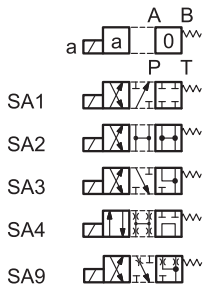
NOTE: zinc-nickel standard finishing surface treatment.

1.2 - Available spools

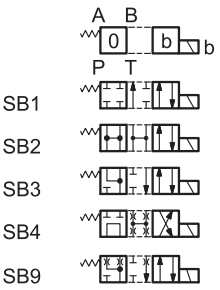
Version **S***:
2 solenoids - 3 positions
with spring centering



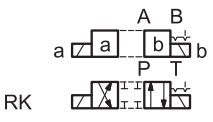
Version **SA***:
1 solenoid side A
2 positions (central + external)
with spring centering



Version **SB***:
1 solenoid side B
2 positions (central + external)
with spring centering

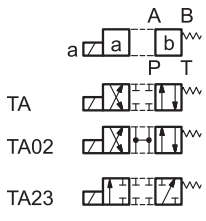


Version **RK**:
2 solenoids - 2 positions
with mechanical retention

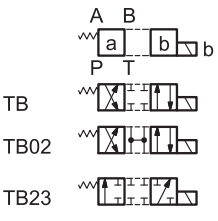


NOTE: TA02/TB02 spool is not available for RAC solenoid valves.

Version **TA**:
1 solenoid side A
2 external positions
with return spring

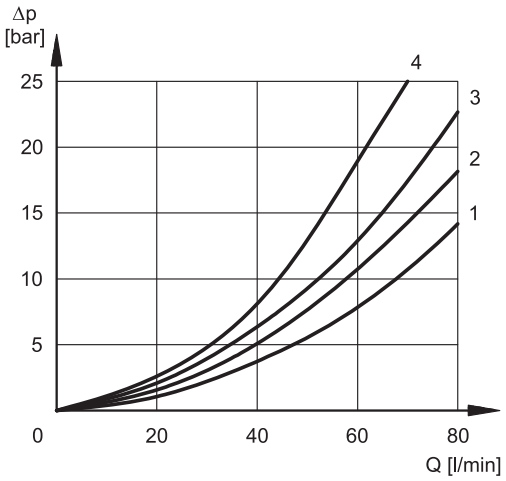


Version **TB**:
1 solenoid side B
2 external positions
with return spring



2 - CHARACTERISTIC CURVES AND PERFORMANCES OF DIRECT OPERATED SOLENOID VALVES DS3KD2

2.1 - Pressure drops Δp-Q (with mineral oil of viscosity of 36 cSt at 50°C)



PRESSURE DROPS WITH VALVE IN ENERGIZED POSITION

SPOOL	FLOW DIRECTION			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPH			
S1, SA1, SB2	2	2	3	3
S2, SA2, SB2	1	1	3	3
S3, SA3, SB3	3	3	1	1
S4, SA4, SB4	4	4	4	4
S9, SA9, SB9	2	2	3	3
TA, TB	3	3	3	3
TA02, TB02	2	2	2	2
TA23, TB23	3	3		
RK	2	2	2	2

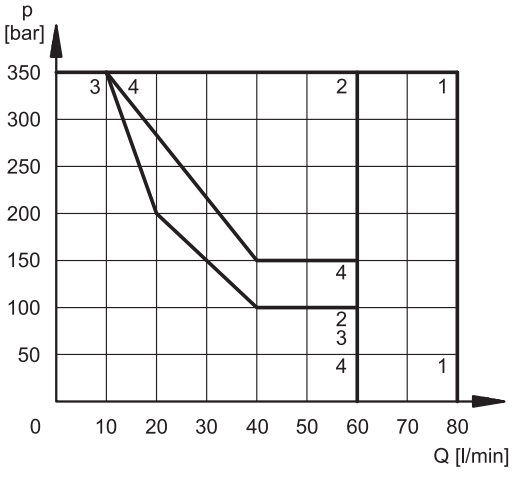
PRESSURE DROPS WITH VALVE IN DE-ENERGIZED POSITION

SPOOL	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S2, SA2, SB2	-	-	-	-	2
S3, SA3, SB3	-	-	3	3	-
S4, SA4, SB4	-	-	-	-	3

2.2 - Performance limits

The curves define the flow rate operating fields according to the valve pressure of the different versions. The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage. The value have been obtained with mineral oil, viscosity 36 cSt, temperature 50 °C and filtration according to ISO 4406:1999 class 18/16/13.

The operating limits can be considerably reduced if a 4-way valve is used as 3-way valve with port A or B plugged or without flow.



DC SOLENOID VALVE

SPOOL	CURVE	
	P→A	P→B
S1,SA1,SB1	1	1
S2, SA2, SB2	2	2
S3, SA3, SB3	3	3
S4, SA4, SB4	2	2
S9, SA9, SB9	1	1
TA, TB	1	1
TA02, TB02	4	4
TA23, TB23	4	4
RK	1	1

RAC SOLENOID VALVE

SPOOL	CURVE	
	P→A	P→B
S1,SA1,SB1	1	1
S2, SA2, SB2	2	2
S3, SA3, SB3	3	3
S4, SA4, SB4	4	4
S9, SA9, SB9	1	1
TA, TB	1	1
TA02, TB02 *		
TA23, TB23	4	4
RK	1	1

* not available

2.3 - Switching times

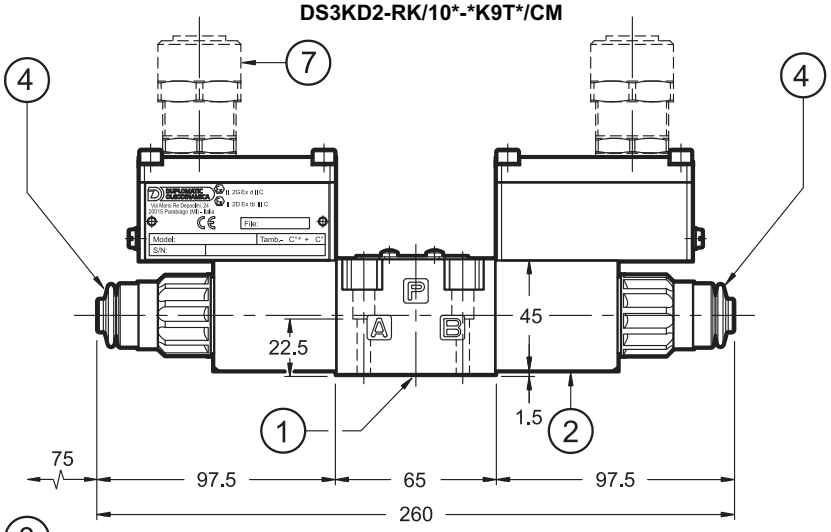
The values indicated are obtained according to ISO 6403 standard, with mineral oil viscosity 36 cSt at 50°C.

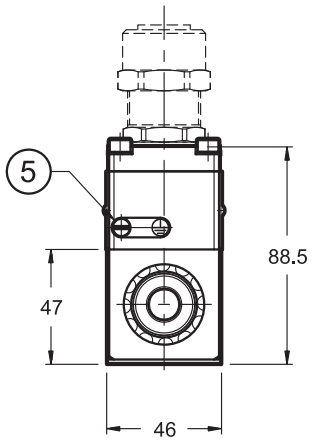
TIMES [ms]	ENERGIZING	DE-ENERGIZING
DC	60	40
RAC	60	140

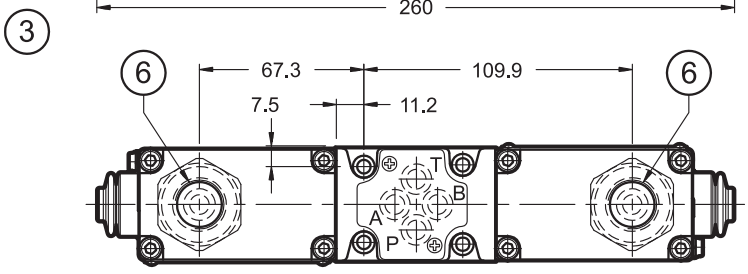
3 - DS3KD2 OVERALL AND MOUNTING DIMENSIONS

DS3KD2-S*/10*-*K9T*/CM
DS3KD2-RK/10*-*K9T*/CM

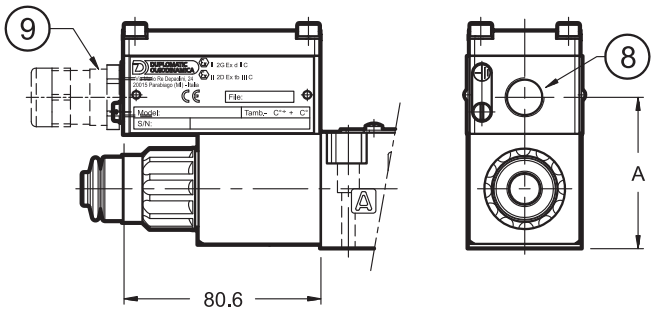
dimensions in mm



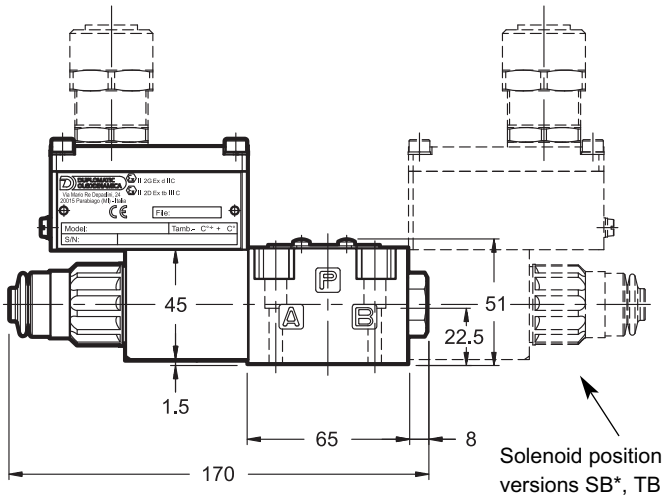




DS3KD2-*/10*-*K9S*/CM



DS3KD2-SA*/10*-*K9T*/CM
DS3KD2-TA/10*-*K9T*/CM
DS3KD2-TA*/10*-*K9T*/CM



Solenoid position for versions SB*, TB and TB*

Side port type	Dimension A
S01	60.5
S04	61.5

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. 16
5	Terminal for supplementary earth connection
6	Upper port for cable gland
7	Cable gland (upper port shown). To be ordered separately, see paragraph 17
8	Side port for cable gland
9	Cable gland (side port shown). To be ordered separately, see paragraph 17

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 d" type protection (explosion-proof coil).**

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class. The R* coils (for alternating current supply) contain a built-in rectifier bridge.

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: "d" 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%)

Coil type	Nominal voltage [V]	Resistance at 20°C [Ω]	Current consumpt. [A]	Power consumpt. [W]
D12	12	7,2	1,7	20
D24	24	28,7	0,83	20
D48	48	115	0,42	20
D110	110	549	0,2	22

Coil type	Nominal voltage [V]	Freq. [Hz]	Resistance at 20°C [Ω]	Current consumpt. [A]	Power consumpt. [VA]
R120	110V-50Hz 120V-60Hz	50/60	489,6	0,19	21
				0,21	25
R240	230V-50Hz 240V-60Hz		2067,7	0,098	22,5
				0,1	24

VOLTAGE SUPPLY FLUCTUATION (ripple included)	± 10% Vnom
MAX SWITCH ON FREQUENCY DS3KD2 DSP5KD2 - DSP5RKD2 DSP7KD2 DSP8KD2 DSP10KD2	 8.000 ins/hr 6.000 ins/hr 6.000 ins/hr 4.000 ins/hr 3.000 ins/hr
DUTY CYCLE	100%
EXPLOSION-PROOF VERSION	According to ATEX 94/9/EC
ELECTROMAGNETIC COMPATIBILITY (EMC) (NOTE)	According to 2004/108/EC
CLASS OF PROTECTION: Atmospheric agents Coil insulation (VDE 0580)	 IP66 / IP68 class H

NOTE: type R* coils are for alternating current supply for both 50 or 60 Hz.
NOTE 1: for R* coils the resistance can not be measured in the usual way because of the presence of diodes bridge inside the coil.

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.

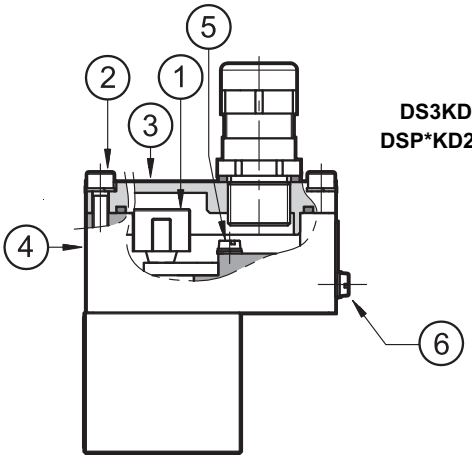
The electrical connection is polarity-independent.

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.

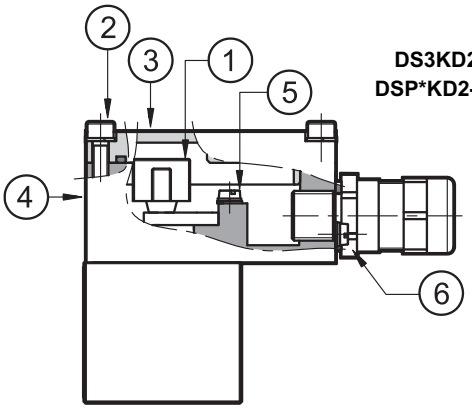
On the external body of the coil there is a grounding point (6) (M4 screw) that allow to ensure equipotentiality between the valve and the general grounding line of the system; connecting this point the regulation of the EN 13463-1 standard, that impose to verify the equipotentiality of the elements included in a potentially explosive environment (the maximum resistance between the elements must be 100 Ω), is guaranteed.

At the end of the electrical wiring, it is necessary to reassemble the cover (3) on the box (4), checking the correct positioning of the seal located in the cover seat and fastening the 4 M5 screws with a torque of 4.9÷6 Nm.

Electrical wiring must be done following the instructions of the rules in compliance with ATEX standards.



DS3KD2-*/10*-*K9T*/*
DSP*KD2-*/10*-*/*/*K9T*/*



DS3KD2-*/10*-*K9S*/*
DSP*KD2-*/10*-*/*/*K9S*/*

Characteristics of the cables connectable for wiring are indicated in the table below:

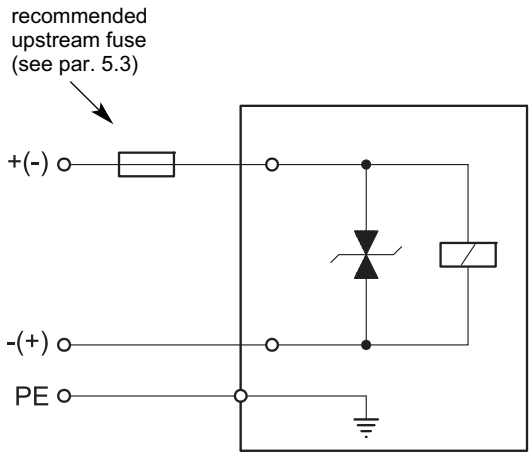
Function	Cable section
Operating voltage cables connection	max 2.5 mm²
Connection for internal grounding point	max 2.5 mm²
Connection for external equipotential grounding point	max 6 mm²

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).

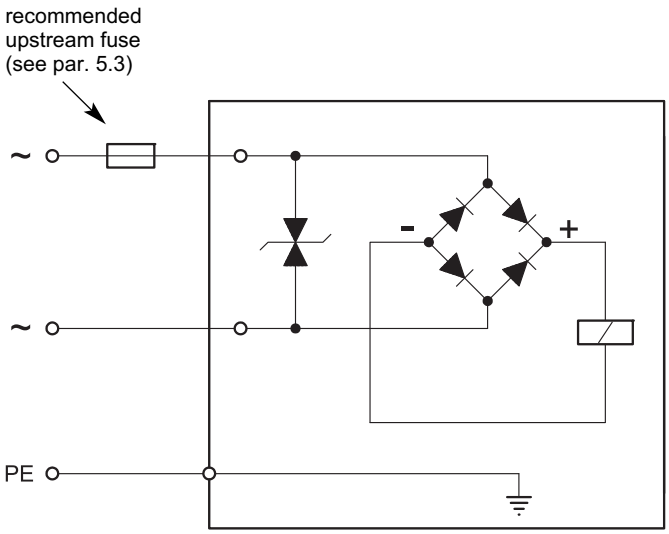
Cable glands (which must be ordered separately, see paragraph 17) allow to use cables with external diameter between 8 and 10 mm.

5.2 - Electrical diagrams

DC coil



RAC coil



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.

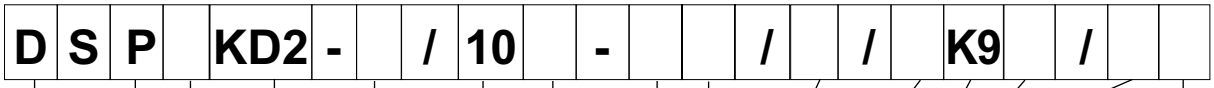
In order to safeguard the electronic device to which the valve is connected, there is a protection circuit in the coil, that reduces voltage peaks, which can occur when inductances are switched off.

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	1,7	2,5	- 49	Transient voltage suppressor bidirectional
D24	24	0,83	1,25	- 49	
D48	48	0,42	0,6	- 81	
D110	110	0,2	0,3	- 309	
R120	120	0,21	0,3	- 3	
R240	240	0,1	0,15	- 3	

6 - IDENTIFICATION OF PILOT OPERATED SOLENOID VALVES DSP*KD2

6.1 - Identification code



Pilot operated directional valve

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: “d”)

Spool type (see par. 6.2)
S* **TA** **TB** **RK**
SA* **TA02** **TB02**
SB*

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 (not available for spools S2 - S4 - TA02 - TB02- S*2 - S*4. If interal piloting should be necessary, choose piloting type C)
E = external
C = internal piloting with backpressure valve (available on DSP7 and DSP8)
Z = internal piloting with 30 bar fixed adjustment pressure reducing valve

Drainage:
I = Internal
E = External

Option: surface treatment not standard. Omit if not required (see **NOTE 1**)

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 16

Connection type for cable gland
Available for upper connection:
T01 = M20x1.5 - ISO 261
T02 = Gk 1/2 - UNI EN 10226-2
T03 = 1/2” NPT - ANSI B1.20.1 (ex ANSI B2.1)
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

Power supply:
D12 = 12 V
D24 = 24 V
D48 = 48 V
D110 = 110 V
} continuous current (DC)

R120 = 120 V
R240 = 240 V
} rectified current (RAC)

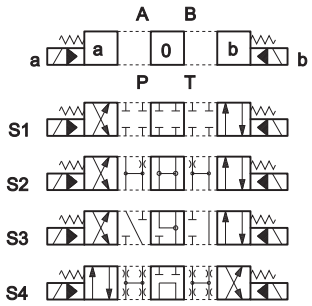
Options:
C = main spool stroke control
D = main spool shifting speed control
P08 = Subplate with restrictor Ø 0,8 on port P placed under the solenoid valve - for valves DSP5 - DSP5R - DSP7 - DSP8
P15 = subplate with restrictor Ø 1,5 on port P placed under the solenoid valve - only for valves DSP10

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.

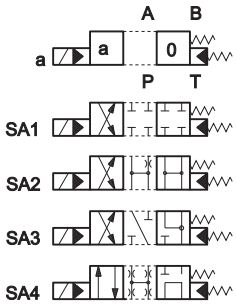
It is available, upon request, except for DSP5RKD2 and DSP10KD2 valve, the version suitable for an operating pressure value of 420 bar on ports P - A - B. For this version the maximum pressure values on port T with external drainage and the piloting pressure can be equal to 350 bar. The maximum pressure on port T with internal drainage is 140 bar. Add the suffix **H** to request this version (ex. DSP5**H**KD2).

6.2 - Spool types

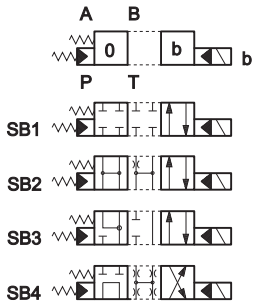
Version **S***:
2 solenoids - 3 positions
with spring centering



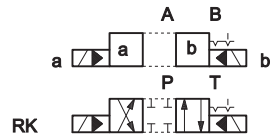
Version **SA***:
1 solenoid side A
2 positions (central + external)
with spring centering



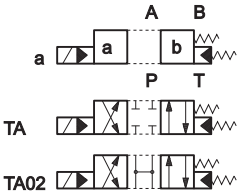
Version **SB***:
1 solenoid side B
2 positions (central + external)
with spring centering



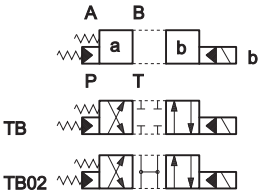
Version **RK**:
2 solenoids - 2 positions
with mechanical retention



Version **TA**:
1 solenoid side A
2 external positions
with return spring



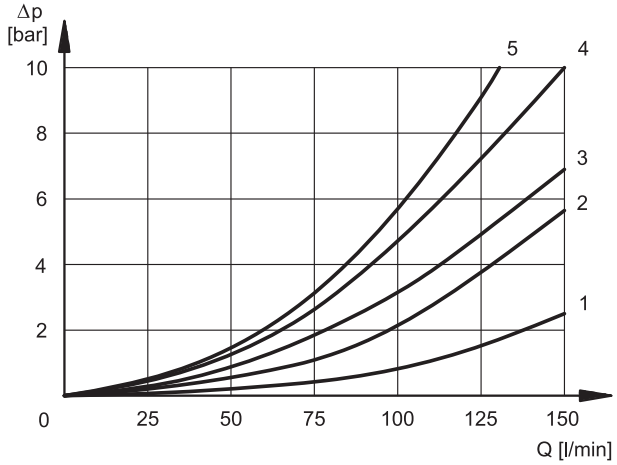
Version **TB**:
1 solenoid side B
2 external positions
with return spring



7 - CHARACTERISTIC CURVES AND PERFORMANCES OF PILOT OPERATED SOLENOID VALVES DSP*KD2

7.1 - Pressure drops Δp-Q (values obtained with viscosity 36 cSt at 50 °C)

DSP5KD2 - DSP5RKD2



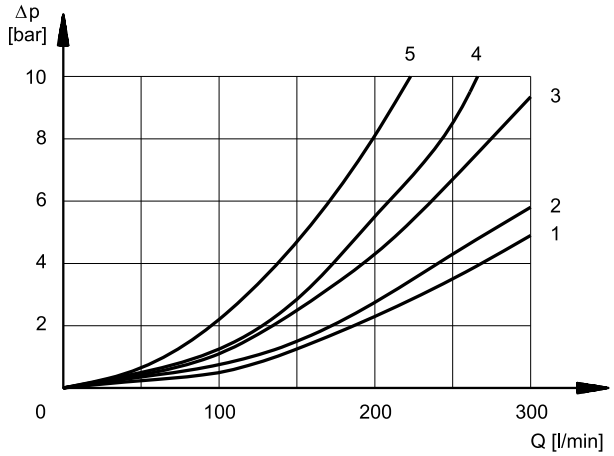
PRESSURE DROPS WITH VALVE IN ENERGIZED POSITION

SPOOL	FLOW DIRECTION			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPH			
S1, SA1, SB1	4	4	1	1
S2, SA2, SB2	3	3	1	2
S3, SA3, SB3	4	4	1	1
S4, SA4, SB4	5	5	2	3
TA, TB	4	4	1	1
TA02, TB02	3	3	1	1
RK	4	4	1	1

PRESSURE DROPS WITH VALVE IN DE-ENERGIZED POSITION

SPOOL	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S2, SA2, SB2	-	-	-	-	5
S3, SA3, SB3	-	-	4	4	-
S4, SA4, SB4	-	-	-	-	5

DSP7KD2



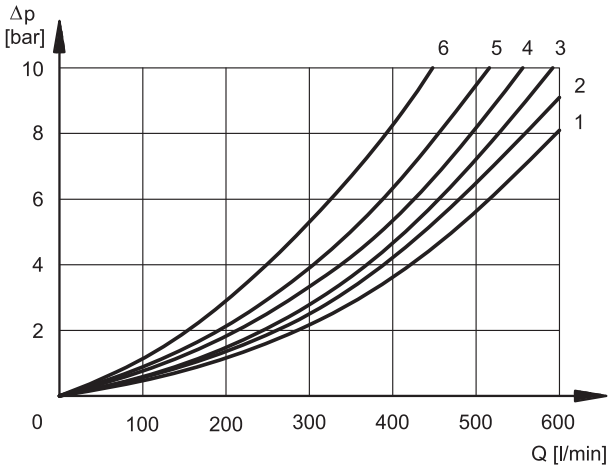
PRESSURE DROPS WITH VALVE IN ENERGIZED POSITION

SPOOL	FLOW DIRECTION			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPH			
S1, SA1, SB1	1	1	3	4
S2, SA2, SB2	1	1	4	4
S3, SA3, SB3	1	1	4	4
S4, SA4, SB4	2	2	4	5
TA, TB	1	1	3	4
TA02, TB02	1	1	4	4
RK	1	1	3	4

PRESSURE DROPS WITH VALVE IN DE-ENERGIZED POSITION

SPOOL	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S2, SA2, SB2	-	-	-	-	2
S3, SA3, SB3	-	-	4	4	-
S4, SA4, SB4	-	-	-	-	4

DSP8KD2



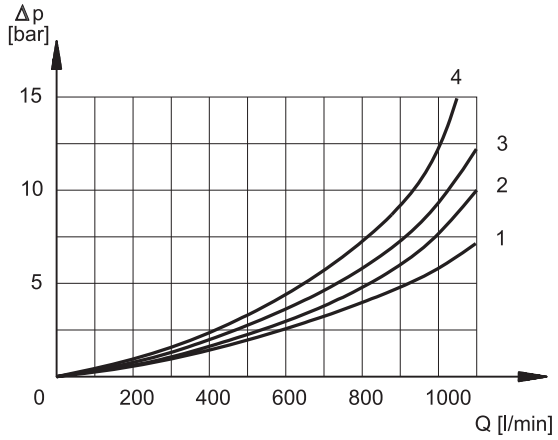
PRESSURE DROPS WITH VALVE IN ENERGIZED POSITION

SPOOL	FLOW DIRECTION			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPH			
S1, SA1, SB1	2	2	3	3
S2, SA2, SB2	1	1	2	1
S3, SA3, SB3	2	2	2	1
S4, SA4, SB4	4	4	3	5
TA, TB	2	2	3	3
TA02, TB02	2	2	3	3
RK	2	2	3	3

PRESSURE DROPS WITH VALVE IN DE-ENERGIZED POSITION

SPOOL	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S2, SA2, SB2	-	-	-	-	4
S3, SA3, SB3	-	-	4	4	-
S4, SA4, SB4	-	-	-	-	6

DSP10KD2



PRESSURE DROPS WITH VALVE IN ENERGIZED POSITION

SPOOL	FLOW DIRECTION			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPH			
S1, SA1, SB1	1	1	1	1
S2, SA2, SB2	2	2	2	2
S3, SA3, SB3	1	1	4	4
S4, SA4, SB4	2	2	2	2
TA, TB	1	1	1	1
TA02, TB02	1	1	1	1
RK	1	1	1	1

PRESSURE DROPS WITH VALVE IN DE-ENERGIZED POSITION

SPOOL	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S2, SA2, SB2	-	-	-	-	3
S3, SA3, SB3	-	-	4	4	-
S4, SA4, SB4	-	-	-	-	4

7.2 - Performance limits

PRESSURES	DSP5KD2 DSP5RKD2	DSP7KD2	DSP8KD2	DSP10KD2
Max pressure in P, A, B ports	320	350	350	350
Max pressure in T line with internal drainage	140	140	140	140
Max pressure in T line with external drainage	210	210	210	210
Min piloting pressure **NOTE 1**	5 ÷ 10	5 ÷ 12	7 ÷ 14	6 ÷ 12
Max piloting pressure **NOTE 2**	210	210	210	210

NOTE 1: minimum piloting pressure can be the lower range value at low flows rates, but with higher flow rates the higher value is needed.

NOTE 2: if the 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.

MAXIMUM FLOW RATES		DSP5KD2 DSP5RKD2		DSP7KD2		DSP8KD2		DSP10KD2	
Spool type		PRESSURES							
		at 210 bar	at 320 bar	at 210 bar	at 350 bar	at 210 bar	at 350 bar	at 210 bar	at 350 bar
S4 - SA4 - SB4	[l/min]	120	100	200	150	500	450	750 (**NOTE**)	600 (**NOTE**)
Other spools		150	120	300	300	600	500	900	700

NOTE: for the DSP10KD2 valve these values are the same for S2 - SA2 - SB2 spools.

7.3 - Switching times

The values indicated refer to a solenoid valve working with piloting pressure of 100 bar, with mineral oil at a temperature of 50°C, at viscosity of 36 cSt and with PA and BT connections.

The energizing and de-energizing times are obtained at the pressure variation which occurs on the lines.

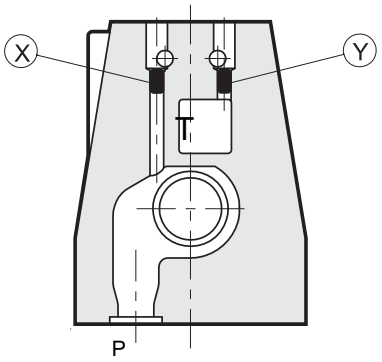
TIMES (± 10%) [ms]	ENERGIZING	DE- ENERGIZING	
	DC - RAC	DC	RAC
DSP5KD2 - DSP5RKD2	70	60	160
DSP7KD2	80	70	170
DSP8KD2	90	70	170
DSP10KD2	120	90	190

8 - PILOTING AND DRAINAGE

DSP*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.

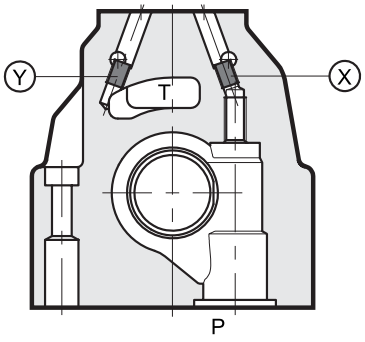
TYPE OF VALVE		Plug assembly	
		X	Y
IE	INTERNAL PILOT AND EXTERNAL DRAIN	NO	YES
II	INTERNAL PILOT AND INTERNAL DRAIN	NO	NO
EE	EXTERNAL PILOT AND EXTERNAL DRAIN	YES	YES
EI	EXTERNAL PILOT AND INTERNAL DRAIN	YES	NO

X: plug M5x6 for external pilot
Y: plug M5x6 for external drain



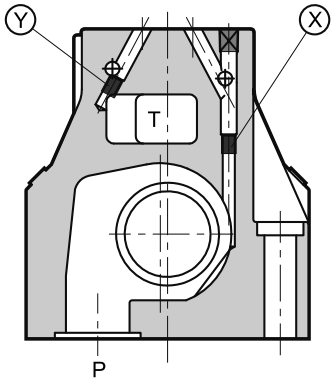
DSP5KD2
DSP5RKD2

X: plug M6x8 for external pilot
Y: plug M6x8 for external drain



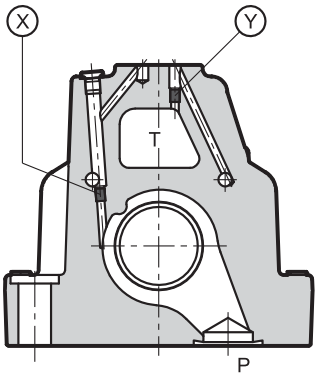
DSP7KD2

X: plug M6x8 for external pilot
Y: plug M6x8 for external drain



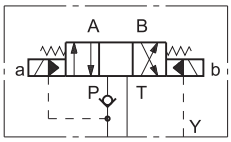
DSP8KD2

X: plug M6x8 for external pilot
Y: plug M6x8 for external drain



DSP10KD2

8.1 - Backpressure valve incorporated on line P (C option)



DSP7KD2 and DSP8KD2 valves are available upon request with backpressure valve incorporated on line P. This is necessary to obtain the piloting pressure when the control valve, in rest position, has the line P connected to the T port (spools S2 - S4 - S*2 - S*4 - TA02 - TB02). The cracking pressure is of 5 bar with a minimum flow rate of 15 l/min.

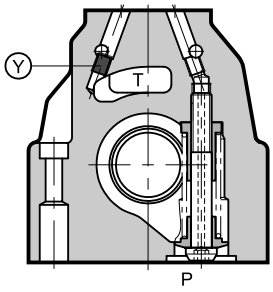
In the C version the piloting is always internal.

NOTE: the backpressure valve can't be used as check valve because it doesn't assure the seal.

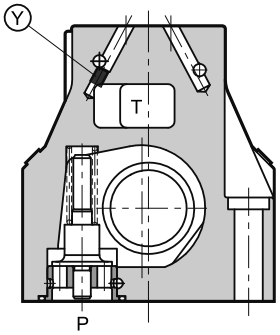
Add **C** to the identification code for this request (see paragraph 6.1).

For DSP7KD2 only, the backpressure valve can be also delivered separately and it can be easily mounted on line P of the main control valve. Ask for code **0266577** to order the backpressure valve.

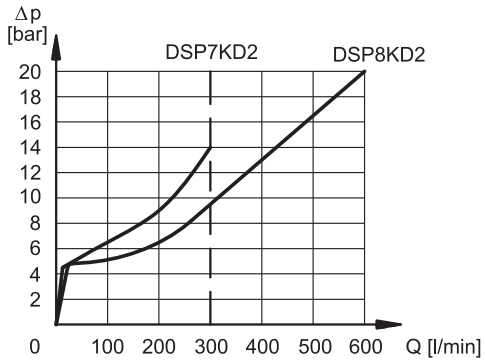
DSP7KD2



DSP8KD2



pilot always internal
Y: plug M6x8 for external drain



The curve refers to the pressure drop (body part only) with backpressure valve energized to which the pressure drop of the reference spool must be added (see paragraph 7.1).

9 - OPTIONS

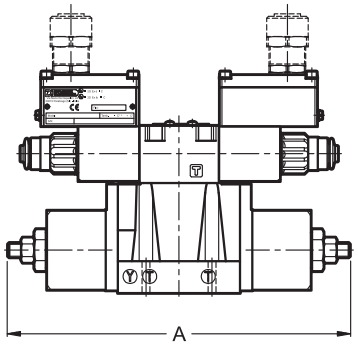
9.1 - Control of the main spool stroke: C

With the help of special side plugs, it is possible to introduce stroke controls in the heads of the piloted valve so as to vary the maximum spool clearance opening.

This solution allows control of the flow rate from the pump to the actuator and from the actuator to the outlet, obtaining a double adjustable control on the actuator.

Add the letter **C** to the identification code to request this device (see paragraph 6.1).

DSP*KD2-*/C



dimensions in mm

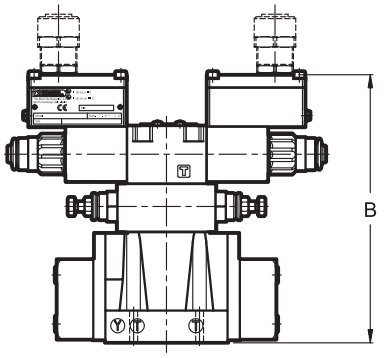
	DSP5KD2 DSP5RKD2	DSP7KD2	DSP8KD2	DSP10KD2
A	280	319	401.5	520

9.2 - Control of the main spool shifting speed: D

By placing a MERS type double flow control valve between the pilot solenoid valve and the main distributor, the piloted flow rate can be controlled and therefore the changeover smoothness can be varied.

Add the letter **D** to the identification code to request this device (see paragraph 6.1).

DSP*KD2-*/D



dimensions in mm

	DSP5KD2 DSP5RKD2	DSP7KD2	DSP8KD2	DSP10KD2
B	218.5	225.5	254.5	310.5

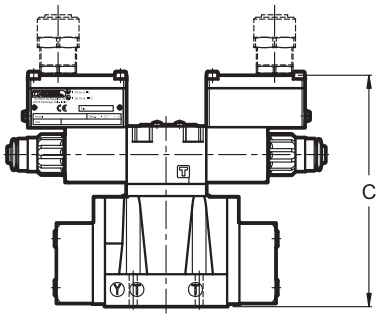
9.3 - Subplate with throttle on line P

It is possible to introduce a subplate with a restrictor on line P between the pilot solenoid valve and the main distributor.

DSP5KD2 - DSP5RKD2 - DSP7KD2 - DSP8KD2: Ø0.8 (add the suffix **P08** in the identification code to request this device - paragraph 6.1)

DSP10KD2: Ø1.5 (add the suffix **P15** in the identification code to request this device - paragraph 6.1).

DSP*KD2-*/P*



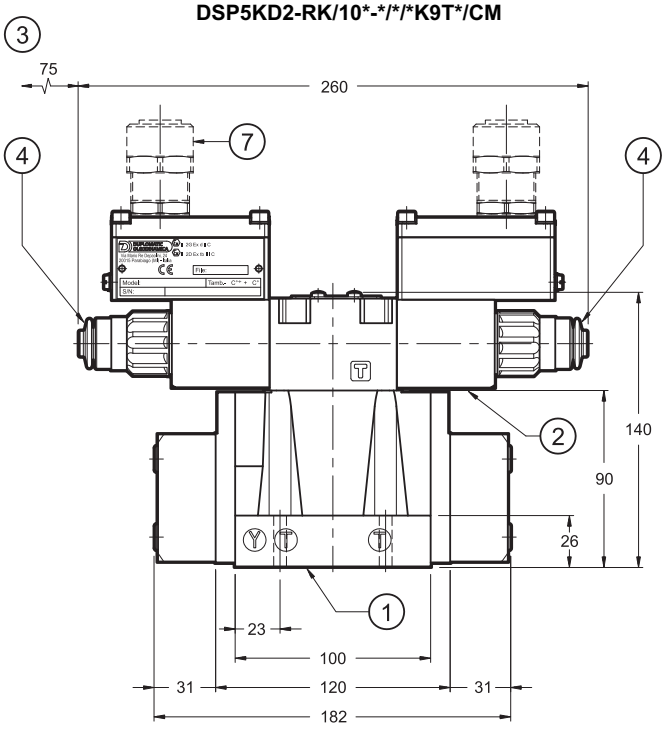
dimensions in mm

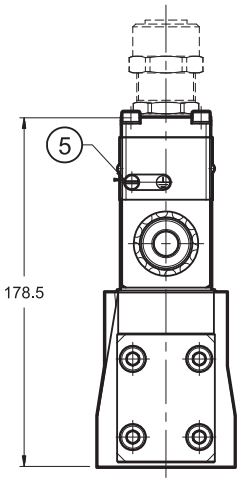
	DSP5KD2 DSP5RKD2	DSP7KD2	DSP8KD2	DSP10KD2
C	188.5	195.5	224.5	280.5

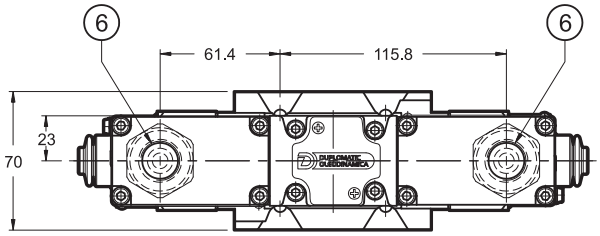
10 - DSP5KD2 and DSP5RKD2 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

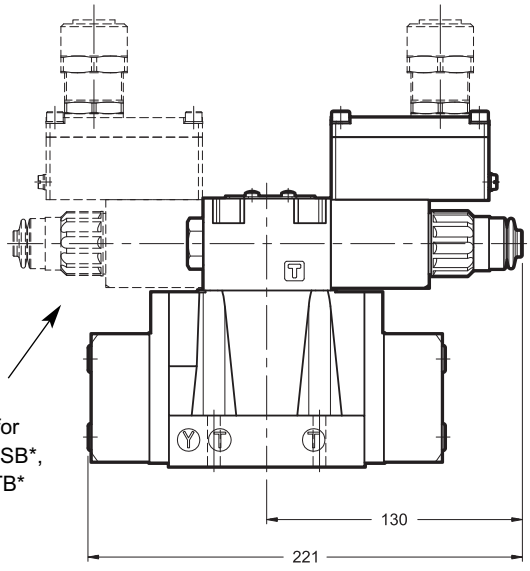
DSP5KD2-S*/10*-*/*/*K9T*/CM
DSP5KD2-RK/10*-*/*/*K9T*/CM







DSP5KD2-SA*/10*-*/*/*K9T*/CM
DSP5KD2-TA/10*-*/*/*K9T*/CM
DSP5KD2-TA*/10*-*/*/*K9T*/CM



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 14.

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. 16
5	Terminal for supplementary earth connection
6	Upper port for cable gland
7	Cable gland (upper port shown). To be ordered separately, see paragraph 17

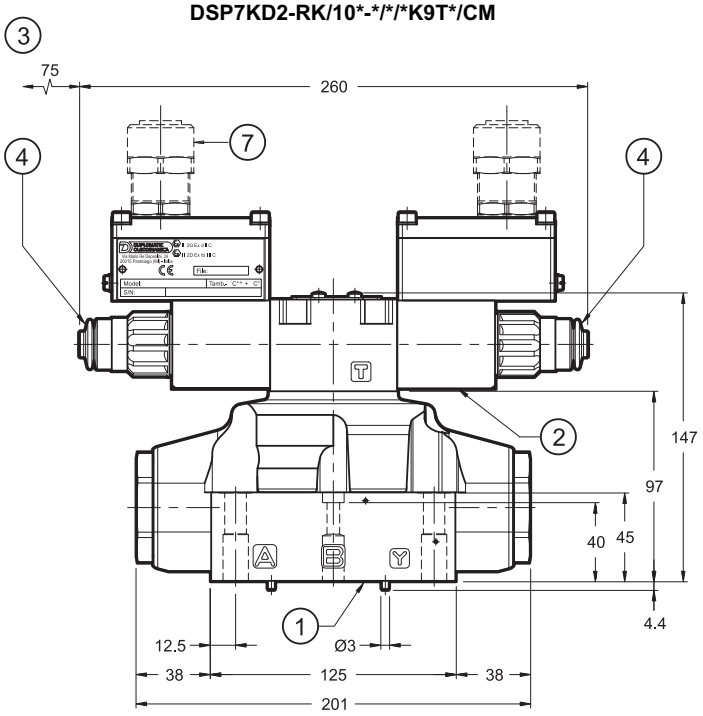
Fastening of single valve: 4 SHC ISO 4762 screws M6x35
Tightening torque: 8 Nm (A8.8 screws) 12 Nm (A10.9 screws)
Threads of mounting holes: M6x10
Sealing rings: 5 OR type 2050 (12.42x1.78) - 90 Shore 2 OR type 2037 (9.25x1.78) - 90 Shore

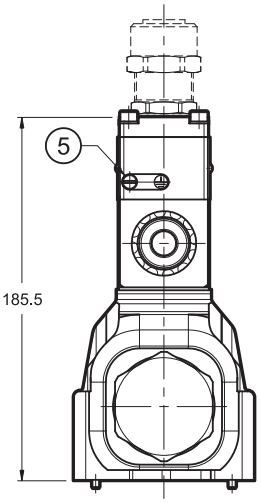
NOTE 3: use of class 10.9 fastening screws is recommended for version H valves (high pressure).

11 - DSP7KD2 OVERALL AND MOUNTING DIMENSIONS

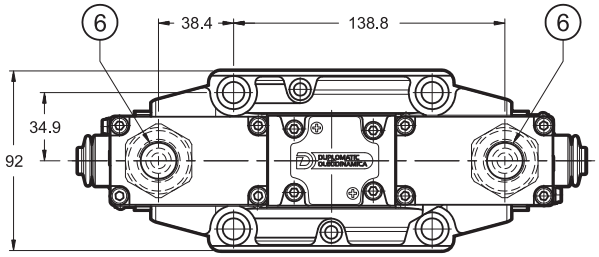
dimensions in mm

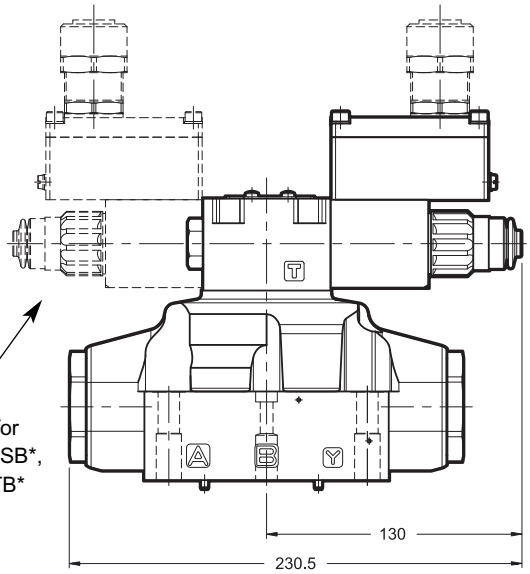
DSP7KD2-S*/10*-*/*/*K9T*/CM
DSP7KD2-RK/10*-*/*/*K9T*/CM





DSP7KD2-SA*/10*-*/*/*K9T*/CM
DSP7KD2-TA/10*-*/*/*K9T*/CM
DSP7KD2-TA*/10*-*/*/*K9T*/CM





Solenoid position for versions SB*, TB and TB*

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 14.

