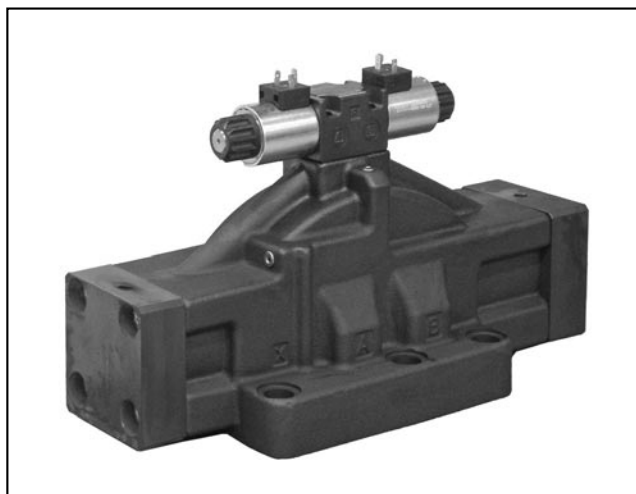




DSP1*

DIRECTIONAL VALVES, PILOT OPERATED, SOLENOID OR HYDRAULIC (DSC1*) ACTUATED

SUBPLATE MOUNTING

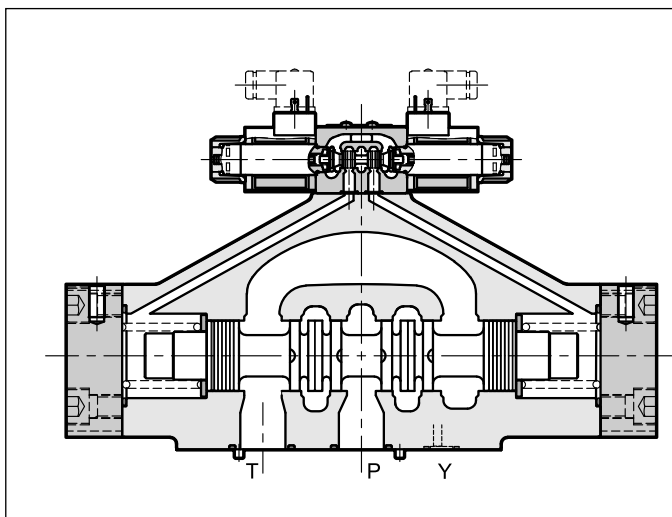
DS*10 ISO 4401-10

DS*11 ISO 4401-10 oversize ports

p max 350 bar

Q max 1600 l/min

OPERATING PRINCIPLE



- The DSP10 and DSP11 are 4-ports directional valves, pilot operated, solenoid actuated, with mounting surface according to ISO 4401-10 standards. The DS*11 valves have ports Ø48 mm.
- Directional valves DSC10 and DSC11 are the hydraulic actuated versions.
- They are available with different spool types (see point 2) and with some options for the opening control.
- The DSP* valves are available with internal or external pilot supply and internal or external drain. A version with internal pilot supply with fixed pressure reducing valve is also available.
- Versions with UL Recognized DC coils are available for the North American markets.

PERFORMANCES

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

		DS*10	DS*10H	DS*11
Maximum operating pressure - ports P - A - B (standard version) - port T (external drainage) - port T (internal drainage)	bar	350 300 210 (CC) / 160 (CA)	420 350 210 (CC) / 160 (CA)	320 250 210 (CC) / 160 (CA)
Maximum flow rate from port P to A - B - T	l/min	1100	1100	1600
Ambient temperature range	°C	-20 / +50		
Fluid temperature range	°C	-20 / +80		
Fluid viscosity range	cSt	10 ÷ 400		
Fluid contamination degree	according to ISO 4406:1999 class 20/18/15			
Recommended viscosity	cSt	25		
Mass: DSP DSC	kg	41.4 40.1	41.4 40.1	38.6 37.3

1 - IDENTIFICATION CODE FOR SOLENOID ACTUATED DIRECTIONAL VALVES

D	S	P			-	/		-		/	/		K1	/	
----------	----------	----------	--	--	----------	----------	--	----------	--	----------	----------	--	-----------	----------	--

Pilot operated directional valve, solenoid actuated

10 = ISO 4401-10 size
11 = ISO 4401-10 with oversize ports

Option: _____
 (omit for standard version)
H = high pressure p_{max} 420 bar
 (not available for DSP11)

Spool type (see point 2) _____
S* **TA**
SA* **TB**
SB* **RK***

Series: _____
22 = for DSP10
12 = for DSP11
 (the overall dimensions do not change within the same ten)

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

Pilot supply (see points 8 and 9) _____
 For spool types S2 - S4 - TA02 - TB02 - RK02 - S*2 - S*4, the available pilot supply version is E. For all other spool types, the available versions are E, I and Z.
E = external
I = internal
Z = internal pilot supply with 30 bar pressure reducing valve, fixed adjustment (see point 9.1)

Drain (see points 8 and 9): _____
E = external **I** = internal

Options (see point 10): _____
C = Maximum flow adjustment (not available for spool S4)
D = Switching time adjustment
P15 = Switching damping by pilot pressure reduction
 Option combinations are available (e.g. **C-D**, **C-P15**). Please contact our Technical Support to verify the feasibility of the requested combination.

