

DSP5

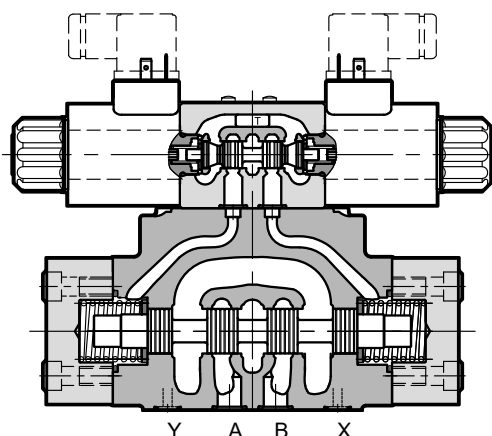
DIRECTIONAL VALVES PILOT OPERATED, SOLENOID OR HYDRAULIC (DSC5) ACTUATED

SERIES 10

SUBPLATE MOUNTING
ISO 4401-05
CETOP P05

p max **350** bar
Q max **150** l/min

OPERATING PRINCIPLE



- The DSP5 and DSP5R are 4-ports directional valves, pilot operated, solenoid actuated, with mounting surface according to ISO 4401-05 standards.
- DSC5 are the hydraulic actuated versions.
- A high pressure version (H) is available.
- These valves are available with different spool types (see points 2 and 3), with some options for the opening control.
- 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)

		DSP5	DSP5H
Maximum operating pressure - ports P - A - B - port T (external drainage) - port T (internal drainage)	bar	350 250 210 (DC) / 160 (AC)	420 350 210 (DC) / 160 (AC)
Maximum flow rate from port P to A - B - T	l/min	150	
Ambient temperature range	°C	-20 / +50	
Fluid temperature range	°C	-20 / +80	
Fluid viscosity range	cSt	10 ÷ 400	
Fluid contamination degree		according to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25	
Mass: DSP5-S, RK DSP5-T*, SA*, SB* DSC5	kg	6.4 5.9 5.4	



1 - IDENTIFICATION CODE FOR SOLENOID ACTUATED DIRECTIONAL VALVES

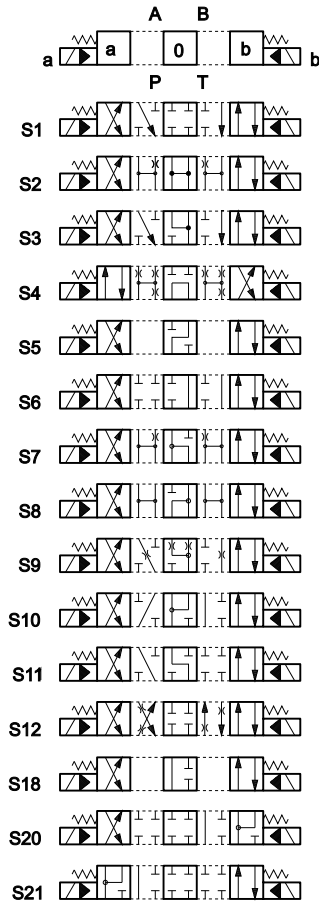
D	S	P		-	/	10	-		/	/		/		
Directional valve, pilot operated, solenoid actuated			Size:		Option:		Spool type (see point 2)		Series: (the overall and mounting dimensions remain unchanged from 10 to 19)		Seals:		Pilot supply (see point 9):	
5 = CETOP P05 5R = 4401-05-05-0-05			H = high pressure p_{max} 420 bar		(omit for standard version)		S* SA* SB* RK TA TB		N = NBR seals for mineral oil (standard) V = FPM seals for special fluids		E = external I = internal Z = internal pilot supply with 30 bar pressure reducing valve, fixed adjustment (see point 9.1)		For spool types S2 - S4 - S7 - S8 - 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.	
Option combinations are available (e.g. C-D, C-P08). 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 19)		Coil electrical connection (see point 17): K1 = plug for connector type EN 175301-803 (ex DIN 43650) K2 = plug for connector type AMP JUNIOR K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S K7D = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S, with diode		Coil version (see availability table): Omit for standard zinc-plated version W = corrosion-protected (point 12) ULW = UL Recognized, corrosion-protected (points 11.2 and 12)		NOTE: The valve protection level against atmospheric agents depends on the combination of the fitted components (configuration). See point 12 for further details.					
Power supply:			direct current		alternate current		D12 = 12 V D24 = 24 V D26 = 26.4 V D00 = valve without coils, with locking rings and O-rings		D48 = 48 V D110 = 110 V D220 = 220 V					
F110 = 110 V - 60 Hz F220 = 220 V - 60 Hz														