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. 16
5	Terminal for supplementary earth connection
6	Upper port for cable gland
7	Cable gland (upper port shown). To be ordered separately, see paragraph 17

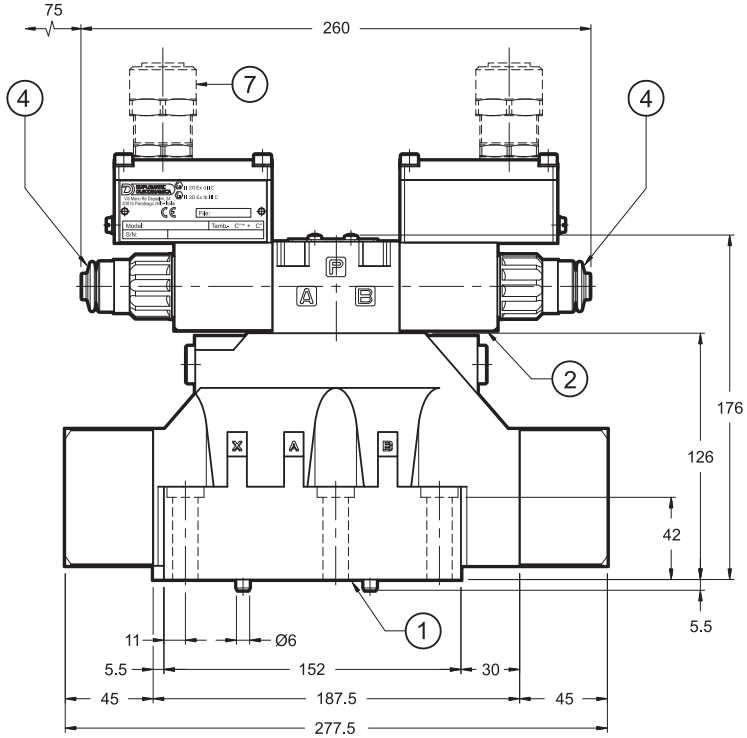
Fastening of single valve: 4 SHC screws ISO 4762 M10x60 2 SHC screws ISO 4762 M6x50
Tightening torque: M10x60: 40 Nm (A8.8 screws) - 57 Nm (A10.9 screws) M6x50: 8 Nm (A8.8 screws) - 12 Nm (A10.9 screws)
Threads of mounting holes: M6x12; M10x18
Sealing rings: 4 OR type 130 (22.22X2.62) - 90 Shore 2 OR type 2043 (10.82x1.78) - 90 Shore

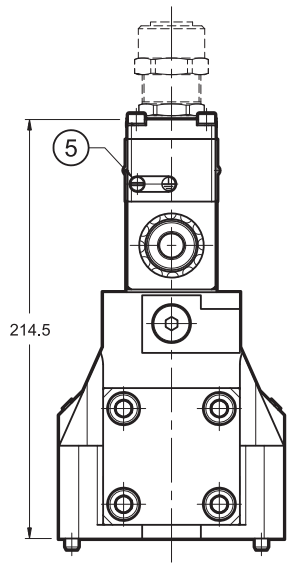
NOTE 3: use of class 10.9 fastening screws is recommended for version H valves (high pressure).

12 - DSP8KD2 OVERALL AND MOUNTING DIMENSIONS

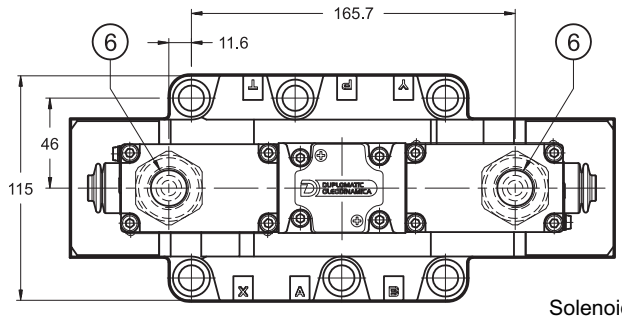
dimensions in mm

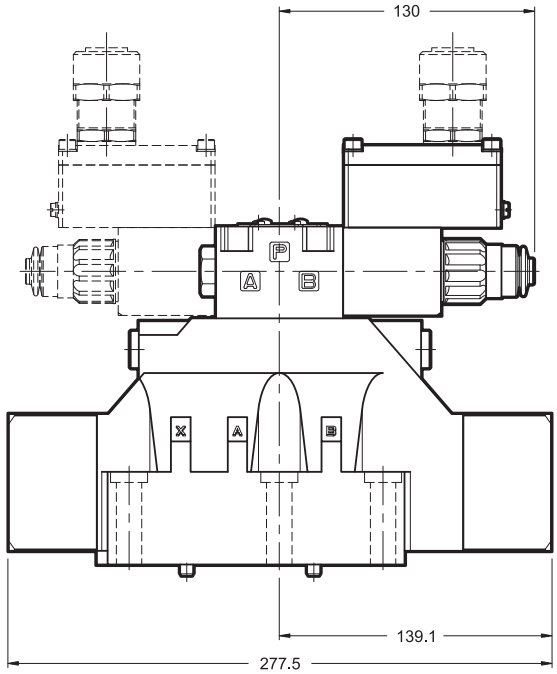
DSP8KD2-S*/10*-*/*/*K9T*/CM
DSP8KD2-RK/10*-*/*/*K9T*/CM





DSP8KD2-SA*/10*-*/*/*K9T*/CM
DSP8KD2-TA/10*-*/*/*K9T*/CM
DSP8KD2-TA*/10*-*/*/*K9T*/CM





Solenoid position for versions SB*, TB and TB*

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 14.

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. 16
5	Terminal for supplementary earth connection
6	Upper port for cable gland
7	Cable gland (upper port shown). To be ordered separately, see paragraph 17

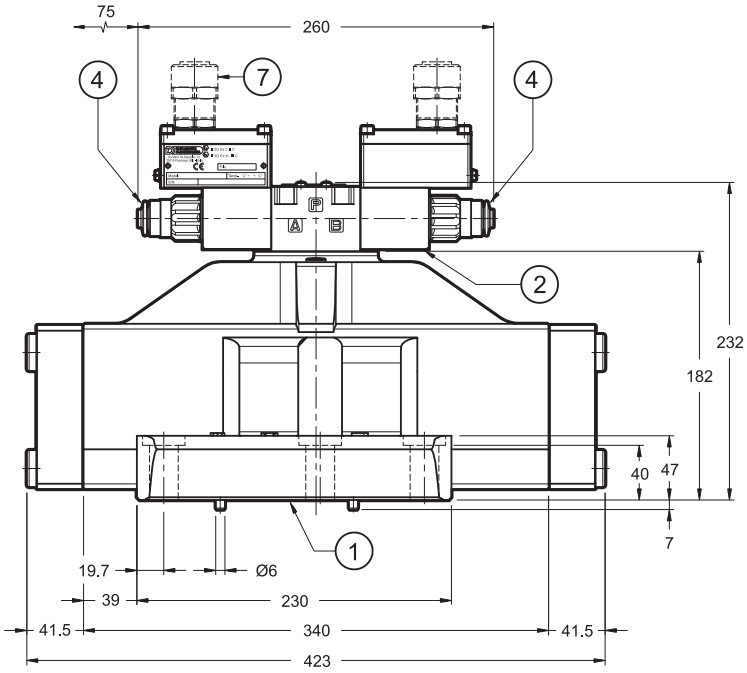
Fastening of single valve: 6 SHC ISO 4762 screws M12x60
Tightening torque: 69 Nm (A8.8 screws) - 97 Nm (A10.9 screws)
Threads of mounting holes: M12x20
Sealing rings: 4 OR type 3118 (29.82x2.62) - 90 Shore 2 OR type 3081 (20.24x2.62) - 90 Shore

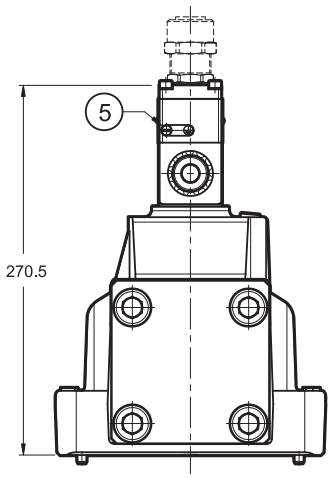
NOTE 3: use of class 10.9 fastening screws is recommended for version H valves (high pressure).

13 - DSP10KD2 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

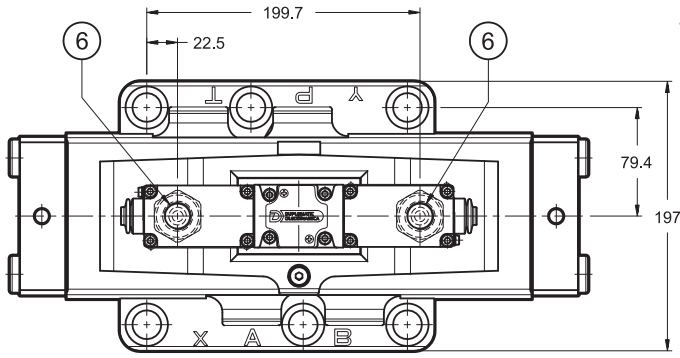
DSP10KD2-S*/10*-*/*/*K9T*/CM
DSP10KD2-RK/10*-*/*/*K9T*/CM

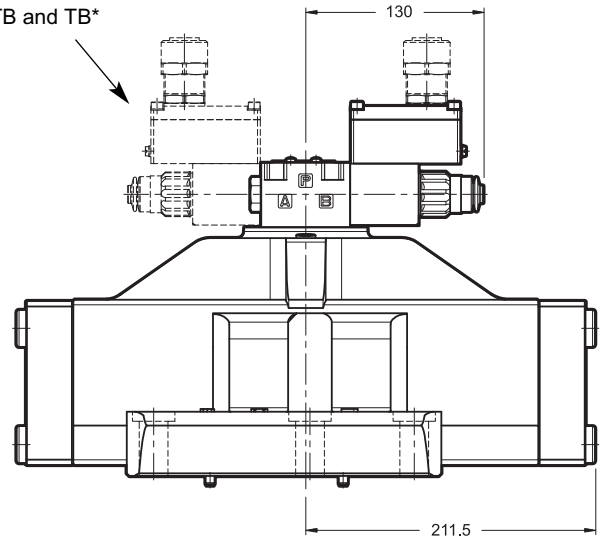




DSP10KD2-SA*/10*-*/*/*K9T*/CM
DSP10KD2-TA/10*-*/*/*K9T*/CM
DSP10KD2-TA*/10*-*/*/*K9T*/CM

Solenoid position for versions SB*, TB and TB*





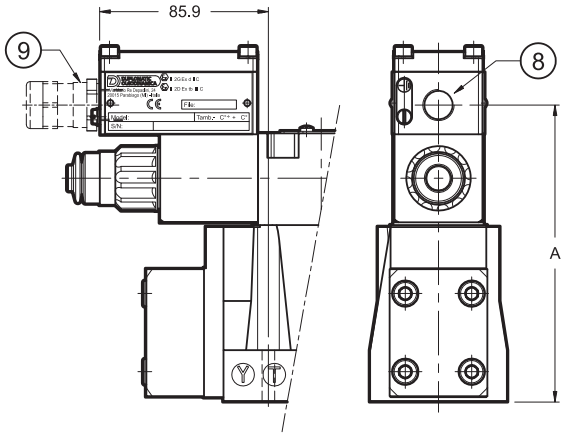
NOTE 1: for overall dimensions with Z option (fixed adjustment pressure reducing valve) consider an increase of 40 mm in height.
NOTE 2: for side port cable gland see paragraph 14.

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. 16
5	Terminal for supplementary earth connection
6	Upper port for cable gland
7	Cable gland (upper port shown). To be ordered separately, see paragraph 17

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

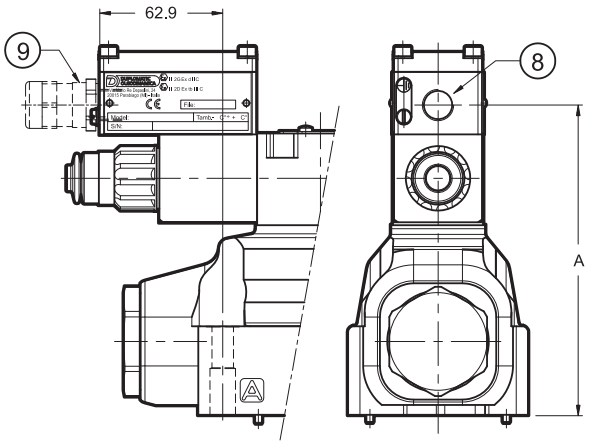
14 - DSP*KD2-*/10*-*/*/*K9S*/* (SIDE CONNECTION) OVERALL AND MOUNTING DIMENSIONS

DSP5KD2-*/10*-*/*/*K9S*/*
DSP5RKD2-*/10*-*/*/*K9S*/*



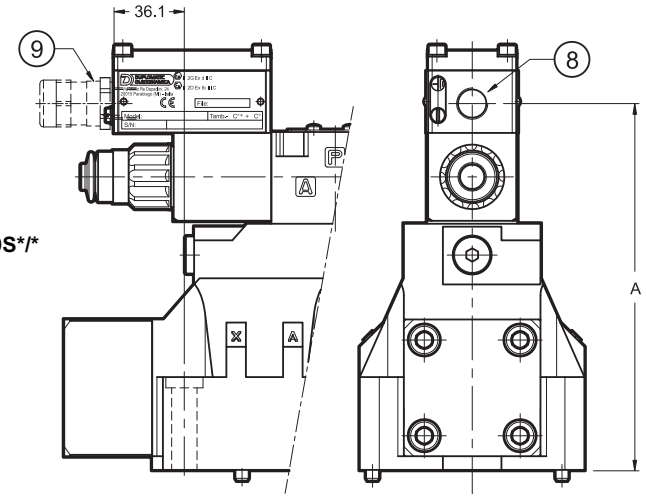
Side port type	Dimension A
S01	150.5
S04	151.5

DSP7KD2-*/10*-*/*/*K9S*/*



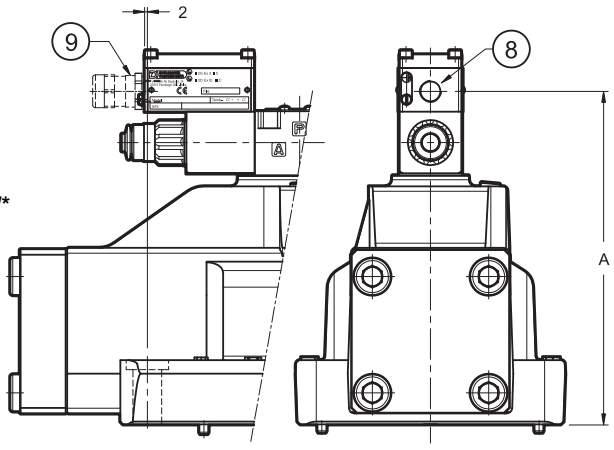
Side port type	Dimension A
S01	157.5
S04	158.5

DSP8KD2-*/10*-*/*/*K9S*/*



Side port type	Dimension A
S01	186.5
S04	187.5

DSP10KD2-*/10*-*/*/*K9S*/*



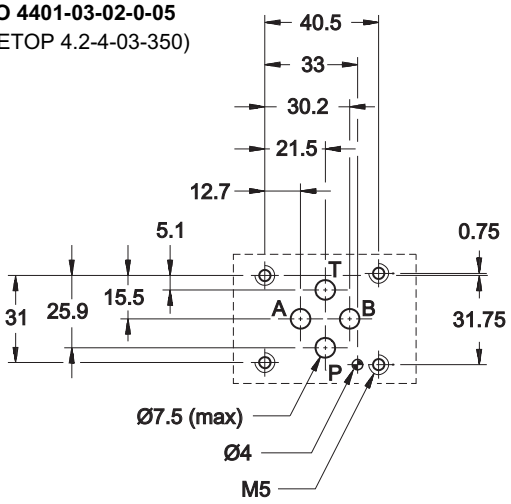
Side port type	Dimension A
S01	242.5
S04	243.5

dimensions in mm

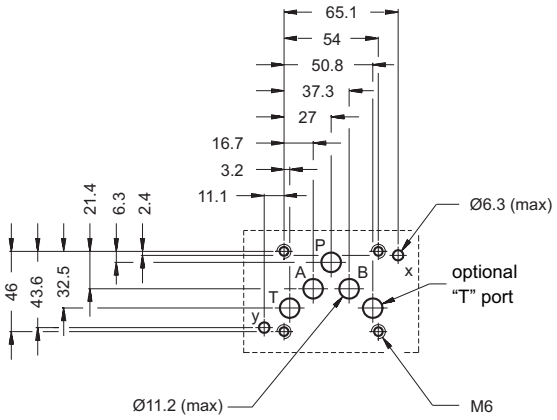
8	Side port
9	Cable gland (side port shown). To be ordered separately, see par. 17

15 - MOUNTING SURFACES

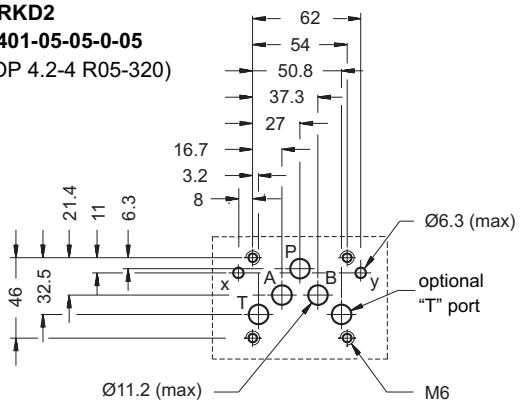
DS3KD2
ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)



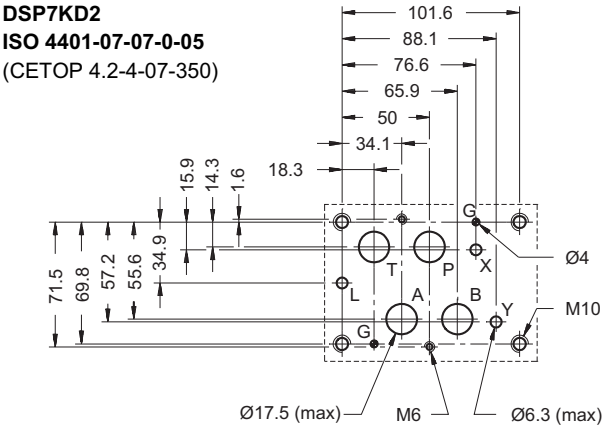
DSP5KD2
CETOP 4.2-4 P05-320



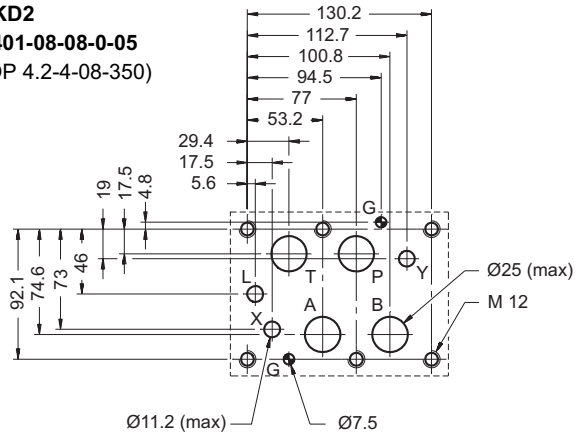
DSP5RKD2
ISO 4401-05-05-0-05
(CETOP 4.2-4 R05-320)



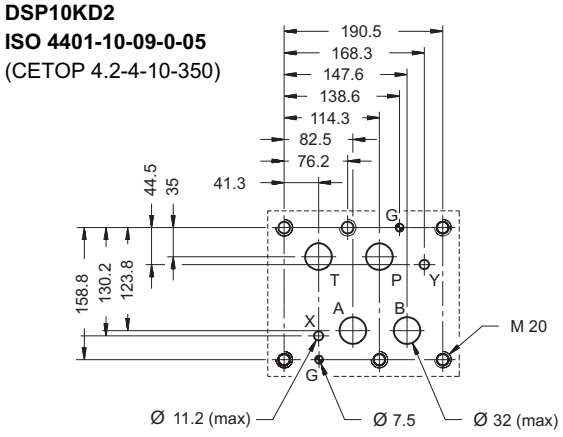
DSP7KD2
ISO 4401-07-07-0-05
(CETOP 4.2-4-07-350)



DSP8KD2
ISO 4401-08-08-0-05
(CETOP 4.2-4-08-350)

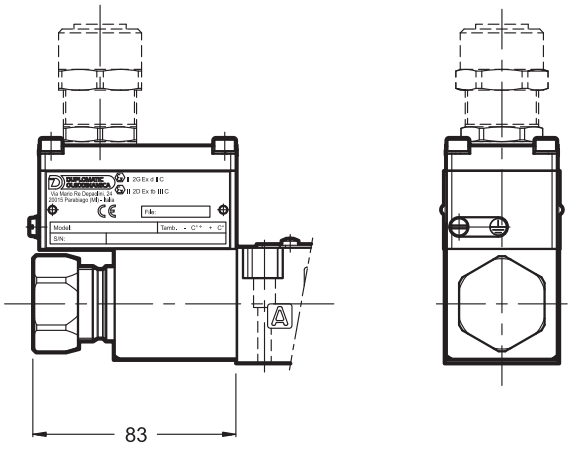


DSP10KD2
ISO 4401-10-09-0-05
(CETOP 4.2-4-10-350)

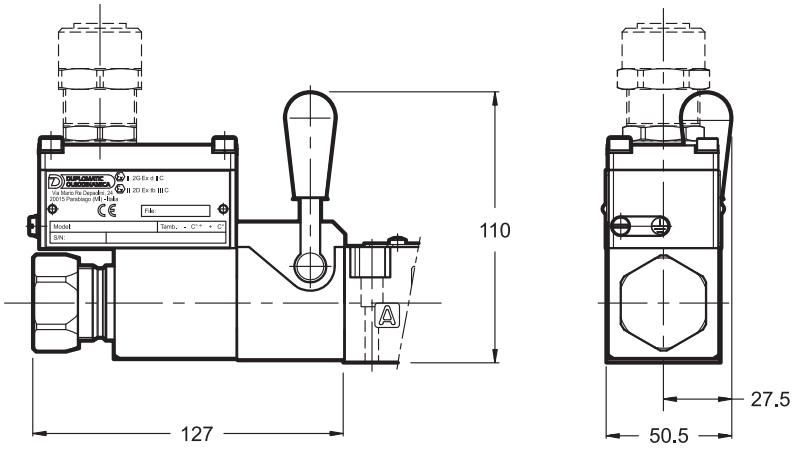


16 - MANUAL OVERRIDE

16.1 - CB - Blind ring nut



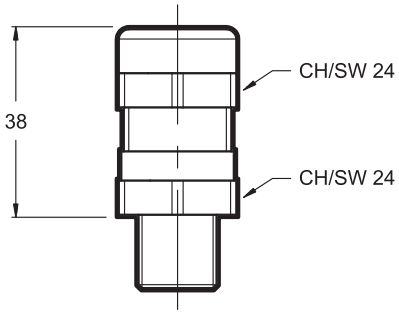
16.2 - CH - Lever manual override



17 - 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 1/2” 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.

18 - HYDRAULIC FLUIDS

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

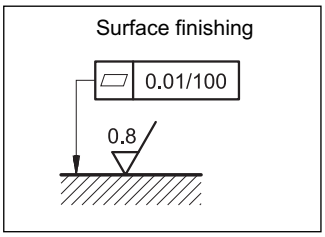
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

19 - INSTALLATION

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.



20 - SUBPLATES (see catalogue 51 000)

	DS3KD2	DSP5KD2	DSP7KD2	DSP8KD2
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	3/8” BSP	3/4” BSP	1” BSP	1 ½” BSP
X, Y ports dimensions	-	1/4” BSP	1/4” BSP	1/4” 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.

DUPLOMATIC OLEODINAMICA

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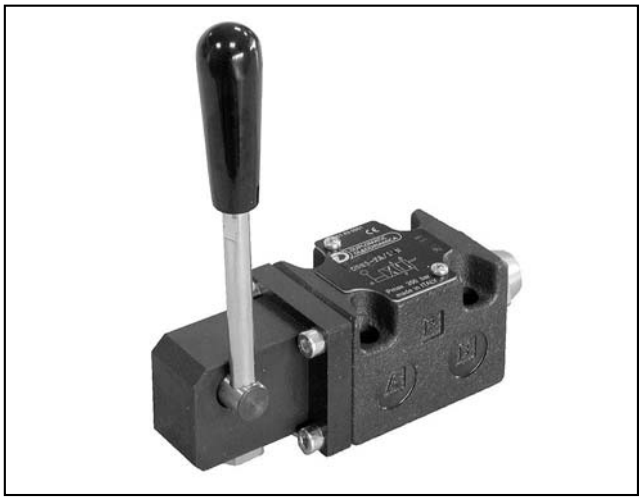
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

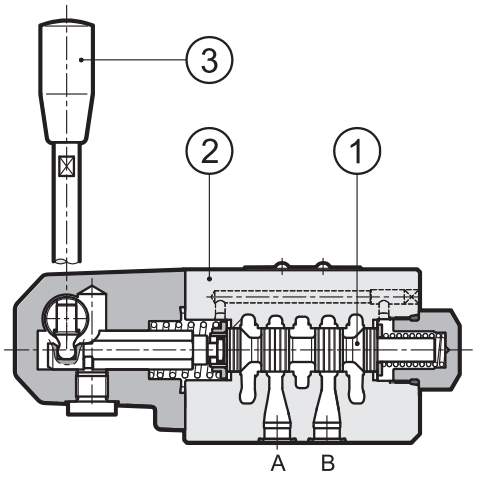


DSH*
LEVER OPERATED DIRECTIONAL CONTROL VALVE

MOUNTING SURFACES
DSH3 **ISO 4401-03** (CETOP 03)
DSH5 **ISO 4401-05** (CETOP 05)

p max (see performances table)
Q nom (see performances table)

OPERATING PRINCIPLE



— The DSH* are lever operated directional control valves, available with 3 or 4 ways and with several types of interchangeable spools (1).

— The valve body (2) is made with high strength iron castings provided with wide internal passages in order to minimize the flow pressure drop.

— They are available with 2 or 3 positions with return spring or mechanical retention.

— On DSH3 version is possible to rotate the lever (3) by 180° compared with the standard position, depending on installation requirements (par. 7).

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

		DSH3	DSH5
Maximum working pressure: - P - A - B ports - T port	bar	 350 210	 320 160
Nominal flow rate	l/min	75	150
Ambient temperature range	°C	-20 / +50	
Fluid temperature range	°C	-20 / +80	
Fluid viscosity range	cSt	10 ÷ 400	
Fluid contamination degree		according to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25	
Mass	kg	2.1	4.2

1 - IDENTIFICATION CODE

D	S	H		-		/		

Directional control valve with spool

Lever operated

Size:
3 = ISO 4401-03 (CETOP 03)
5 = ISO 4401-05 (CETOP 05)

NOTE:
On request it is possible to have the lever mounted in different positions from those in the catalogue. Consult our Technical Department.

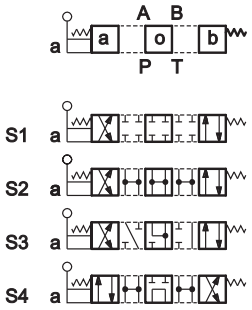
Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Series No.:
11 for DSH3 (the overall and mounting dimensions remain unchanged from 10 to 19)
30 for DSH5 (the overall and mounting dimensions remain unchanged from 30 to 39)

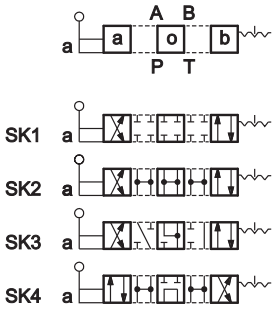
Spool type (see par. 2)
S* **SK*** **SA*** **SAK***
TA **TAK**
TA23 **TAK23**

2 - SPOOL TYPE

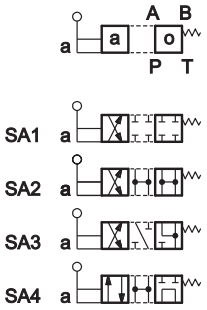
Type **S***:
3 positions
with spring centering



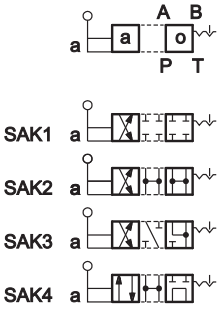
Type **SK***:
3 positions
with mechanical retention



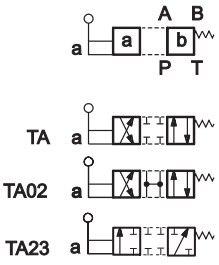
Type **SA***:
2 positions
(central + external)
with spring centering



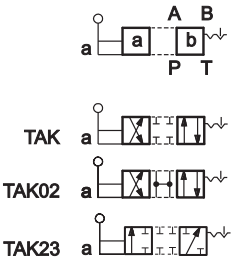
Type **SAK***:
2 positions
(central + external)
with mechanical retention



Type **TA**:
2 external positions
with return spring



Type **TAK**:
2 external positions
with mechanical retention



Besides the diagrams shown, which are the most frequently used, other special versions are available: consult our Technical Department for their identification and operating limits.

NOTE: TA02,TA23, TAK02 and TAK23 spools are available only for DSH3.

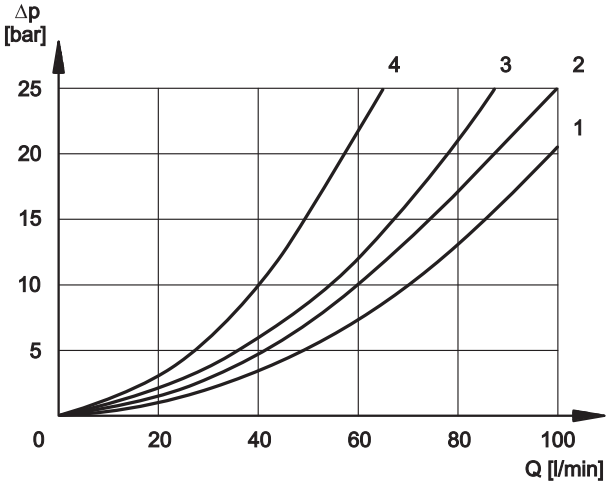
3 - HYDRAULIC FLUIDS

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

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

4 - PRESSURE DROPS Δp-Q (values obtained with viscosity 36 cSt at 50 °C)

4.1 - DSH3



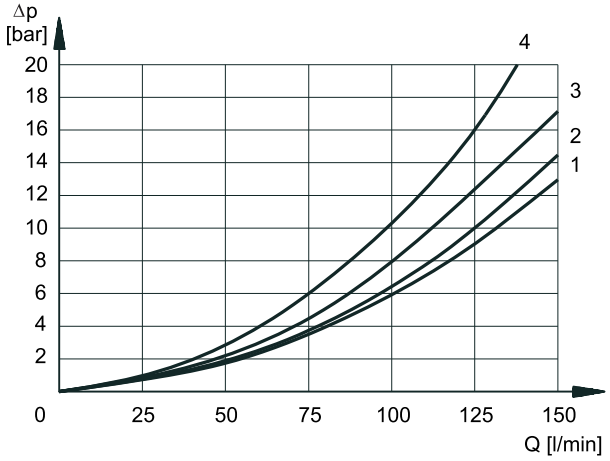
VALVE IN ENERGIZED POSITION

SPOOL TYPE	FLOW DIRECTION			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPH			
S1, SA1, SAK1	2	2	3	3
S2, SA2, SAK2	1	1	3	3
S3, SA3, SAK3	3	3	1	1
S4, SA4, SAK4	4	4	4	4
TA, TAK	3	3	3	3
TA02, TAK02	2	2	2	2
TA23, TAK23	3	3		

VALVE IN DE-ENERGIZED POSITION

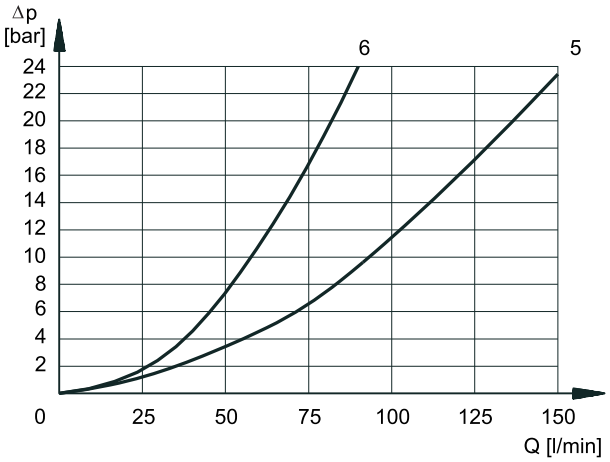
SPOOL TYPE	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S2, SA2, SAK2					2
S3, SA3, SAK3			3	3	
S4, SA4, SAK4					3

4.2 - DSH5



VALVE IN ENERGIZED POSITION

SPOOL TYPE	FLOW DIRECTION			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPH			
S1, SK1	2	2	1	1
S2, SK2	3	3	1	1
S3, SK3	3	3	2	2
S4, SK4	1	1	2	2
TA, TAK	3	3	2	2



VALVE IN DE-ENERGIZED POSITION

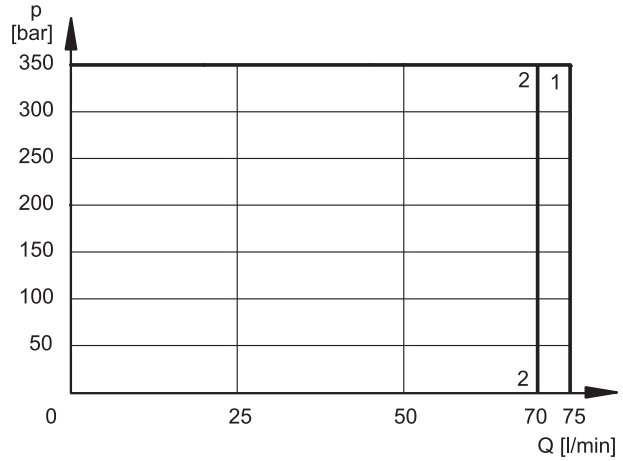
SPOOL TYPE	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S2, SK2					5
S3, SK3			6	6	
S4, SK4					5

5 - OPERATING LIMITS

The curves define the flow rate operating fields according to the valve pressure of the different versions.

The values have been obtained according to ISO 6403 norm, with mineral oil viscosity 36 cSt at 50 °C and filtration ISO 4406:1999 class 18/16/13.

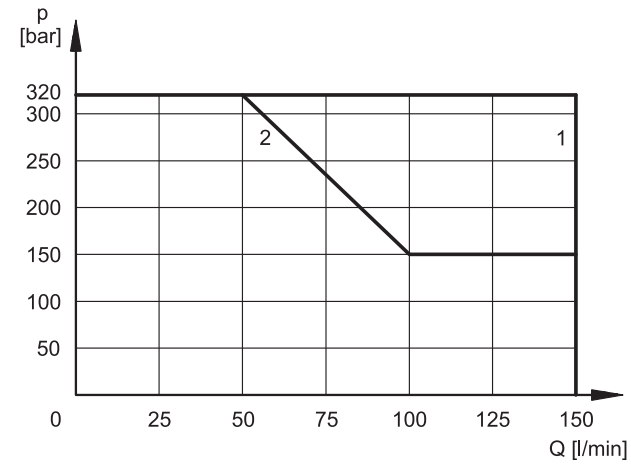
5.1 - DSH3



SPOOL TYPE	CURVE	
	P→A	P→B
S1, SK1, SA1, SAK1	1	1
S2, SK2, SA2, SAK2	1	1
S3, SK3, SA3, SAK3	1	1
S4, SK4, SA4, SAK4	2	2

SPOOL TYPE	CURVE	
	P→A	P→B
TA, TAK	1	1
TA02, TAK02	1	1
TA23, TAK23	1	1

5.2 - DSH5



SPOOL TYPE	CURVE	
	P→A	P→B
S1, SK1, SA1, SAK1	1	1
S2, SK2, SA2, SAK2	1	1
S3, SK3, SA3, SAK3	1	1
S4, SK4, SA4, SAK4	2	2

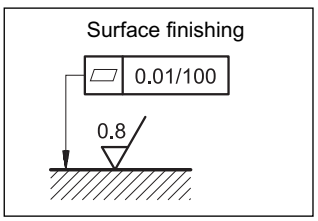
SPOOL TYPE	CURVE	
	P→A	P→B
TA, TAK	1	1

NOTE: Values in the graphs are relevant to the standard valve. The operating limits can be considerably reduced if a 4-way valve is used with port A or B plugged.

6 - INSTALLATION

Configurations with centering and return springs can be mounted in any position; valves with mechanical detent must be mounted with the longitudinal axis horizontal.

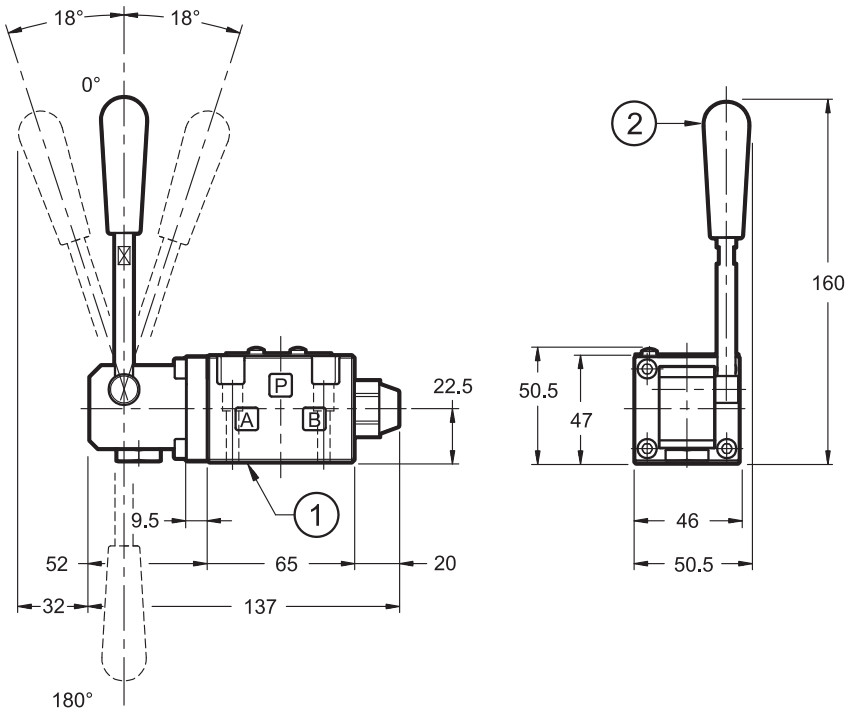
Valve fixing is by means of screws or tie rods, with the valve mounted on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing. If the minimum values of planarity and/or smoothness are not met, fluid leakage between valve and mounting surface can easily occur.

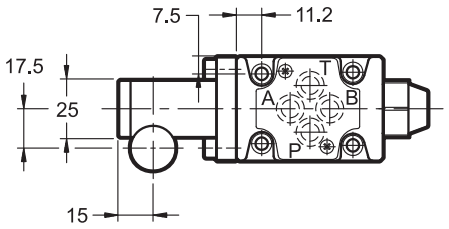


7 - OVERALL AND MOUNTING DIMENSIONS DSH3

dimensions in mm

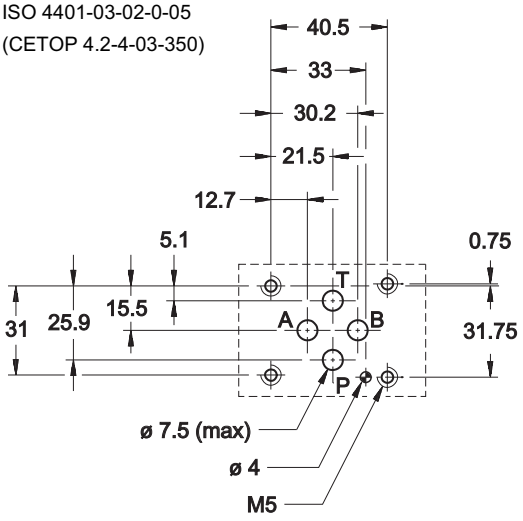
DSH3 - S*
DSH3 - SK*





DSH3 MOUNTING SURFACE

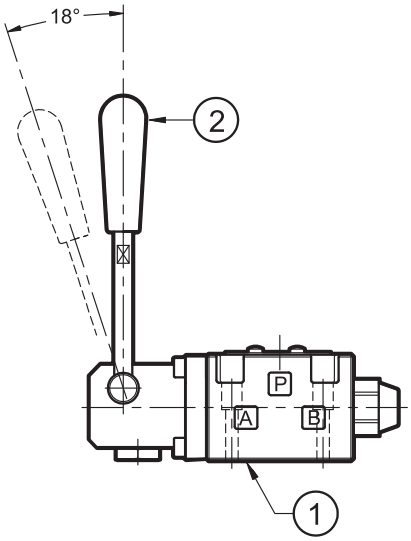
ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)



DSH3-TA
DSH3-TAK

DSH3-TA23
DSH3-TAK23

DSH3-SA*
DSH3-SAK*



1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) - 90 Shore
2	Hand lever (**NOTE**)

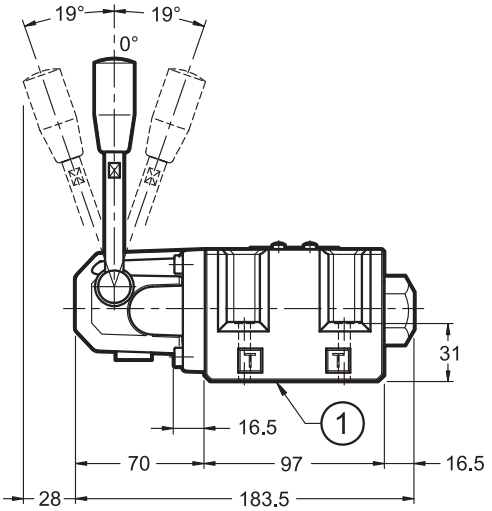
Valve fastening:	N. 4 SHC screws M5x30 ISO 4762
Tightening torque:	5 Nm (bolts A 8.8)
Threads of mounting holes:	M5x10

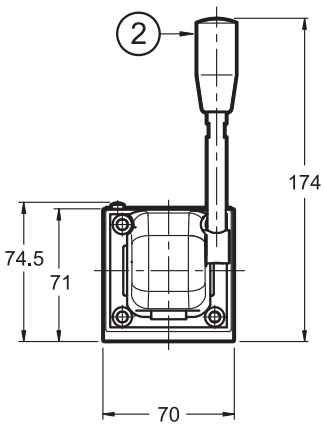
NOTE: The valve is supplied with the hand lever oriented in a perpendicular position with respect to the mounting surface (as indicated in the above drawing). For installation needs the hand lever can be oriented by the user directly at 180° to the standard position, simply by unscrewing the lever and re-screwing it in the desired position.

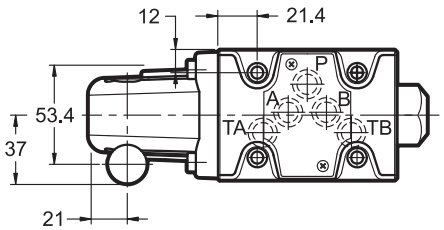
8 - OVERALL AND MOUNTING DIMENSIONS DSH5

dimensions in mm

DSH5-S*
DSH5-SK*

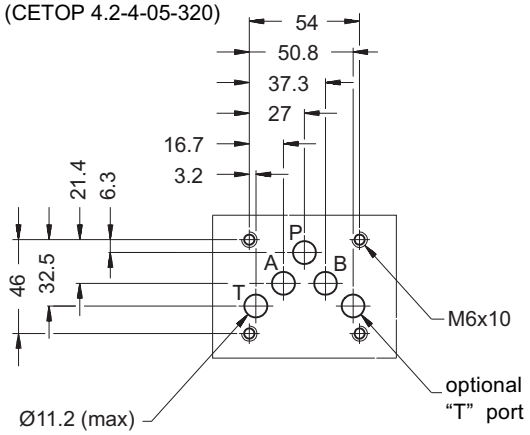






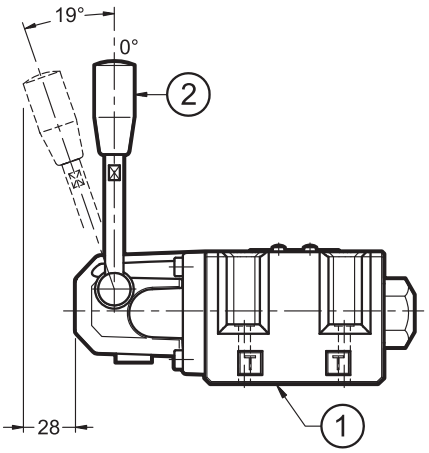
MOUNTING SURFACE DSH5

(CETOP 4.2-4-05-320)



DSH5-TA
DSH5-TAK

DSH5-SA*
DSH5-SAK*



1	Mounting surface with sealing rings: N. 5 OR type 2050 (12.42x1.78) - 90 Shore
2	Hand lever (**NOTE**)

Valve fastening:	N. 4 SHC screws ISO 4762 M6x40
Tightening torque:	8 Nm (A 8.8 screws)
Threads of mounting holes:	M6x10

NOTE: the valve can be supplied with hand lever oriented in different positions; ask our technical department for details.

9 - SUBPLATES (See catalogue 51 000)

	DSH3	DSH5
Type with rear ports	PMMD-AI3G	PMD4-AI4G - 3/4" BSP threaded
Type with side ports	PMMD-AL3G	PMD4-AL4G - 1/2" BSP threaded
P, T, A and B threads	3/8" BSP	

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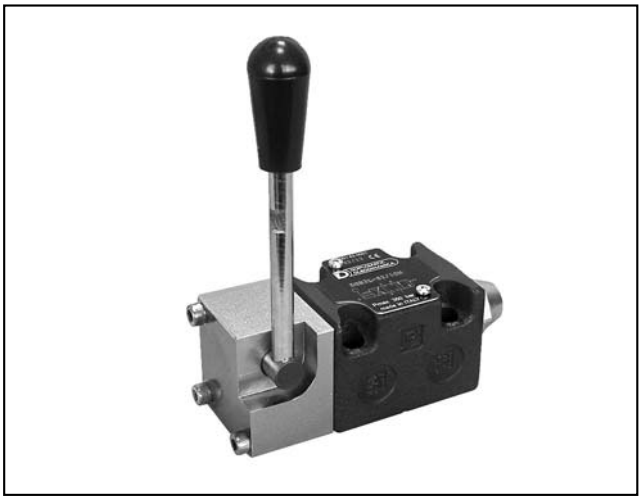
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

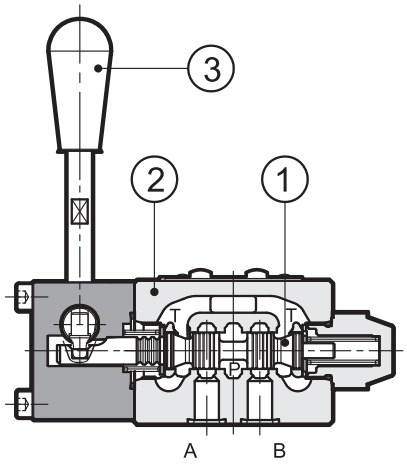


DSH3L
LEVER OPERATED DIRECTIONAL CONTROL VALVE
SERIES 10

MOUNTING SURFACE
ISO 4401-03 (CETOP 03)

p max (see performances table)
Q nom **60** l/min

OPERATING PRINCIPLE



— DSH3L are lever (3) operated directional control valves, available with the more common types of spools (1).