Manual override:
 Omit for override integrated in the tube (**standard**)
CM = Manual override, boot protected (see point 18)

Coil electrical connection:
 plug for connector
 type EN 175301-803
 (ex DIN 43650)

Coil version
 (see availability table):
 Omit for standard zinc-plated version
ULW = UL Recognized (point 11.2)

Power supply:
 direct current
D12 = 12 V **D48** = 48 V
D24 = 24 V **D110** = 110 V
D26 = 26.4 V **D220** = 220 V
D00 = valve without coils,
 with locking rings and
 O-rings

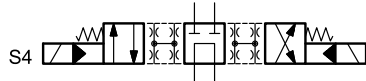
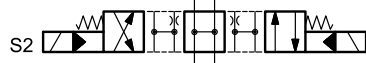
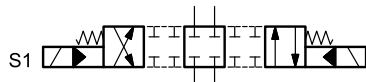
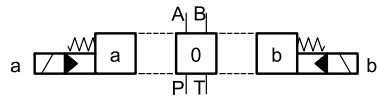
alternate current
A24 = 24 V - 50 Hz
A48 = 48 V - 50 Hz
A110 = 110 V - 50 Hz / 120 V - 60 Hz
A230 = 230 V - 50 Hz / 240 V - 60 Hz
A00 = valve without coils, with locking rings
 and O-rings
F110 = 110 V - 60 Hz
F220 = 220 V - 60 Hz

AVAILABILITY

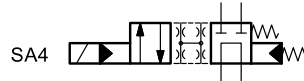
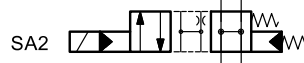
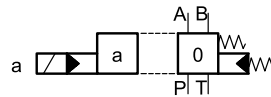
Voltage	coil version	
	std	ULW
D12, D24	■	■
D26	-	■
D48, D110, D220	-	■
A*, F*	■	-

2 - DSP10 AND DSP11 SPOOLS TYPES

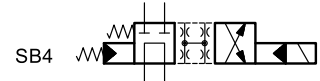
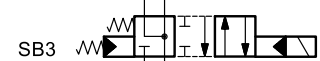
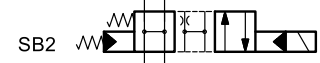
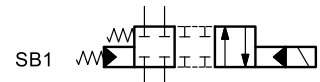
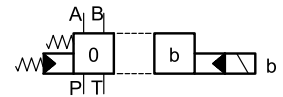
Type S*:
2 solenoids - 3 positions
with spring centering



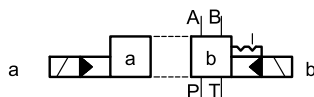
Type SA*:
1 solenoid side A
2 positions (central + external)
with spring centering



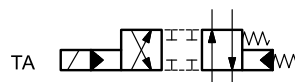
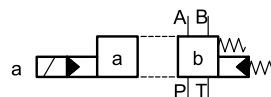
Type SB*:
1 solenoid side B
2 positions (central + external)
with spring centering



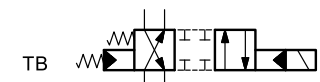
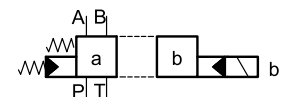
Type RK:
2 solenoids - 2 positions
with mechanical retention



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



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



Please consult our Technical Department for other types of spools.

3 - IDENTIFICATION CODE FOR HYDRAULIC ACTUATED DIRECTIONAL VALVES

D	S	C			-		/	12		-	E	E
---	---	---	--	--	---	--	---	----	--	---	---	---

Pilot operated directional valve, hydraulic actuated

10 = ISO 4401-10 size
11 = ISO 4401-10 with oversize ports

Option: (omit for standard version)
H = high pressure p_{max} 420 bar
(not available for DSP11)

Spool type (see hydraulic symbols below)

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

External drain (see points 8 and 9)

External pilot supply (see points 8 and 9)

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

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

Spool type

DSC* valves are delivered with short-circuit subplate.
The hydraulic actuation take place by pressurization in X and Y ports.