AVAILABILITY

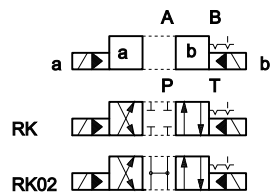
Voltage	electr. conn.	coil version		
		std	W	ULW
D12, D24	K1	■	■	■
	K2	-	-	■
	K7	-	-	■
	K7D	-	■	-
D26	K1	-	■	■
	K7	-	-	■
D48, D110, D220	K1	-	-	■
A*, F*	K1	■	-	-

2 - DSP5 SPOOL TYPES

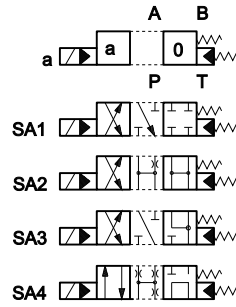
Type **S***:
2 solenoids - 3 positions
with spring centring



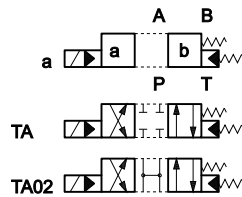
Type **RK**:
2 solenoids - 2 positions
with mechanical retention



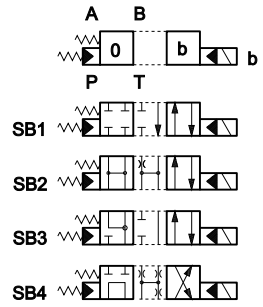
Type **SA***:
1 solenoid side A
2 positions (central + external)
with spring centring



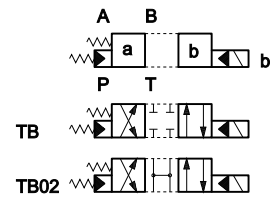
Type **TA**:
1 solenoid side A
2 external positions
with return spring



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



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



Type **23TA / 23TB**
three-way valve - 1 solenoid - 2 external positions, return spring



Special versions are available in addition to these spools : consult our technical dept. for their identification, feasibility and operating limits.

3 - IDENTIFICATION CODE FOR HYDRAULIC ACTUATED DIRECTIONAL VALVES

D S C **-** **/ 10** **- E E**

Pilot operated directional valve,
hydraulic actuated

Size: _____
5 = CETOP P05
5R = 4401-05-05-0-05

Option: _____
(omit for standard version)
H = high pressure p_{max} 420 bar

Spool type (see point 2 and below)

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

Option:
/ W7 = Zinc-nickel surface
treatment (see **NOTE**)
Omit if not required

Control option:
/ C = Main spool stroke control.
Omit if not required

External drain (see point 9)

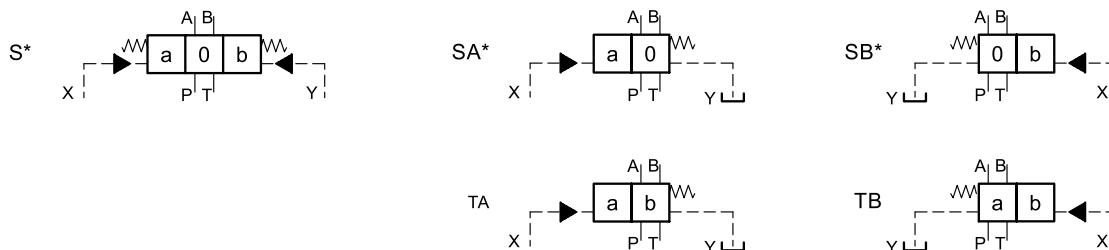
External pilot (see point 9)

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 types

DSC5 valves are delivered with short-circuit subplate.
The hydraulic actuation take place by pressurization in X and Y ports.



NOTE : The standard valve is supplied with surface treatment of phosphating black.