— The valve body (2) is made with high strength iron castings provided with wide internal passages in order to minimize the flow pressure drop.

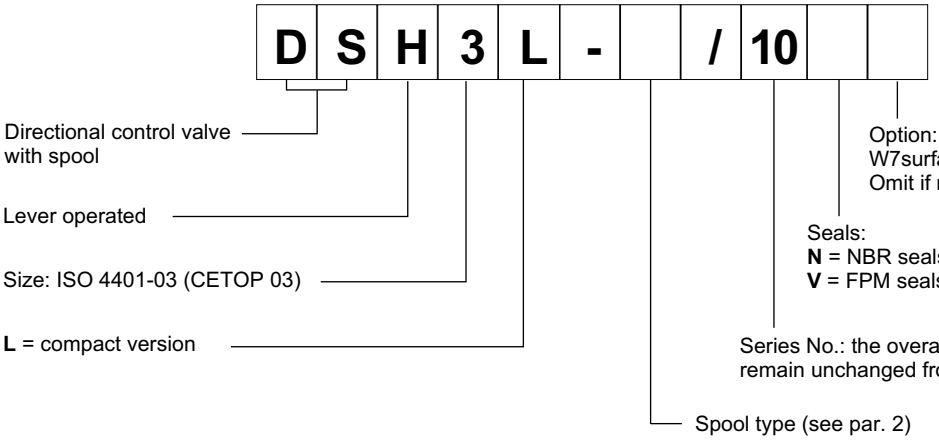
— They are available with 2 or 3 positions with return spring or mechanical retention.

— Upon request we can supply these valves with zinc-nickel surface treatment.

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

Maximum working pressure: - P - A - B ports - T port	bar	 350 210
Nominal flow rate	l/min	60
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree		according to ISO 4406:1999 class 20/18/15
Recommended viscosity	cSt	25
Mass	kg	1.4

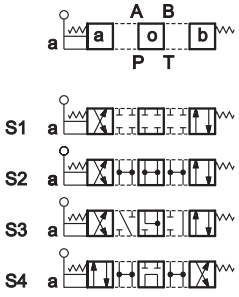
1 - IDENTIFICATION CODE



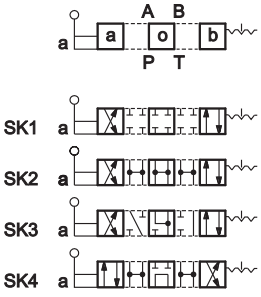
NOTE: Upon request we can supply these valves with zinc-nickel surface treatment.
Add the suffix **/W7** at the end of the identification code.

2 - SPOOL TYPE

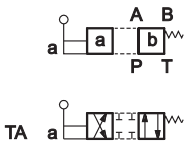
Type **S***:
3 positions
with spring centering



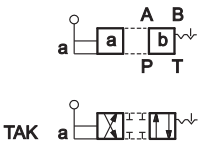
Type **SK***:
3 positions
with mechanical retention



Type **TA**:
2 external positions
with return spring



Type **TAK**:
2 external positions
with mechanical retention

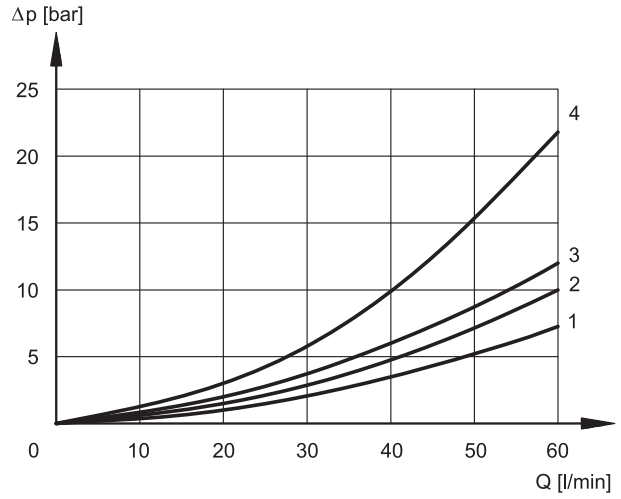


3 - HYDRAULIC FLUIDS

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

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

4 - PRESSURE DROPS Δp-Q (values obtained with viscosity 36 cSt at 50 °C)



VALVE IN ENERGIZED POSITION

SPOOL TYPE	FLOW DIRECTION			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPH			
S1, SK1	2	2	3	3
S2, SK2	1	1	3	3
S3, SK3	3	3	1	1
S4, SK4	4	4	4	4
TA, TAK	3	3	3	3

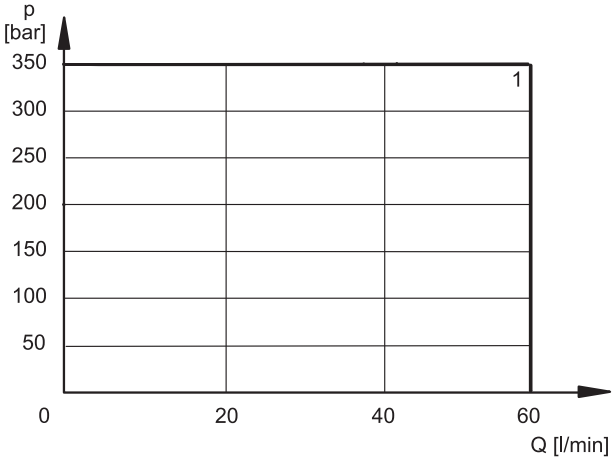
VALVE IN DE-ENERGIZED POSITION

SPOOL TYPE	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S2, SK2					2
S3, SK3			3	3	
S4, SK4					3

5 - OPERATING LIMITS

The curves define the flow rate operating fields according to the valve pressure of the different versions.

The values have been obtained according to ISO 6403 norm, with mineral oil viscosity 36 cSt at 50 °C and filtration ISO 4406:1999 class 18/16/13.



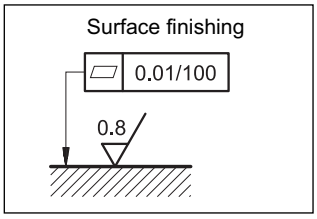
SPOOL TYPE	CURVE	
	P→A	P→B
S1, SK1	1	1
S2, SK2	1	1
S3, SK3	1	1
S4, SK4	1	1

SPOOL TYPE	CURVE	
	P→A	P→B
TA, TAK	1	1

6 - INSTALLATION

Configurations with centering and return springs can be mounted in any position; valves with mechanical detent must be mounted with the longitudinal axis horizontal.

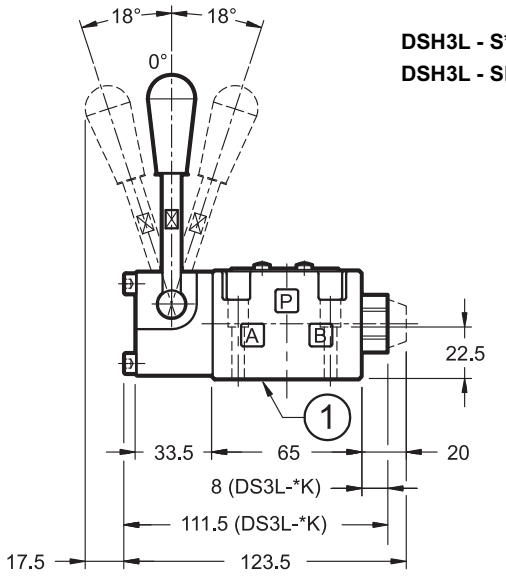
Valve fixing is by means of screws or tie rods, with the valve mounted on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing. If the minimum values of planarity and/or smoothness are not met, fluid leakage between valve and mounting surface can easily occur.

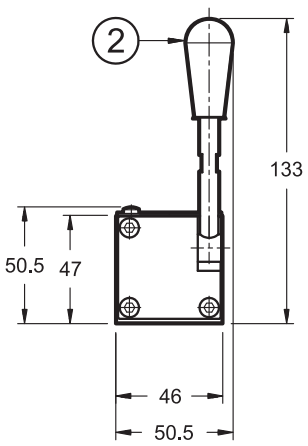


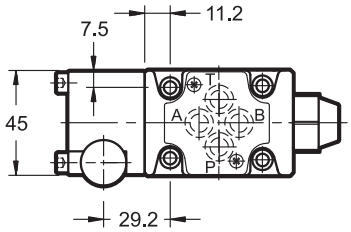
7 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

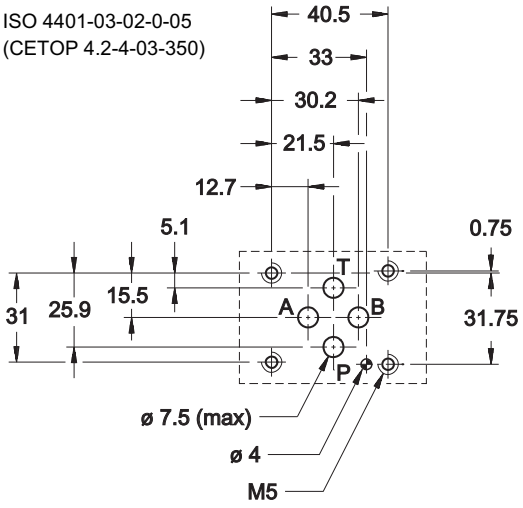
DSH3L - S*
DSH3L - SK*



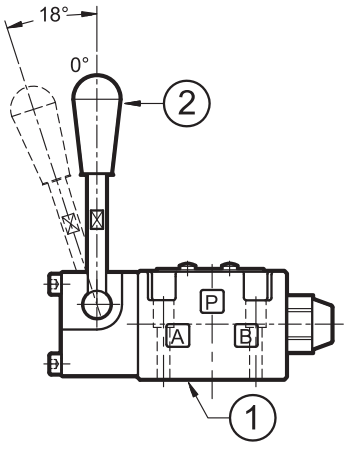




MOUNTING SURFACE
ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)



DSH3L-TA
DSH3L-TAK



1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) - 90 Shore
2	Hand lever

Valve fastening: N. 4 SHC screws M5x30 - ISO 4762
Tightening torque: 5 Nm (A 8.8 screws)
Threads of mounting holes: M5x10

8 - SUBPLATES (see catalogue 51 000)

Type with rear ports: PMMD-AI3G
Type with side ports: PMMD-AL3G
P, T, A and B threads: 3/8” BSP

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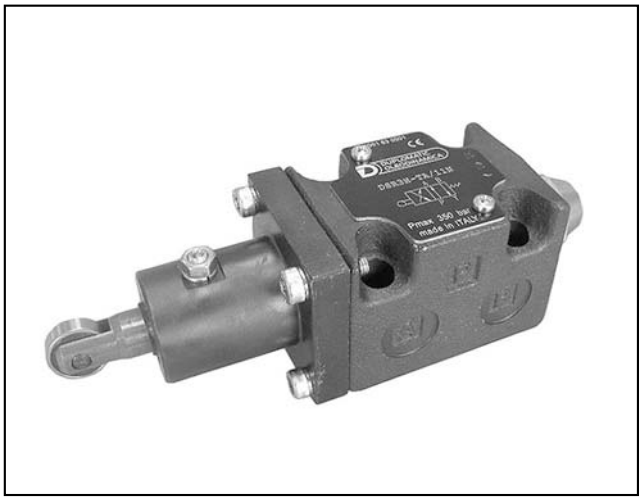
www.duplomatic.com • e-mail: sales.exp@duplomatic.com



DSR3

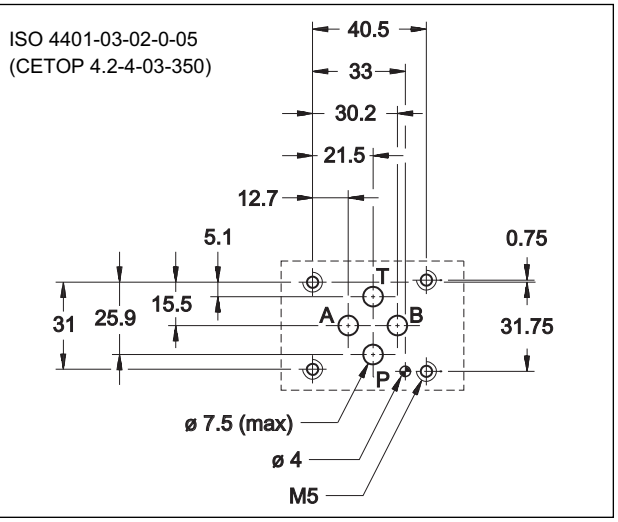
ROLLER CAM OPERATED DIRECTIONAL CONTROL VALVE

SERIES 11

SUBPLATE MOUNTING
ISO 4401-03 (CETOP 03)

p max **350** bar
Q nom **75** l/min

MOUNTING INTERFACE



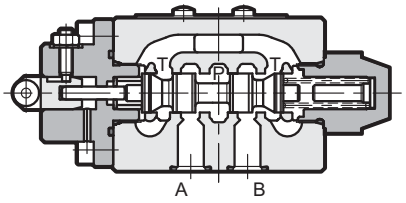
PERFORMANCE RATINGS

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

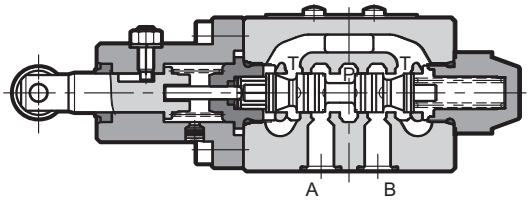
Maximum operating pressure: - P A B ports - T ports	bar	 350 25
Nominal flow rate	l/min	75
Pressure drop Δp-Q	see par. 4	
Operating limits	see par. 5	
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	according to ISO 4406: 1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass: DSR3L-TA DSR3L-R DSR3H-TA	kg	1,1 1,2 1,2

OPERATING PRINCIPLE

DSR3L



DSR3H



— The DSR3* are roller cam operated directional control valves, available with 4 ways, with mounting interface according to ISO 4401 (CETOP RP121H) standards.

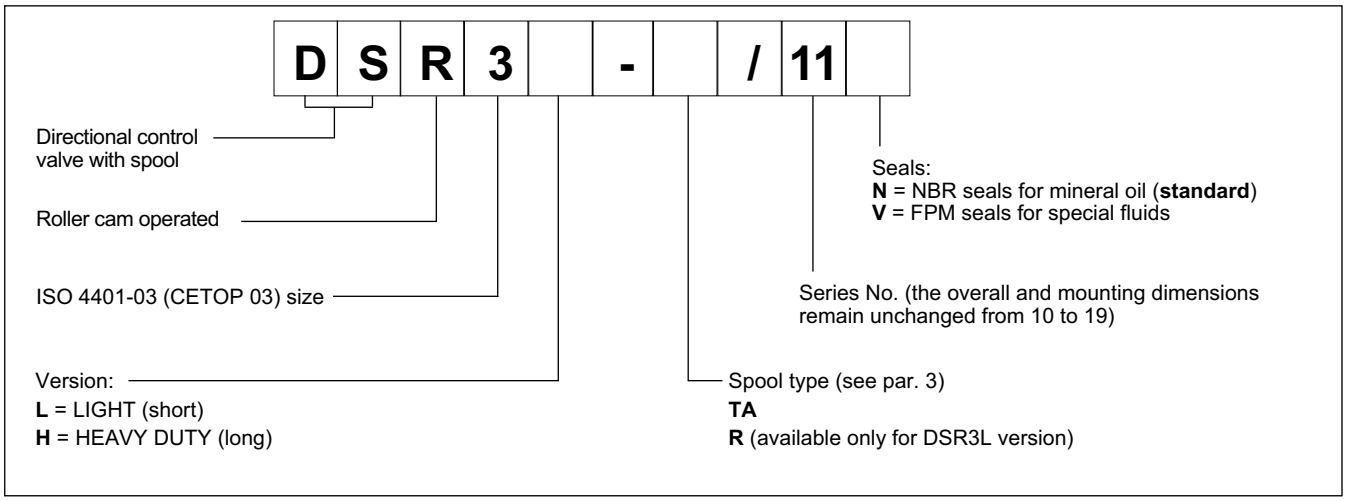
— The valve body is made with high strength iron castings provided with wide internal passages in order to minimize the flow pressure drop.

— It is available in LIGHT (short) and HEAVY DUTY (long) versions, with 2 positions with return spring or with 2 positions with double mechanical command.

— The roller of the valve operating device can be positioned at 90° with respect to the valve mounting surface, in order to achieve flexible installation.

— This type of valve can be used as a hydraulic stroke end for cylinders, speed selectors (not compensated), hydraulic safety devices, directional control of hydraulic axes.

1 - IDENTIFICATION CODE



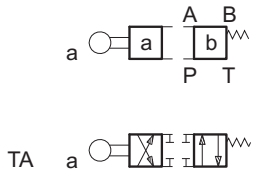
2 - HYDRAULIC FLUIDS

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

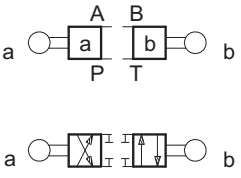
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

3 - SPOOL TYPE

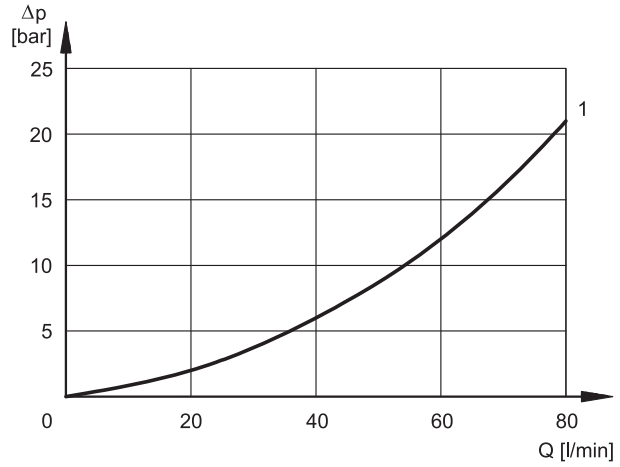
Type **TA**:
2 external positions
with return spring



Type **R**:
2 positions
with double mechanical command



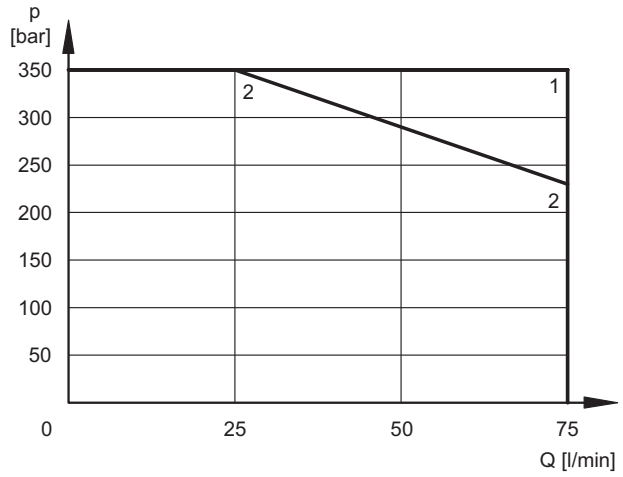
4 - PRESSURE DROPS Δp-Q (obtained with viscosity 36 cSt at 50 °C)



SPOOL TYPE	FLOW DIRECTION			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPH			
DSR3L-TA	1	1	1	1
DSR3L-R	1	1	1	1
DSR3H-TA	1	1	1	1

5 - OPERATING LIMITS

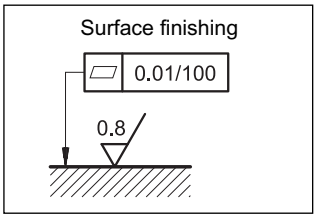
The curves define the flow rate operating fields according to the valve pressure of the different versions. The values have been obtained according to ISO 6403 norm, with mineral oil viscosity 36 cSt at 50 °C and filtration according to ISO 4406:1999 class 18/16/13.



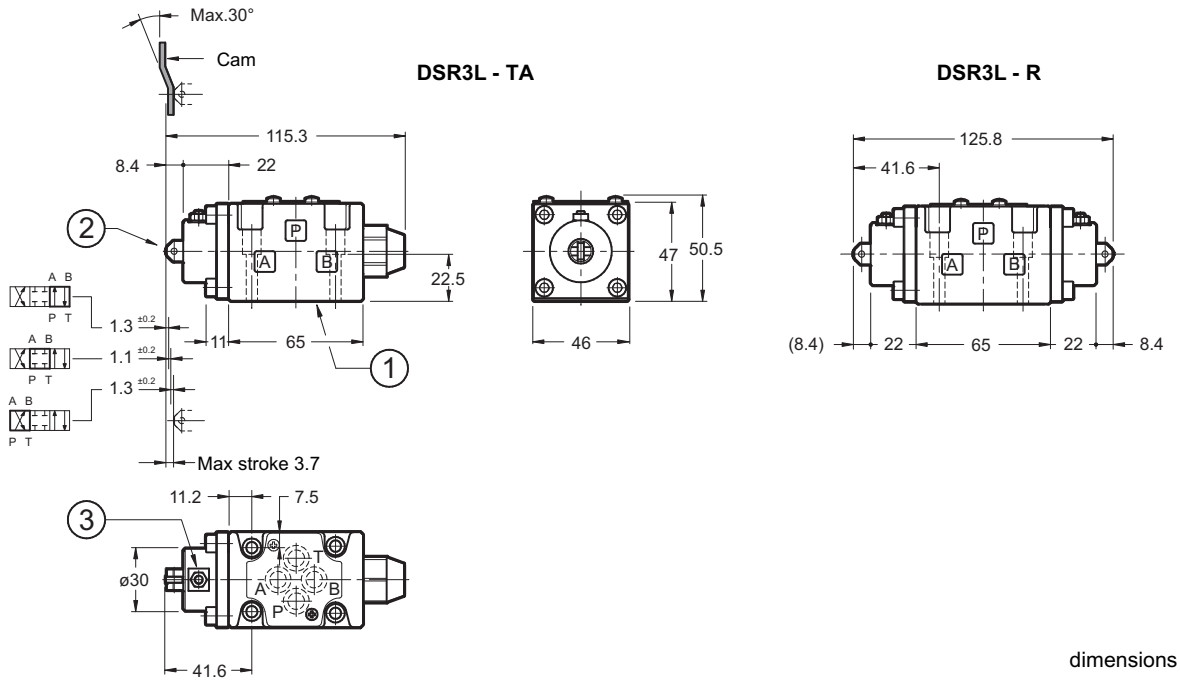
SPOOL TYPE	CURVE	
	P→A	P→B
DSR3L-TA	2	2
DSR3L-R	1	1
DSR3H-TA	1	1

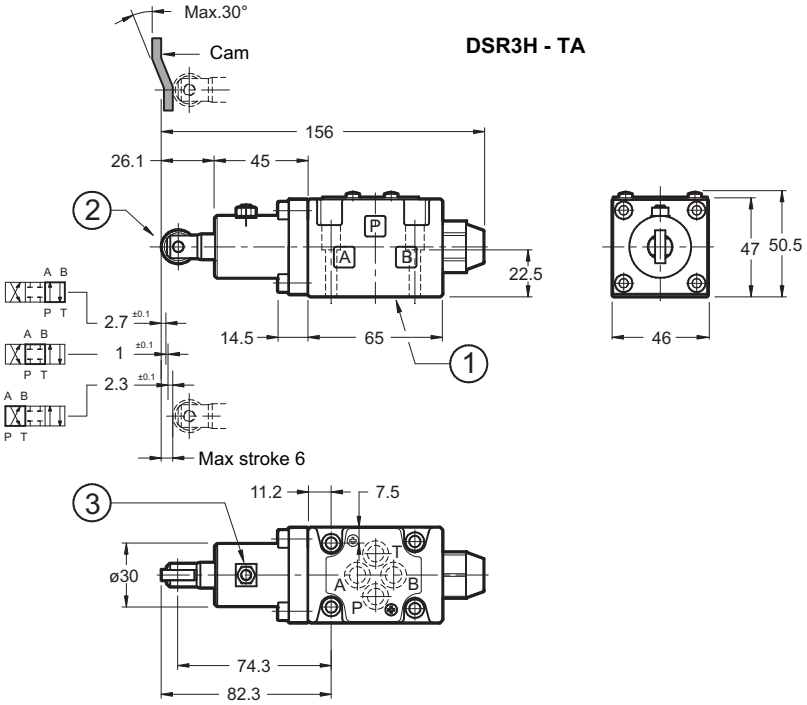
6 - INSTALLATION

Configurations with centering and return springs can be mounted in any position; type R valves - without springs - must be mounted with the longitudinal axis horizontal. Valve fixing is by means of screws or tie rods, with the valve mounted on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing. If the minimum values of planarity and/or smoothness are not met, fluid leakage between valve and mounting surface can easily occur.



7 - OVERALL AND MOUNTING DIMENSIONS





dimensions in mm

1	Mounting surface with sealing rings 4 OR type 2037 (9.25x1.78) - 90 Shore
2	Roller for valve operation (see **NOTE**)
3	Countersunk hexagonal screw for roller operation: **DSR3L** spanner 2 **DSR3H** spanner 2,5

NOTE: The valve is supplied as standard with the operating roller oriented in a perpendicular position with respect to the mounting surface. For installation needs the roller can be oriented by the user directly at 90° to the standard position:

- untight the locking nut and the countersunk hexagonal screw (ref. 3) until the spool and the relevant roller can be freely oriented.
- rotate through 90° the spool with the roller
- tighten the fixing screw (ref. 3) being careful that it goes inside the spool anti-rotation slot without preventing the spool movement.

8 - VALVE FASTENING BOLTS

N. 4 fastening bolts SHC ISO 4762 M5x30
Tightening torque 5 Nm (bolts A 8.8)

9 - SUBPLATES (see catalogue 51 000)

Type PMMD-AI3G with rear ports 3/8” BSP
Type PMMD-AL3G with side ports 3/8” BSP

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DSA*

PNEUMATICALLY OPERATED DIRECTIONAL CONTROL VALVE

SUBPLATE MOUNTING

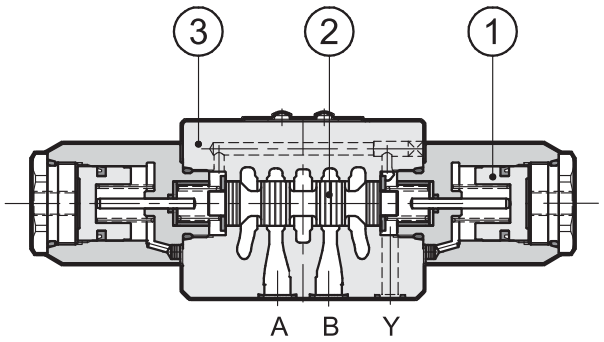
DSA3 **ISO 4401-03** (CETOP 03)

DSA5 **ISO 4401-05** (CETOP R05)

p max (see performances table)

Q nom (see performances table)

OPERATING PRINCIPLE



— The DSA* are pneumatically operated (1) directional control valves, available with 3 or 4 ways with several interchangeable spools (2) and with mounting interface according to ISO 4401 (CETOP RP121H) standards.

— The valve body (3) is made with high strength iron castings provided with wide internal passages in order to minimize the flow pressure drop.

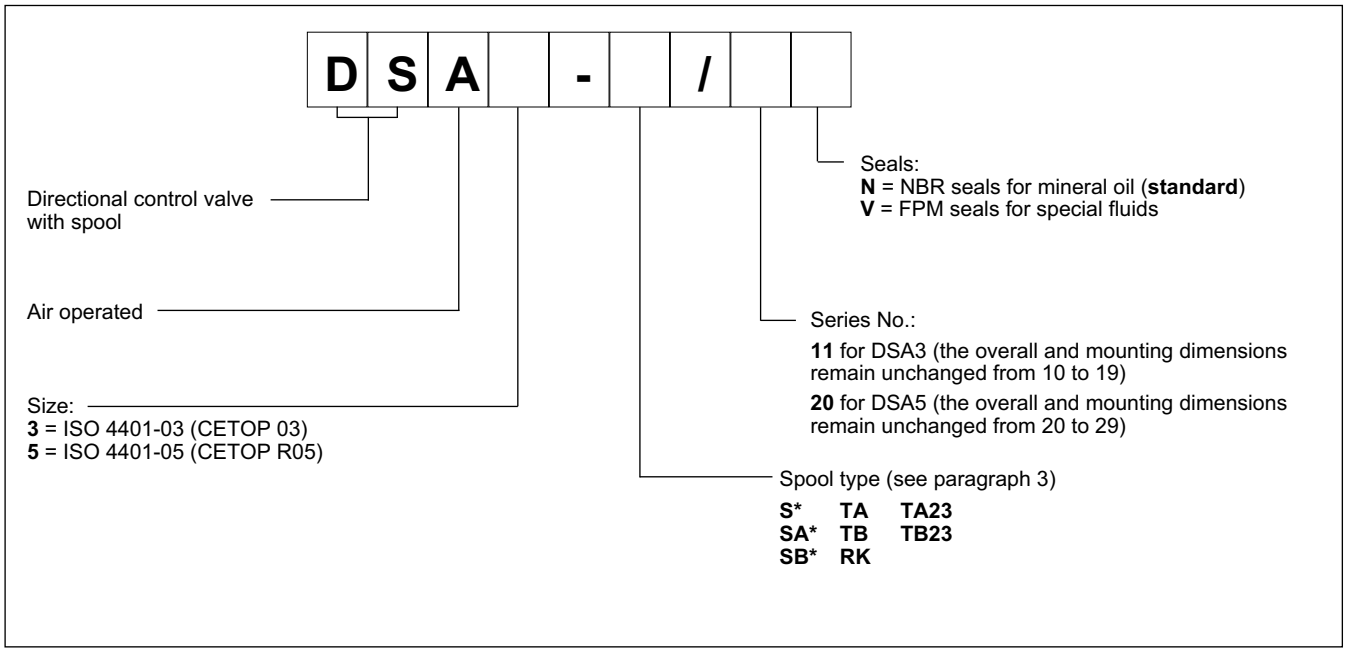
— It is available with 2 or 3 positions with return spring, or with 2 positions with mechanical retention.

— The Y external drain is available (standard) for the ISO 4401-05 (CETOP R05) size and it must be connected when there is backpressure higher than 25 bar on the T port.

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

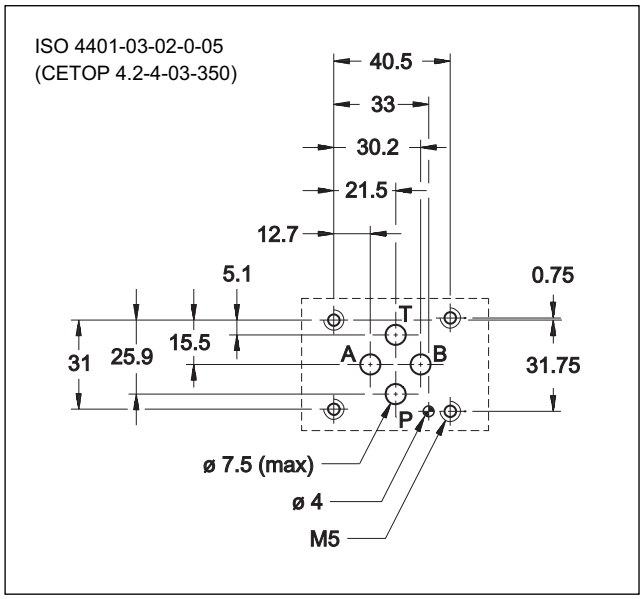
		DSA3	DSA5
Maximum working pressure: - P, A, B ports - T port without Y external drain - T port with Y external drain (available for DSA5 only)	bar	 350 25 -	 320 25 320
Piloting pressure: - min - max	bar	 4 12	 4,5 12
Nominal flow rate	l/min	75	120
Ambient temperature range	°C	-20 / +50	
Fluid temperature range	°C	-20 / +80	
Fluid viscosity range	cSt	10 ÷ 400	
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15		
Recommended viscosity	cSt	25	
Mass: single operator valve dual operator valve	kg	1,3 1,7	3,2 4,0

1 - IDENTIFICATION CODE

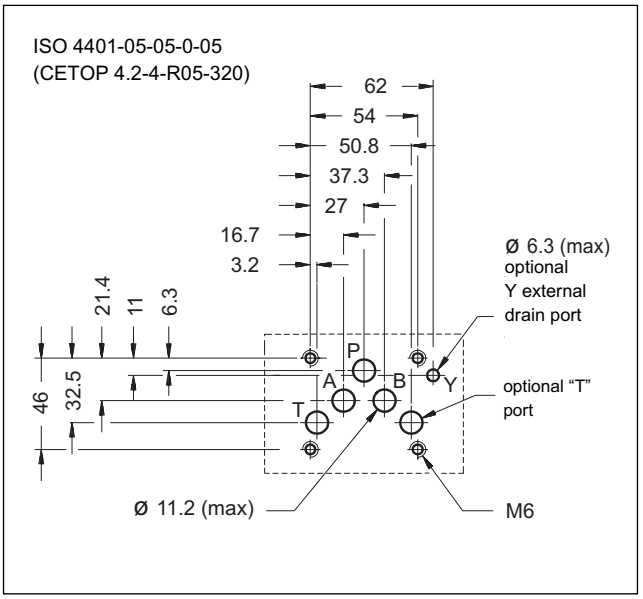


2 - MOUNTING INTERFACE

DSA3



DSA5



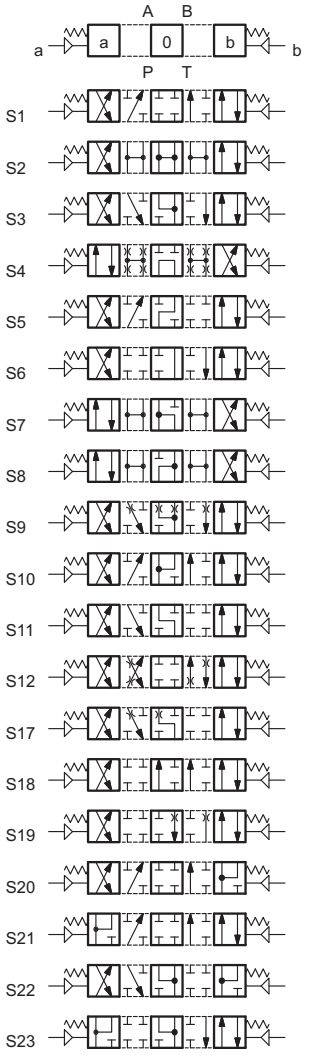
3 - HYDRAULIC FLUIDS

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

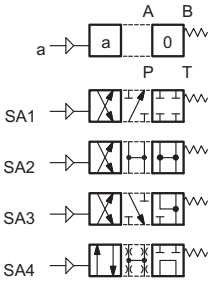
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

4 - SPOOL TYPE

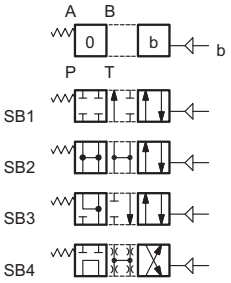
Type **S***:
2 operations - 3 positions
with spring centering



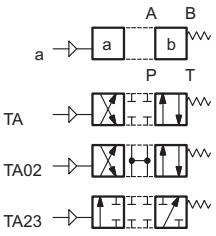
Type **SA***:
1 operation side A
2 positions (central + external)
with spring centering



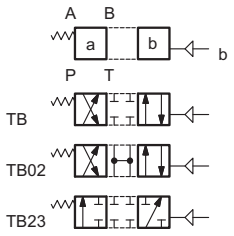
Type **SB***:
1 operation side B
2 positions (central + external)
with spring centering



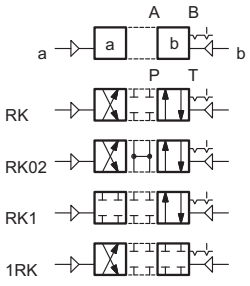
Type **TA**:
1 operation side A
2 external positions
with return spring



Type **TB**:
1 operation side B
2 external positions
with return spring



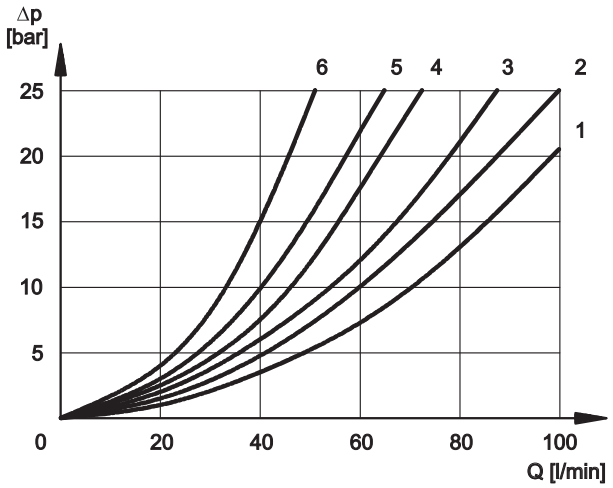
Type **RK**:
2 operations - 2 positions
with mechanical retention



Besides the diagrams shown, which are the most frequently used, other special versions are available: consult our technical department for their identification and operating limits.

5 - PRESSURE DROPS Δp-Q (values obtained with viscosity 36 cSt at 50 °C)

5.1 - DSA3



For pressure drops between A and B lines of spools S10, S20, S21, S22 and S23, which are used in the regenerative diagram, refer to curve 5.

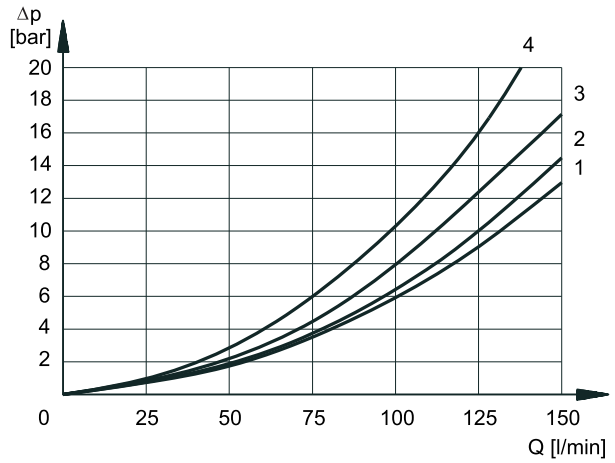
PRESSURE DROPS WITH VALVE IN ENERGIZED POSITION

SPOOL TYPE	FLOW DIRECTION			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPH			
S1, SA1, SB1	2	2	3	3
S2, SA2, SB2	1	1	3	3
S3, SA3, SB3	3	3	1	1
S4, SA4, SB4	5	5	5	5
S5	2	1	3	3
S6	2	2	3	1
S7, S8	4	5	5	5
S9	2	2	3	3
S10	1	3	1	3
S11	2	2	1	3
S12	2	2	3	3
S17	2	2	3	3
S18	1	2	3	3
S19	2	2	3	3
S20	1	5	2	
S21	5	1		2
S22	1	5	2	
S23	5	1		2
TA, TB	3	3	3	3
TA02, TB02	2	2	2	2
TA23, TB23	3	3		
RK	2	2	2	2
RK02	2	2	2	2
RK1, 1RK	2	2	2	2

PRESSURE DROPS WITH VALVE IN DE-ENERGIZED POSITION

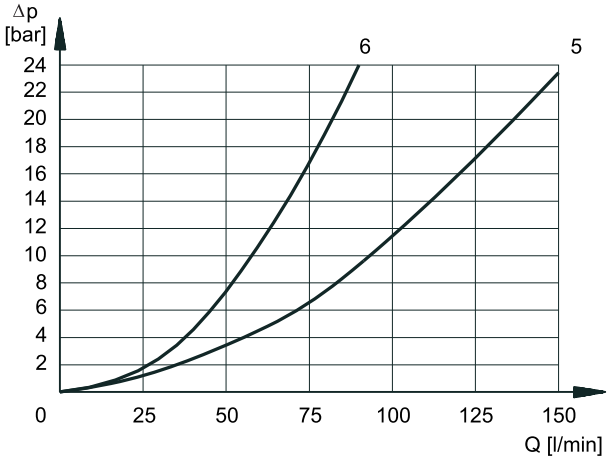
SPOOL TYPE	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S2, SA2, SB2					2
S3, SA3, SB3			3	3	
S4, SA4, SB4					5
S5		4			
S6				3	
S7, S8			6	6	5
S10	3	3			
S11			3		
S18	4				
S22			3	3	
S23			3	3	

5.2 - DSA5



PRESSURE DROPS WITH VALVE IN ENERGIZED POSITION

SPOOL TYPE	FLOW DIRECTION			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPH			
S1, SA1, SB1	2	2	1	1
S2, SA2, SB2	3	3	1	1
S3, SA3, SB3	3	3	2	2
S4, SA4, SB4	1	1	2	2
S5	2	1	1	1
S6, S11	3	3	2	2
S7, S8	1	1	2	2
S9	3	3	2	2
S10	1	1	1	1
S12	2	2	1	1
S17, S19	2	2	1	1
S18	1	2	1	1
S20, S21				
S22, S23				
TA, TB	3	3	2	2
TA02, TB02	3	3	2	2
TA23, TB23	4	4		
RK	3	3	2	2
RK02	3	3	2	2
RK1, 1RK	3	3	2	2



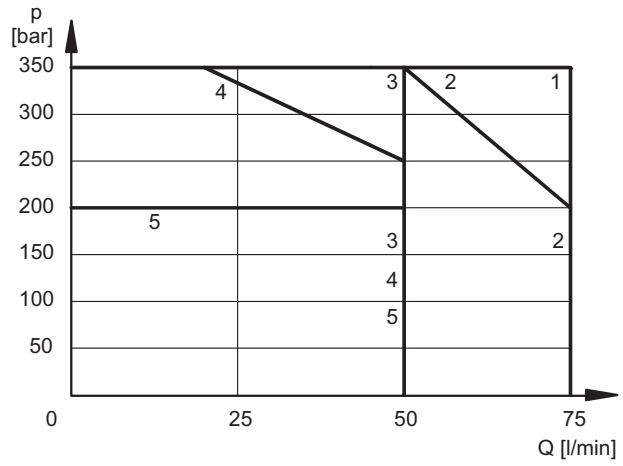
PRESSURE DROPS WITH VALVE IN DE-ENERGIZED POSITION

SPOOL TYPE	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S2, SA2, SB2					5
S3, SA3, SB3			6	6	
S4, SA4, SB4					5
S5		3			
S6				6	
S7					5
S10	3	3			
S11			6		
S18	3				
S22					
S23					

6 - OPERATING LIMITS

The curves define the flow rate operating fields according to the valve pressure of the different versions. The values have been obtained according to ISO 6403 norm, with mineral oil viscosity 36 cSt at 50 °C and filtration according to ISO 4406:1999 class 18/16/13.

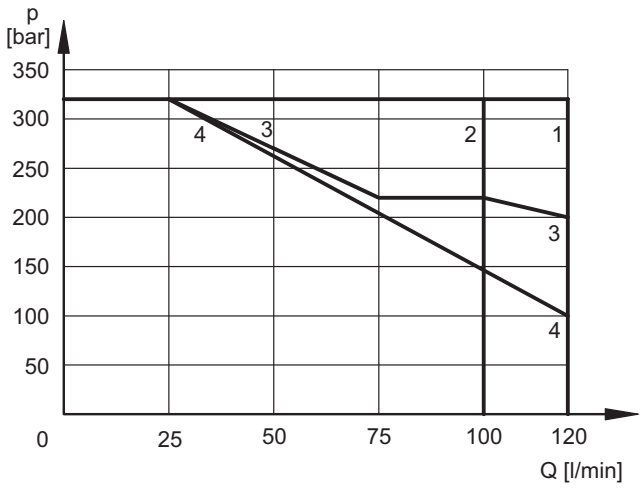
6.1 - DSA3



SPOOL TYPE	CURVE	
	P→A	P→B
S1,SA1,SB1	1	1
S2, SA2, SB2	1	1
S3, SA3, SB3	2	2
S4, SA4, SB4	3	3
S5	1	1
S6	3	2
S7	3	3
S8	3	3
S9	1	1
S10	1	1
S11	2	3
S12	1	1

SPOOL TYPE	CURVE	
	P→A	P→B
S17	1	1
S18	1	1
S19	1	1
S20	4	4
S21	4	4
S22	5	4
S23	4	5
TA, TB	1	1
TA02, TB02	1	1
TA23, TB23	1	1
RK	1	1
RK02	1	1
RK1, 1RK	1	1

6.2 - DSA5



SPOOL TYPE	CURVE	
	P→A	P→B
S1,SA1,SB1	1	1
S2, SA2, SB2	1	1
S3, SA3, SB3	3 *	3 *
S4, SA4, SB4	4	4
S5		
S6		
S7		
S8		
S9		
S10		
S11		
S12		

SPOOL TYPE	CURVE	
	P→A	P→B
S17		
S18		
S19		
S20		
S21		
S22		
S23		
TA, TB	2 *	2 *
TA02, TB02		
TA23, TB23		
RK		
RK02		
RK1, 1RK		

* **NOTE:** for spools S3 and TA, the curve has been obtained with a min. piloting pressure of 4,5 bar. If the minimum piloting pressure used is 5,5 bar, refer to the curve n° 1 (320 bar - 120 l/min).