S*

SA*

SB*

TA

TB

4 - HYDRAULIC FLUIDS

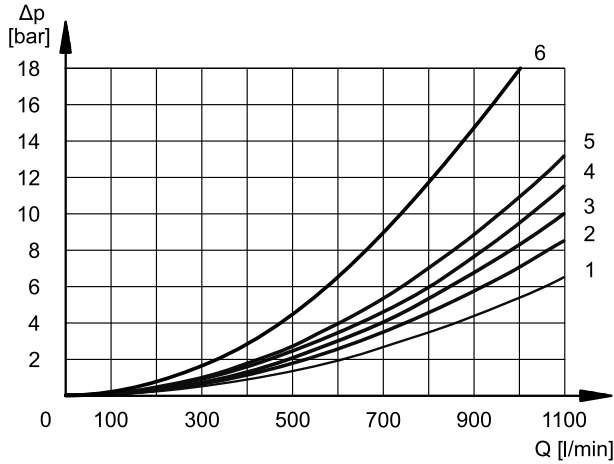
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code V). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at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

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

5 - PRESSURE DROPS Δp -Q

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

5.1 - DSP10 pressure drops



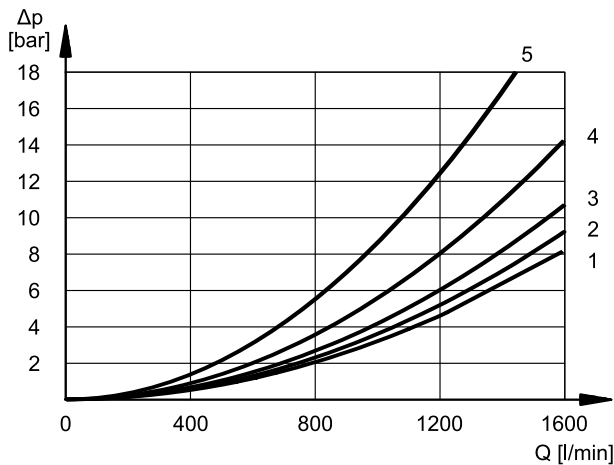
ACTUATED VALVE

SPOOL	FLOW DIRECTIONS				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S1, SA1, SB1	3	3	1	2	
S2, SA2, SB2	4	4	2	4	
S3, SA3, SB3	3	3	2	4	
S4, SA4, SB4	3	3	2	4	
TA, TB	3	3	1	2	
TA02, TB02	4	4	2	4	
RK	3	3	1	2	

NORMAL POSITION

SPOOL	FLOW DIRECTIONS				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S2			3	4	5
S3			5	5	
S4, TA02					6

5.2 - DSP11 pressure drops



ACTUATED VALVE

SPOOL	FLOW DIRECTIONS				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S1, SA1, SB1	1	1	1	2	
S2, SA2, SB2	1	1	1	3	
S3, SA3, SB3	1	1	1	3	
S4, SA4, SB4	1	1	1	3	
TA, TB	1	1	1	2	
TA02, TB02	1	1	1	3	
RK	1	1	1	2	

NORMAL POSITION

SPOOL	FLOW DIRECTIONS				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S2			2	2	2
S3			4	4	
S4					5

6 - SWITCHING TIMES

The values indicated refer to a solenoid valve working with piloting pressure of 100 bar, with mineral oil at a temperature of 50°C, at viscosity of 36 cSt and with P→A / B→T connections.

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

TIMES (± 10%) [ms]	ENERGIZED		DE-ENERGIZED	
	2 Pos	3 Pos	2 Pos	3 Pos
AC solenoid	90	60	90	60
DC solenoid	130	100	90	60



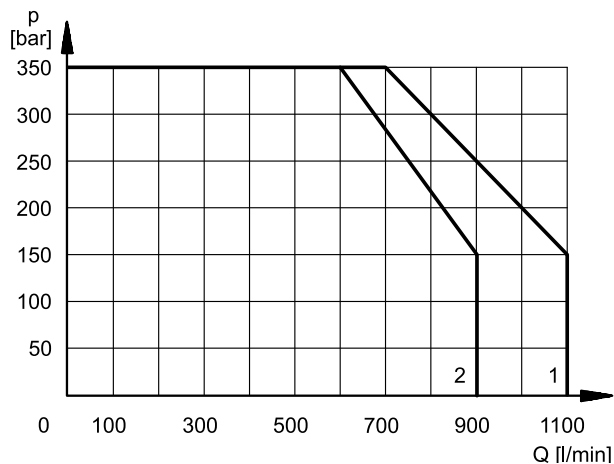
7 - OPERATING LIMITS

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, with pilot supply pressure of 10 bar

The value have been obtained with mineral oil, viscosity 36 cSt, temperature 50 °C and filtration according to ISO 4406.1999 class 18/16/13.