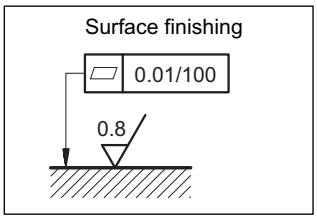
NOTE: The values indicated in the graphs are relevant to the standard valve. The operating limits can be considerably reduced if a 4-way valve is used with port A or B plugged or without flow.

7 - 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.

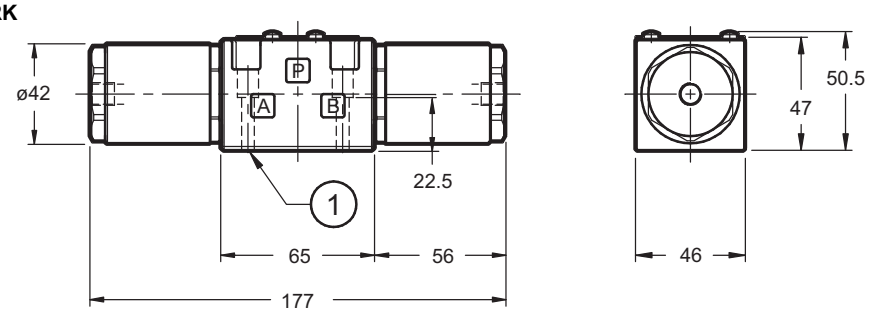
Valve fixing is by means of screws or tie rods, with the valve mounted on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing.

If the minimum values of planarity and/or smoothness are not met, fluid leakage between valve and mounting surface can easily occur.

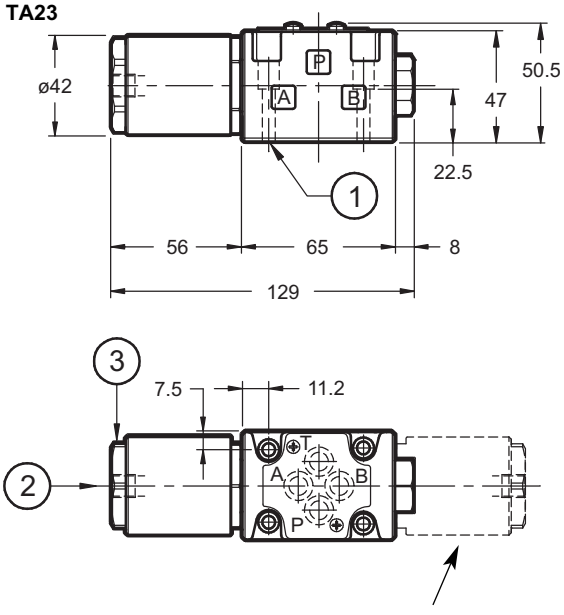


8 - DSA3 OVERALL AND MOUNTING DIMENSIONS

DSA3 - S*
DSA3 - RK



DSA3 - TA
DSA3 - SA*
DSA3 - TA23



operation position configuration SB*, TB and TB23

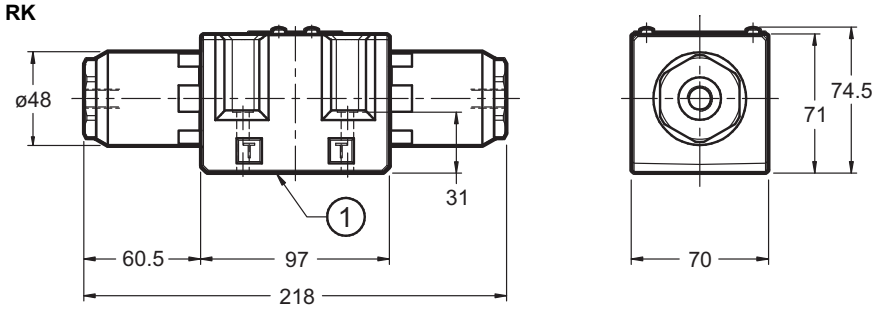
dimensions in mm

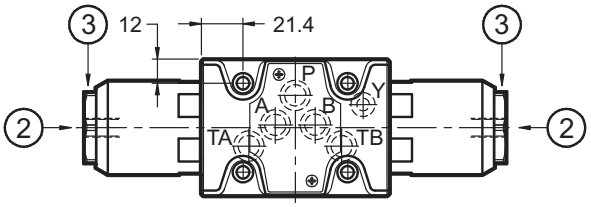
1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	1/4" BSP connection for pneumatic operator
3	Hexagon: spanner 38 Tightening torque 35 ÷ 40 Nm

Valve fastening:	N. 4 SHC screws ISO 4762 - M5x30
Tightening torque:	5 Nm (bolts A 8.8)
Threads of mounting holes: M5x10	

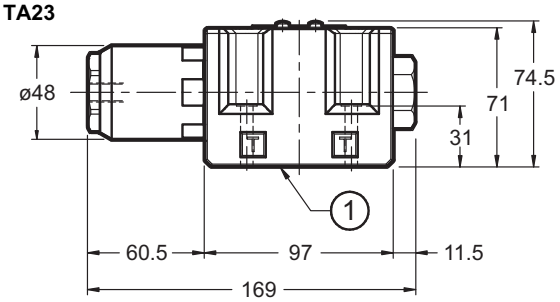
9 - DSA5 OVERALL AND MOUNTING DIMENSIONS

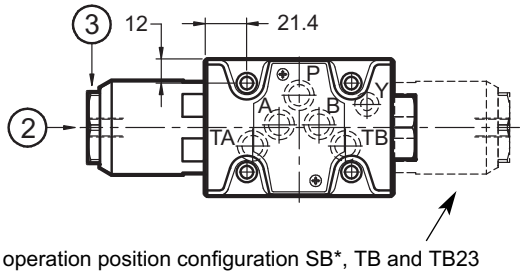
DSA5 - S*
DSA5 - RK





DSA5 - TA
DSA5 - SA*
DSA5 - TA23





operation position configuration SB*, TB and TB23

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
2	1/4" BSP connection for pneumatic operator
3	Hexagon: spanner 38 Tightening torque 35 ÷ 40 Nm

Valve fastening:	N. 4 SHC screws ISO 4762 - M6x40
Tightening torque:	8 Nm (bolts A 8.8)
Threads of mounting holes: M6x10	

10 - SUBPLATES (see catalogue 51 000)

	DSA3	DSA5
Type with rear ports	PMMD-AI3G	PMD4-AI4G - 3/4" BSP threaded
Type with side ports	PMMD-AL3G	PMD4-AL4G - 1/2" BSP threaded
Threading of ports P, T, A and B	3/8" BSP	

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DUPLOMATIC OLEODINAMICA

DSC3

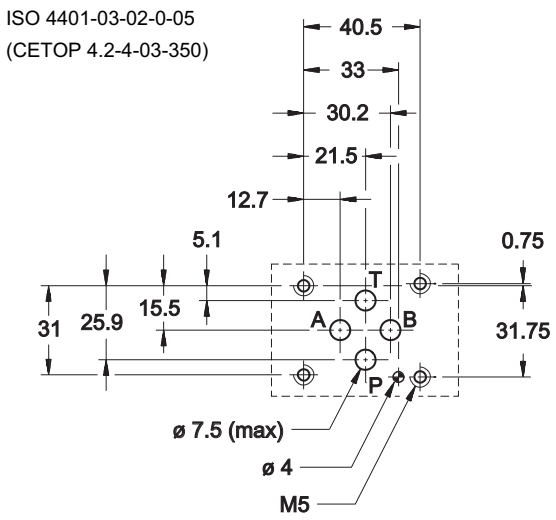
HYDRAULICALLY OPERATED DIRECTIONAL CONTROL VALVE

SERIES 11

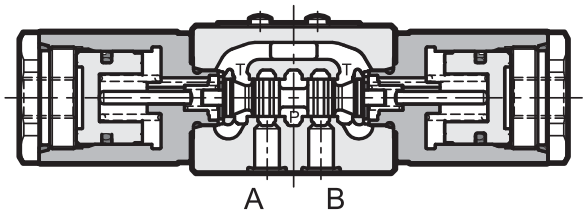
SUBPLATE MOUNTING
ISO 4401-03 (CETOP 03)

p max (see performances table)
Q nom (see performances table)

MOUNTING SURFACE



OPERATING PRINCIPLE



— The DSC3 are hydraulically operated directional control valves, available with 3 or 4 ways with several interchangeable spools and with mounting interface according to ISO 4401 (CETOP RP121H) standards.

— The valve body is made with high strength iron castings provided with wide internal passages in order to minimize the flow pressure drop.

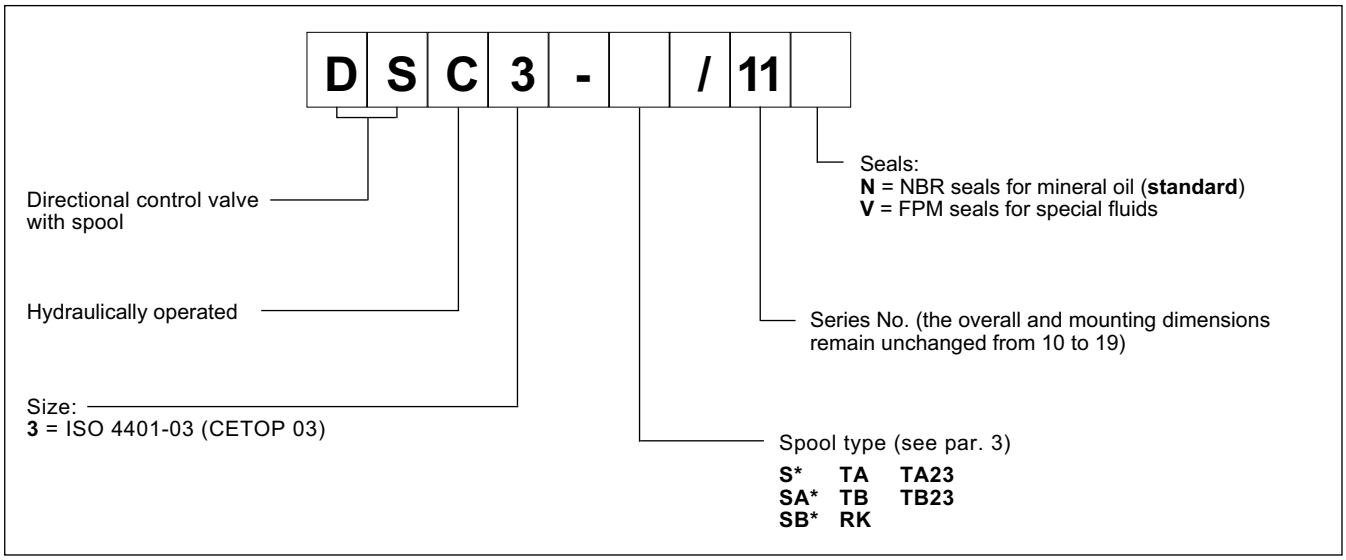
— It is available with 2 or 3 positions with return spring, or with two positions with mechanical retention.

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

Maximum working pressure: - P A B ports - T port	bar	 350 25
Piloting pressure - min - max	bar	 15 (**NOTE 1**) 210
Nominal flowrate	l/min	75
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass: single operation valve double operation valve	kg	1,3 1,7

NOTE 1: The piloting pressure must be higher than the counterpressure on T port, of 15 bar at least: to allow the cursor reversal at middle the piloting pressure has to lower quickly at 0 bar.
The piston return spring generates a minimum backpressure of 0.5 bar on the piloting line.

1 - IDENTIFICATION CODE

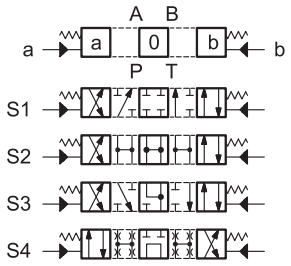


2 - HYDRAULIC FLUIDS

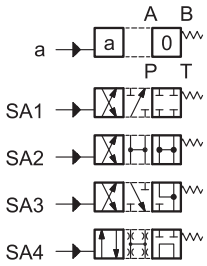
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V).
For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

3 - SPOOL TYPE

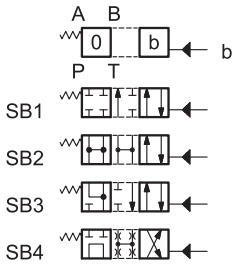
Type **S***:
2 operations - 3 positions
with spring centering



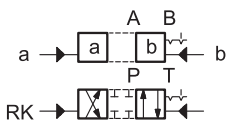
Type **SA***:
1 operation side A
2 positions (central + external)
with spring centering



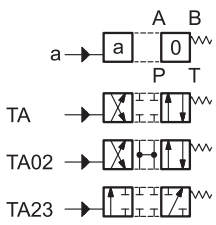
Type **SB***:
1 operation side B
2 positions (central + external)
with spring centering



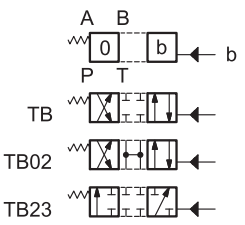
Type **RK**:
2 operations - 2 positions
with mechanical retention



Type **TA**:
1 operation side A
2 external positions
with return spring

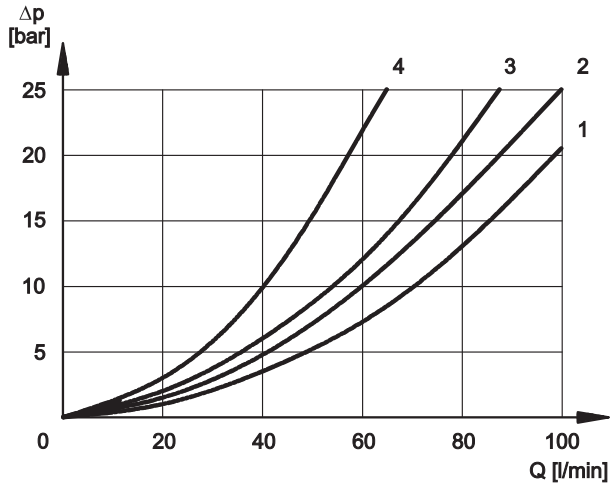


Type **TB**:
1 operation side B
2 external positions
with return spring



Besides the diagrams shown, which are the most frequently used, other special versions are available: consult our technical department for their identification and operating limits.

4 - PRESSURE DROPS Δp-Q (values obtained with viscosity 36 cSt at 50 °C)



PRESSURE DROPS WITH VALVE IN ENERGIZED POSITION

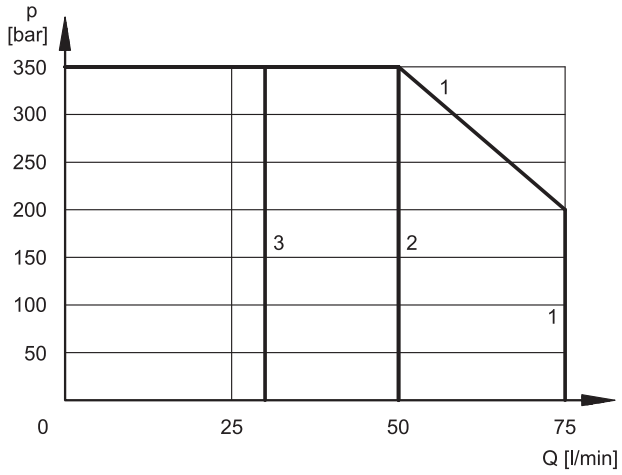
SPOOL TYPE	FLOW DIRECTION			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPH			
S1, SA1, SB1	2	2	3	3
S2, SA2, SB2	1	1	3	3
S3, SA3, SB3	3	3	1	1
S4, SA4, SB4	4	4	4	4
TA, TB	3	3	3	3
TA02, TB02	2	2	2	2
TA23, TB23	3	3		
RK	2	2	2	2

PRESSURE DROPS WITH VALVE IN DE-ENERGIZED POSITION

SPOOL TYPE	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S2, SA2, SB2					2
S3, SA3, SB3			3	3	
S4, SA4, SB4					3

5 - OPERATING LIMITS

The curves define the flow rate operating fields according to the valve pressure of the different versions. The values indicated in the graphs are relevant to the standard solenoid valve. The operating limits can be considerably reduced if a 4-way valve is used as 3-way valve with port A or B plugged or without flow.The values have been obtained according to ISO 6403 norm, with mineral oil viscosity 36 cSt at 50 °C and filtration according to ISO 4406:1999 class 18/16/13.



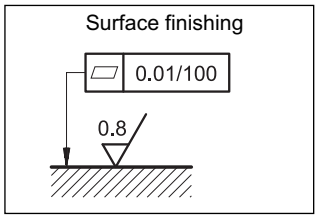
SPOOL TYPE	CURVE	
	P→A	P→B
S1,SA1,SB1	1	1
S2, SA2, SB2	2	2
S3, SA3, SB3	1	1
S4, SA4, SB4	2	2

SPOOL TYPE	CURVE	
	P→A	P→B
TA, TB	1	1
TA02, TB02	2	2
TA23, TB23	1	1
RK	3	3

NOTE: The values indicated in the graphs are relevant to the standard valve. The operating limits can be considerably reduced if a 4-way valve is used with port A or B plugged or without flow.

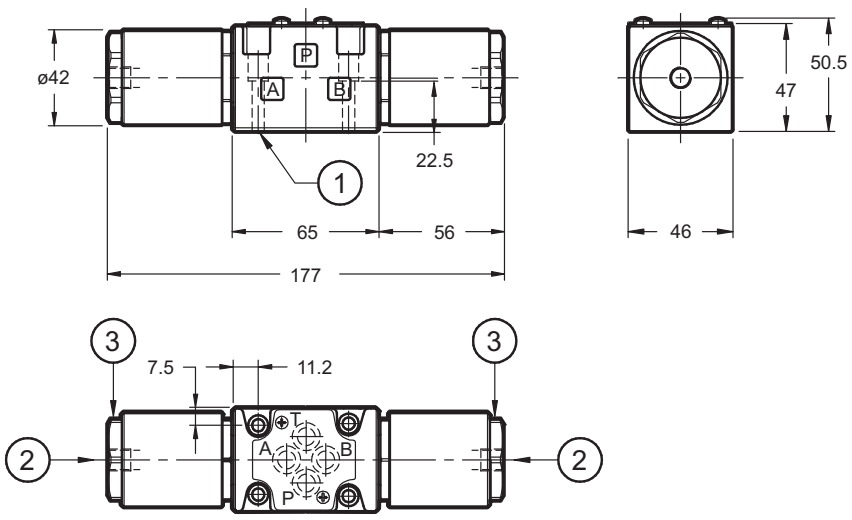
6 - INSTALLATION

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.

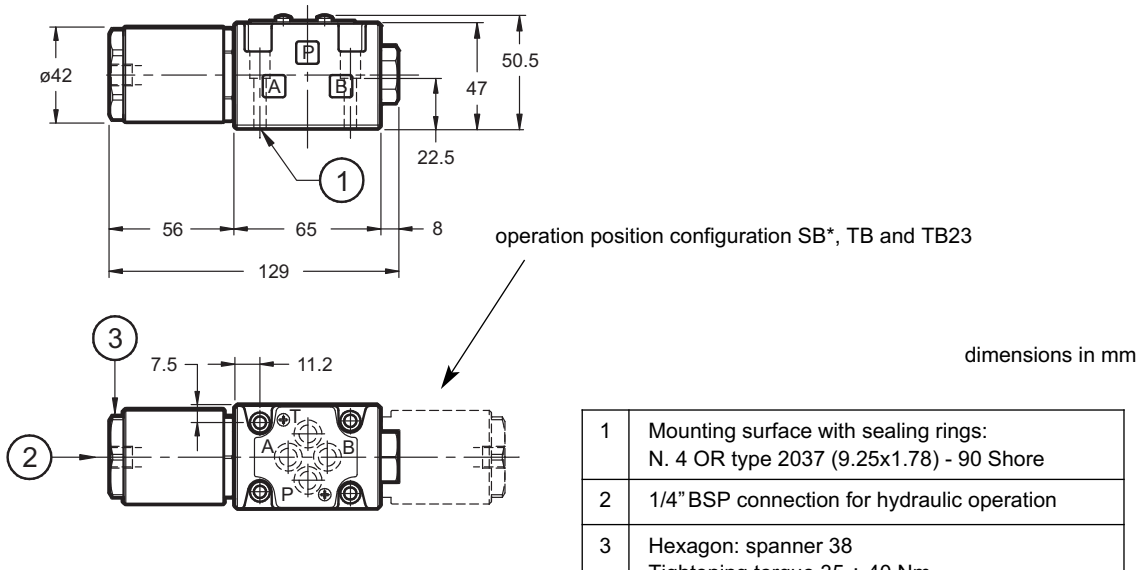


7 - OVERALL AND MOUNTING DIMENSIONS

DSC3 - S*
DSC3 - RK



DSC3 - TA
DSC3 - SA*
DSC3 - TA23



dimensions in mm

1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) - 90 Shore
2	1/4" BSP connection for hydraulic operation
3	Hexagon: spanner 38 Tightening torque 35 ÷ 40 Nm

8 - VALVE FASTENING BOLTS

N. 4 fastening bolts SHC ISO 4762 M5x30
Tightening torque 5 Nm (bolts A 8.8)

9 - SUBPLATES (see cat. 51 000)

PMMD-AI3G Type with rear ports
PMMD-AL3G Type with side ports
Threading of ports P, T, A, B: 3/8" BSP

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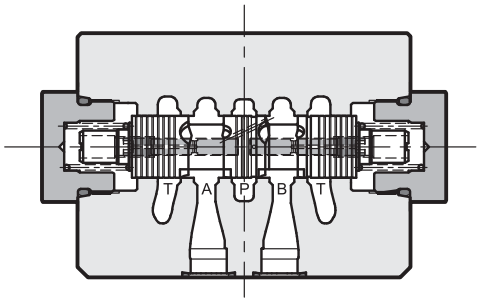
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

DSB*
SELF-REVERSING VALVE
SERIES 10

MOUNTING SURFACES
DSB3 **ISO 4401-03** (CETOP 03)
DSB5 **ISO 4401-05** (CETOP 05)

p max (see performances table)
Q nom (see performances table)

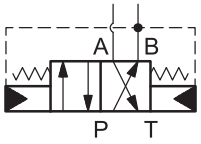
OPERATING PRINCIPLE



— The DSB* are directional control valves with self-reversing spool and mounting interface according to ISO 4401-03 and 4401-05 (CETOP RP121H) standards.

— The valves realize the reciprocation of the flow direction when the flowrate stops in A or B line (f.e., when a cylinder reaches the end stroke). The reversing process is independent of the line pressure.

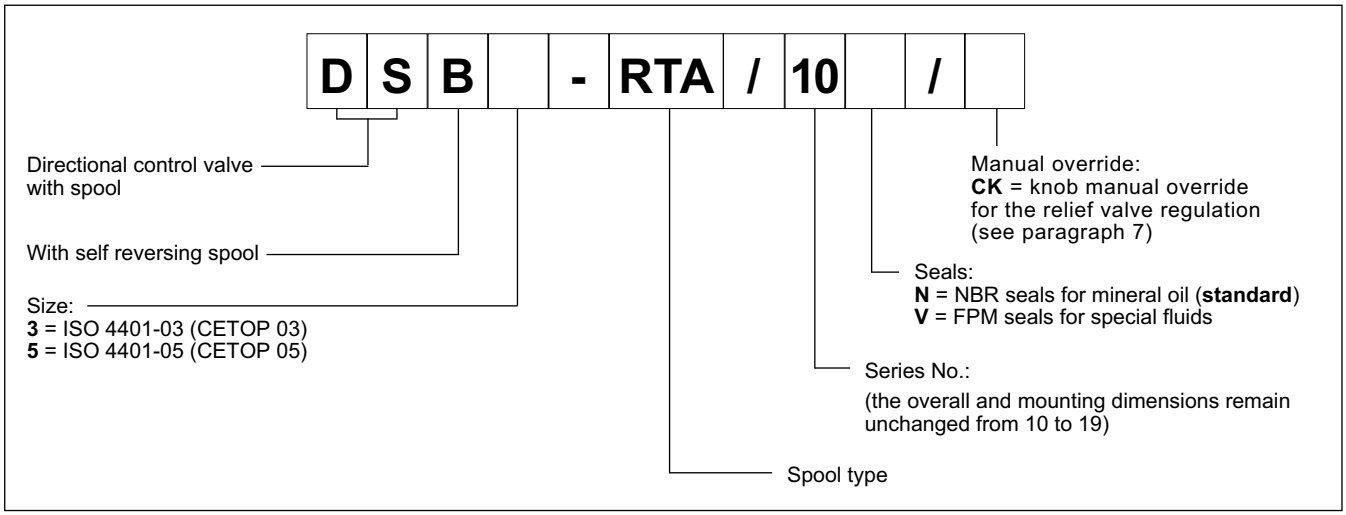
HYDRAULIC SYMBOL



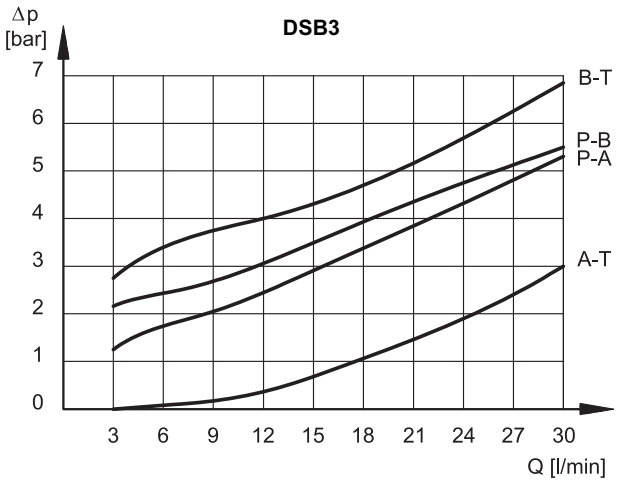
PERFORMANCES (measured with mineral oil of viscosity 36 cSt at 50°C)

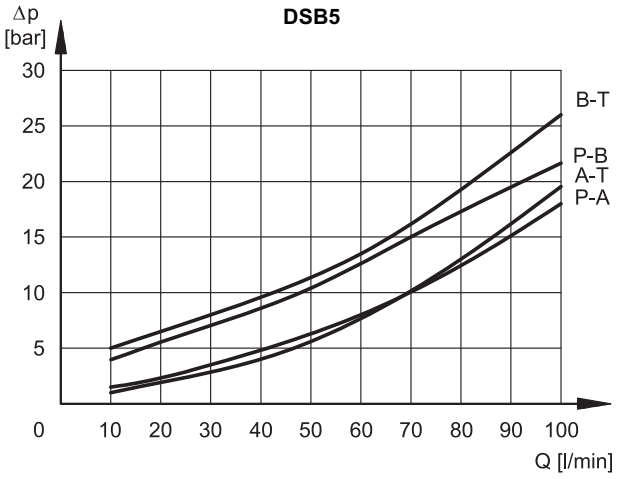
		DSB3	DSB5
Maximum operating pressure on port P	bar	350	320
Minimum allowed pressure	bar	50	60
Maximum flow rate	l/min	30	100
Minimum allowed flow rate	l/min	3	10
Ambient temperature range	°C	-20 / +50	
Fluid temperature range	°C	-20 / +80	
Fluid viscosity range	cSt	10 ÷ 400	
Recommended viscosity	cSt	25	
Fluid contamination degree		according to ISO 4406:1999 class 20/18/15	
Mass	kg	0,9	2,8

1 - IDENTIFICATION CODE



2 - PRESSURE DROPS Δp-Q (values obtained with viscosity 36 cSt at 50 °C)





3 - HYDRAULIC FLUIDS

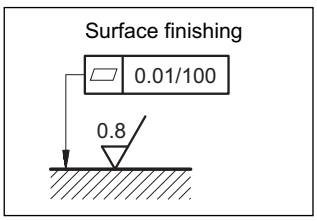
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

4 - INSTALLATION

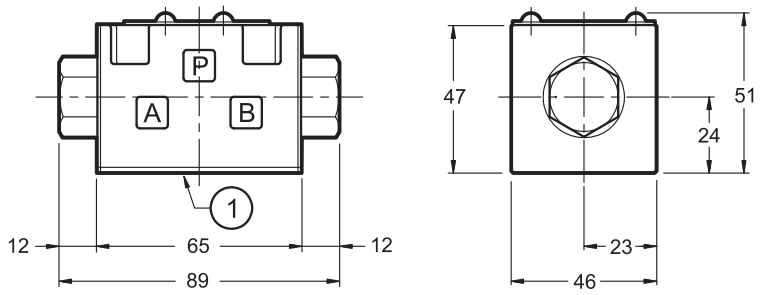
The valves can be mounted in any position. Valve fixing is by means of screws or tie rods, with the valve mounted on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing.

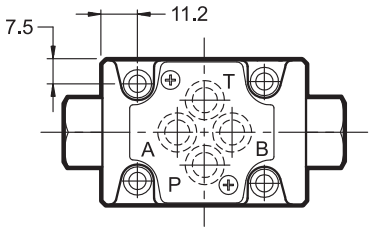
If the minimum values of planarity and/or smoothness are not met, fluid leakage between valve and mounting surface can easily occur.



5 - OVERALL AND MOUNTING DIMENSIONS DSB3

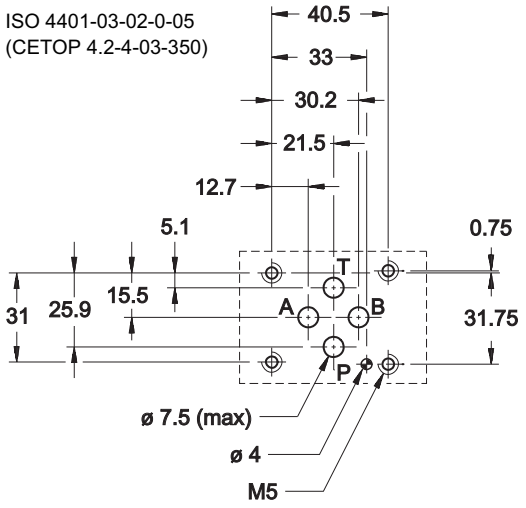
dimensions in mm





MOUNTING SURFACE

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

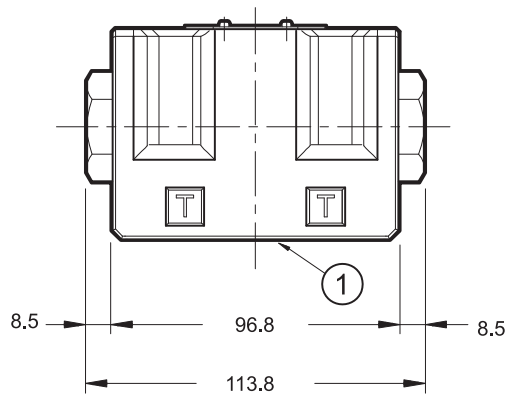


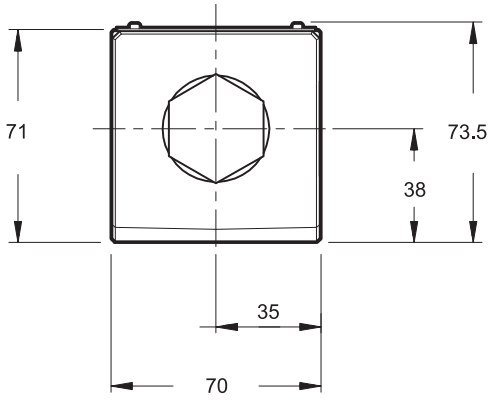
1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 shore

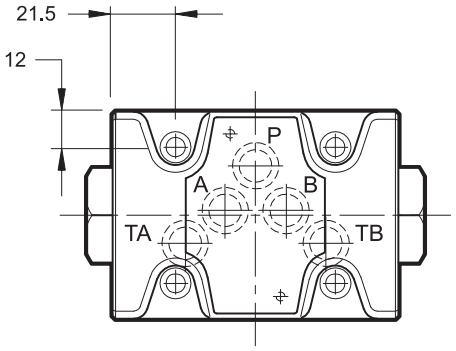
Valve fastening:	N. 4 bolts SHC M5x30 - ISO 4762
Tightening torque:	5 Nm (bolts A 8.8)

6 - OVERALL AND MOUNTING DIMENSIONS DSB5

dimensions in mm

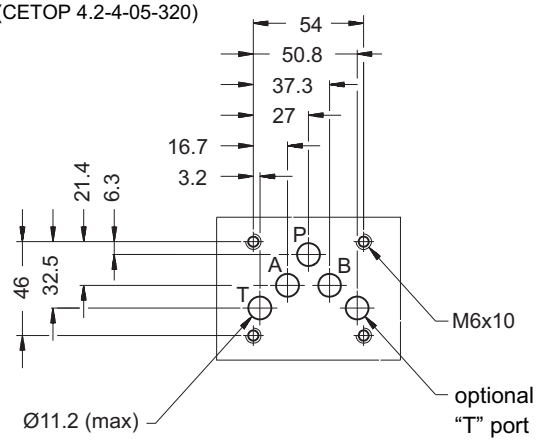






MOUNTING SURFACE

ISO 4401-05-04-0-05
(CETOP 4.2-4-05-320)

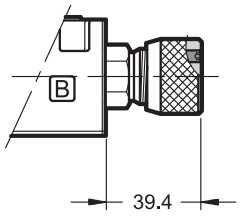
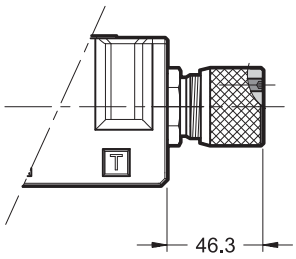


1	Mounting surface with sealing rings: N. 5 OR type 2050 (12.42x1.78) 90 shore

Valve fastening:	N. 4 bolts SHC M6x40 - ISO 4762
Tightening torque:	8 Nm (bolts A 8.8)

7 - KNOB MANUAL OVERRIDE

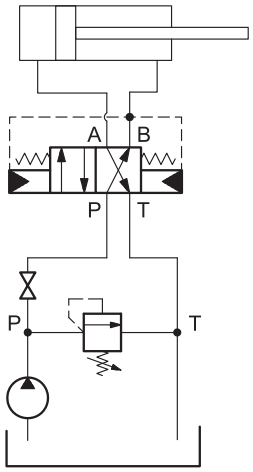
The knob manual override **CK** allows to set the pressure of the relief valve without using shut-off valves.

Manual override CK for **DSB3**	Manual override CK for **DSB5**
	
Spanner for set screw: 2,5 mm	Spanner for set screw: 3 mm

8 - APPLICATION EXAMPLES

We suggest to use the circuits shown, connecting the A port with the rear chamber of the cylinder. In this way, with the start of the pump, the valve places itself, so as to retract the rod. To work properly the valve needs an area ratio of the cylinder chambers included between 1:1,25 and 1:2.

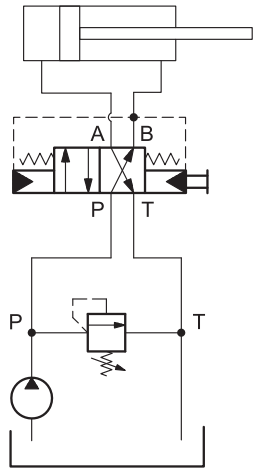
8.1 - Standard valve



To set the system relief valve correctly, the self-reversing function must be inactive.

To do so, close the shut-off valve, start the pump, set the pressure relief valve and stop the pump. Then, open the shut-off valve and restart the pump.

8.2 - Valve with knob manual override



To set the system relief valve correctly, the self-reversing function must be inactive.

To do so, completely unscrew the set screw then tighten the knob until it is at machanical stop. The spool is now clamped in position P → B and A → T. Start the pump, set the pressure of the relief valve and then stop the pump. Re-establish the working conditions of the valve, unscrewing almost completely the knob and screwing the set screw, until its point is aligned with the edge of the knob.

The valve is in normal working conditions when the knob is tightened and the point of the set screw is aligned with the edge of the knob.

⚠ Do not use the manual override when the valve is on, if it is necessary stop the pump.

8 - SUBPLATES (see catalogue 51 000)

	DSB3	DSB5
Type with rear ports	PMMD-AI3G	PMD4-AI4G - 3/4” BSP threaded
Type with side ports	PMMD-AL3G	PMD4-AL4G - 1/2” BSP threaded
Threading of ports P, T, A, B	3/8” BSP	-

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DT03

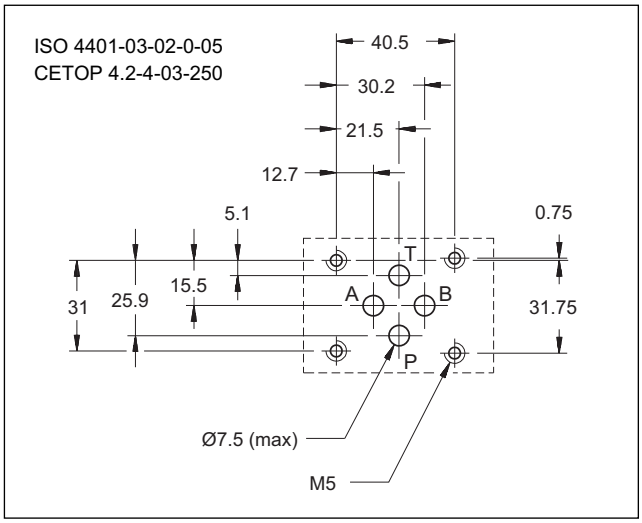
POPPET TYPE SOLENOID OPERATED DIRECTIONAL CONTROL VALVE

SERIES 10

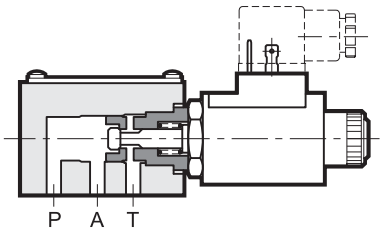
SUBPLATE MOUNTING
ISO 4401-03 (CETOP 03)

p max **250** bar
Q max **25** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



— Direct-acting control valve with conical seat seal.

— Two- or three-way versions with possibility of seal in both directions for two-way valves.

— Leakproof solenoids in oil bath, available in alternating and direct current supply voltages.

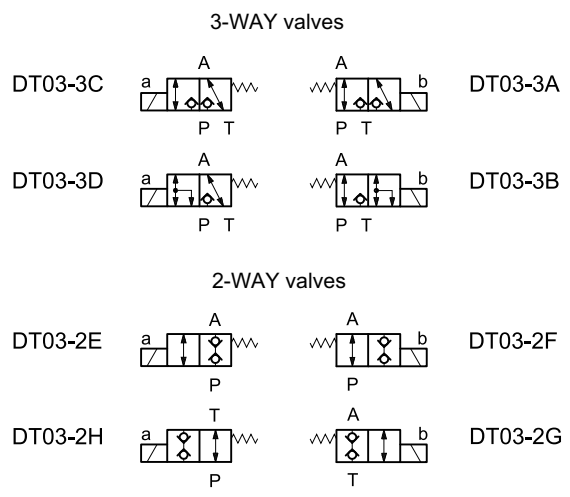
CONFIGURATIONS (see hydraulic symbols table below)

– Configurations “A”, “B”, “C”, “D”: 3-way, 2-position solenoid valves.
– Configurations “E”, “F”, “G”, “H”: 2-way, 2-position solenoid valves.

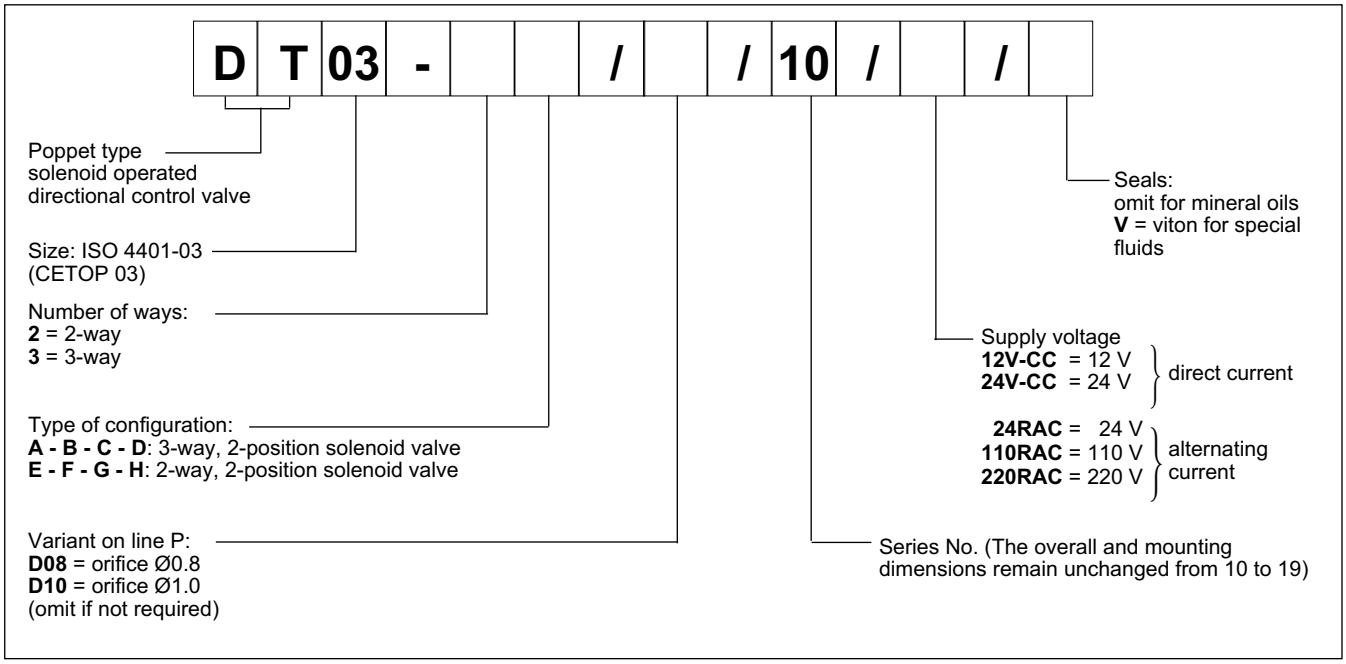
PERFORMANCES (measured with mineral oil of viscosity 36 cSt at 50°C)

Maximum operating pressure	bar	250
Maximum flow rate	l/min	25
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass	kg	1,3

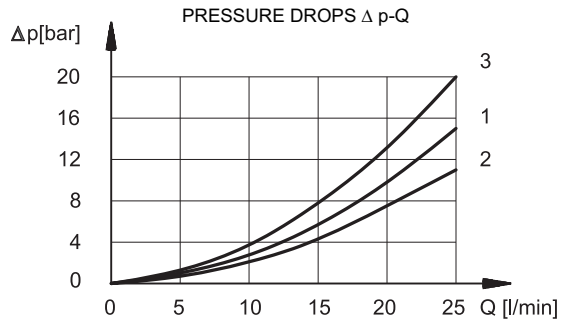
HYDRAULIC SYMBOLS

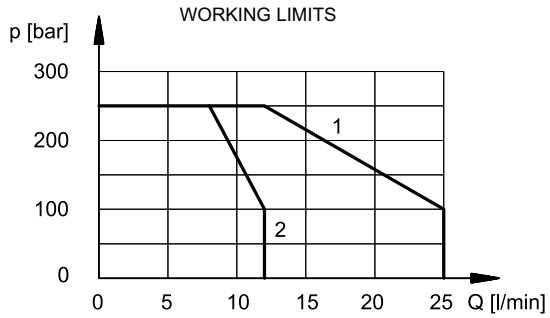


1 - IDENTIFICATION CODE



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





valve code	Curve on graph	
	De-energized solenoid	Energized solenoid
DT03-3A	1	3
DT03-3B	2	3
DT03-3C	1	3
DT03-3D	2	3
DT03-2E	-	3
DT03-2F	1	-
DT03-2G	-	3
DT03-2H	1	-

Valve	Curve on graph
DT03-3A	2
DT03-3B	1
DT03-3C	1
DT03-3D	1
DT03-2E	1
DT03-2F	2
DT03-2G	1
DT03-2H	1

3 - 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 FEATURES

4.1 - 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, and can be turned 360° on its axis, compatible with space available. The interchangeability of coils of different voltages is allowed within the same type of supply current: alternating or direct (DC / RAC).

VOLTAGE SUPPLY FLUCTUATION	± 10% Vnom
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC) (**NOTE 1**)	In compliance with 2004/108/CE
LOW VOLTAGE	In compliance with 2006/95/CE
CLASS OF PROTECTION: Atmospheric agents (CEI EN 60529) Coil insulation (VDE 0580) Impregnation	IP 65 (**NOTE 2**) class H class F

4.2 - Current and power consumption

The table shows the consumption values for the different coil type.
It is necessary to always use “D” type connectors (with rectifier incorporated) and RAC coils for alternating current supply.
Rectified current supply takes place by using a bridge rectifier bridge, externally or fitted within the “D” type connectors, between the alternating current source (24V or 110V, /50 or /60 Hz) and the coil.

Coil	Voltage [V]	Resistance at 20°C [Ω]	Current consumption [A]	Power consumption [W]	Coil code
12V-CC	12	5,6	2,14	25,7	1902050
24V-CC	24	21,8	1,10	26,4	1902051
24RAC	24	17	1,23	26	1902052
110RAC	110	420	0,23	22	1902053
220RAC	220	1750	0,11	22	1902054

4.3 - Switching times

The values indicated refer to a flow rate of Q = 10 l/min, p = 210 bar working with mineral oil at a temperature of 50°C, a viscosity of 36 cSt and supply voltage equal to 90% of the nominal voltage.

TIMES (±10%)	ENERGIZING	DE-ENERGIZING
	30 ms	50 ms

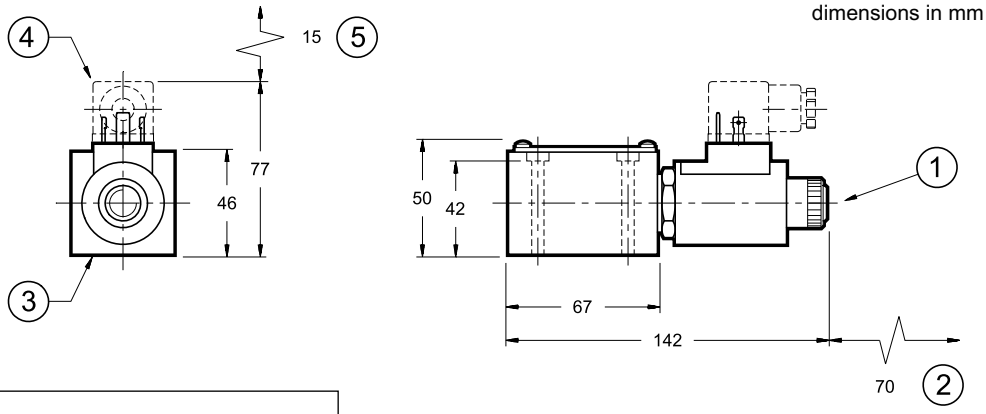
4.4 - Electric connectors

The solenoid valves are never supplied with connector.
Connectors must be ordered separately.
For the identification of the connector type to be ordered, please see catalogue 49 000.

5 - OVERALL AND MOUNTING DIMENSIONS

NOTE: The solenoid position here shown is for A-B-F-G versions.
For the other versions the solenoid is on the opposite side.

dimensions in mm

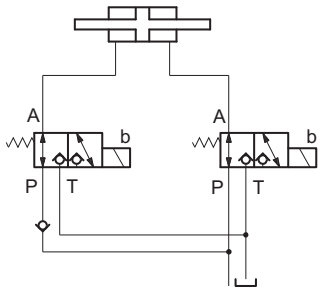


Fastening bolts:
4 bolts M5 x 50
Torque: 5 Nm

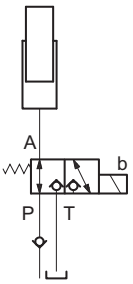
1	Manual override
2	Coil removal space
3	Mounting surface with sealing rings: 4 OR type 2037 (9.25X1.78) - 90 Shore
4	Electric connector to be ordered separately (see cat. 49 000)
5	Connector removal space

6 - APPLICATION EXAMPLES

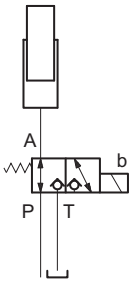
DT03-3A/10



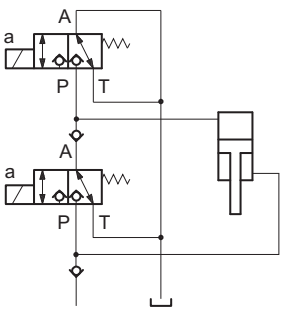
DT03-3A/10



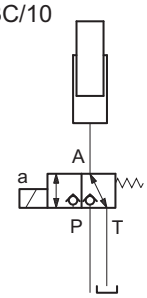
DT03-3A/10



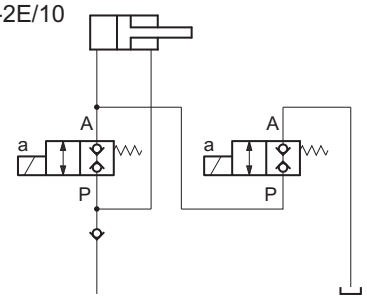
DT03-3C/10



DT03-3C/10



DT03-2E/10



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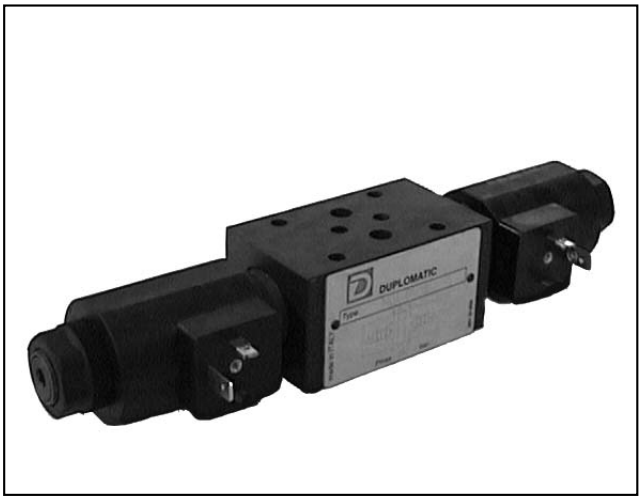


MDT

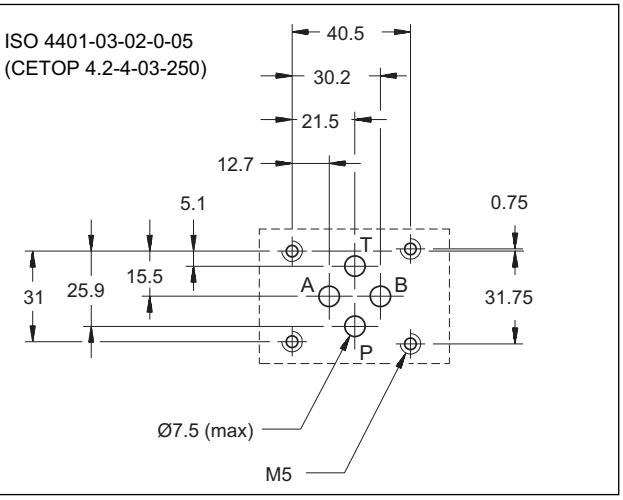
POPPET TYPE SOLENOID OPERATED DIRECTIONAL CONTROL VALVE

SERIES 10

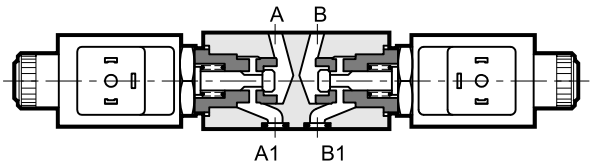
MODULAR VERSION
ISO 4401-03 (CETOP 03)

p max **250** bar
Q max **25** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



— Direct-acting control valve with conical seat seal, for maintaining hydraulic actuators in position.

— Two-way execution, normally closed, with seal in both directions when solenoid is de-energized.

— Leakproof solenoids in oil bath, available in AC and DC supply voltages.

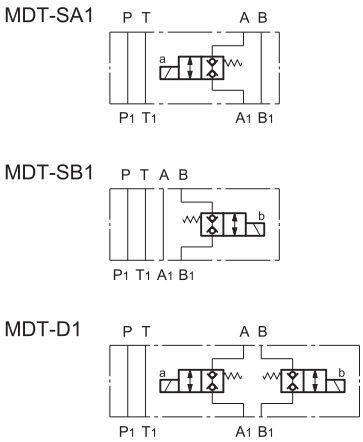
VALVE CONFIGURATIONS (see Hydraulic symbols table)

Configuration “SA”: utilized when line A flow is to be controlled.
Configuration “SB”: utilized when line B flow is to be controlled.
Configuration “D”: utilized when flows of lines A and B are to be controlled

PERFORMANCE RATINGS (working with mineral oil of viscosity of 36 cSt at 50°C)

Maximum operating pressure	bar	250
Maximum flow rate in controlled lines Maximum flow rate in free lines	l/min	25 65
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass MDT-D MDT-SA/SB	kg	1,7 1,2

HYDRAULIC SYMBOLS



1 - IDENTIFICATION CODE

M	D	T	-		1	/	10	-		/	

Modular valve
ISO 4401-03 (CETOP 03 size)

Poppet type solenoid operated directional control valve

Configurations: **SA** = control on line A
SB = control on line B
D = control on lines A and B

double seal - normally closed

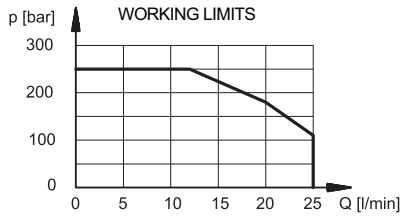
Seals: omit for mineral oils
V = viton for special fluids

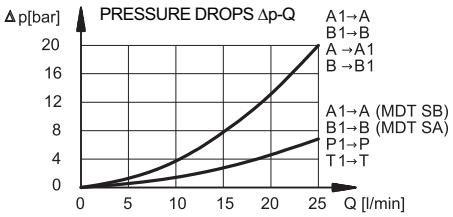
Supply voltages: see par. 3
Direct current: **12V DC**
24V DC
Alternating current: **110 RAC**
220 RAC

Series No.: (the overall and mounting dimensions remain unchanged from 10 to 19)

NOTE: The solenoid valves are never supplied with connector. Connectors must be ordered separately. To identificate the connector type to be ordered, please see catalogue 49 000.

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





3 - SUPPLY VOLTAGES

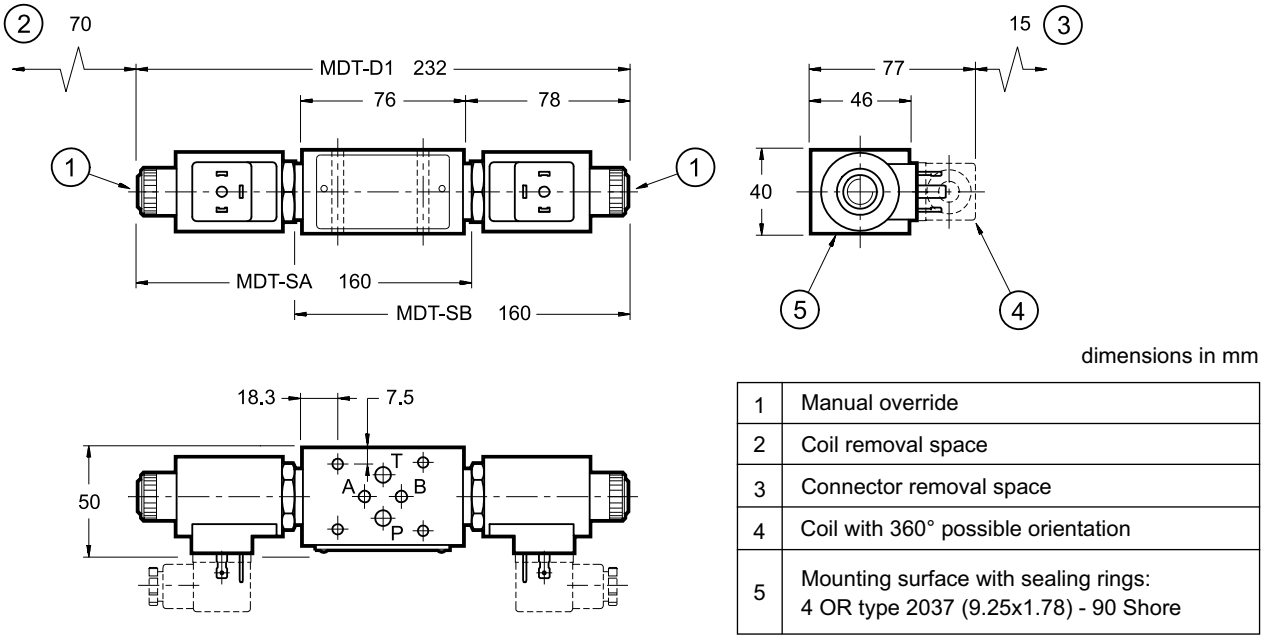
A connector with bridge rectifier and RAC coils are always used for alternating current supply.

Times ±10%	
Energizing	30 ms
De-energizing	50 ms

4 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

5 - OVERALL AND MOUNTING DIMENSIONS



dimensions in mm

1	Manual override
2	Coil removal space
3	Connector removal space
4	Coil with 360° possible orientation
5	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) - 90 Shore

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KT08

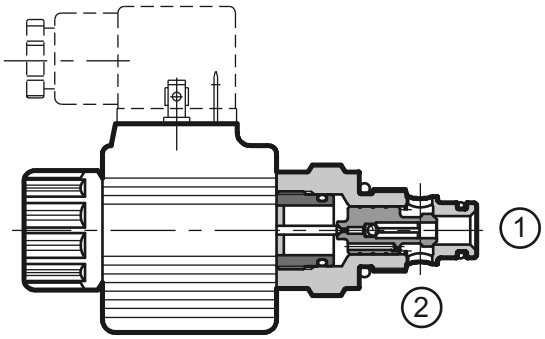
CARTRIDGE SOLENOID VALVE

SERIES 10

CARTRIDGE TYPE
seat 3/4-16 UNF-2B ISO 725

p max **350** bar
Q nom **50** l/min

OPERATING PRINCIPLE



— The KT08 is a 2-ways solenoid valve, poppet type, cartridge execution, available in normally closed version (NC) and normally open version (NO) with nominal flow rate of 50 l/min.

— It ensures a low internal leakage, which decreases while the pressure increases.

— The valve can be ordered with direct current or rectified current solenoids and with five different types of electrical connections, in order to cover many installation requirements (see paragraph 8).

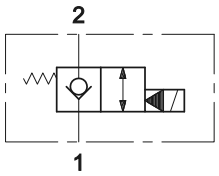
— For every version, the emergency manual override is an available option (see paragraph 7).

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

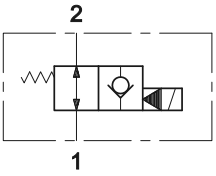
Maximum operating pressure	bar	350
Nominal flow rate	l/min	50
Pressure drops Δp - Q	see paragraph 3	
Electrical characteristics	see paragraph 5	
Electrical connections	see paragraph 8	
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass	kg	0,32
Surface treatment with white colour zinc	Fe / Zn 8c 1B UNI ISO 2081/4520	

HYDRAULIC SYMBOLS

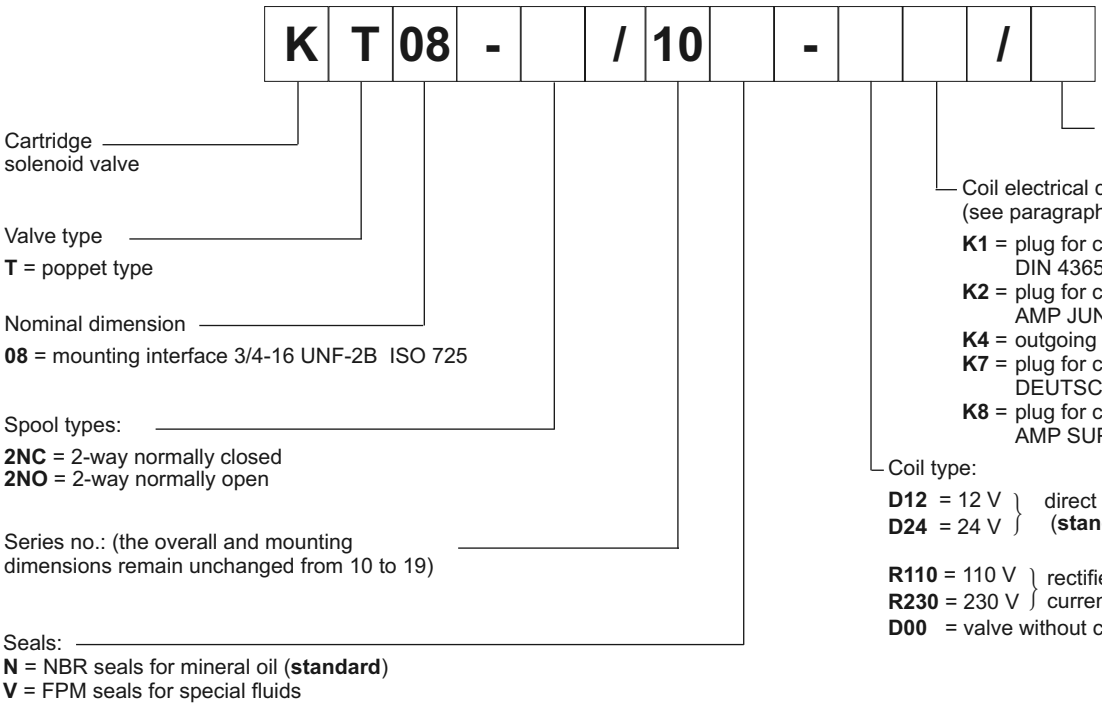
KT08-2NC



KT08-2NO

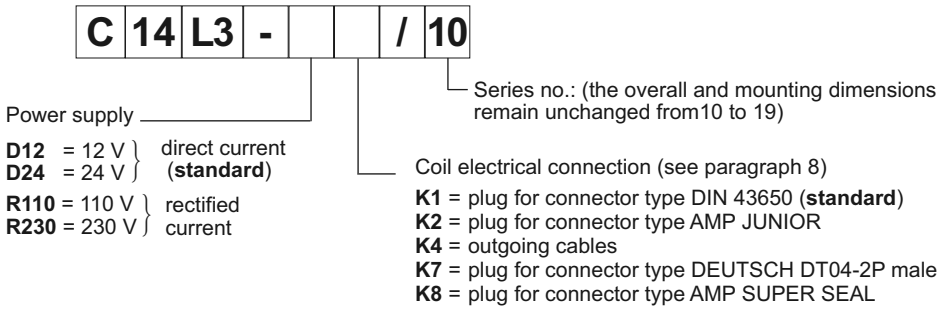


1 - IDENTIFICATION CODE



NOTE 1: The coil locking ring and the relevant seals are included in the supply.
NOTE 2: The manual override **CM** is available as an option (see paragraph 7).

1.1 - Coil identification code



2 - HYDRAULIC FLUIDS

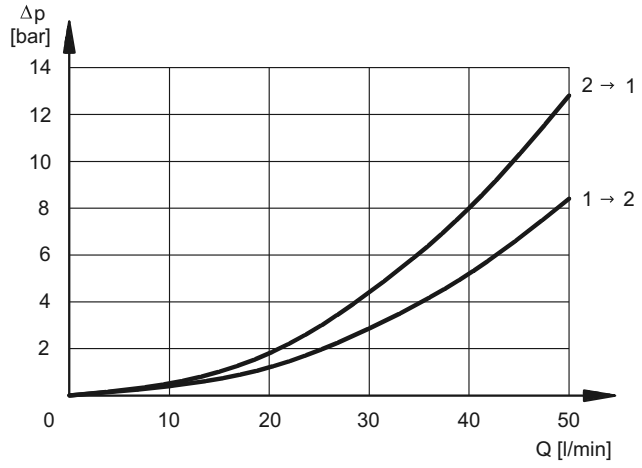
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

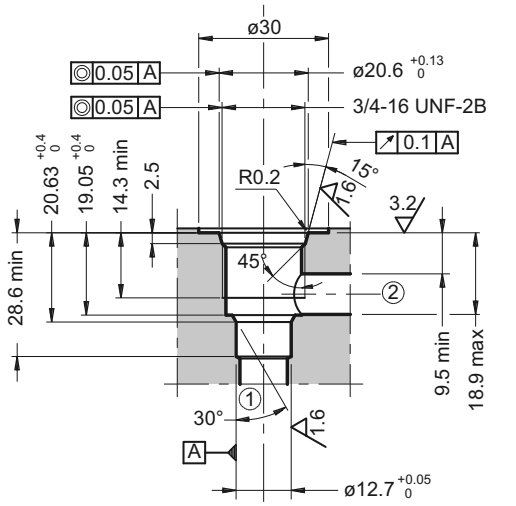
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

3 - PRESSURE DROPS Δp-Q (obtained with viscosity of 36 cSt at 50 °C)

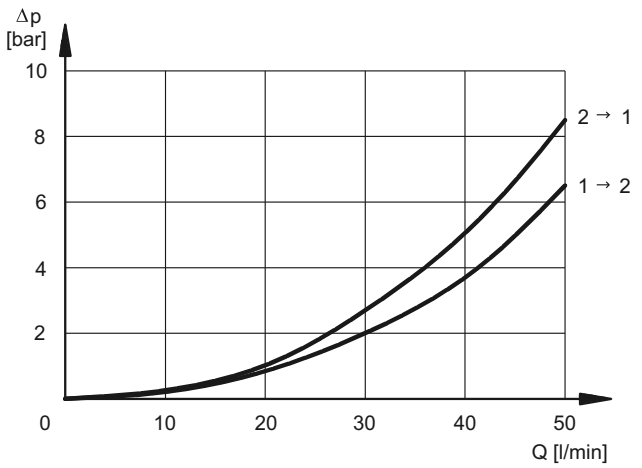
The values in graphs refer to both NC and NO valves and they differ for the mounting interface used.

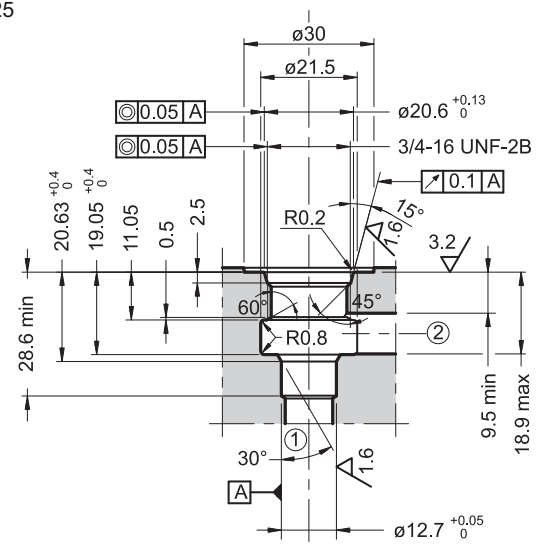
standard mounting interface dimensions dimensions in mm
3/4-16 UNF-2B ISO 725





oversize mounting interface dimensions dimensions in mm
3/4-16 UNF-2B ISO 725





4 - SWITCHING TIMES

The values indicated refer to a valve tested with Q = 25 l/min, p = 350 bar, working with mineral oil at a temperature of 50°C and a viscosity of 36 cSt.

TIMES (±10%)		
	ENERGIZING	**DE-ENERGIZING**
KT08-2NC	60 ms	85 ms
KT08-2NO	85 ms	60 ms

5 - ELECTRICAL FEATURES

5.1 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, and can be rotated according to the available space.

The interchangeability of coils of different voltages both D or R type is possible without removing the tube.

Protection according CEI EN 60529 - atmospheric agents

Connector	IP 65	IP 67	IP 69 K
K1 DIN 43650	x		
K2 AMP JUNIOR	x	x	
K4 outgoing cables	x	x	
K7 DEUTSCH DT04 male	x	x	x
K8 AMP SUPER SEAL	x	x	x

NOTE: The protection degree is guaranteed only if the connector is correctly installed and locked.

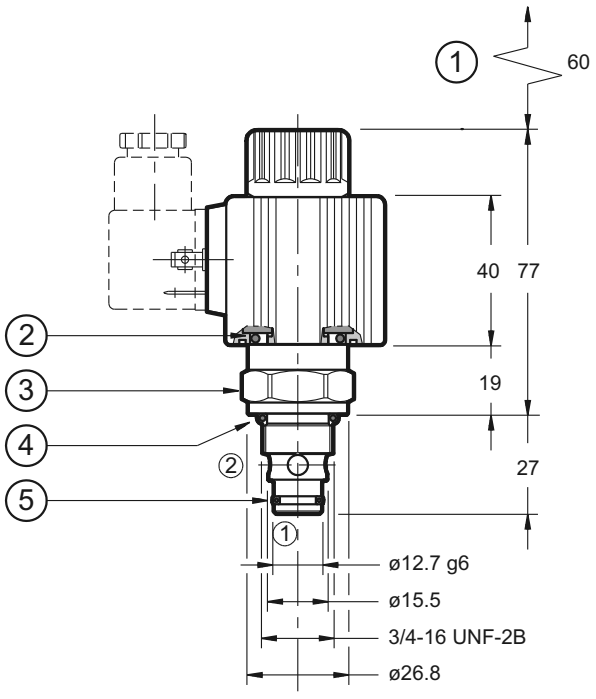
SUPPLY VOLTAGE FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY	10.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	In compliance with 2004/108/CE
LOW VOLTAGE	In compliance with 2006/95/CE
CLASS OF PROTECTION : Coil insulation (VDE 0580) Impregnation	 class H class H

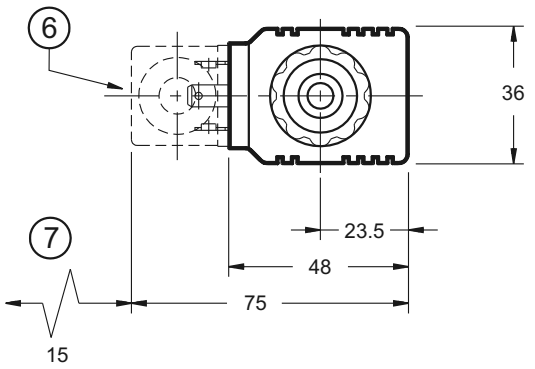
5.2 Current and absorbed power

In the table are shown current and power consumption values relevant to the different coil types. “R” coil must be used when the valve is fed with AC power supply subsequently rectified by means of rectifier bridge, externally or incorporated in the “D” type connector (see cat. 49 000).

	Resistance at 20°C [Ω] (±1%)	Absorbed current [A] (±5%)	Absorbed power (±5%) [W]	[VA]	Coil code K1	K2	K4	K7	K8
C14L3-D12*	5,4	2,2	26,5		1902740	1902750	1902770	1902980	1903020
C14L3-D24*	20,7	1,16	27,8		1902741	1902751	1902771	1902981	1903021
C14L3-R110*	363	0,25		27,2	1902742				
C14L3-R230*	1640	0,11		26,4	1902743				

6 - OVERALL AND MOUNTING DIMENSIONS



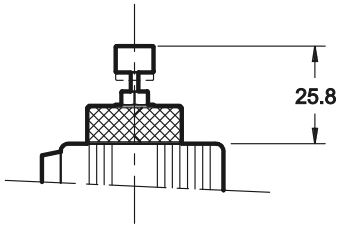


dimensions in mm

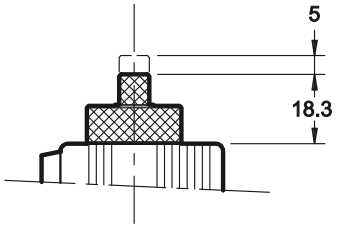
1	Coil removal space
2	OR type 4081 (20.22x3.53)
3	Hexagonal: spanner 27 - tightening torque 50 Nm
4	OR type 3.908 (16.36x2.21)
5	OR type 2037 (9.25x1.78) - 90 Shore
6	Electric connector DIN 43650 (drawing relevant to standard connection K1 - for other types of connection see paragraph 8)
7	Connector removal space

7 - MANUAL OVERRIDE

CM for **NO** version (pushing type)

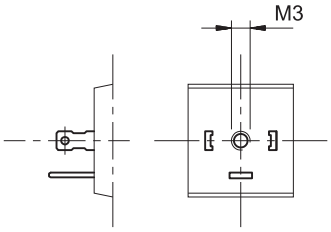


CM for **NC** version (screw type)

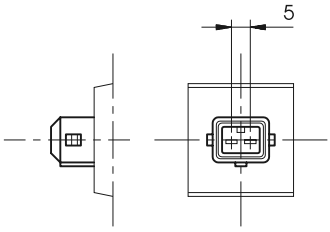


8 - ELECTRIC CONNECTIONS

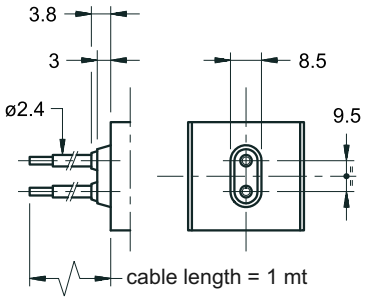
connection for DIN 43650 connector
code **K1** (**standard**)



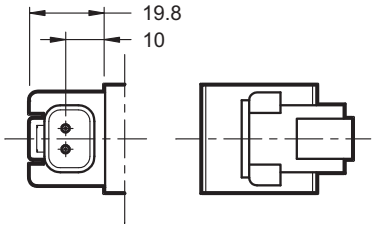
connection for AMP JUNIOR connector
code **K2**



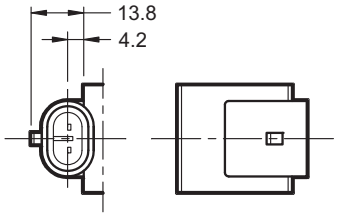
outgoing cables connection
code **K4**



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



connection for AMP SUPER SEAL connector (two contacts)
code **K8**



9 - ELECTRIC CONNECTORS

The solenoid valves are supplied without connectors. For coils with standard electrical connections K1 type (DIN 43650) the connectors can be ordered separately. For the identification of the connector type to be ordered please see catalogue 49 000.

For K2, K7 and K8 connection type the relative connectors are not available.

10 - SUBPLATES FOR MODULAR MOUNTING

10.1 - Identification code

K	T	M	3	-		/	10	

Modular subplate
for KT08 cartridge solenoid valves

Size ISO 4401-03
(CETOP 03)

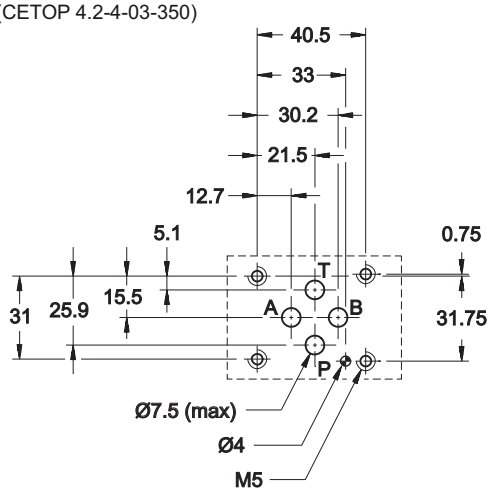
P = delivery interception on P line
PT = interception on P-T lines
D = outgoing interception on A and B lines
RD = incoming interception on A and B lines
SB = outgoing interception on B line

Series no.: (the overall and mounting dimensions remain unchanged from10 to 19)

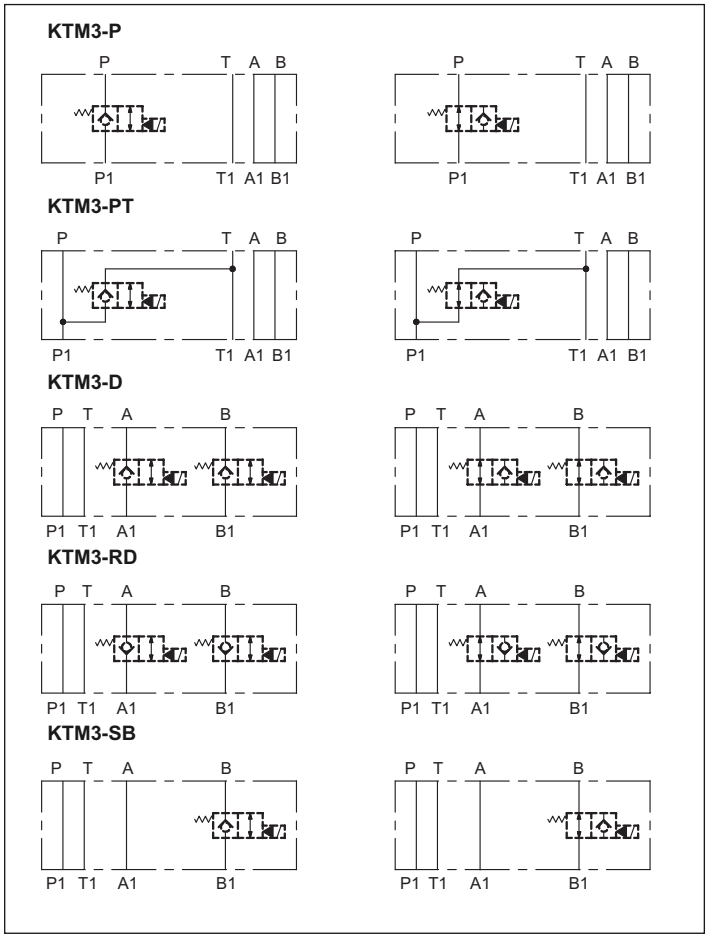
Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

MOUNTING INTERFACE

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

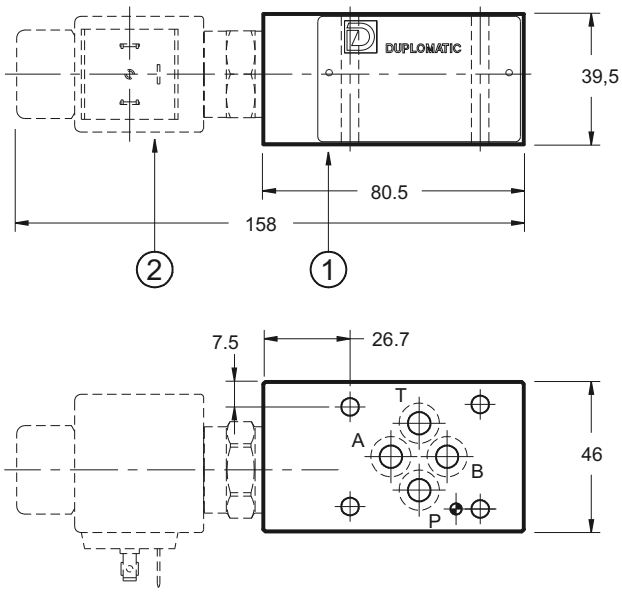


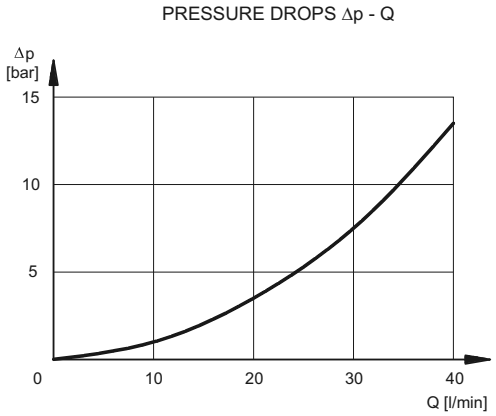
HYDRAULIC SYMBOLS



10.2 - Overall and mounting dimensions KTM3-P

dimensions in mm



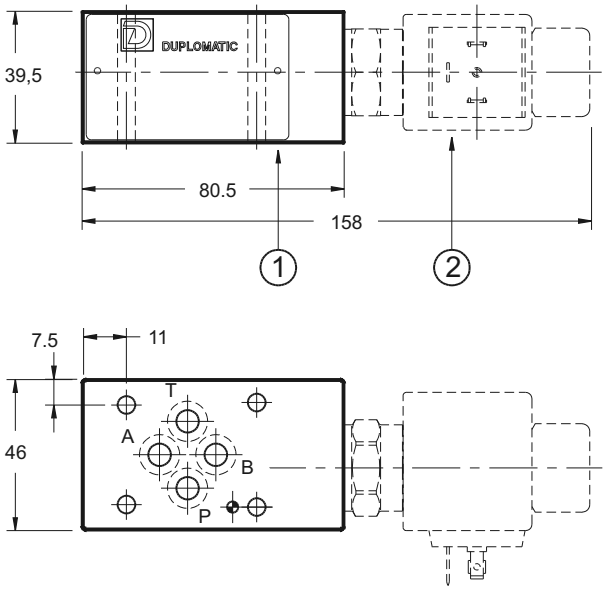


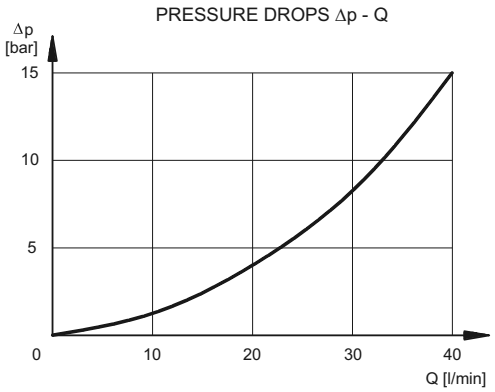
pressure drops relevant to the subplate and the valve mounted with flow rate 2 -1

1	Mounting surface with sealing rings: n. 4 OR type 2037 (9.25x1.78) - 90 Shore
2	Cartridge solenoid valve KT08 (to be ordered separately)

10.3 - Overall and mounting dimensions KTM3-PT

dimensions in mm





pressure drops relevant to the subplate and the valve mounted with flow rate 2 - 1

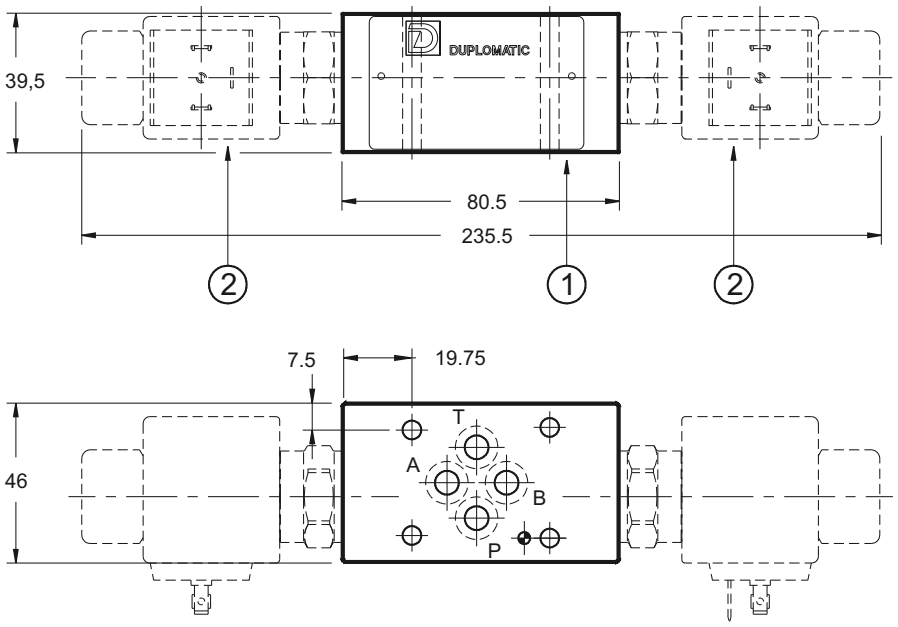
1	Mounting surface with sealing rings: n. 4 OR type 2037 (9.25x1.78) - 90 Shore
2	Cartridge solenoid valve KT08 (to be ordered separately)

10.4 - Overall and mounting dimensions KTM3-D, KTM3-RD and KTM3-SB

KTM3-D

KTM3-RD

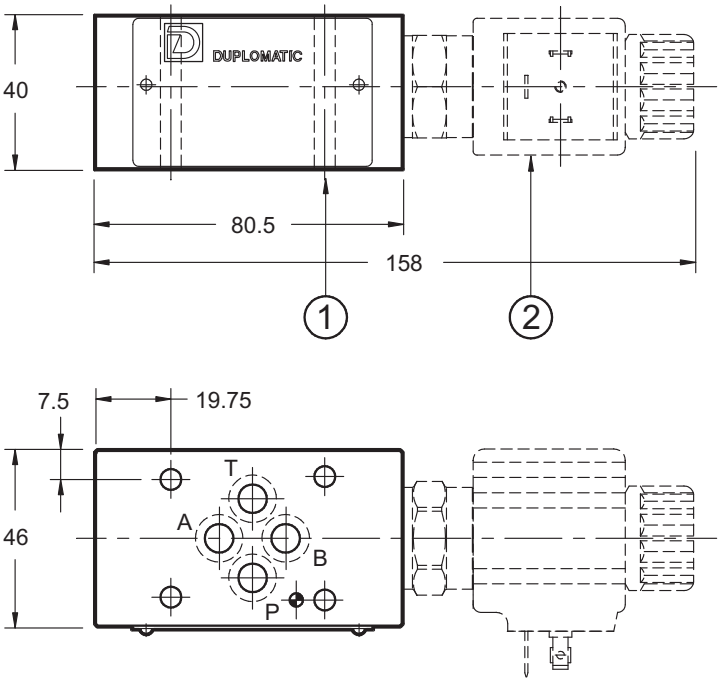
dimensions in mm



NOTE: In order to use a single port (interception on line A), a plug must be ordered separately.

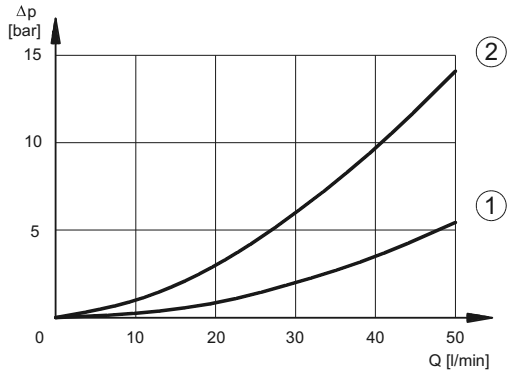
Code 0266683 for NBR seals (standard) or 0266684 for viton seals.

KTM3-SB



1	Mounting surface with sealing rings: n. 4 OR type 2037 (9.25x1.78) - 90 Shore
2	Cartridge solenoid valve KT08 (to be ordered separately)

PRESSURE DROPS Δp - Q



(1) subplate pressure drops

(2) pressure drops relevant to the subplate and the valve mounted with flow rate 2 - 1

DUPLOMATIC OLEODINAMICA

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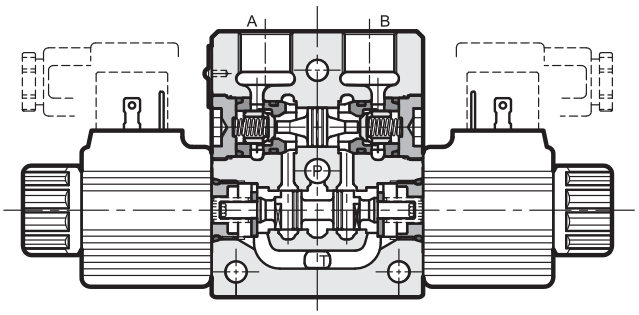
BD6

BANKABLE DIRECTIONAL CONTROL VALVE

SERIES 20

p max **280** bar
Q max **40** l/min

OPERATING PRINCIPLE



— The directional control valve BD6 is a bankable valve very well-rounded thanks to its modular design.

— This valve has been designed to be assembled with series or parallel connection, mounting up to 6 body-modules.

— The BD6 valve is suitable for compact applications in the mobile and mini-power pack industries.

— The intake ports A and B, the inlet P and the outlet T are 3/8" BSP threaded.

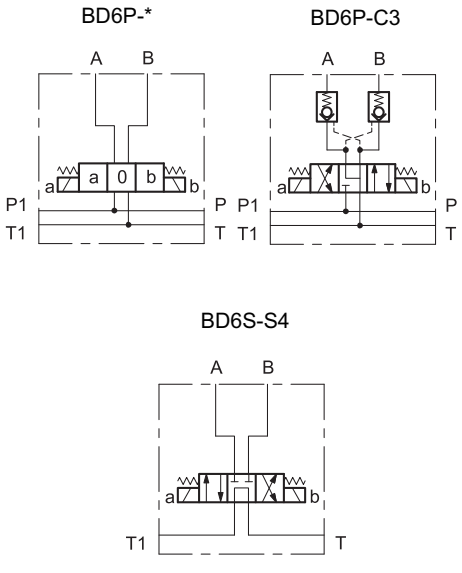
— A version with built-in pilot check valves is available for the series configuration.

— The series configuration allows a max operating pressure of 250 bar

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

Maximum operating pressure: - P-A-B ports (parallel) - P-A-B ports (series) - T and T1 ports	bar	280 250 250
Maximum flowrate: - parallel - series	l/min	40 25
Pressure drops Δp - Q	see paragraph 3	
Electrical characteristics	see paragraph 6	
Operating limits	see paragraph 5	
Electrical connections	see paragraph 9	
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Single body mass	kg	1,84
Surface treatment of body and plates:	thermochemical antioxidant	

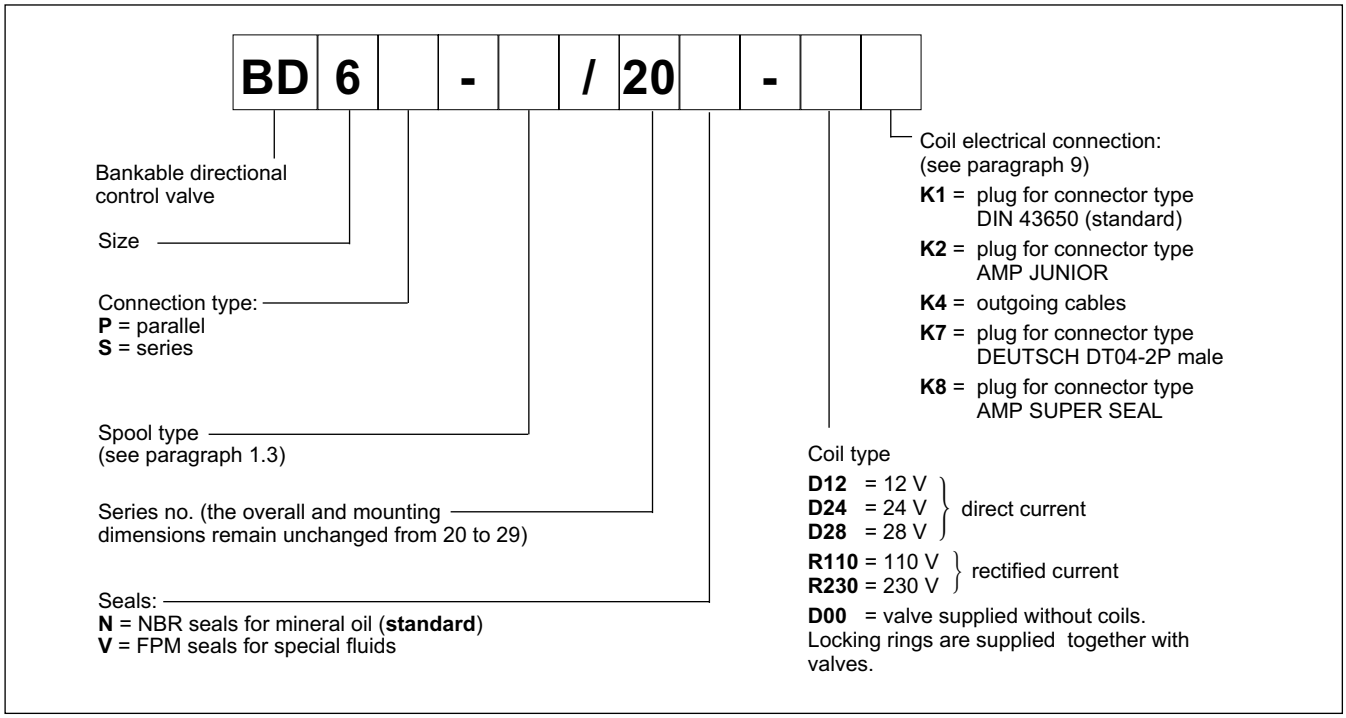
HYDRAULIC SYMBOLS



1 - IDENTIFICATION CODES FOR LOOSE MODULES

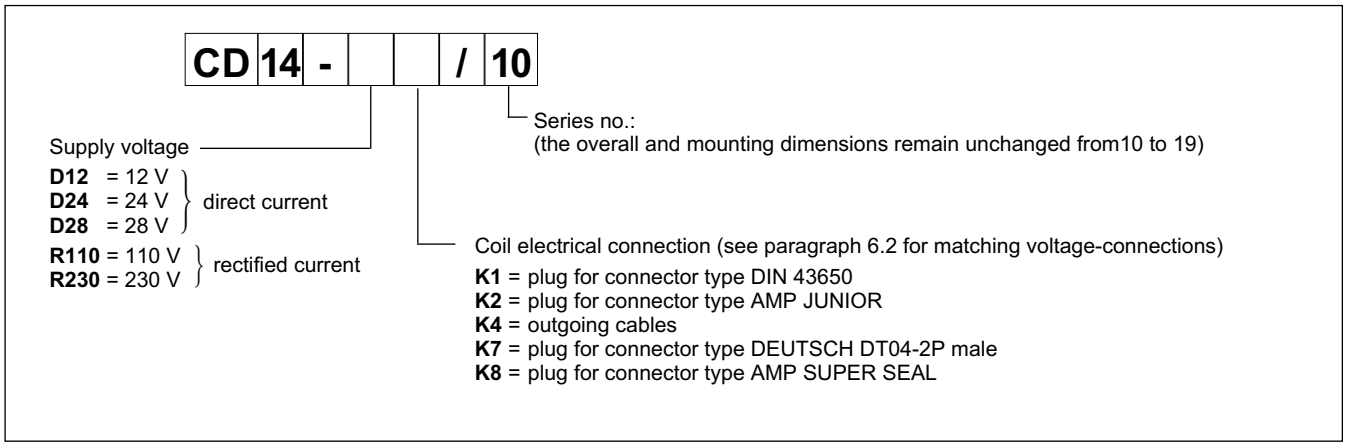
Here below all the loose components identification codes of the bankable valve are shown. To order a whole assembled valve, please use the codes at paragraphes 11 and 12.
The pressure control valve and the poppet type valve with unloading function are briefly described. Fore more detailed information about them please see the 21 100 datasheet for the pressure control valve and the 43 100 for the unloading valve.