Limits refer to the 4-port operation. The operating limits of a 4-port valve in 3-port operation, or with port A or B plugged, or without flow may reduce considerably.

7.1 - DSP10

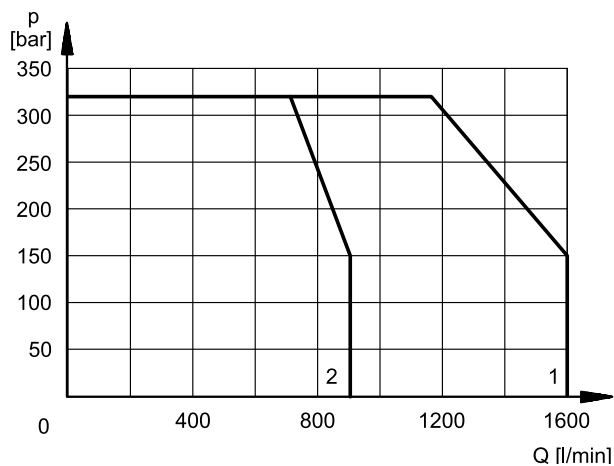


DC SOLENOID VALVE

SPOOL	CURVE	
	P→A	P→B
S1, SA1, SB1	1	1
S2, SA2, SB2	2	2
S3, SA3, SB3	1	1
S4, SA4, SB4	2	2
TA, TB	1	1
TA02, TB02	1	1
RK	1	1

NOTE: Limits showed for S1, S3, TA / TB and RK spools are determined by the value of the piloting pressure (10 bar).

7.1 - DSP11



8 - PERFORMANCE CHARACTERISTICS

PRESSURES [bar]	DSP10	DSP10H	DSC10	DSC10H	DSP11	DSC11
Max pressure in P, A, B ports	350	420	350	420	320	320
Max pressure in T line with external drain	300	350	300	350	250	250
Max pressure in T line with internal drain	210 (DC) 160 (AC)	210 (DC) 160 (AC)	-	-	210 (DC) 160 (AC)	-
Max pressure in Y line with external drain	210 (DC) 160 (AC)	210 (DC) 160 (AC)	-	-	210 (DC) 160 (AC)	-
Minimum pilot supply pressure (NOTE 1)	5 ÷ 12					
Maximum pilot supply pressure (NOTE 2)	280	350	280	350	280	320

NOTE 1: The valve needs a difference of at least +10 bar between the pilot pressure and the discharge/drainage pressure in order to work correctly.

NOTE 2: If the working pressure is higher than these rated limits, then provide an external pilot line with p_{max} within the rated limits and purchase the valve with E type pilot supply.

For DSP10, DSP10H and DSP11 valves, if the external pilot line is not possible, you must opt for the version with Z type pilot supply (see point 9.1). In this configuration, the maximum inlet pressure at port P is:

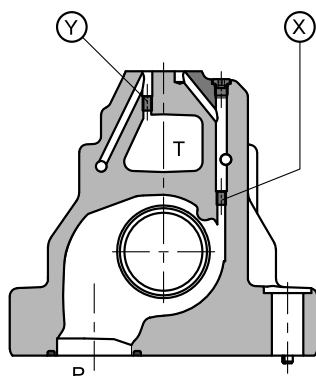
- 350 bar for DSP10 and DSP10H valves
- 320 bar for DSP11 valves

9 - PILOT AND DRAIN

The valves with electro-hydraulic actuation (DSP) are available with both pilot supply and drain internal or external. The version with external drain allows a higher back pressure on the return line.

The valves with hydraulic actuation (DSC) are available with external pilot supply and external drain only.

NOTE: The pilot supply and drainage configuration must be chosen when ordering. Subsequent modification is only permitted by authorized experienced operators or at the factory.



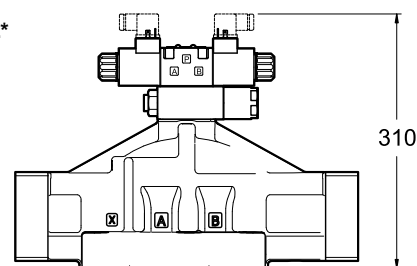
X: plug M6x8 for external pilot
Y: plug M6x8 for external drain

TYPE OF VALVE		Plug assembly	
		X	Y
IE	internal pilot and external drain	NO	YES
II	internal pilot and internal drain	NO	NO
EE	external pilot and external drain	YES	YES
EI	external pilot and internal drain	YES	NO

9.1 - Z type pilot supply: internal pilot supply with pressure reducing valve

The Z type pilot supply consists of an arrangement with internal pilot and 30 bar supply pressure to the pilot stage by means of a fixed adjustment pressure reducing valve placed between the main stage and the pilot valve.