1.1 - Valve body



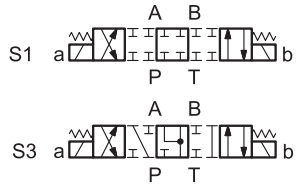
NOTE: The valve bodies and plates are supplied with a thermochemical anti-oxidation treatment.

1.2 - Coil identification code

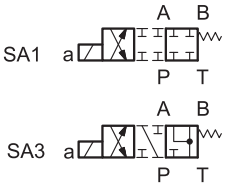


1.3 - Available spool type for parallel configuration BD6P

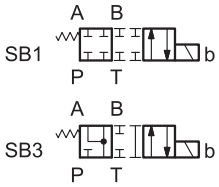
Type **S**:
2 solenoids - 3 positions
spring centering



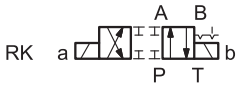
Type **SA***: 1 solenoid side A
2 positions (central + external)
spring centering



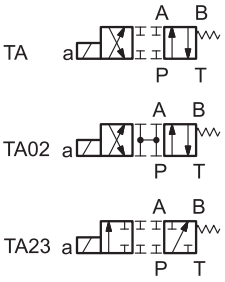
Type **SB***: 1 solenoid side B
2 positions (central + external)
spring centering



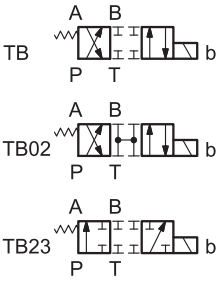
Type **RK**:
2 solenoids - 2 positions
with mechanical retention



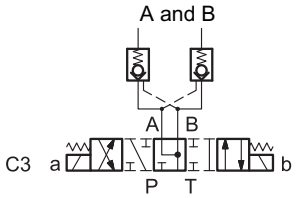
Type **TA***:
1 solenoid side A
2 external positions
with return spring



Type **TB***:
1 solenoid side B
2 external positions
with return spring



Type **C3**: 2 solenoids 3 positions
with spring centering and check valve on
A and B



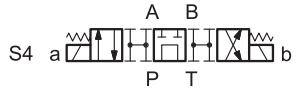
piloting ratio: 3:1

check valve cracking
pressure: 3 bar

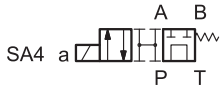
Q_{max} 40 l/min

1.4 - Available spool type for series configuration BD6S

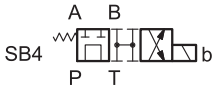
Type **S4**:
2 solenoids 3 positions
spring centering



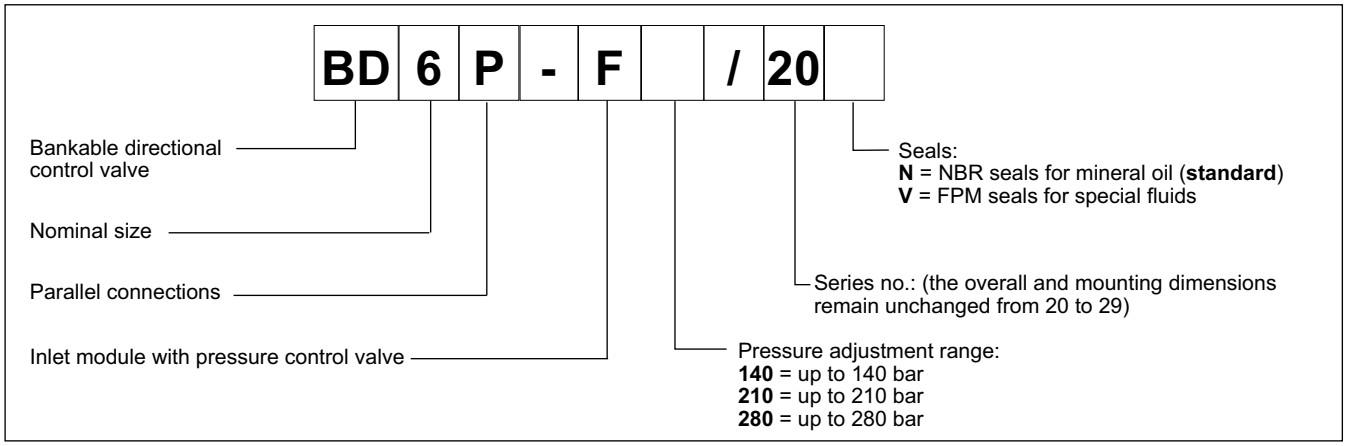
Type **SA***:
1 solenoid side A
2 positions (central + external)
spring centering



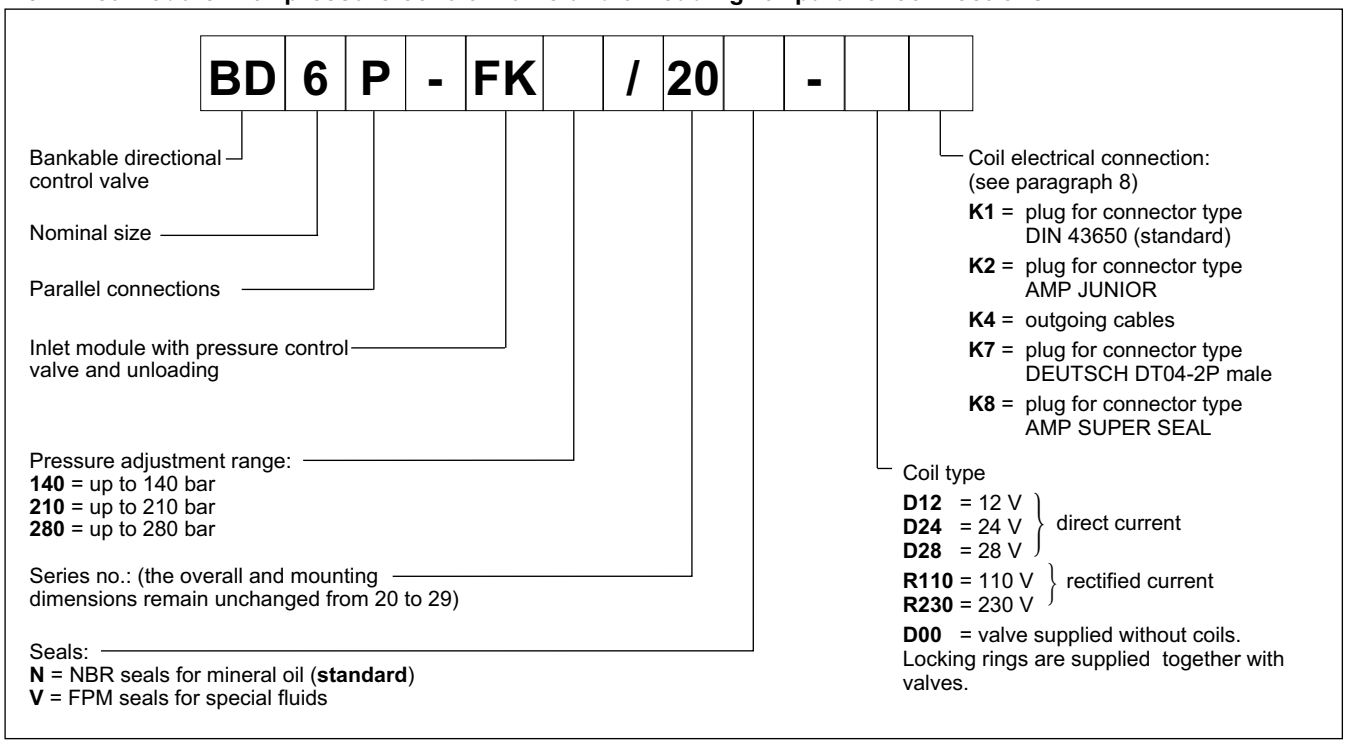
Type **SB***:
1 solenoid side B
2 positions (central + external)
spring centering



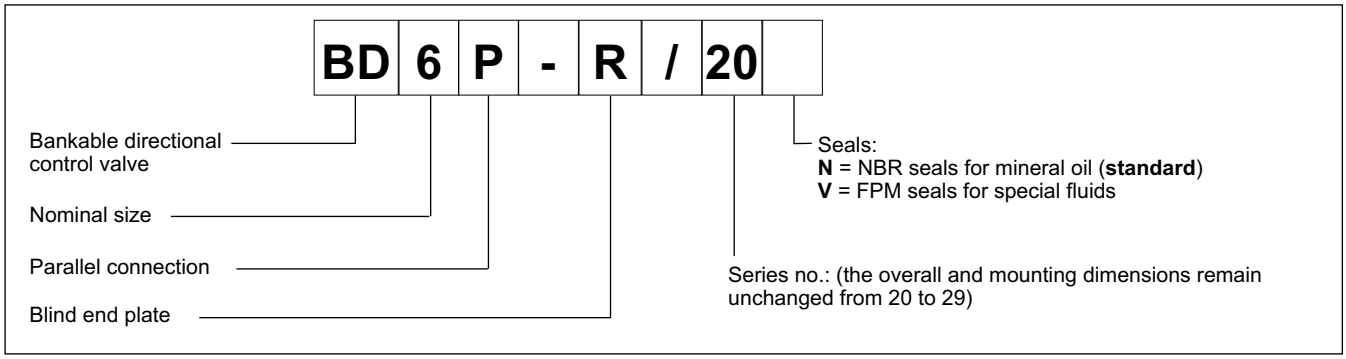
1.4 - Inlet module with pressure control valve for parallel connection



1.5 - Inlet module with pressure control valve and unloading for parallel connections



1.6 - End plate module for parallel connections



1.7 - Inlet module with pressure control valve for series connection

BD	6	S	-	F		/	20	

Bankable directional control valve

Nominal size

Series connection

Inlet module with pressure control valve

Pressure adjustment range:
140 = up to 140 bar
210 = up to 210 bar (**NOTE**)

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

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

NOTE: Screwing completely the pressure control valve, the reachable max operating pressure is 240 bar with Q ≥ 5 l/min

1.8 - Outlet end plate for series connection

BD	6	S	-	R1	/	20	

Bankable directional control valve

Nominal size

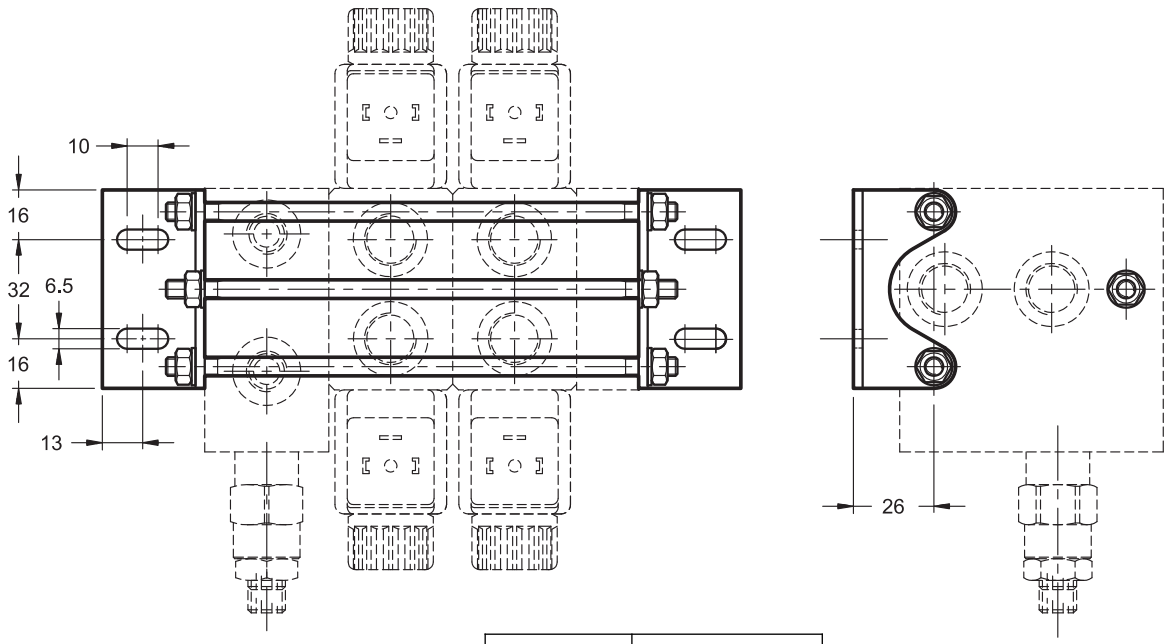
Series configuration

Outlet plate with T1 port 3/8" BSP threaded

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

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

1.9 - Studs and fixing kit



no. of body modules	KIT code
2	3404100010
3	3404100011
4	3404100012
5	3404100013
6	3404100014

The kit includes:
3 galvanized studs
6 galvanized nuts
6 galvanized safety washers
2 fixing feet

Tightening torque: 5 Nm

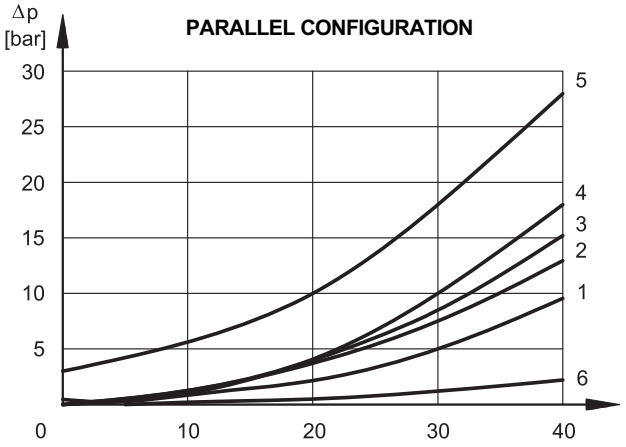
Fixing feet fastening:
n. 4 bolts M6 (not included)

2 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

3 - CHARACTERISTIC CURVES (values obtained with viscosity 36 cSt at 50 °C)

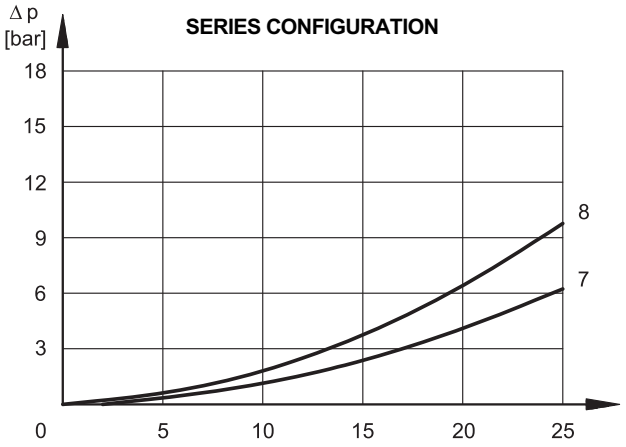
3.1 - Body modules pressure drops Δp-Q



ENERGIZED VALVE

SPOOL TYPE	FLOW DIRECTION			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPHS			
S1, SA1, SB1	2	2	1	1
S3, SA3, SB3	2	2	1	1
C3	5	5	3	3
TA, TB	4	4	1	1
TA02, TB02	4	4	1	1
TA23, TB23	4	4		
RK	2	2	1	1
S4, SA4, SB4	8	8	8	8

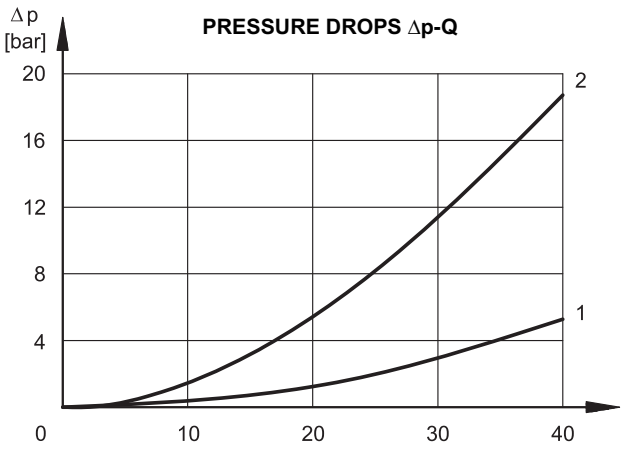
NOTE: The curve 6 shows the pressure drops in passing P or T.



DE-ENERGIZED VALVE (central position)

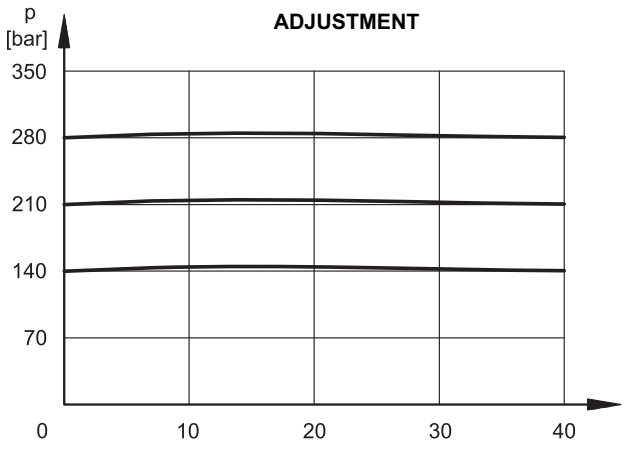
SPOOL TYPE	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPHS				
S3, SA3, SB3			2	2	
S4, SA4, SB4					7

3.1 - Inlet modules



1 - P-T characteristic of pressure control valve wholly unscrewed

2 - P-T characteristic of the unloading valve



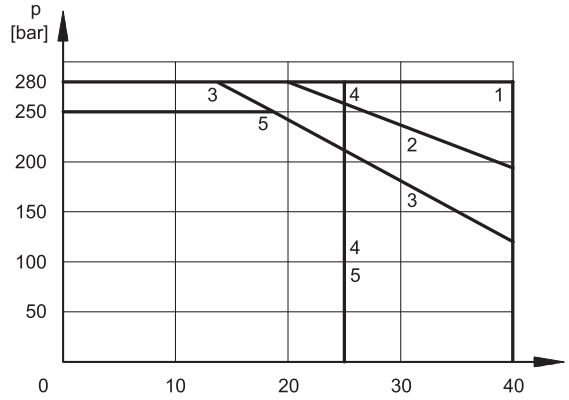
4 - SWITCHING TIMES

Values obtained according to ISO 6403, with mineral oil with viscosity 36 cSt at 50°C.

TIMES	ENERGIZING	DE-ENERGIZING
ms (±10%)	25 ÷ 75	15 ÷ 25

5 - BODY MODULE OPERATING LIMITS

The curves define the flow rate operating fields according to the valve pressure of the different versions. The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage. The value have been obtained with mineral oil, viscosity 36 cSt, temperature 50 °C and filtration according to ISO 4406:1999 class 18/16/13.



SPOOL TYPE	P-A CURVE	P-B CURVE
S1, SA1, SB1	1	1
S3, SA3, SB3	3	3
S4, SA4, SB4	5	5
TA, TB	2	2
TA02, TB02	2	2
TA23, TB23	2	2
RK	4	4
C3	3	3

6 - ELECTRICAL FEATURES

6.1 Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation. The coil is fastened to the tube by a threaded ring, and can be rotated to suit the available space. The interchangeability of coils of different voltages is allowed within the same type of supply current, rectified or direct.

Protection from atmospheric agents CEI EN 60529

Connector	IP 65	IP 67	IP 69 K
K1 DIN 43650	x		
K2 AMP JUNIOR	x	x	
K4 outgoing cables	x	x	
K7 DEUTSCH DT04 male	x	x	x
K8 AMP SUPER SEAL	x	x	x

NOTE: The protection degree is guaranteed only with the connector correctly wired and installed.

SUPPLY VOLTAGE FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY	10.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	In compliance with 2004/108/CE
LOW VOLTAGE	In compliance with 2006/95/CE
CLASS OF PROTECTION : Coil insulation (VDE 0580) Impregnation:	 class H class H

6.2 Current and absorbed power

In the table are shown current and power consumption values relevant to the different coil types. “R” coil must be used when the valve is fed with AC power supply subsequently rectified by means of rectifier bridge, externally or incorporated in the “D” type connector (see cat. 49 000).

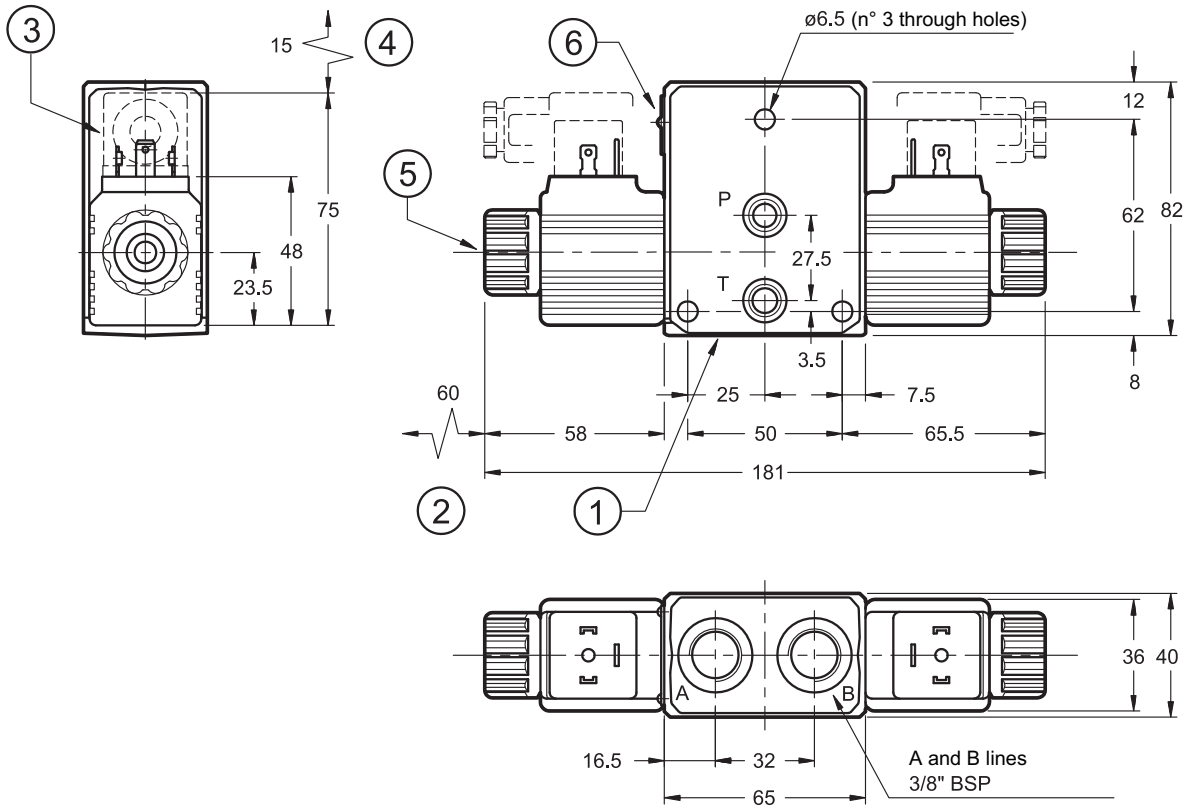
	Resistance 20°C [Ω] (±1%)	Absorbed current [A] (±5%)	Absorbed power (±5%) [W]	[VA]	Coil code K1	K2	K4	K7	K8
CD14-D12*	5,4	2,2	26,5		1902740	1902750	1902770	1902980	1903020
CD14-D24*	20,7	1,16	27,8		1902741	1902751	1902771	1902981	1903021
CD14-D28*	27,5	1,02	28,5		1902744				
CD14-R110*	363	0,25		27,2	1902742				
CD14-R230*	1640	0,11		26,4	1902743				

7 - OVERALL AND MOUNTING DIMENSIONS

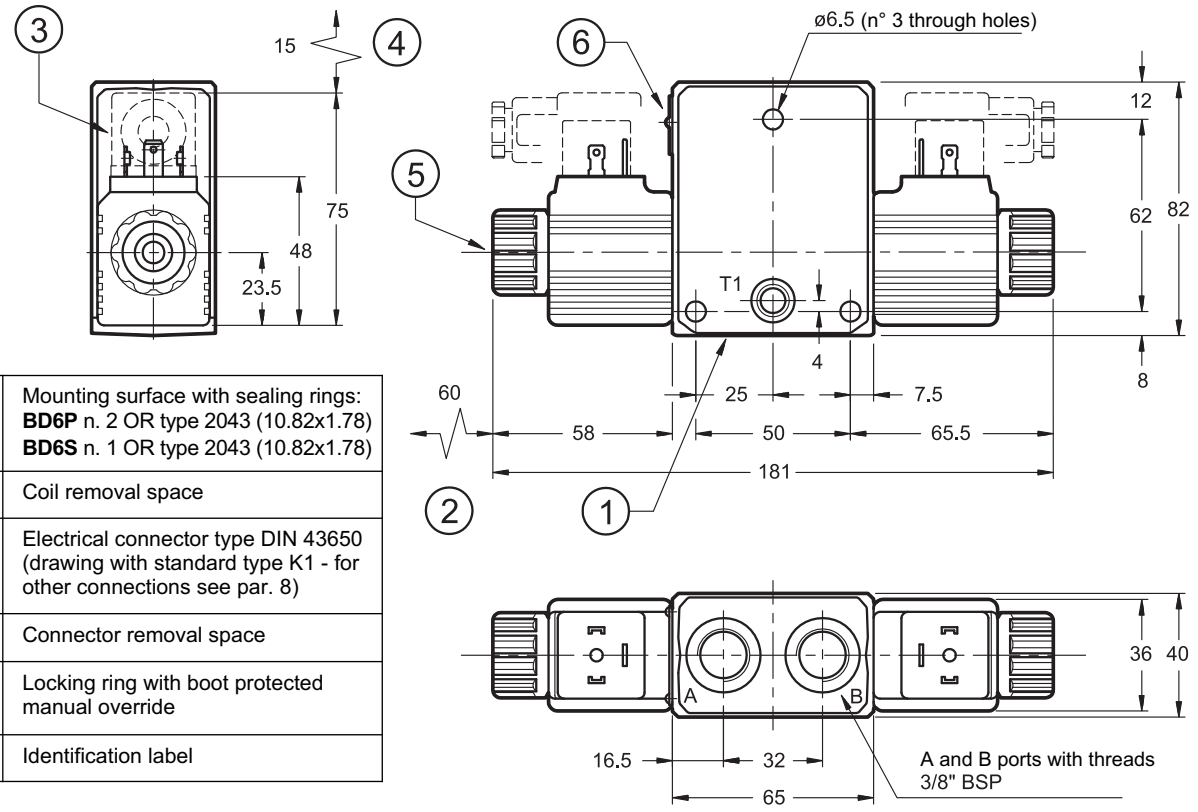
7.1 - Body module

PARALLEL CONFIGURATION BD6P

dimensions in mm



SERIES CONFIGURATION BD6S



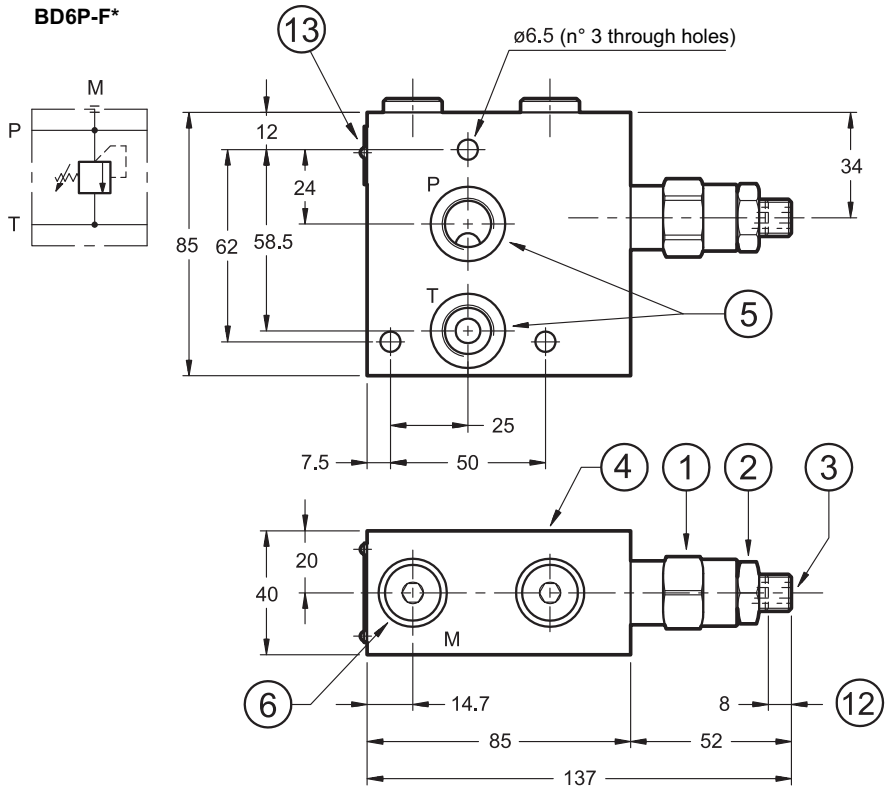
1	Mounting surface with sealing rings: **BD6P** n. 2 OR type 2043 (10.82x1.78) **BD6S** n. 1 OR type 2043 (10.82x1.78)
2	Coil removal space
3	Electrical connector type DIN 43650 (drawing with standard type K1 - for other connections see par. 8)
4	Connector removal space
5	Locking ring with boot protected manual override
6	Identification label

7.2 - Inlet modules for parallel configuration

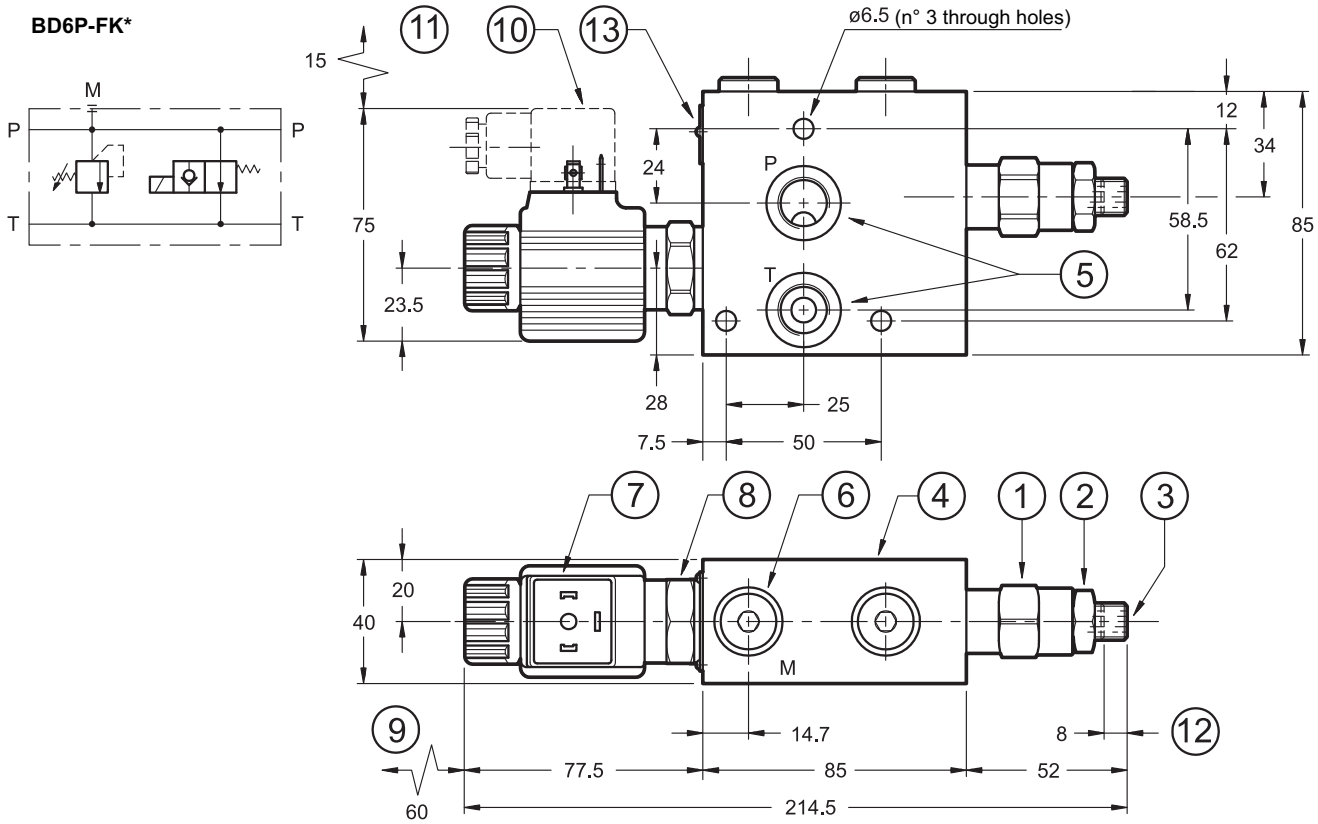
1	Pressure control valve
2	Locking nut: spanner 19
3	Countersunk hex adjustment screw: spanner 6 (standard) Clockwise rotation to increase pressure
4	Mounting surface without sealing rings: OR on the body module.
5	P and T: 3/8" BSP
6	Pressure gauge port: 1/4" BSP
7	Poppet-type solenoid valve for unloading
8	Hexagonal: spanner 27 tightening torque 50 Nm
9	Coil removal space
10	Electrical connector type DIN 43650 (drawing with standard type K1 - for other connections see paragraph 8)
11	Connector removal space
12	Maximum screw stroke
13	Identification label

dimensions in mm

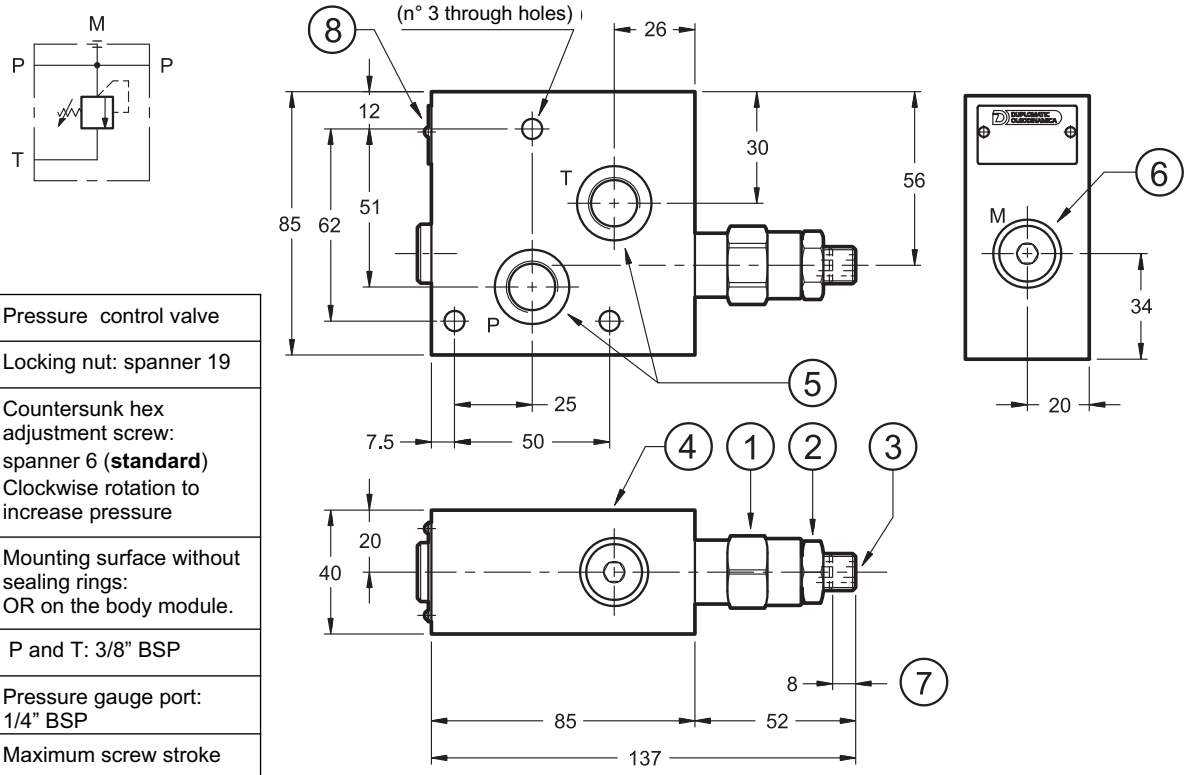
BD6P-F*



BD6P-FK*



7.3 - Inlet module BD6S-F* for series configuration

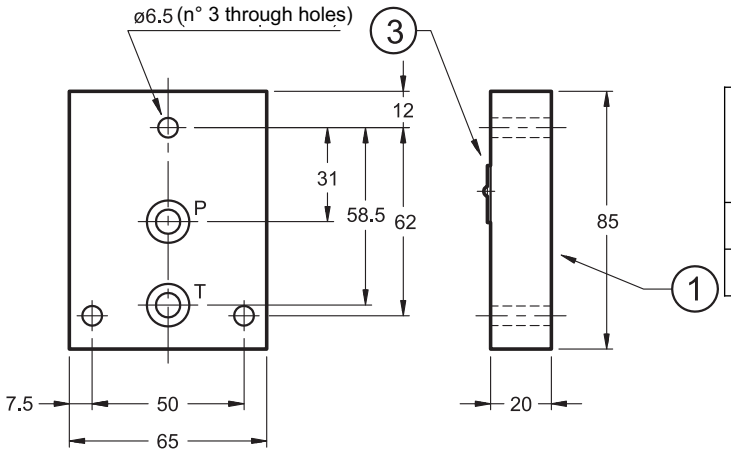


1	Pressure control valve
2	Locking nut: spanner 19
3	Countersunk hex adjustment screw: spanner 6 (**standard**) Clockwise rotation to increase pressure
4	Mounting surface without sealing rings: OR on the body module.
5	P and T: 3/8" BSP
6	Pressure gauge port: 1/4" BSP
7	Maximum screw stroke
8	Identification label

7.4 - End modules

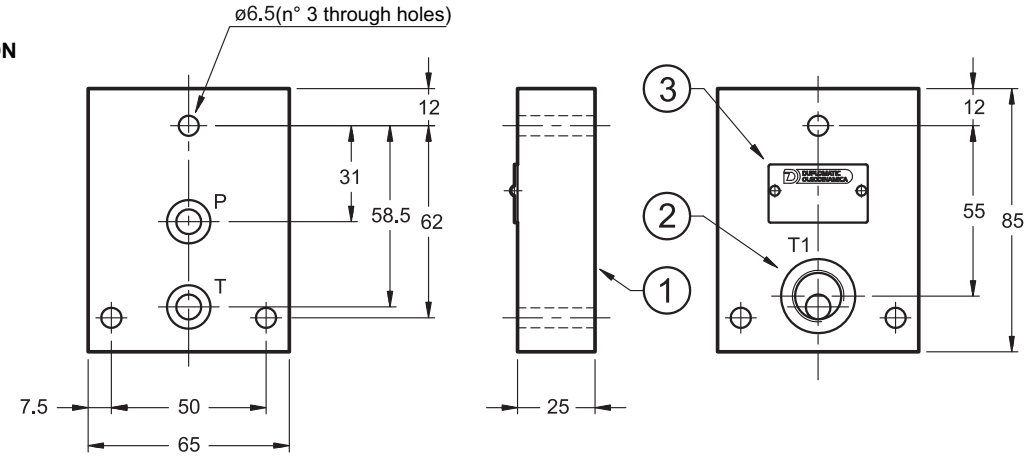
PARALLEL CONFIGURATION BD6P-R

dimensions in mm



1	Mounting surface with sealing rings: N. 2 OR type 2043 (10.82x1.78) 90 Shore
2	T1 outlet: 3/8" BSP
3	Identification label

SERIES CONFIGURATION BD6S-R1

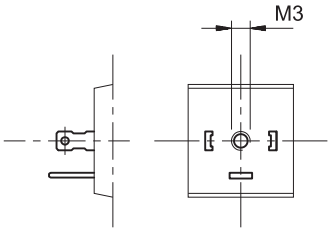


8 - INSTALLATION

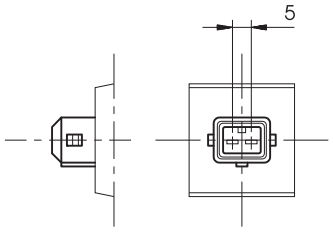
Configurations with centering and return springs can be mounted in any position.

9 - ELECTRIC CONNECTIONS

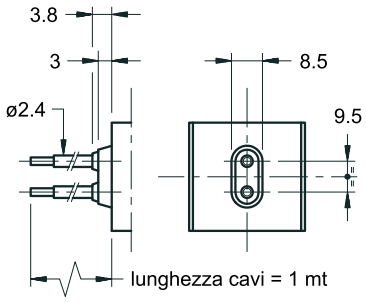
connection for DIN 43650 connector code **K1**



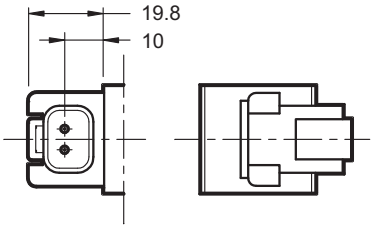
connection for AMP JUNIOR connector type code **K2**



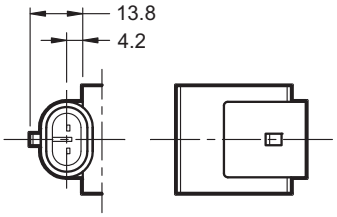
outgoing cable connections code **K4**



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



connection for AMP SUPER SEAL (two contacts) connector type code **K8**



10 - ELECTRIC CONNECTORS

The solenoid valves are supplied without connectors.For coils with standard electrical connections K1 type (DIN 43650) the connectors can be ordered separately. For the identification of the connector type to be ordered please see cat. 49 000.
For K2, K7 and K8 connection type the relative connectors are not available.

11 - ASSEMBLED VALVE - PARALLEL CONFIGURATION

11.1 - Identification code

BD6	-	P		-			/			/	R	/	20		-		

Bankable directional control valve

Parallel configuration

No. of body modules

Inlet module
F = with pressure control valve
FK = with pressure control valve and unloading valve

Pressure adjustment range:
140 = up to 140 bar
210 = up to 210 bar
280 = up to 280 bar

Spool type:
Enter the spool type.
See the available spools at paragraph 1.3
Repeat for each module.

Blind end plate

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

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

Coil type
D12 = 12 V, **D24** = 24 V } direct current (**standard**)
R110 = 110 V, **R230** = 230 V } rectified current
D00 = Valve supplied without coils (see par. 1.1 for available coils). Locking rings are supplied together with valves.

Coil electrical connection: (see paragraph 9)
K1 = plug for connector type DIN 43650 (standard)
K2 = plug for connector type AMP JUNIOR
K4 = outgoing cables
K7 = plug for connector type DEUTSCH DT04-2P male
K8 = plug for connector type AMP SUPER SEAL

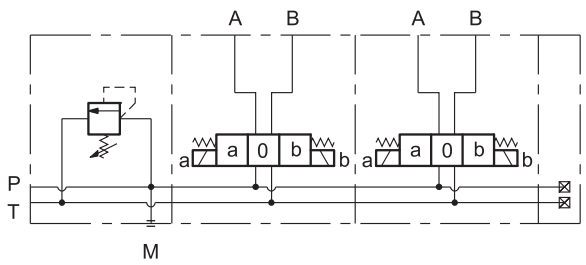
Coding example:

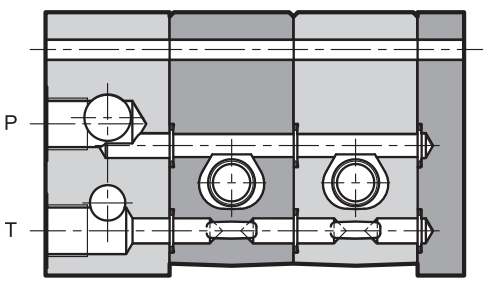
BD6-P4-F140/S1-S1-S1-S1/R/20N-D24K1: assembled valve includes: inlet module with pressure control valve with adjustment up to 140 bar; 4 body modules S1; blind end plate; NBR seals, 24V DC coils and K1 connection.