DSP1*-/Z*



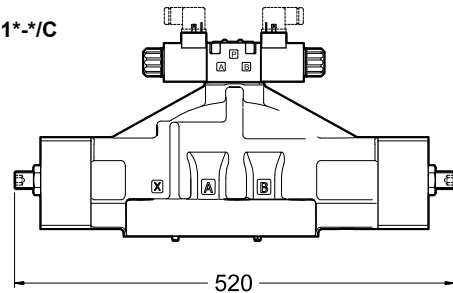
10 - OPTIONS

10.1 - C - Maximum flow adjustment

This option allows the adjustment of the flow rate from the pump to the actuator and from the actuator to the outlet, providing adjustable dual control of the actuator. Adjustment is achieved by means of stroke limiters installed on the side covers of the main stage, which limit the maximum spool opening.

Add **C** in the identification code to order this version (see point 1).

DSP1*-/C

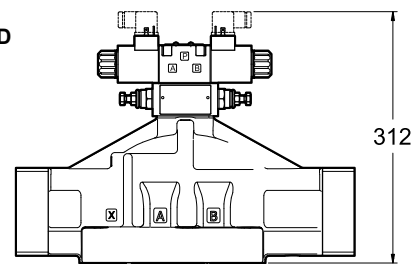


10.2 - D - Switching time adjustment

This option allows adjustment of the main spool switching times, reducing the movement speed and adapting the valve response to the application requirements. Adjustment is achieved by means of a flow control valve (QTM3 type), installed between the pilot solenoid valve and the main stage.

Add **D** in the identification code to order this version (see point 1).

DSP1*-/D

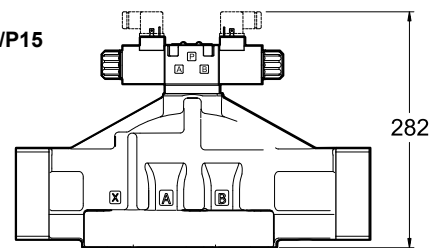


10.3 - P15- Switching damping by pilot pressure reduction

This option reduces the pilot pressure, providing a damping effect during switching and ensuring smoother, more controlled spool movement. The function is achieved by installing a subplate fitted with a Ø1.5 calibrated restrictor in the P line between the pilot solenoid valve and the main stage. Subplate thickness: 10 mm.

Add **P15** in the identification code to order this version (see point 1).

DSP1*-/P15



10.4 - Combination of multiple options

The valve can be configured with a combination of functional options to provide a solution tailored to the specific application requirements. For example, the maximum flow adjustment (option C) can be combined with the switching time adjustment (option D), as well as with other available options (e.g. C-D, C-P15).

The feasibility of the requested combinations shall be verified with our Technical Support.

11 - ELECTRICAL FEATURES

11.1 - Solenoids

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

11.2 - UL Recognized coils

ULW type coils are UL Recognized Components (cUR@us marking) intended for installation within end-use equipment that is subject to evaluation in accordance with the applicable UL and CSA standards.

11.3. - DC solenoid valve - current and power consumption

The table shows current and power consumption values of the DC coils.

Using connectors type 'D' or 'D1' (see cat. 49 000) with embedded bridge rectifier it is possible to feed DC coils with alternating current (50 or 60 Hz), considering a reduction of the operating limits.

SUPPLY VOLTAGE FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY	6,000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC) (NOTE)	In compliance with 2014/30/EU
LOW VOLTAGE	In compliance with 2014/35/EU
CLASS OF PROTECTION Coil insulation (VDE 0580) Impregnation: DC valve AC valve	class H class F class H

NOTE: To further reduce emissions, when using a DC power supply, type H connectors are recommended. These prevent overvoltage peaks when the coil supply circuit is opened (see catalogue 49 000).

(values ± 10%)

	nominal voltage [V]	resistance at 20°C [Ω]	current consumpt [A]	power consumpt [W]
D12	12	4.5	2.68	32.2
D24 (std, W)	24	18.6	1.29	31
D24 (ULW)	24	16.6	1.45	34.7
D26	26.4	20.6	1.28	33.9
D48	48	77.7	0.62	29.7
D110	110	419.8	0.26	28.8
D220	220	1670	0.13	29

11.4 - AC solenoid valve - current and power consumption

The table shows current and power consumption values at inrush and at holding, for AC coils.

(values ± 5%)

	Nominal Voltage	Freq.	Resistance at 20°C	Current consumption at inrush	Current consumption at holding	Power consumption at inrush	Power consumption at holding
	[V]	[Hz]	[Ω]	[A]	[A]	[VA]	[VA]
A24	24	50	1.69	5.81	1.32	139	32
A48	48		6.02	3.78	0.86	182	41
A110	110V-50Hz 120V-60Hz	50/60	33	1.76	0.40	194	44
				1.54	0.35	185	42
A230	230V-50Hz 240V-60Hz		135	0.92	0.21	213	48
				0.79	0.18	190	43
F110	110	60	28.5	1.45	0.33	160	36
F220	220		103	0.92	0.21	203	46

12 - ELECTRICAL CONNECTORS

Solenoid valves are delivered without connectors. Connectors can be ordered separately. See catalogue 49 000.



13 - IP DEGREE OF PROTECTION

The IP degree of protection is defined according to IEC 60529 and indicates the level of protection against the ingress of solid objects and liquids.

The actual IP degree of protection of the valve depends on the type of electrical connection, the solenoid tube protection and the design solutions adopted. The stated IP degree of protection is guaranteed only when a connector with an equivalent degree of protection is correctly wired and installed.

coil version	IP rating	
	electrical conn.	valve
standard	IP65	IP65
ULW	IP66	IP65
ULW + manual override type CM	IP66	IP66

IP Ratings: Selection Guide

The IP rating indicates protection against solid objects (first digit) and liquids (second digit). For solid objects, rating 6 is the highest level and provides complete dust protection. Our solenoid valves fall into this category.

For liquids, three types are distinguished:

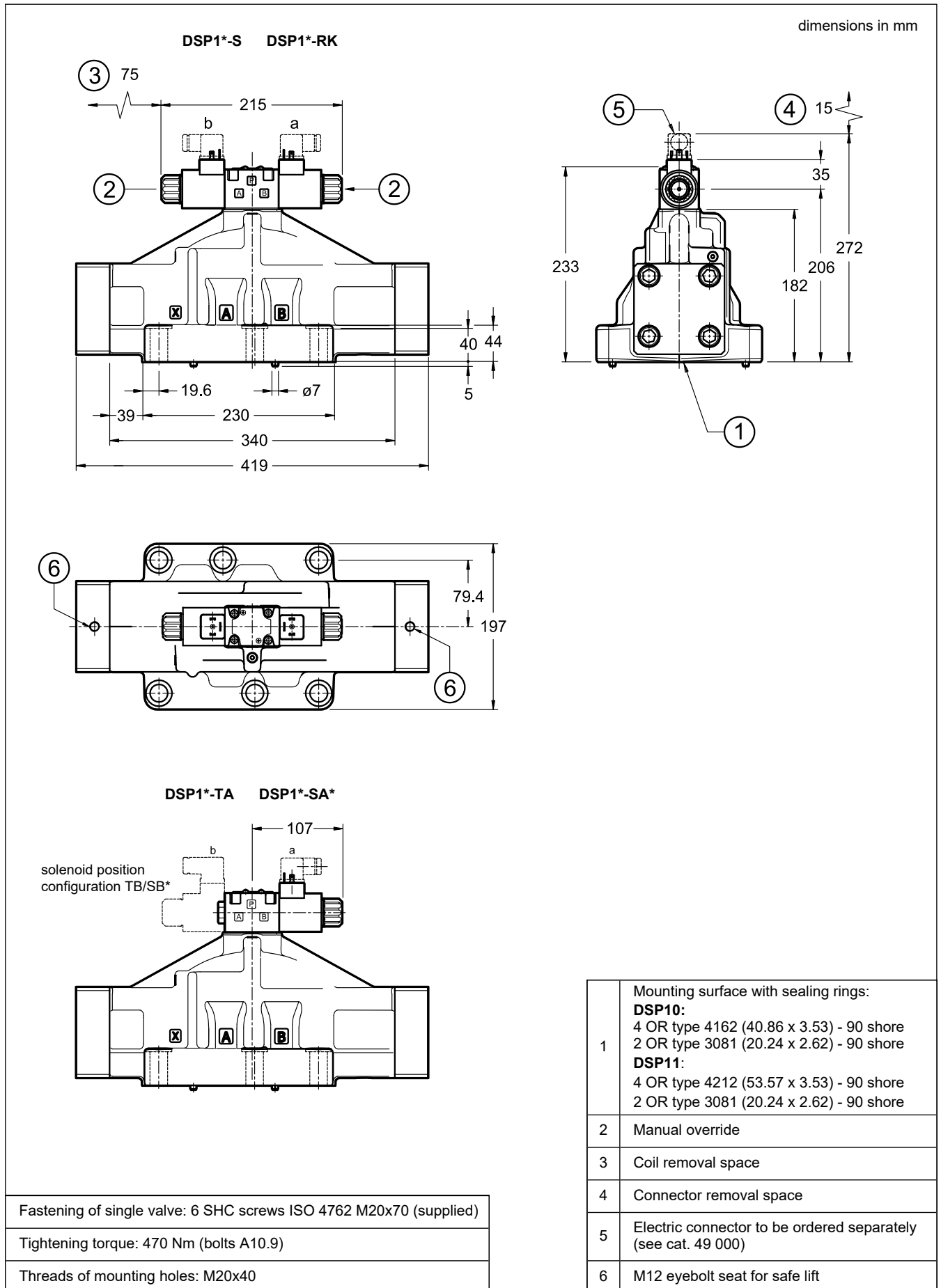
- degree 1 to 6: protection against water jets;
- degree 7 and 8: protection against immersion;
- degree 9: protection against high-pressure, high-temperature water jets.