BD6-P3-FK280/S1-C3-S1/R/20N-D24K1: assembled valve includes: inlet module with pressure control valve with adjustment up to 280 bar and unloading valve; 1st body module with spool S1, 2nd body module with spool C3 and 3th body module with spool S1; blind end plate; NBR seals, 24V DC coils and K1 connection.

11.2 - Hydraulic symbols and connection scheme

PARALLEL CONNECTION





12 - ASSEMBLED VALVE - SERIES CONFIGURATION

12.1 - Identification code

BD6	-	S		-	F		/			/	R1	/	20		-		

Bankable directional control valve

Series configuration

No. of body modules

Inlet module with pressure relief control valve

Pressure adjustment range:
140 = up to 140 bar
210 = up to 210 bar (**NOTE**)

Spool type:
Enter the spool type.
See the available spools at paragraph 1.4
Repeat for each module.

Outlet plate with T1 port 3/8" BSP threaded

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

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

Coil type
D12 = 12 V
D24 = 24 V
D28 = 28 V
} direct current
R110 = 110 V
R230 = 230 V
} rectified current
D00 = valve supplied without coils. Locking rings are supplied together with valves.

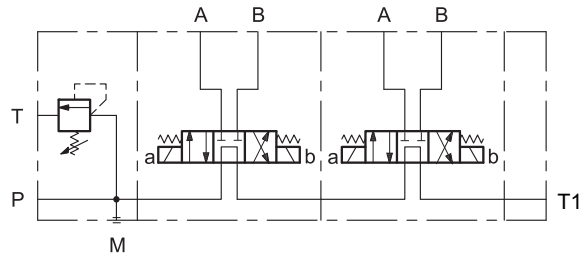
Coil electrical connection:
(see paragraph 9)
K1 = plug for connector type DIN 43650
K2 = plug for connector type AMP JUNIOR
K4 = outgoing cables
K7 = plug for connector type DEUTSCH DT04-2P male
K8 = plug for connector type AMP SUPER SEAL

NOTE: Screwing completely the pressure control valve, the reachable max operating pressure is 240 bar with Q ≥ 5 l/min

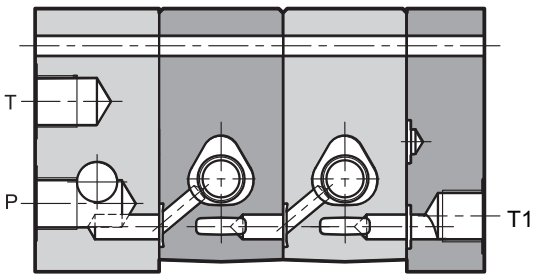
Coding example:

BD6-S3-F140/S4-SB4-SA4/R1/20N-D24K1: assembled valve includes: inlet module with pressure control relief valve, with adjustment up to 140 bar, 1st body module with spool S4, 2nd body module with spool SB4 and 3th body module with spool SA4; outlet plate; NBR seals, 24V DC coils and K1 connection.

12.2 - Hydraulic symbols and connection scheme

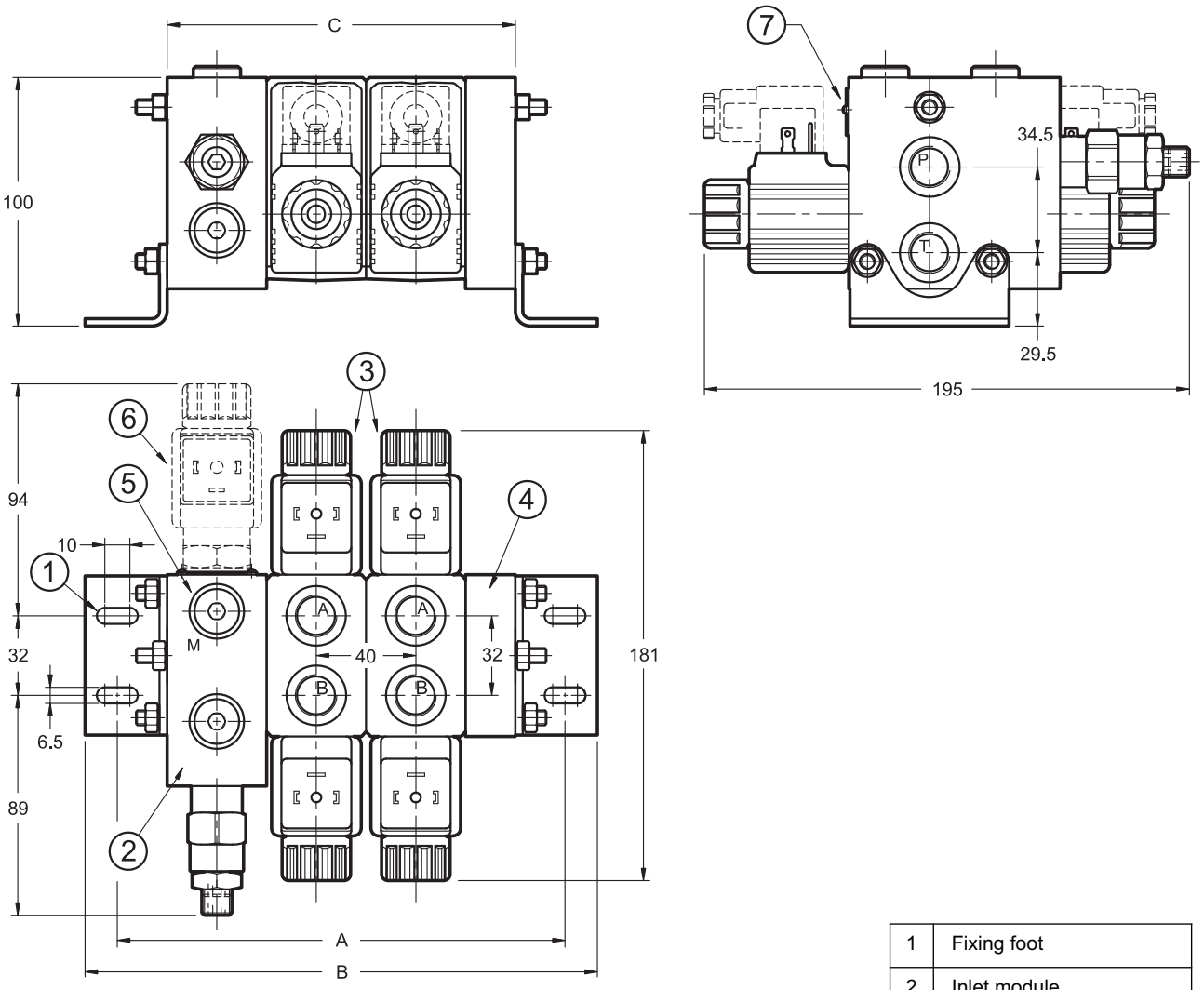


SERIES CONNECTION



13 - OVERALL DIMENSION OF THE ASSEMBLED VALVE IN PARALLEL CONFIGURATION

dimensions in mm

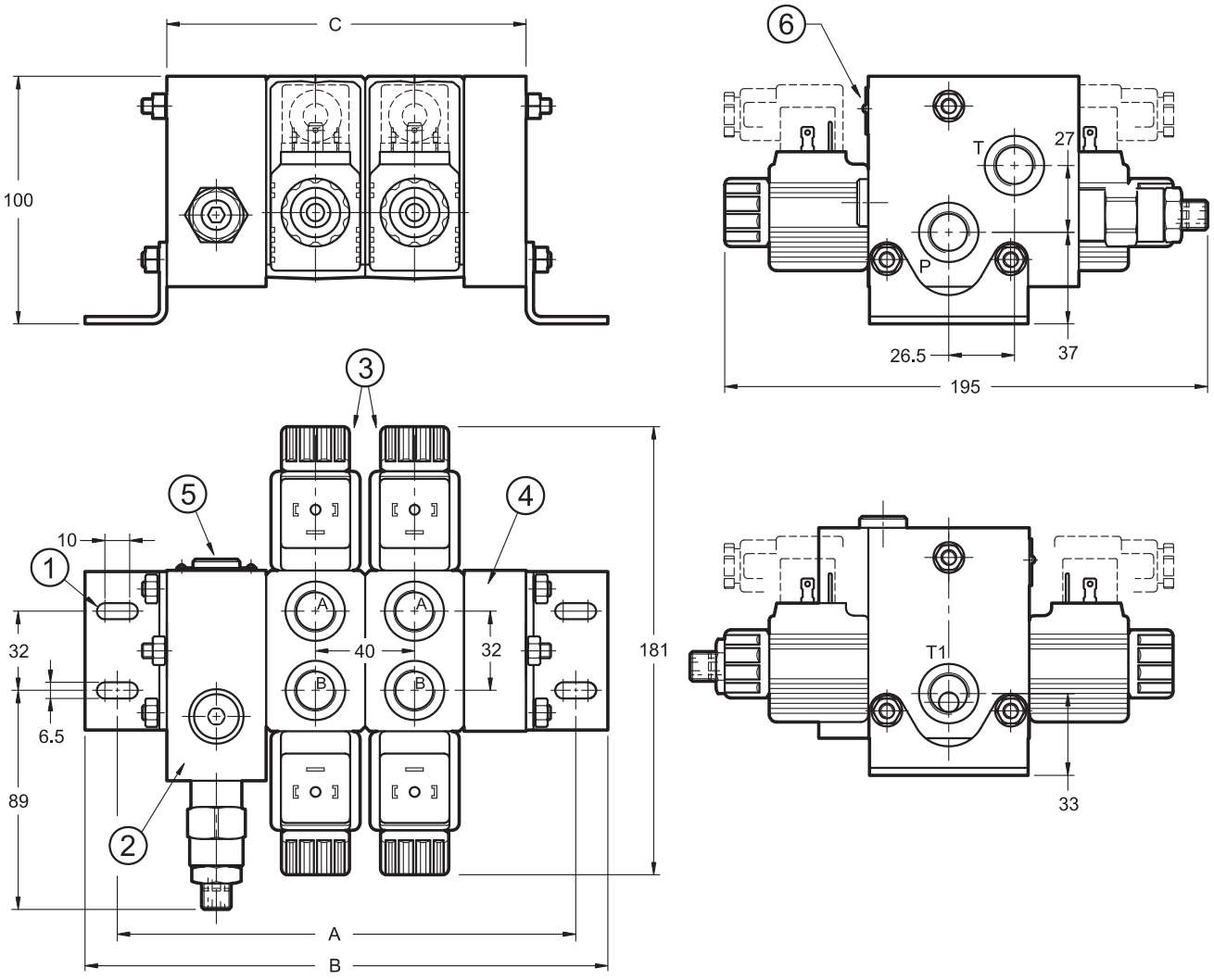


modules	A	B	C
2	180	206	140
3	220	246	180
4	260	286	220
5	300	326	260
6	340	366	300

1	Fixing foot
2	Inlet module
3	Valve bodies
4	End plate
5	Pressure gauge port: 1/4” BSP
6	Poppet-type solenoid valve for unloading (FK version)
7	Identification label

14 - OVERALL DIMENSION OF THE ASSEMBLED VALVE IN SERIES CONFIGURATION

dimensions in mm



modules	A	B	C
2	185	211	145
3	225	241	185
4	265	281	225
5	305	321	265
6	345	361	305

1	Fixing foot
2	Inlet module
3	Valve bodies
4	Outlet plate
5	Pressure gauge port: 1/4” BSP
6	Identification label

DUPLOMATIC OLEODINAMICA

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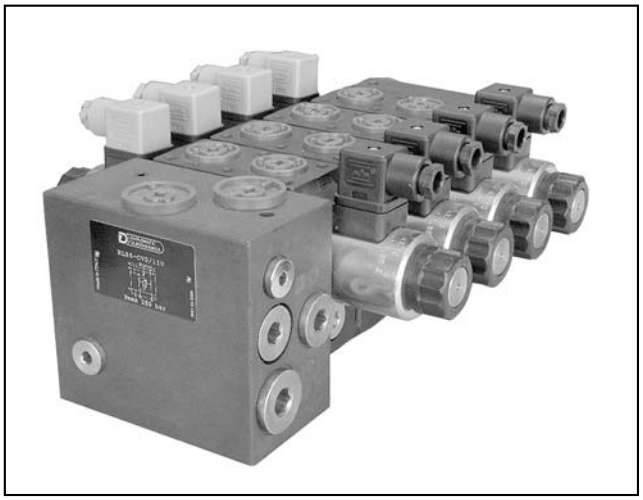


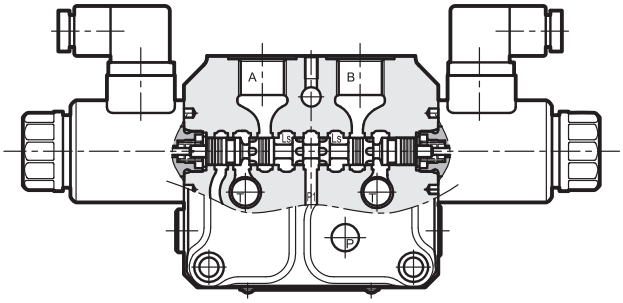
BLS6

BANKABLE LOAD SENSING PROPORTIONAL CONTROL VALVE

SERIES 11

p max **300** bar
Q max **120** l/min

OPERATING PRINCIPLE



— The BLS6 directional control valve is stackable and can be assembled up to 8 different proportional and on/off modules .

— Each module is equipped with a meter-in compensator that keep costant the flow, independently from load changes.

— Sections with pressure compensators are not influenced in any way by other operated functions, provided that sufficient pump capacity is available. To correctly work, the sum of the flows contemporarily used must not overcome the 90% of the inlet flow.

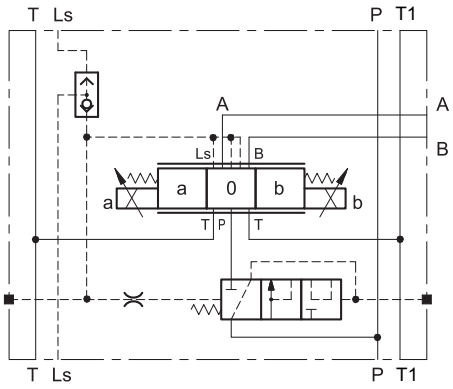
— The user ports A and B are threaded 1/2" BSP. On the inlet module the ports P1, P2 and T1 are threaded 3/4" BSP.

— The manual lever override is available as option.

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

Maximum operating pressure: - A and B ports - P1 and P2 ports - T1 port	bar	 300 250 20
Maximum flowrate: - A and B ports - P1 and P2 ports - T1 port	l/min	 45 100 120
Electrical characteristics	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
Single body mass	kg	4,5
Surface treatment of body and plates	thermochemical antioxidant	

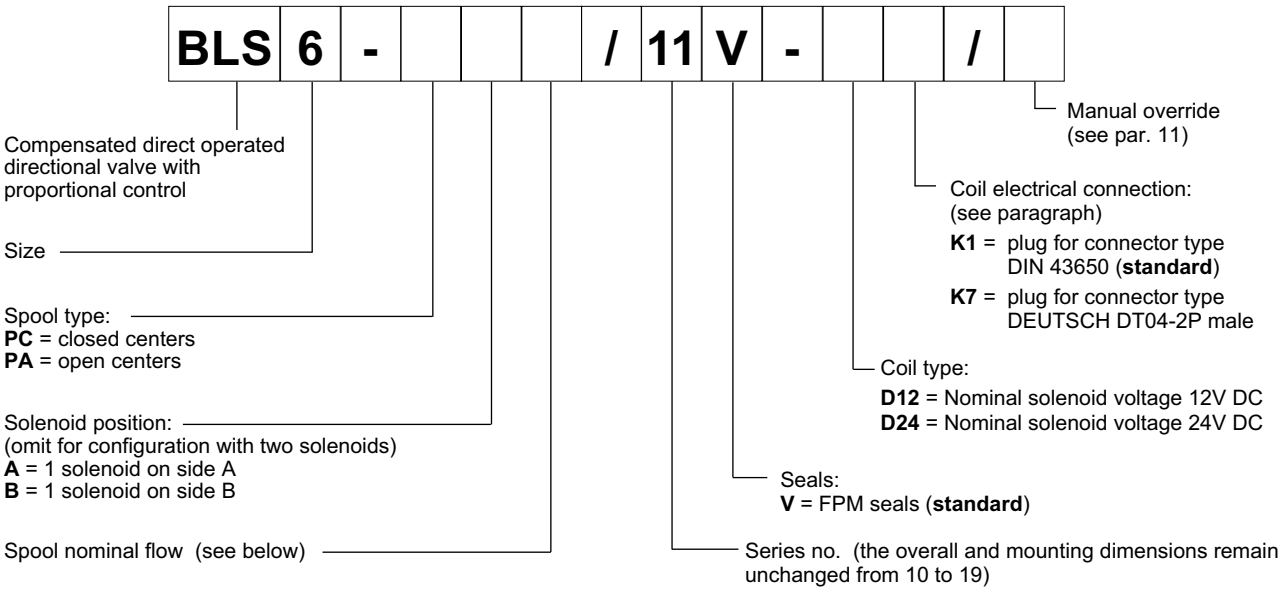
HYDRAULIC SYMBOL



1 - IDENTIFICATION CODES FOR LOOSE MODULES

Here below all the loose components identification codes of the bankable valve are shown. To order a whole assembled valve, please use the codes at paragraphes 9 and 10.
The inlet section is available in different version for fixed pump and for system with Load Sensing pump.

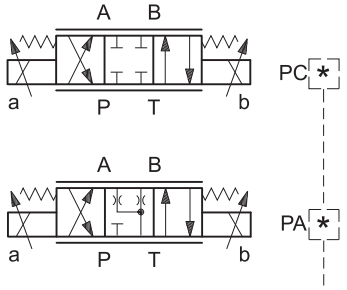
1.1 - Proportional module



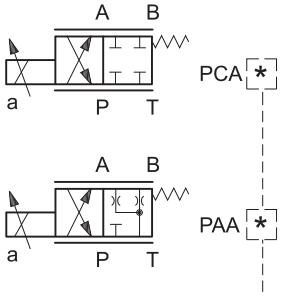
SPOOLS

Valve configuration depends on the combination of the following elements:
number of proportional solenoids, spool type, nominal flow rate.

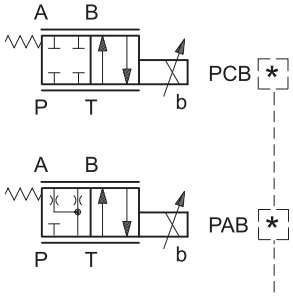
2 solenoids configuration:
3 positions with spring centering



1 solenoid on side A.
2 positions (central + external) with spring centering

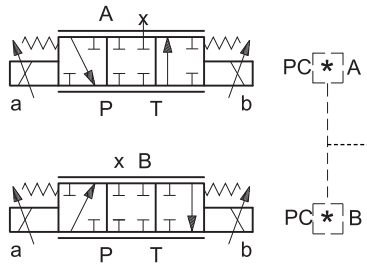


1 solenoid on side B.
2 positions (central + external) with spring centering



SYMMETRICAL	
max flow	Δp
15/15	4
25/25	8
30/30	4
45/45	8

ASYMMETRICAL	
max flow	Δp
15/10	4
25/15	8
30/20	4
45/30	8



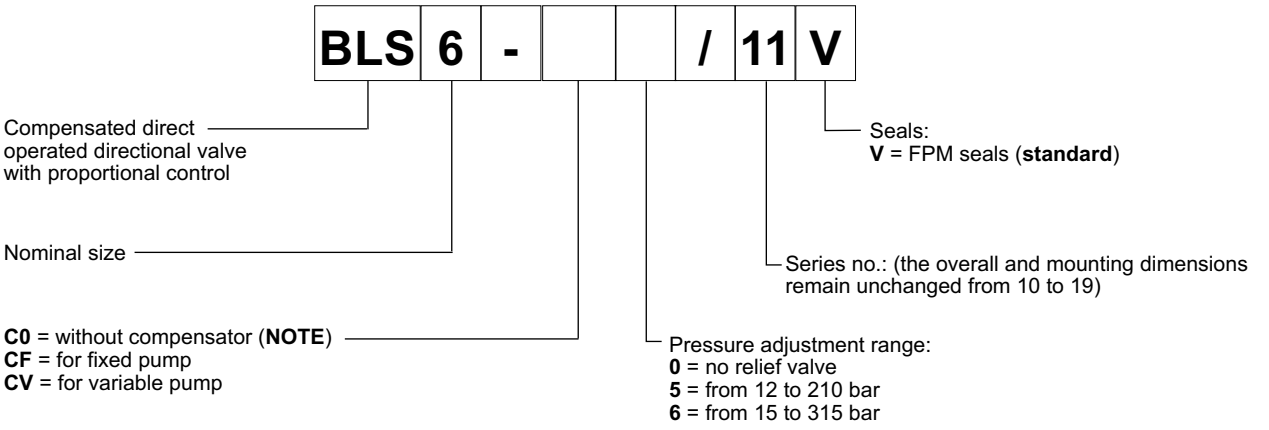
SINGLE FLOW	
max flow	Δp
30	4
45	8

1.2 - On-off modules

If necessary the proportional spool can be used together with on-off solenoids. In this case the description for the spool type as to be as follow:
SC = closed center with on-off solenoid
SA = open center with on-off solenoid
In this version is also available a spool for high flow named SC60/60 and SA60/60.

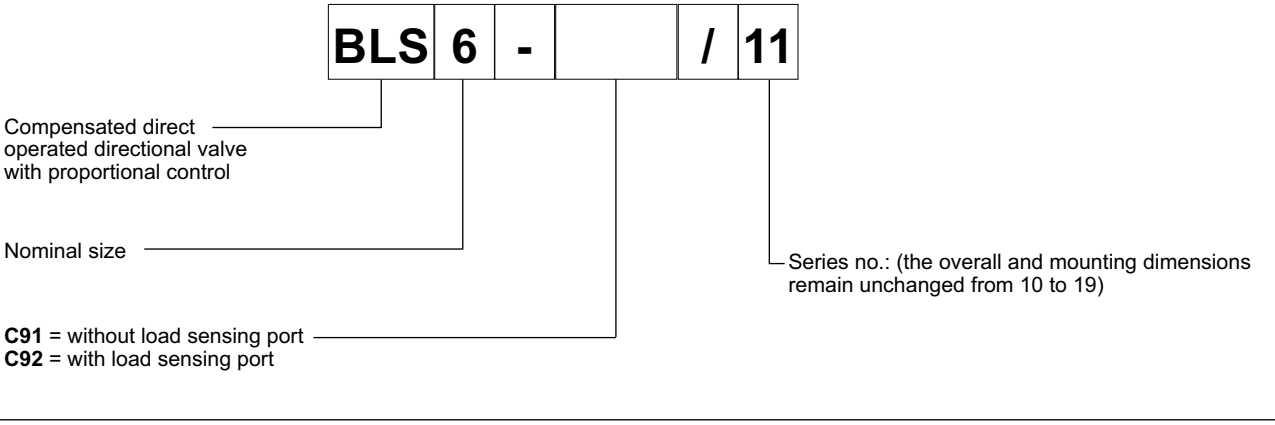
1.3 - Inlet modules

The inlet section is available in different version, for fixed and for variable pumps with load sensing. The version for fixed pump can be easily converted to work with variable pumps and vice versa.



NOTE: The version C0 is available only without the pressure relief valve, code BLS6-C00/11V.

1.4 - End plate modules



2 - HYDRAULIC FLUIDS

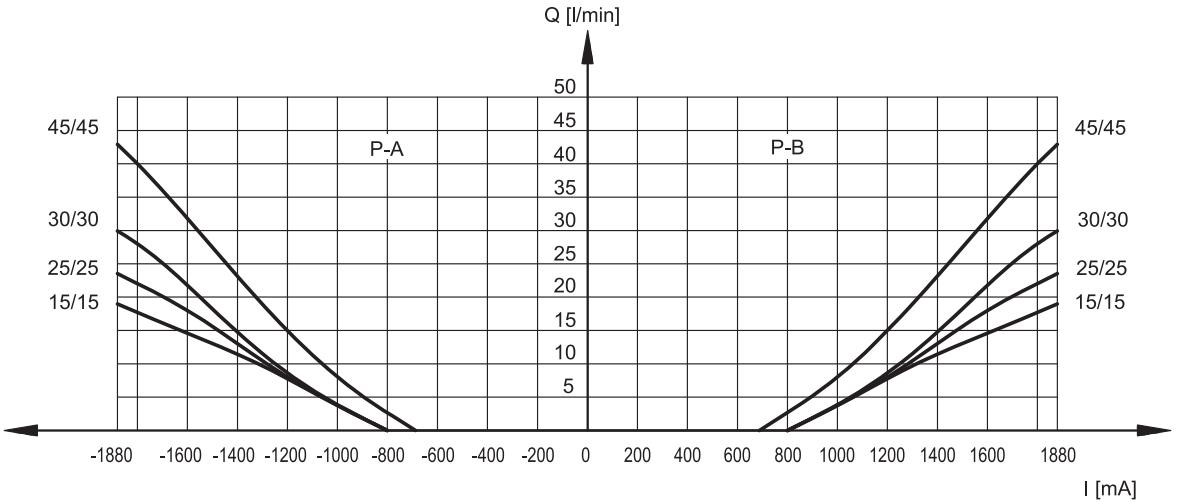
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4 or fluids HFDR type. For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

3 - CHARACTERISTIC CURVES (values obtained with viscosity 36 cSt at 50 °C)

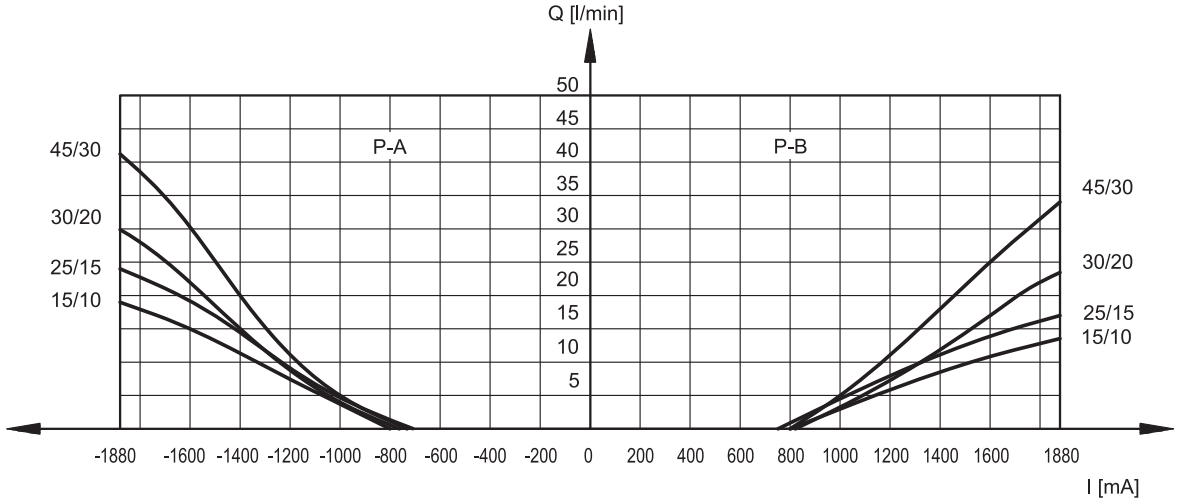
Typical constant flow rate obtained with internal 2-way compensator, and current with 12V solenoid type (for D24 version the maximum current is 860 mA), measured for the various spool types available.

PROPORTIONAL MODULES PRESSURE DROPS Δp-Q

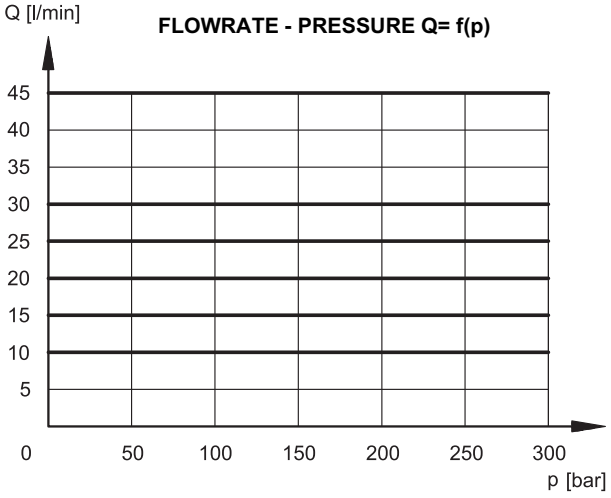
SYMMETRICAL FLOWS - PC AND PA SPOOLS



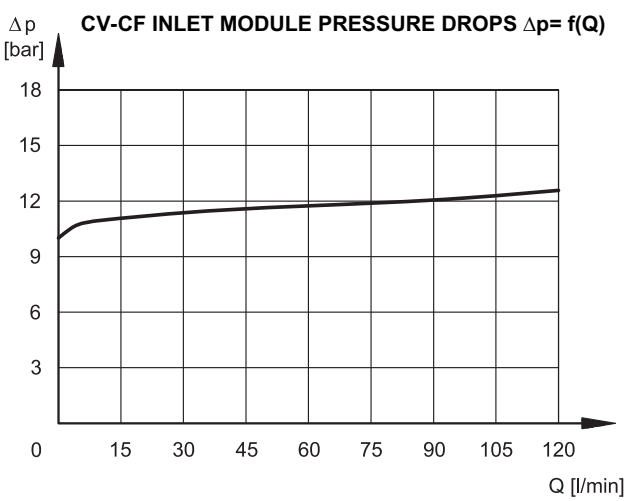
ASYMMETRICAL FLOWS - PC AND PA SPOOLS



FLOWRATE - PRESSURE Q= f(p)



CV-CF INLET MODULE PRESSURE DROPS Δp= f(Q)



4 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut. It can be rotated through 360° depending on installation clearances.

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) **K1 COIL** **K7 COIL**	Ω	3.66 4	17.6 19
NOMINAL CURRENT	A	1.88	0.86
DUTY CYCLE		100%	
PWM FREQUENCY	Hz	200	100
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2004/108/CE		
CLASS OF PROTECTION : Coil insulation (VDE 0580) Impregnation:	class H class F		

5 - STEP RESPONSE

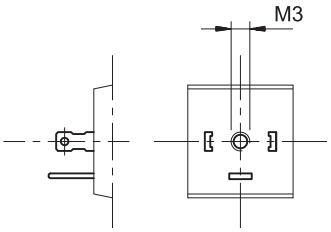
(measured with mineral oil with viscosity of 36 cSt at 50°C with the relative electronic control units)

Step response is the time (delay) taken for the valve to reach 90% of the set position value following a step change of the reference signal.

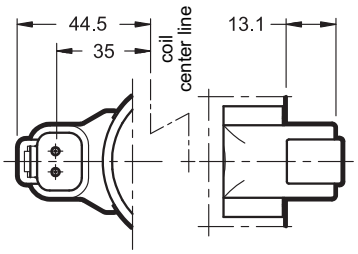
Reference signal step	0 →100%	100 →0%
Step response [ms]		
BLS6	50	40

6 - ELECTRIC CONNECTIONS

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



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



7 - ELECTRIC CONNECTORS

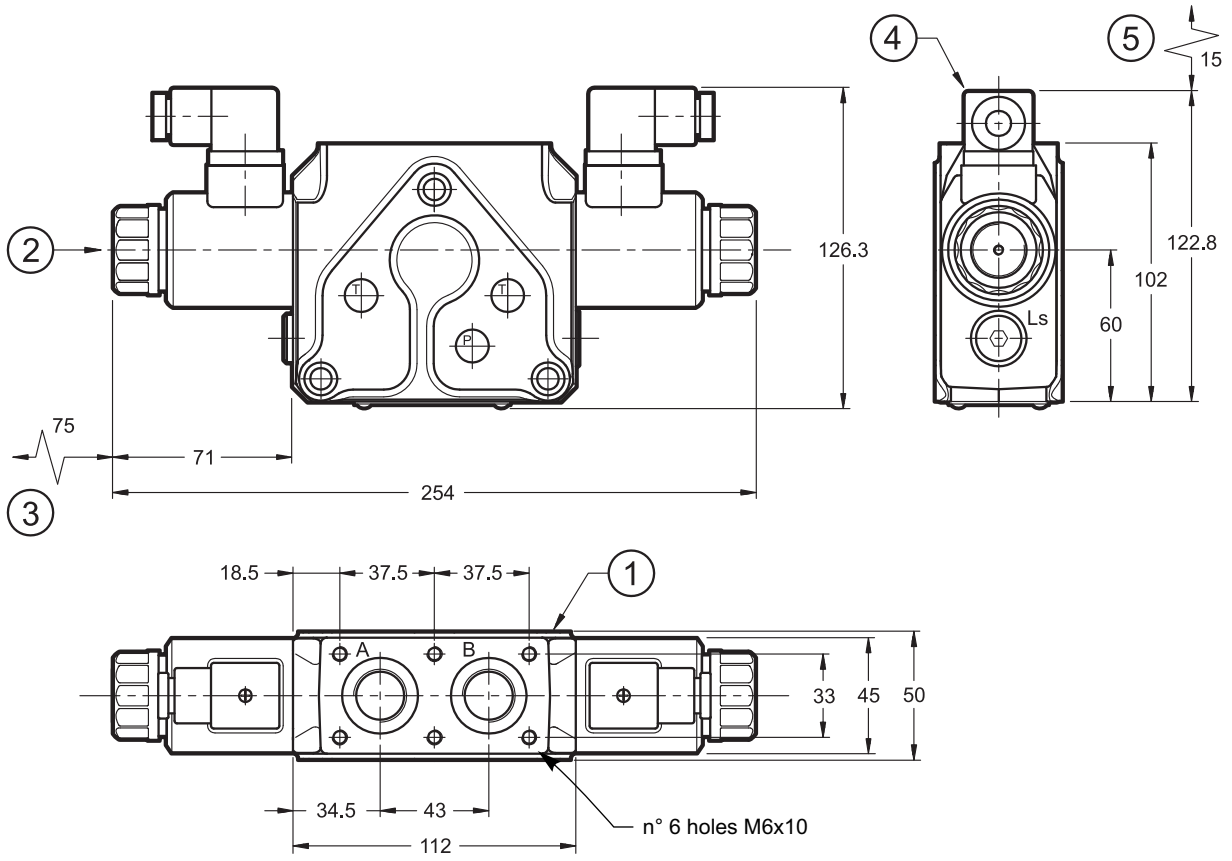
The on-off valves are supplied without connectors. For coils with standard electrical connections K1 type (DIN 43650) the connectors can be ordered separately. For the identification of the connector type to be ordered please see cat. 49 000. Connectors for K7 connections are not available.

8 - OVERALL AND MOUNTING DIMENSIONS

8.1 - Proportional module

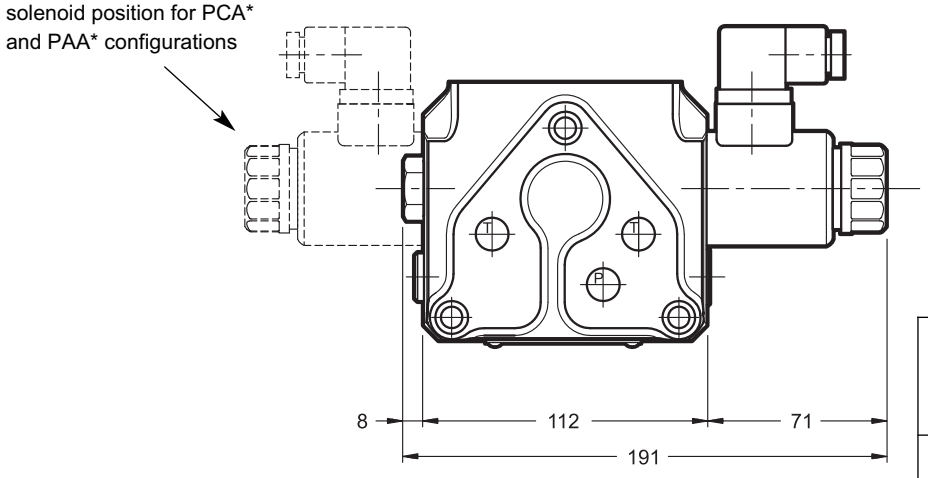
2 SOLENOIDS **BLS6-PC***
BLS6-PA*

dimensions in mm



1 SOLENOID **BLS6-PCB***
BLS6-PAB*

solenoid position for PCA*
and PAA* configurations

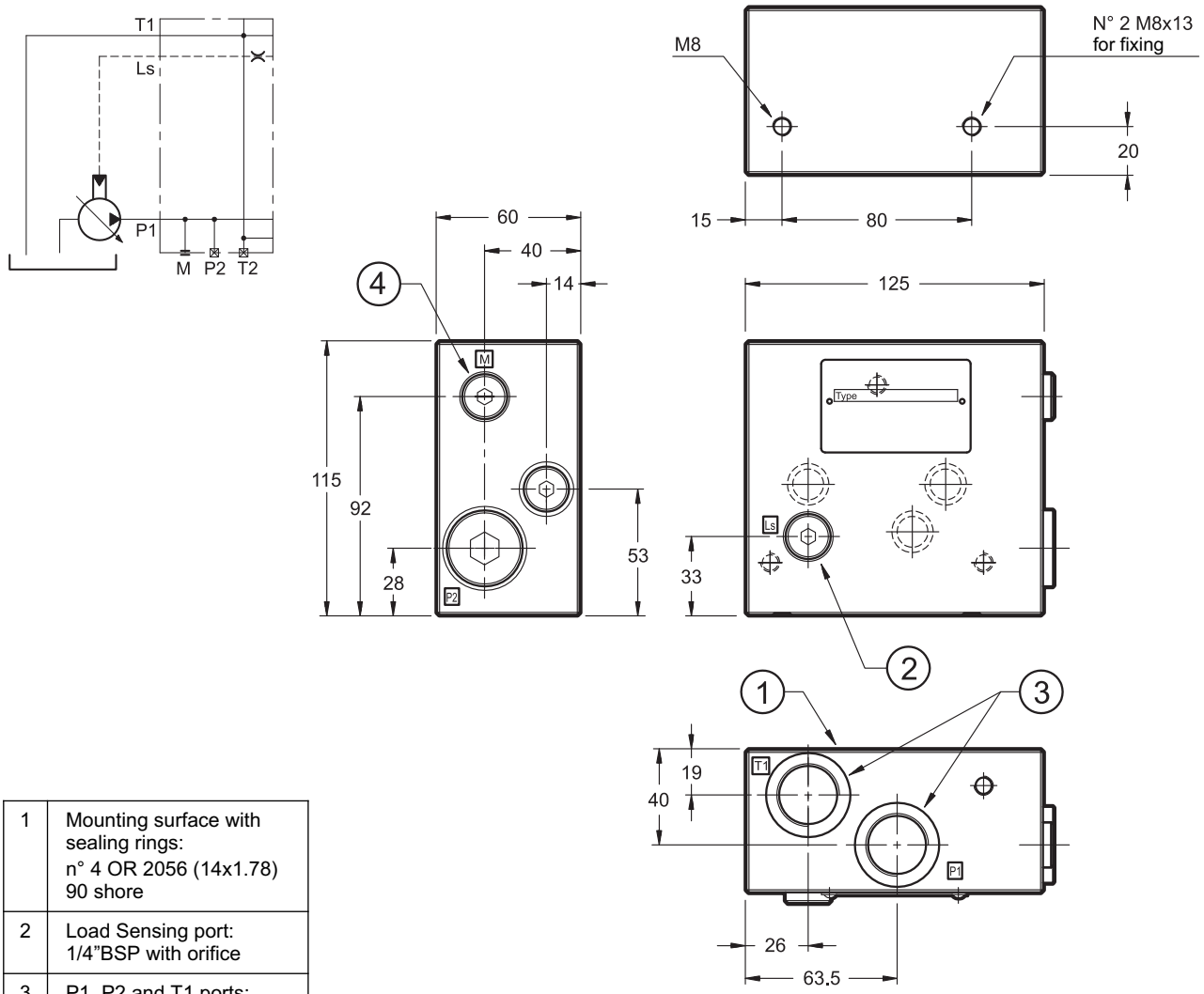


1	Mounting surface with sealing rings: n° 4 OR 2056 (14x1.78) 90 shore
2	Locking ring with boot protected manual override
3	Coil removal space
4	Electrical connector type DIN 43650 (drawing with standard type K1 - for other connections see par. 6)
5	Connector removal space

8.2 - Inlet modules

dimensions in mm

BLS6-C00

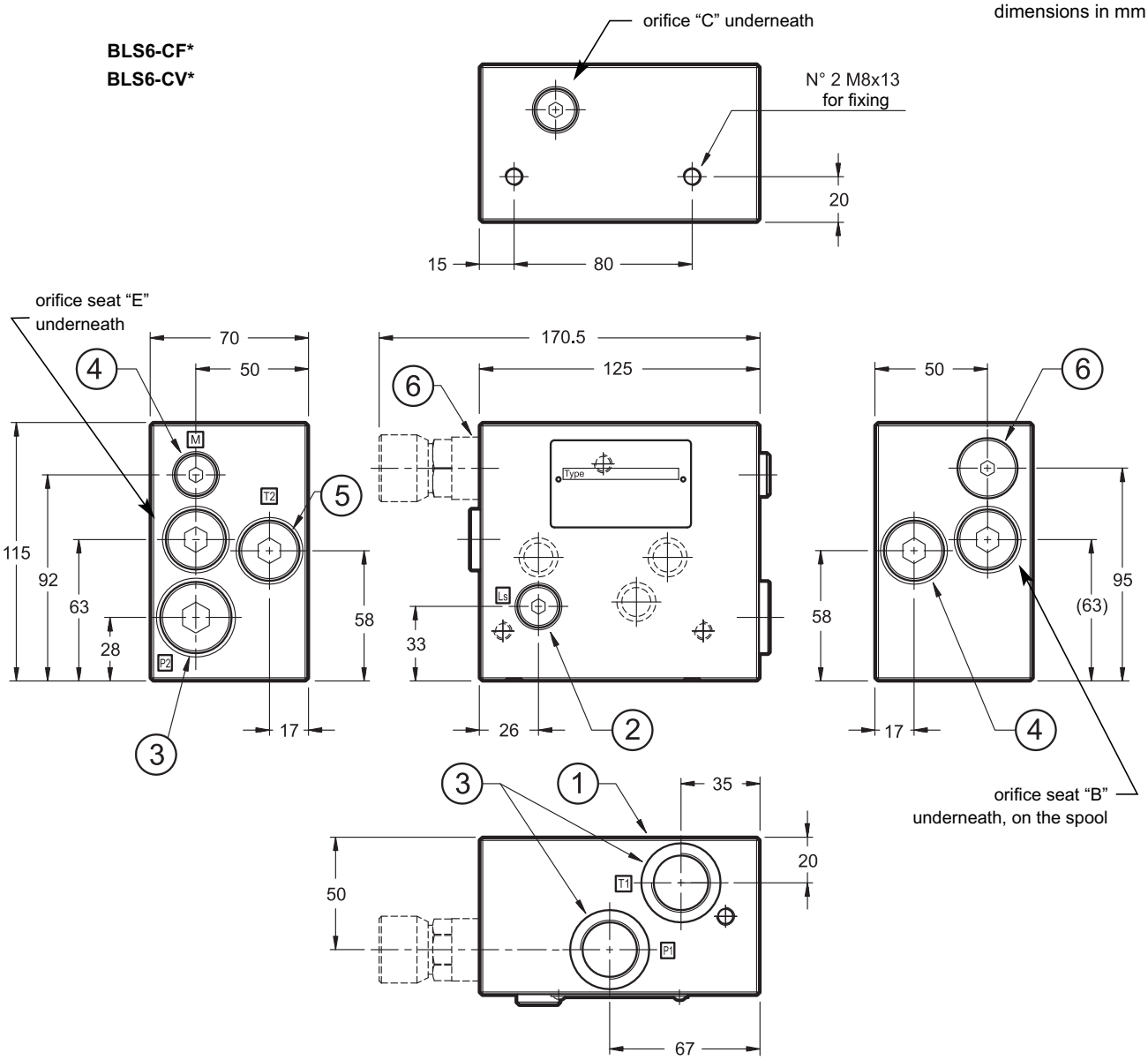


1	Mounting surface with sealing rings: n° 4 OR 2056 (14x1.78) 90 shore
2	Load Sensing port: 1/4”BSP with orifice
3	P1, P2 and T1 ports: 3/4” BSP
4	Pressure gauge port: 1/4” BSP

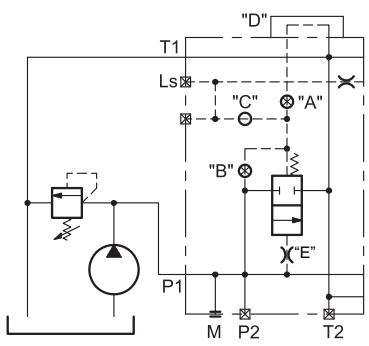
8.2 - Inlet modules

dimensions in mm

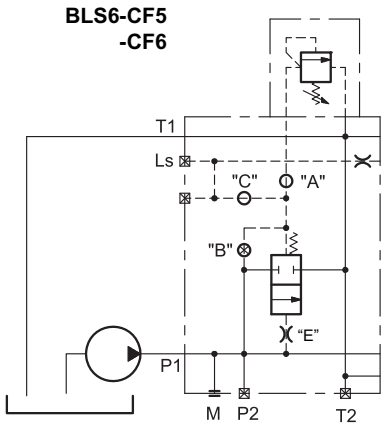
BLS6-CF*
BLS6-CV*

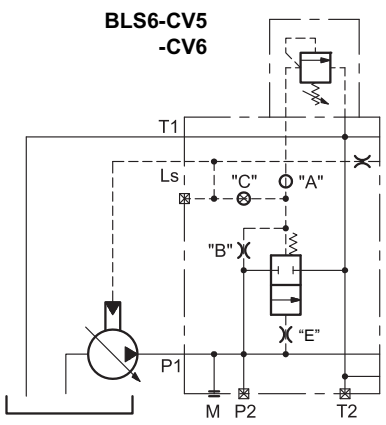


BLS6-CF0



1	Mounting surface with sealing rings: n° 4 OR 2056 (14x1.78) 90 shore
2	Load Sensing port: 1/4" BSP
3	P1, P2 and T1 ports: 3/4" BSP
4	Pressure gauge port: 1/4" BSP
5	T2 port: 1/2" BSP
6	Special plug for the pressure relief valve seat. (D). Orifice seat "A" underneath.