IP ratings are neither equivalent nor cumulative: IP66 covers lower ratings; IP68 covers IP67 only, not IP66, IP65 or lower ratings; IP69 does not cover any other rating.

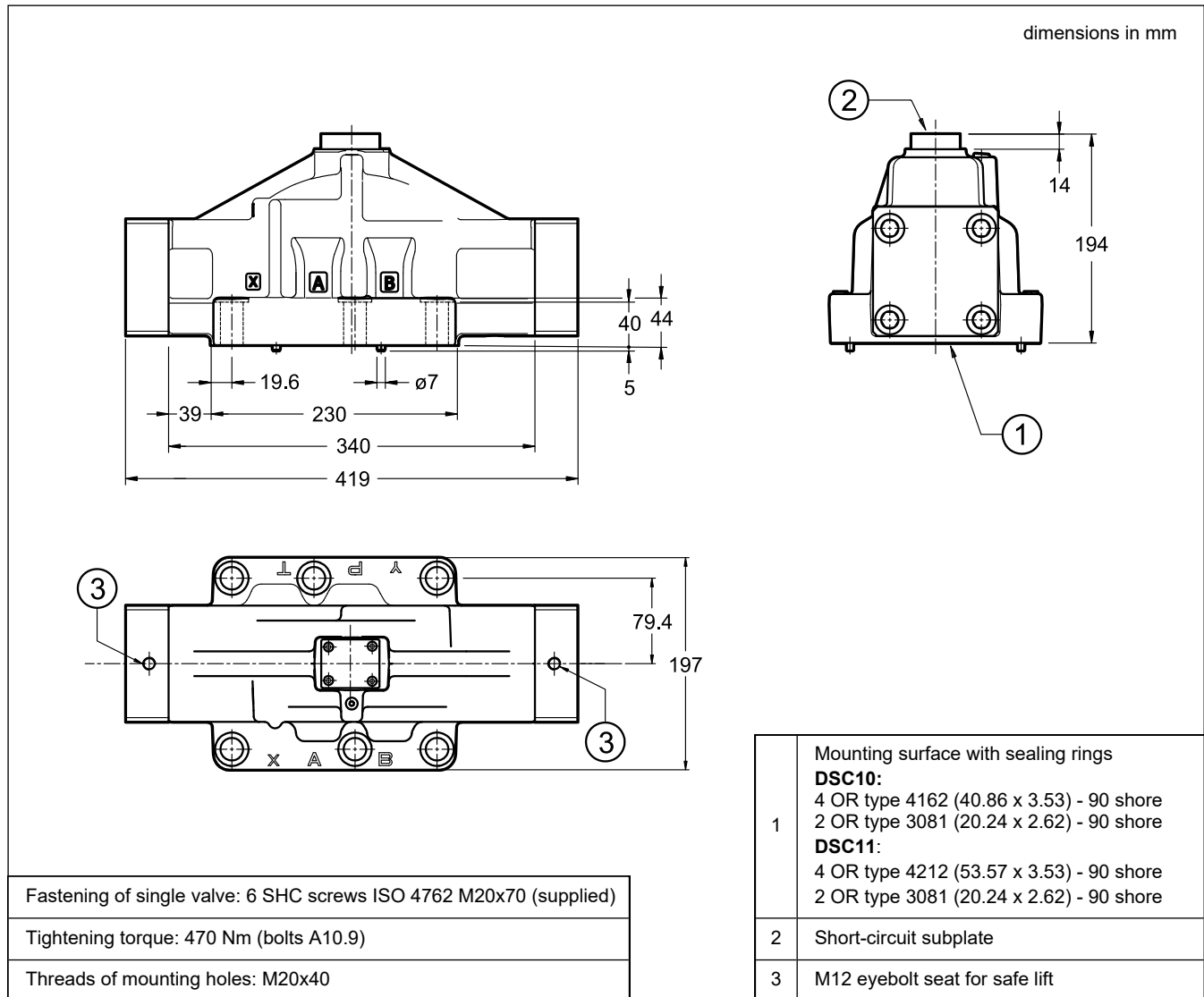
Where a component complies with more than one type of protection, all applicable IP ratings shall be stated.

Example: equipment protected against powerful water jets and continuous immersion is marked IP66/IP68.

14 - DSP10 AND DSP11 - OVERALL AND MOUNTING DIMENSIONS



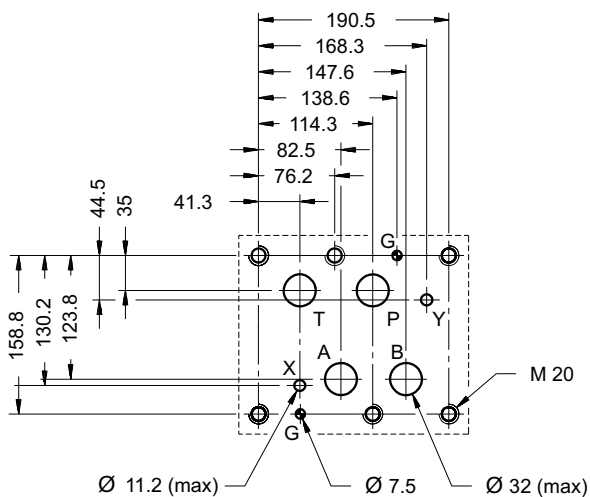
15 - DSC10 AND DSC11 - OVERALL AND MOUNTING DIMENSIONS



16 - MOUNTING INTERFACES

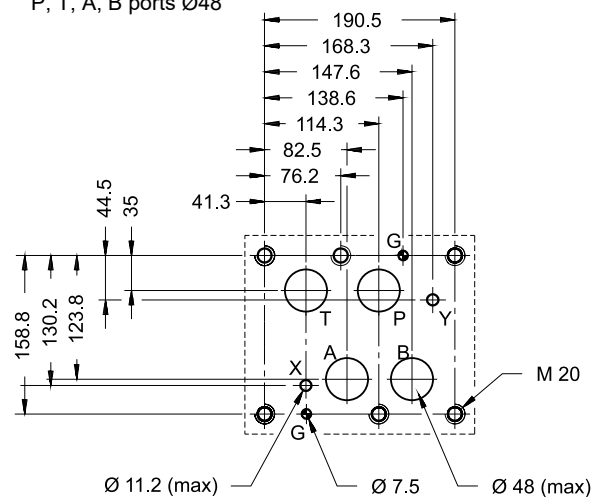
DS*10

ISO 4401-10-09-0-05
(CETOP 4.2-4-10-350)



DS*11

ISO 4401-10-09-0-05
(CETOP 4.2-4-10-320)
deviating from standard:
P, T, A, B ports Ø48

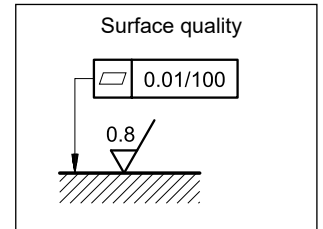


17 - INSTALLATION

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.

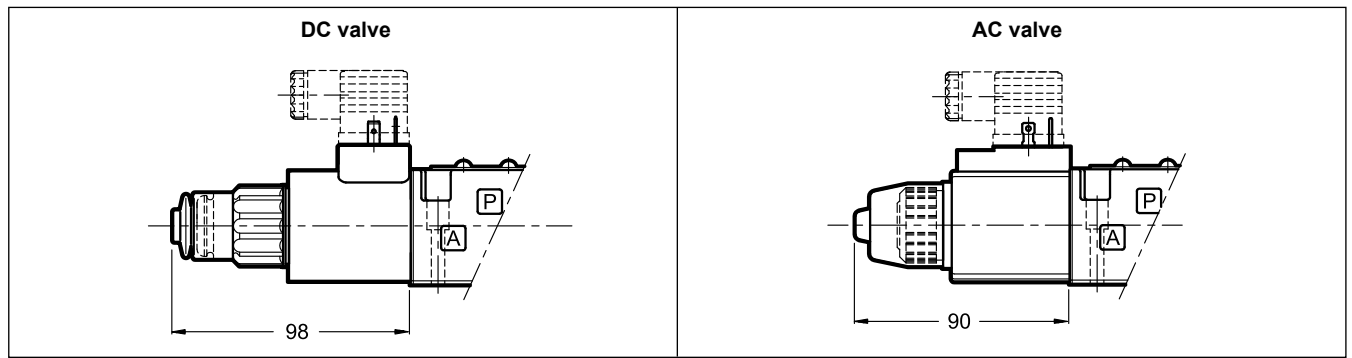
If the minimum values of planarity or smoothness are not met, fluid leakages between valve and mounting surface can easily occur.



18 - MANUAL OVERRIDE

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

Add **/CM** at the end of the identification code to order this version (see point 1).





DSP1*

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