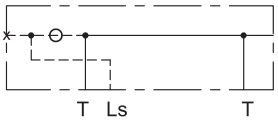




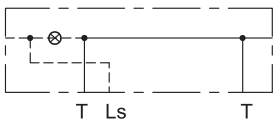
8.3 - End modules

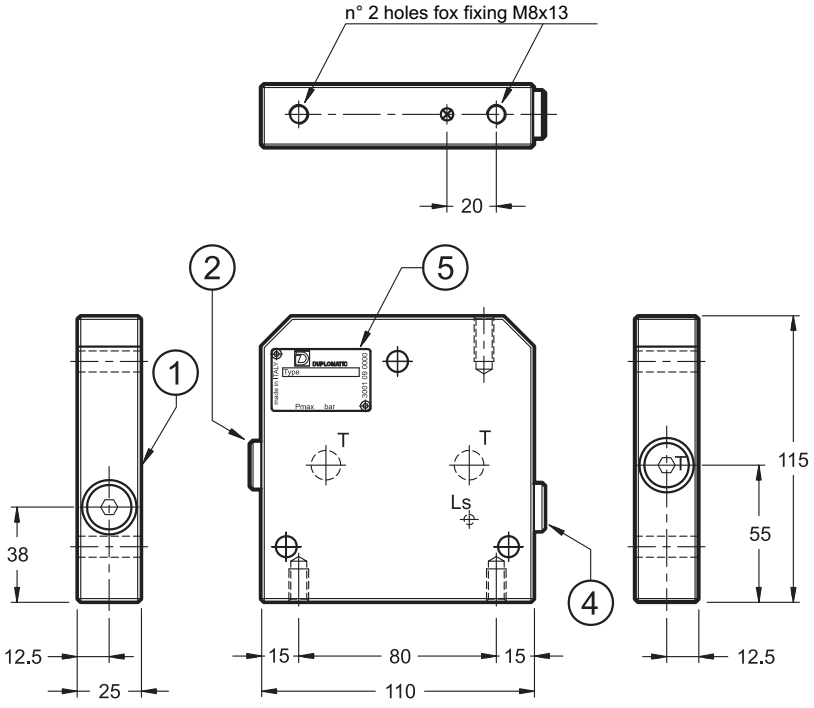
dimensions in mm

BLS6-C91



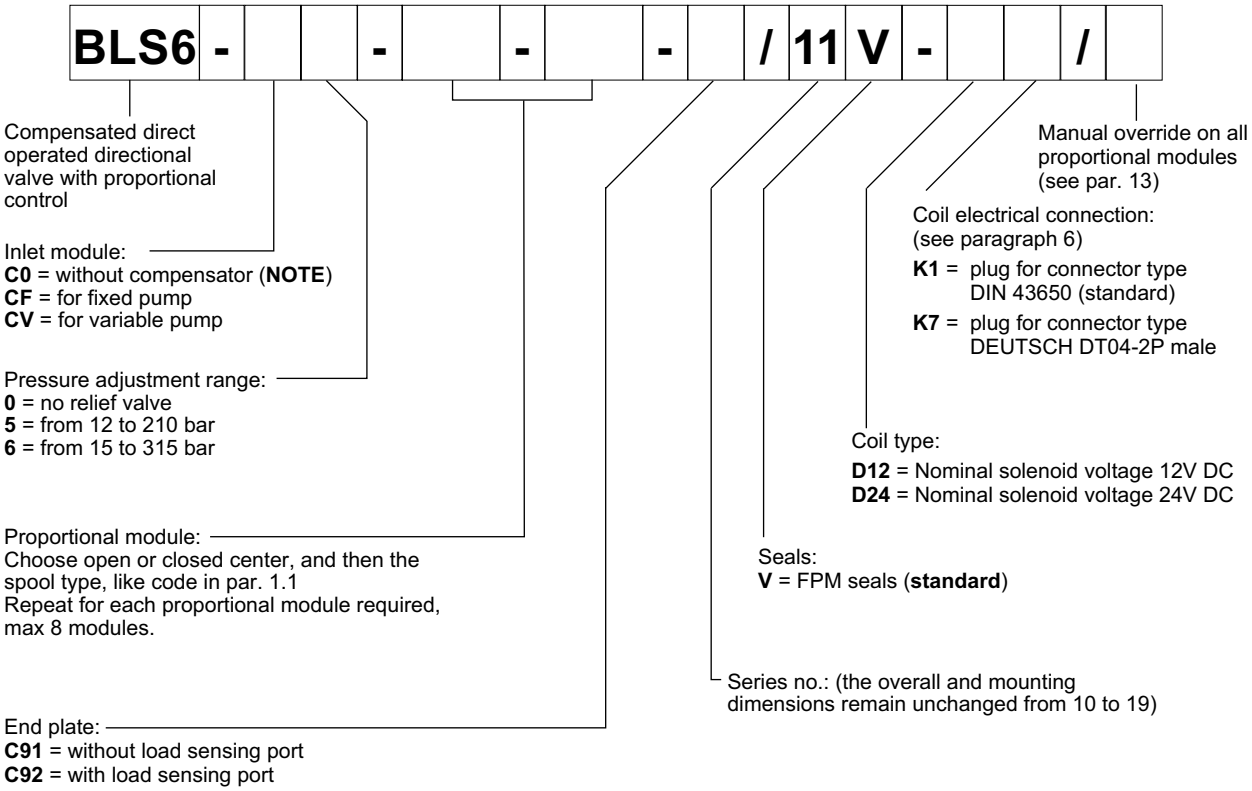
BLS6-C92





1	Mounting surface with no sealing rings
2	T1 outlet: 3/8” BSP
3	Identification label
4	Load Sensing port: 1/4” BSP
5	Identification label

9 - IDENTIFICATION CODE OF ASSEMBLED VALVE



NOTE: The version C0 is available only without the pressure relief valve, wiith code BLS6-C00/11V.

Coding example:

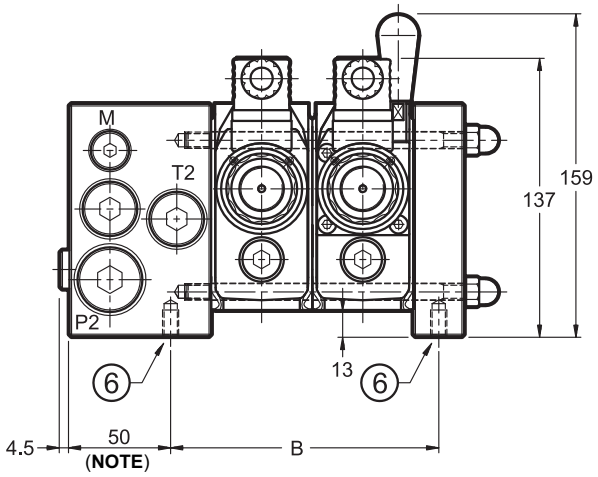
BLS6-C00-PC30/30-PC30/30-C92/11V-D24K1: assembled valve includes: inlet module without 3 way compensator; 2 prop. modules with closed center flow 30/30; end plate without load sensing port; FPM seals, 24V DC coils and K1 connection.

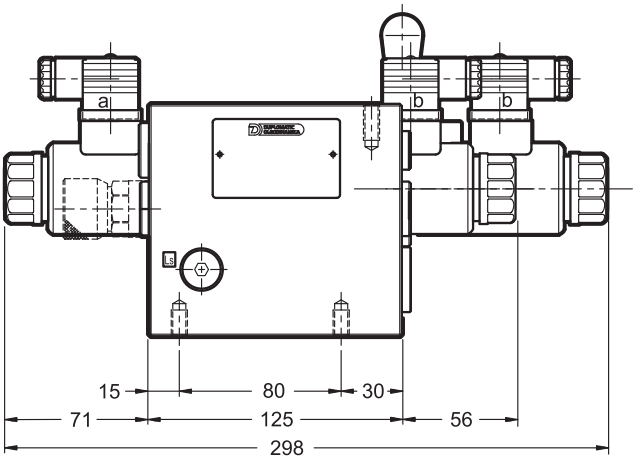
BLS6-CF5-PA45/30-PA45/30-PC30/30-PAB15/15-C91/11V-D12K1: assembled valve includes: inlet module for fixed pump, with pressure max 210 bar; 2 prop. modules with open center flow 45/30, 1 prop. module with close center, flow 30/30 and 1 prop. module with open center and solenoid only on side B, flow 15/15; end plate with load sensing port; FPM seals, 12V DC coils and K1 connection.

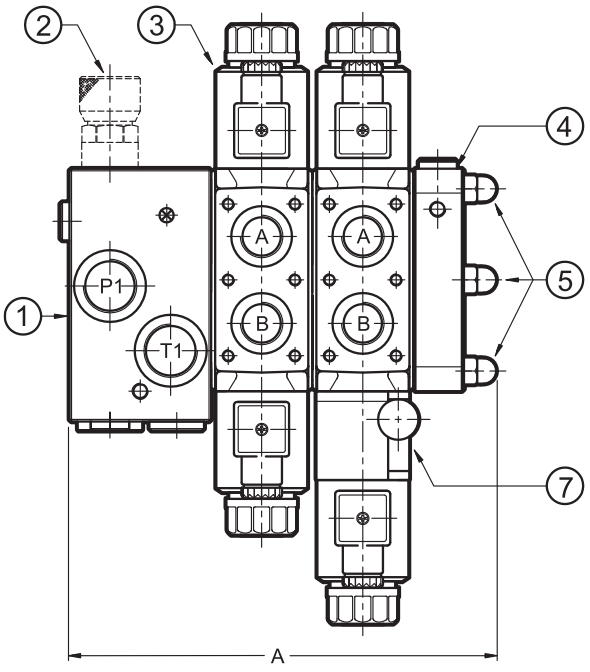
NOTE: To obtain the best performances, we suggest to mount the spool with the max flow first, and then the others decreasing.

10 - INSTALLATION AND OVERALL DIMENSIONS OF THE ASSEMBLED VALVE

dimensions in mm







Modules	A (**NOTE**)	B
2	212	132,5
3	262	182,5
4	312	232,5
5	362	282,5
6	412	332,5
7	462	382,5
8	512	432,5

NOTE: with the inlet module BLS6-C00 the dimension results 10 mm shorter.

1	Inlet module
2	Pressure relief valve
3	Proportional modules
4	End plate
5	Fixing studs
6	Fixing holes
7	Manual lever override module

Fixing kit

The fixing kit includes n° 3 studs, 3 self locking nuts and 3 washers, all zinc-coated.
To order it please use the following codes:

No. of body modules	**Code**
2	3404150010
3	3404150011
4	3404150012
5	3404150013
6	3404150014
7	3404150015
8	3404150016

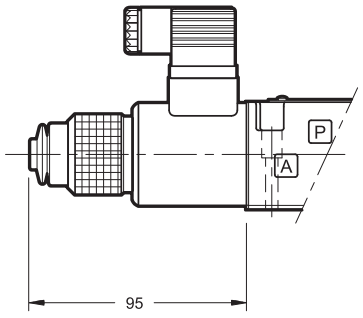
Tightening torque: 25 Nm

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.
Four different manual override version are available upon request:

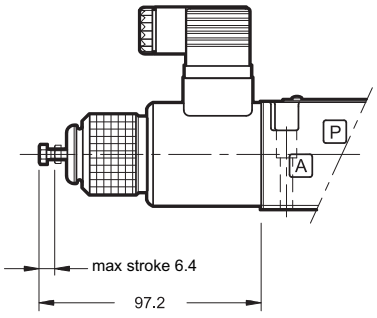
- **CM** version, manual override belt protected.
- **CS** version, with metal ring nut provided with a M4 screw and a blocking locknut to allow the continuous mechanical operations.
- **CH** version, lever manual override.
- **CK** version, knob. When the set screw is screwed and its point is aligned 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



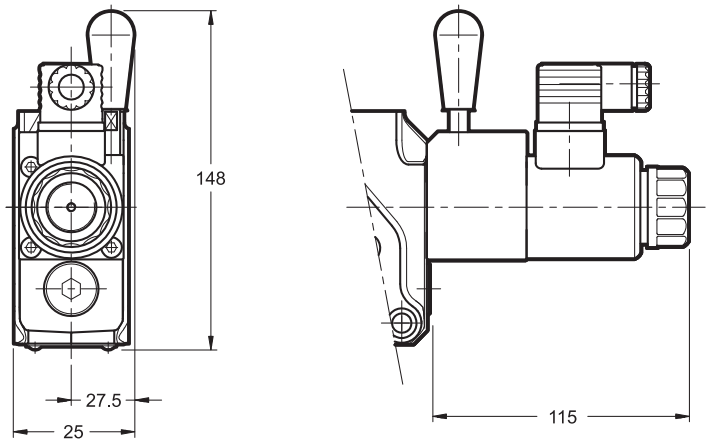
Code: 3803210003

CS Version

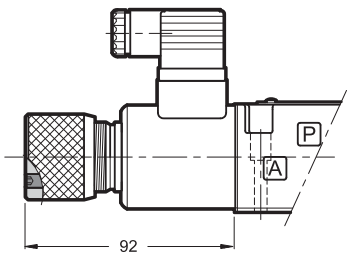


Code: 3803210004

CH Version



CK Version



Spanner for set screw: 3 mm
Code: 3803210005

12 - ELECTRONIC CONTROL UNITS

One solenoid

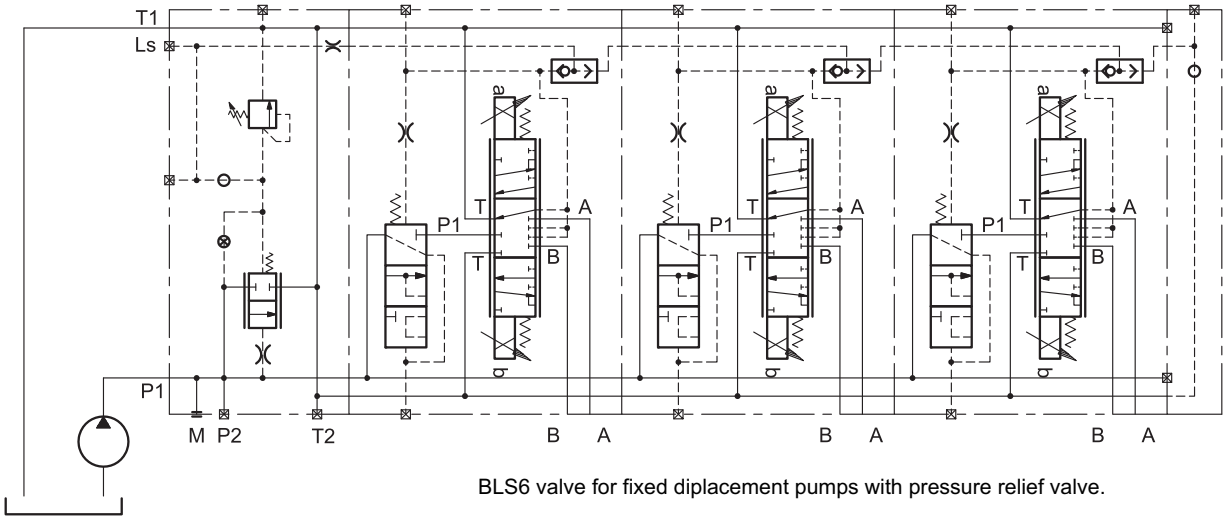
EDC-111	for solenoid 24V DC	plug version	see cat. 89 120
EDC-141	for solenoid 12V DC		
EDM-M111	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250
EDM-M141	for solenoid 12V DC		

Two solenoids

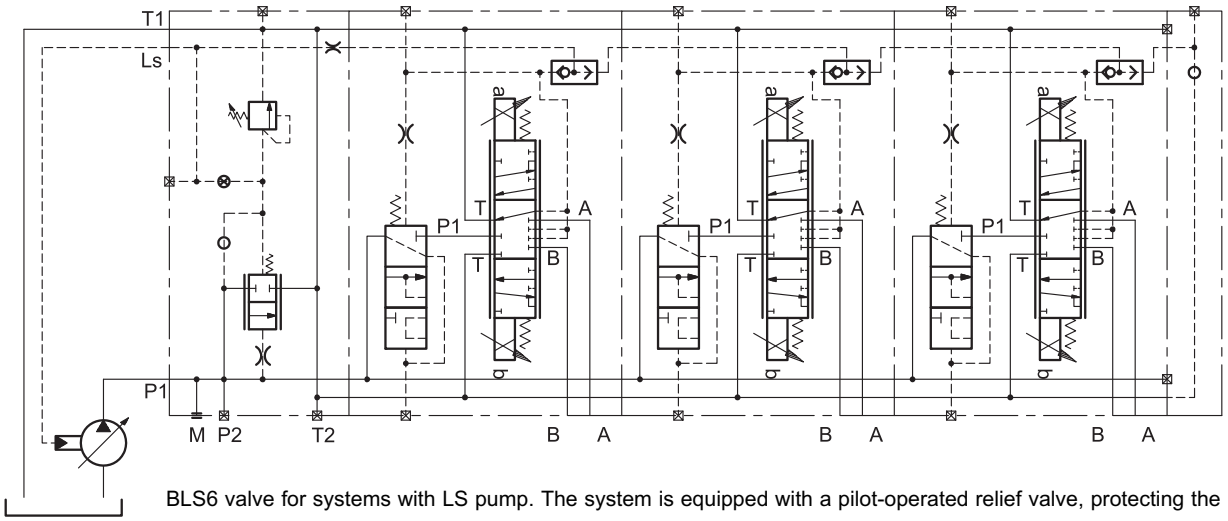
EDM-M211	for solenoid 24V DC	rail mounting DIN EN 50022	see cat. 89 250
EDM-M241	for solenoid 12V DC		

These cards drive only a module at once.
Every module to be driven with electronic card must have its one.

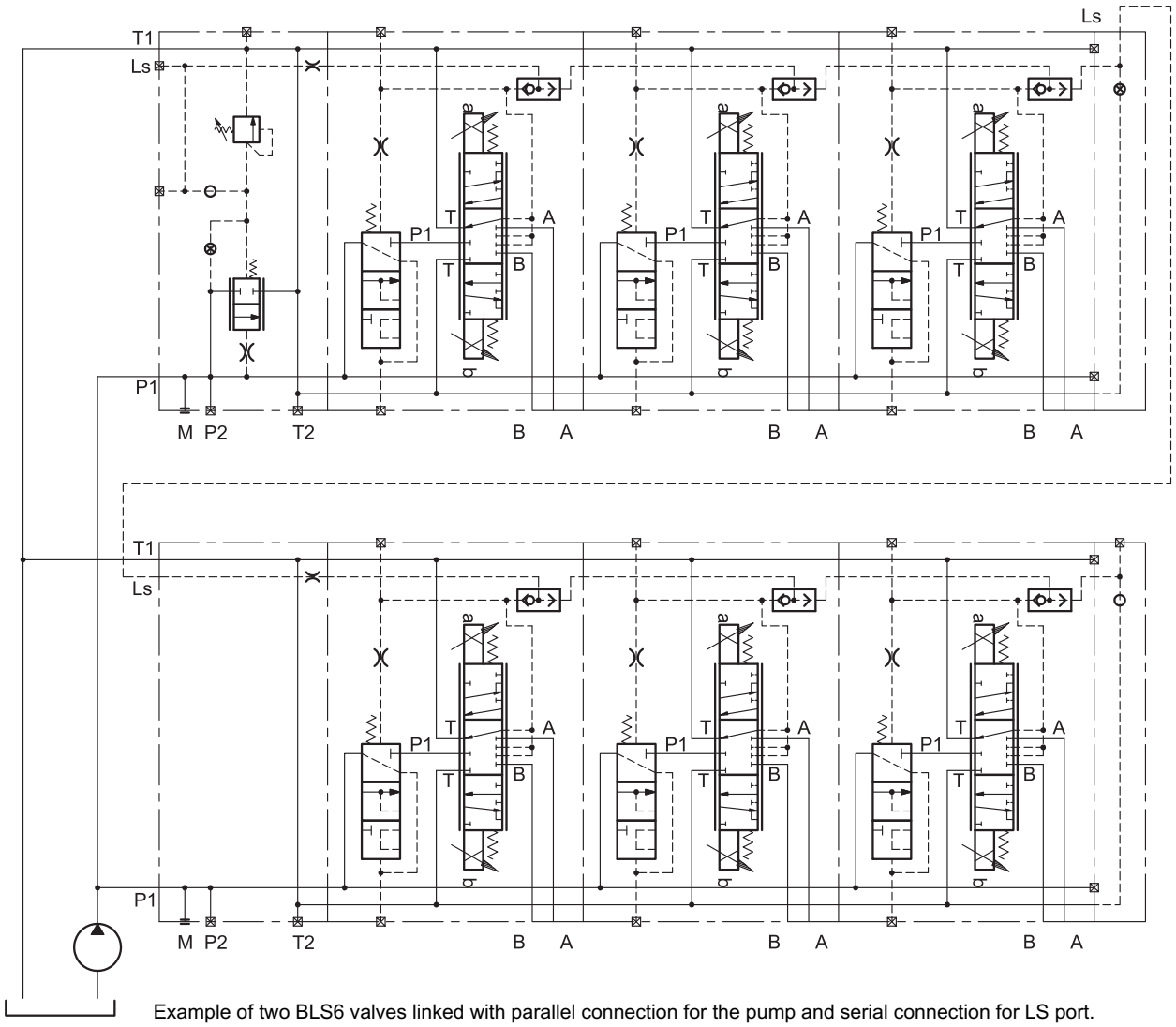
13 - EXAMPLES OF APPLICATION



BLS6 valve for fixed diplacement pumps with pressure relief valve.



BLS6 valve for systems with LS pump. The system is equipped with a pilot-operated relief valve, protecting the pump.



Example of two BLS6 valves linked with parallel connection for the pump and serial connection for LS port.

DUPLOMATIC OLEODINAMICA

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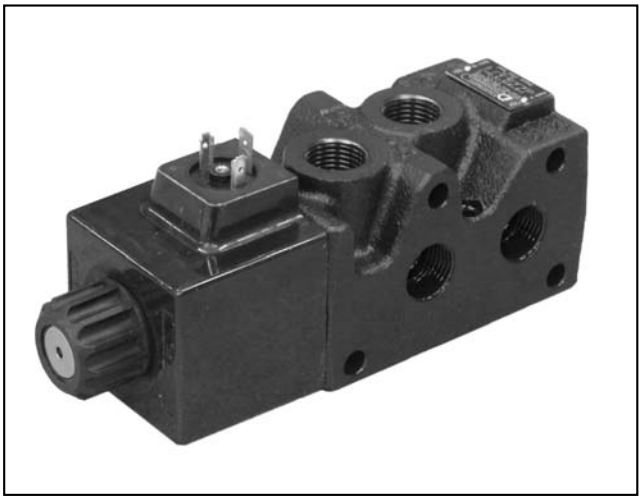
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com



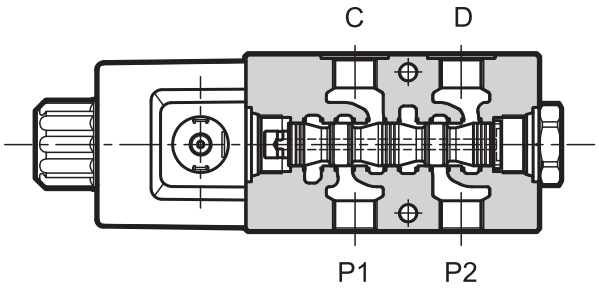
BFD*

SIX WAYS BANKABLE FLOW DIVERTER

SERIES 10

p max **320** bar
Q max **90** l/min

OPERATING PRINCIPLE



— BFD* is a 6 ways bankable flow diverter that allows the simultaneous connection of 2 utilities, alternating the direction of flow through a solenoid operate directional valve.

— It is available in two sizes, depending on the requested flow, and is used mainly for compact applications for the mobile sector.

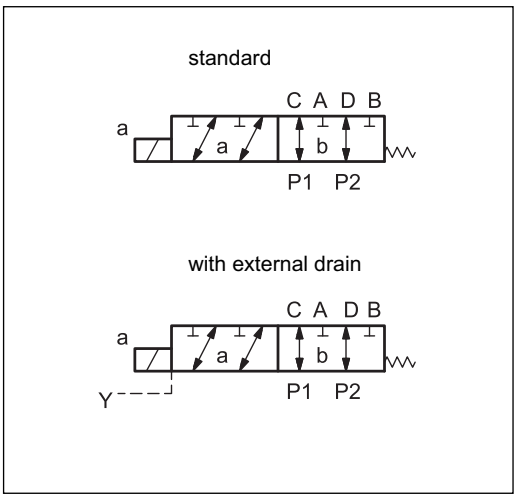
— Valve BFD is also suitable for series mounting, lining up to max 5 modules.

— The external drain is available as an option on both versions.

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

		BFD06	BFD10
Maximum operating pressure : - with drain Y	bar	250 320	
Maximum flow	l/min	60	90
Pressure drops Δp - Q	see paragraph 3		
Electrical features	see paragraph 6		
Operating limits	see paragraph 4		
Electrical connections	see paragraph 10		
Ambient temperature range	°C	-20 / +50	
Fluid temperature range	°C	-20 / +80	
Fluid viscosity range	cSt	10 ÷ 400	
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15		
Recommended viscosity	cSt	25	
Mass:	kg	3	4,2
Surface treatment	thermochemical antioxidant		

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

BFD		-		-	TA6	/	10		-			/		

Bankable 6 ways flow diverter

Nominal size
06 = 60 l/min
10 = 90 l/min

Ports: (see **NOTE 1**)
G038 = 3/8" BSP (for BFD06)
G012 = 1/2" BSP

Spool type:

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

NOTE 1: On BFD06 are available upon request for the threads: 3/4" 16 UNF (**S08**).
NOTE 2: The locking rings of the coils and the relevant O-Rings are supplied together with valves.

Coil type
D12 = 12 V
D24 = 24 V
D28 = 28 V (BFD06 only)
D00 = valve without coils (see **NOTE 2**)

Coil electrical connection (see. par. 9):
K1 = plug for connector type DIN 43650 (**standard**)
K7 = plug for connector type DEUTSCH DT04-2P male (available only for DN06)

Manual override: omit for override integrated in the tube (**standard**)
CM = manual override, boot protected

Option:
Y = External drain (see par. 12.2)

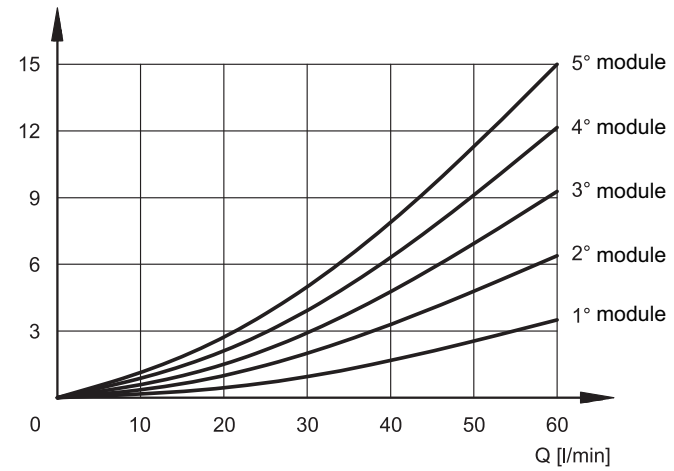
2 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N).
For fluids HFDR type (phosphate esters) use FPM seals (code V).
For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

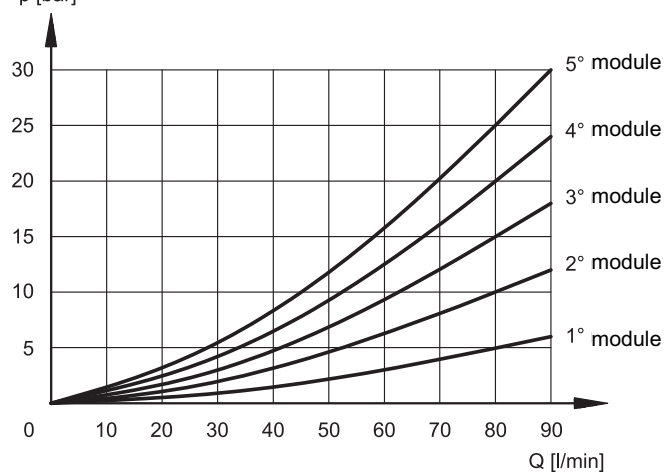
3 - CHARACTERISTIC CURVES (obtained with viscosity 36 cSt at 50 °C)

3.1 - Pressure Drops Δp-Q at rest

BDF06

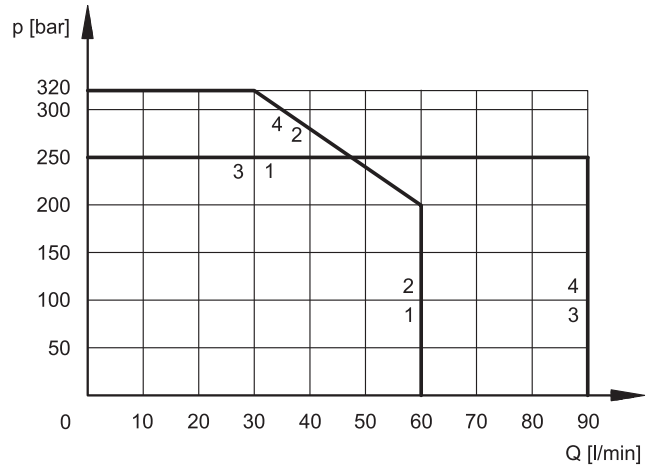


BFD10



4 - OPERATING LIMITS

The curves define the flow rate operating fields according to the valve pressure of the different versions.
The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage.
The value have been obtained with mineral oil, viscosity 36 cSt, temperature 50 °C and filtration according to ISO 4406:1999 class 18/16/13.



VALVE	CURVE
BFD06*	1
BFD06*/Y	2
BFD10*	3
BFD10*/Y	4

5 - SWITCHING TIMES

The values indicated are obtained according to ISO 6403 standard, with mineral oil viscosity 36 cSt at 50°C.

TIMES ms (±10%)	ENERGIZING	DE-ENERGIZING
BFD06	25 ÷ 75	20 ÷ 50
BFD10	50 ÷ 100	20 ÷ 40

6 - ELECTRICAL CHARACTERISTICS

6.1 Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation.

Protection from atmospheric agents CEI EN 60529

Plug-in type	IP
K1 DIN 43650	IP 65
K7 DEUTSCH DT04 male	IP 69 K

NOTE: The protection degree is guaranteed only with the connector correctly connected and installed.

NOTE 2: In order to further reduce the emissions, use of type H connectors is recommended. These prevent voltage peaks on opening of the coil supply electrical circuit (see cat. 49 000).

SUPPLY VOLTAGE FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY	10.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC) (NOTE 2)	In compliance with 2004/108/ CE
LOW VOLTAGE	In compliance with 2006/95 CE
CLASS OF PROTECTION : Coil insulation (VDE 0580) Impregnation:	 class H class F (BFD06) class H (BFD10)

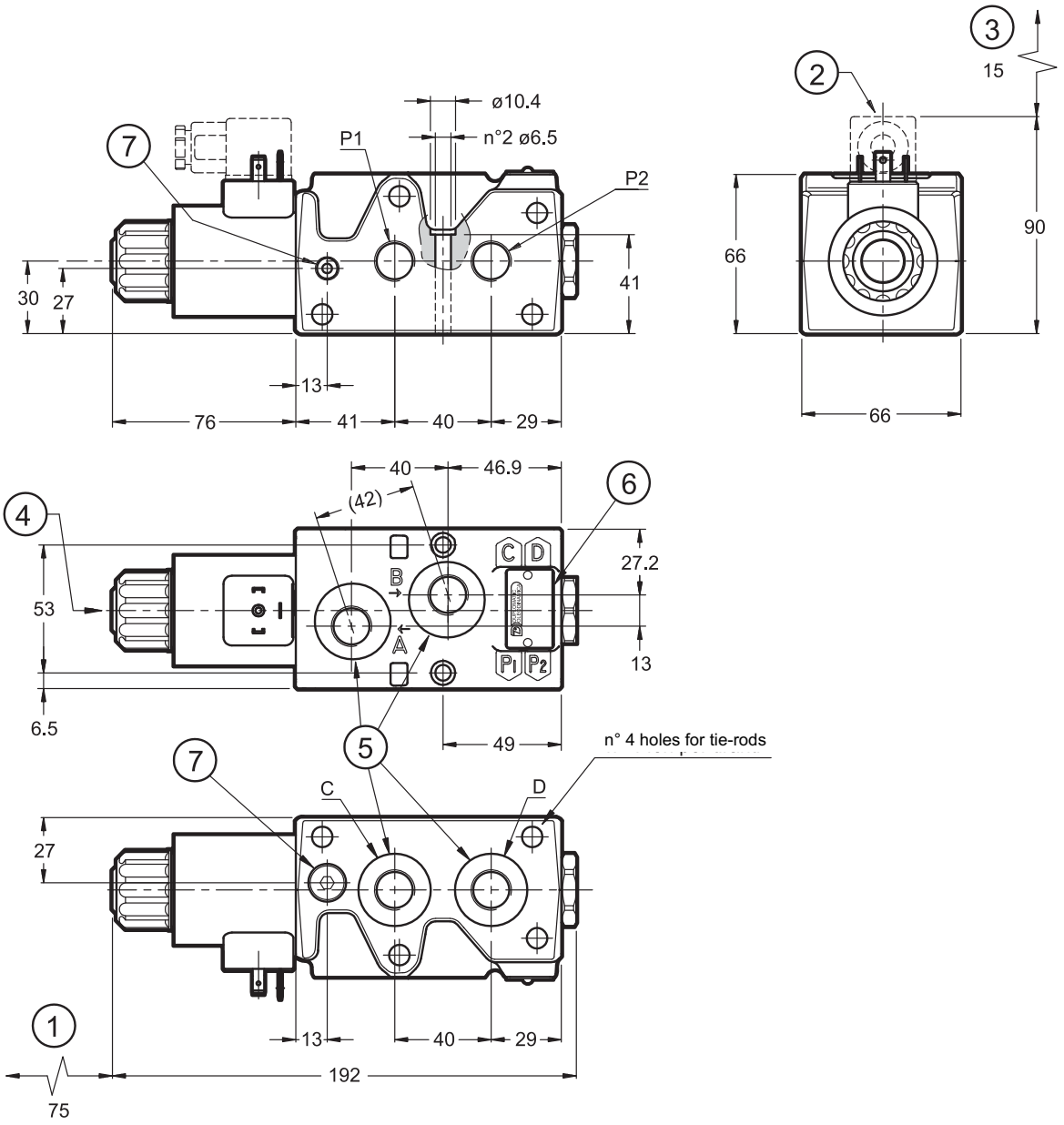
6.2 Current and absorbed power

The table shows current and power consumption values relevant to the different coil types.

Valve	Coil	Resistance at 20°C [Ω] (±1%)	Current consumpt. [A] (±5%)	Absorbed power [W] (±5%)	Coil code K1	Coil code K7
BFD06*	**C22S3-D12**	4 ÷ 5	2,72	32,7	1903080	1902940
	C22S3-D24	18 ÷ 19,5	1,29	31	1903081	1902941
	C22S3-D28	24,5 ÷ 27	1,11	31	1903082	-
BFD10*	**C22L5-D12***	2,9	4,14	50	1903150	-
	C22L5-D24*	12,3	1,95	47	1903151	-

7 - BFD06 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

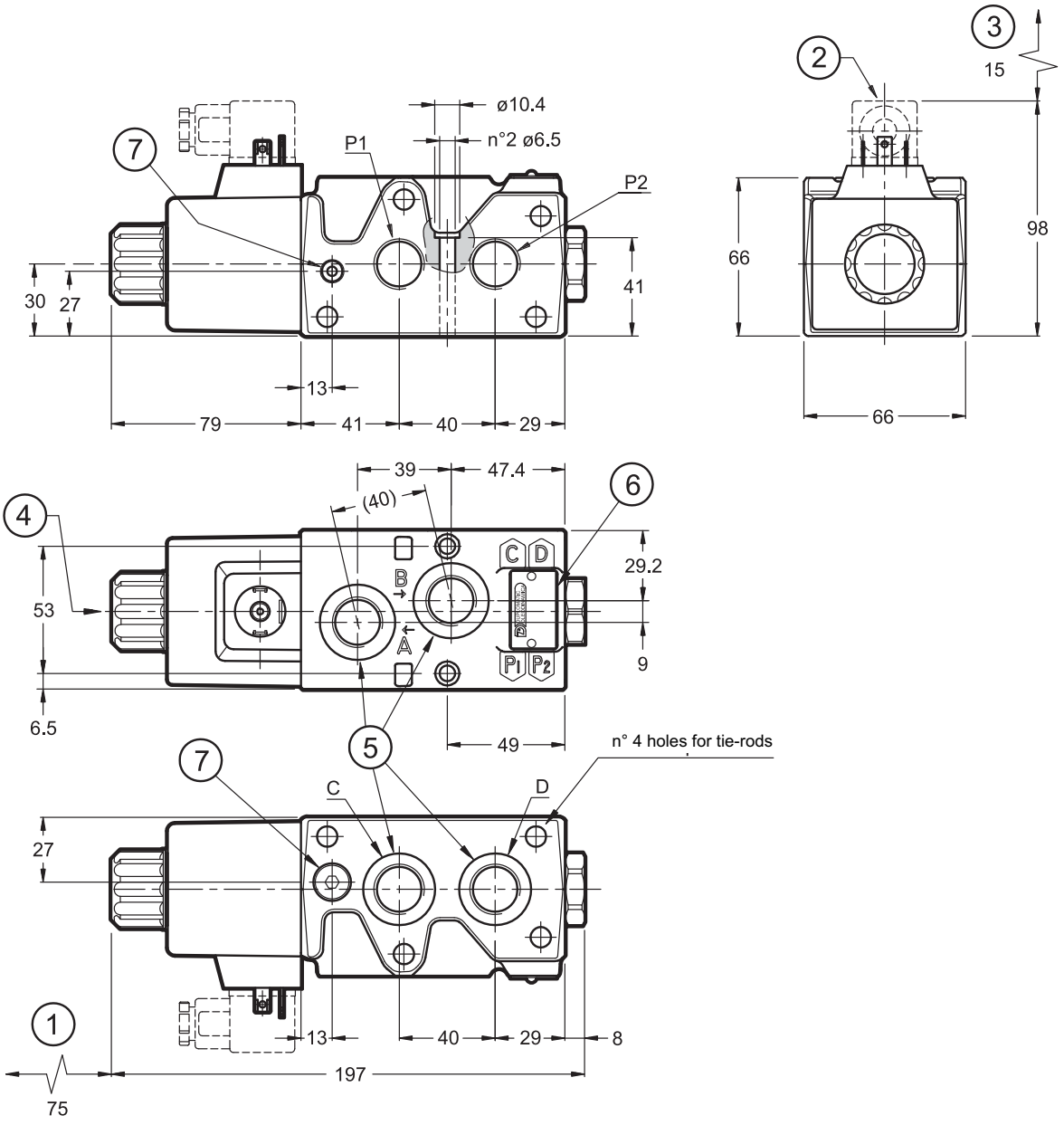


1	Coil removal space
2	DIN 43650 electrical connector
3	Connector removal space (representation with standard connection type K1 - for connection K7 see par. 10)
4	Standard manual override included in the solenoid tube
5	Ports: 3/8” BSP
6	Identification label
7	Option: external drain port Y 1/8” BSP

Fastening bolts: n°2 M6x50

8 - BFD10 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	Coil removal space
2	DIN 43650 electrical connector
3	Connector removal space
4	Standard manual override included in the solenoid tube
5	Ports: 1/2” BSP
6	Identification label
7	Option: external drain port Y 1/8” BSP

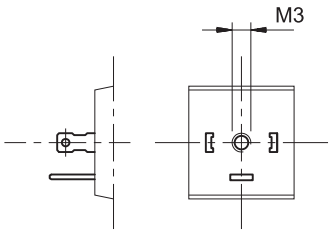
Fastening bolts: n°2 M6x50

9 - INSTALLATION

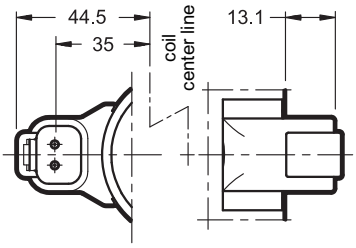
The solenoid operated valve can be installed in any position without undermining the proper functioning.

10 - ELECTRICAL CONNECTIONS

Connection type connector DIN 43650 - Code **K1**



Connection type connector DEUTSCH DT04-2P male
Code **K7** (for BFD06 only)



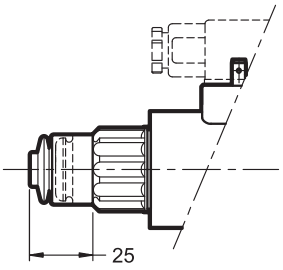
11 - ELECTRICAL CONNECTORS

The solenoid valves are supplied without connectors. For coils with electrical connection type K1 (DIN 43650) connectors can be ordered separately. To identify the type of connector to be ordered catalogue to see 49 000.
For connections K7 its connectors are not available.

12 - OPTIONS

12.1 Boot 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. Option is available on both versions.



Code: 3401150006

12.2 - Subplate external drain port (option Y)

This version allows the operation with pressures up to 320 bar on the ports.

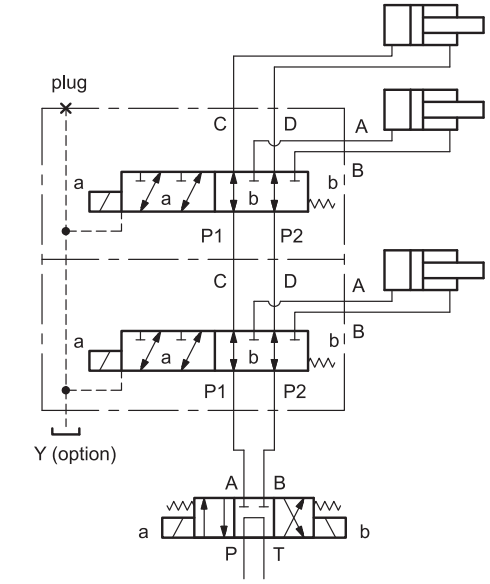
It consists in a Y drain hole realized on the valve coupling interface, where the Y port is connected with the solenoid tubes: in this way the tubes are not stressed by the pressure operating on the valve ports.

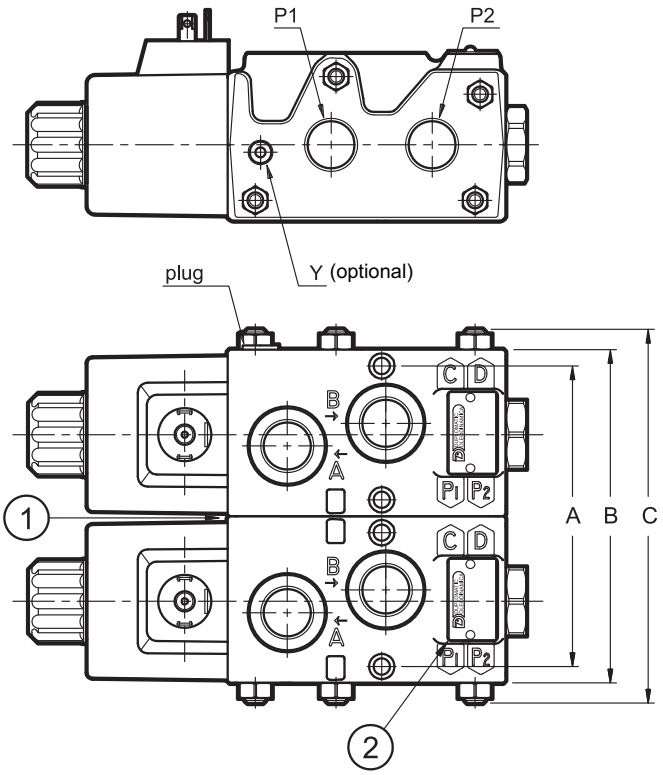
13 - SERIES CONFIGURATION

The BFD* valve can also mounted in series, bundled up to 5 individual modules. The fixing kit must be ordered separately. It includes: rods and screws, nuts, security washers and OR, as indicated in the table below.

13.1 Hydraulic scheme, dimensions and installation

MOUNTING EXAMPLE





BFD06: 3/8" BSP ports
BFD10: 1/2" BSP ports

1	Mounting surface with sealing rings: OR 2106 (26.7x1.78) 90 shore additional just for Y version: OR 2050 (12,42x1,78) 90 shore
2	Identification label

Tightening torque: 17 Nm

module s no.	ways no.	A	B	C	bolts or tie-rods	nuts & washers	n° OR 2106	n° OR 2050	kit BFD*/10N	kit BFD*/10V
2	8	119	132	156	n° 4 bolts M8x145	4+4	2	1	3404200002	3404200012
3	10	185	198	220	n° 4 tie-rods M8x200	8+8	4	2	3404200003	3404200013
4	12	251	264	285	n° 4 tie-rods M8x265	8+8	6	3	3404200004	3404200014
5	14	317	330	350	n° 4 tie-rods M8x330	8+8	8	4	3404200005	3404200015

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