The zinc-nickel finishing makes the valve suitable to ensure a salt spray resistance up to **600** hours. (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

4 - HYDRAULIC FLUIDS

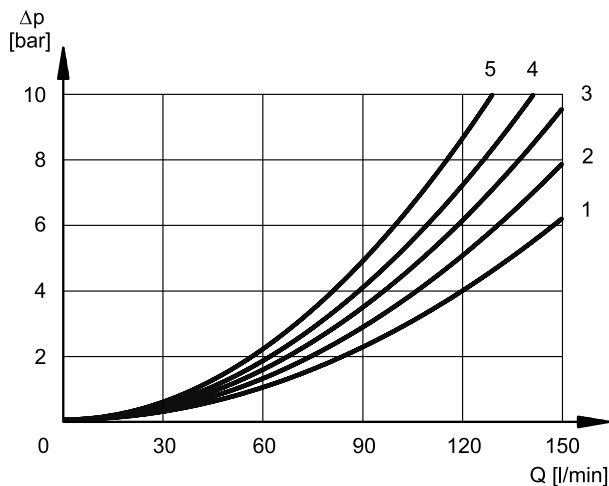
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V).

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

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

5 - DSP5 PRESSURE DROPS Δp -Q

(values obtained with viscosity 36 cSt at 50 °C and optional discharge port closed)



ACTUATED POSITION

SPOOL	FLOW DIRECTIONS			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPH			
S1, SA1, SB1	2	2	2	3
S2, SA2, SB2	3	3	1	2
S3, SA3, SB3	2	2	1	2
S4, SA4, SB4	2	2	2	4
S6				
S7				
S8				
S9				
S10				
S11				
S12	2	2	2	3
S20				
S21				
TA, TB	3	3	3	4
TA02, TB02				
RK				

NORMAL POSITION

SPOOL	FLOW DIRECTIONS				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S2, SA2, SB2	-	-	2	2	3
S3, SA3, SB3			5	5	
S4, SA4, SB4					5
S6					
S7					
S8					
S10					
S11					
TA					

6 - OPERATING LIMITS

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

MAXIMUM FLOW RATES [l/min]		
	at 210 bar	at 350 bar
S4, S7, S8	120	100
All the other spools	150	120



7 - SWITCHING TIMES

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

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

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

8 - PERFORMANCE CHARACTERISTICS

PRESSURES [bar]	DSP5	DSP5H	DSC5	DSC5H
Max pressure in P, A, B ports	350	420	350	420
Max pressure in T line with external drain	250	350	250	350
Max pressure in T line with internal drain	210 (DC) 160 (AC)	210 (DC) 160 (AC)	-	-
Max pressure in Y line with external drain	210 (DC) 160 (AC)	210 (DC) 160 (AC)	-	-
Minimum pilot supply pressure (NOTE 1)	5 ÷ 12			
Maximum pilot supply pressure (NOTE 2)	210	350	210	420

NOTE 1: The minimum piloting pressure can be the lower range value at low flow rates, but with higher flow rates the higher value is needed.

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

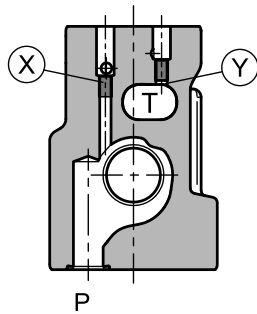
For DSP5 and DSP5H valves, if the external pilot line is not possible, you must opt for the version with Z type pilot supply (see point 9.1), providing max 350 bar at inlet pressure P.

9 - PILOT AND DRAIN

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

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

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



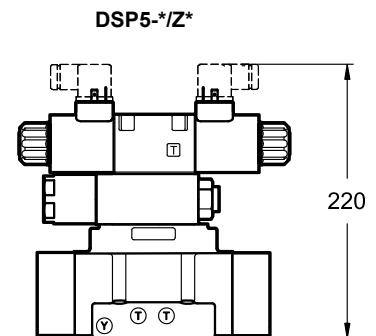
X: plug M5x6 for external pilot

Y: plug M5x6 for external drain

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

9.1 - 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.

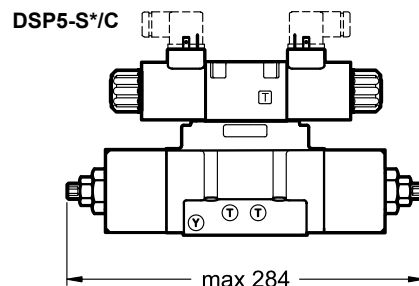


10 - OPTIONS

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.

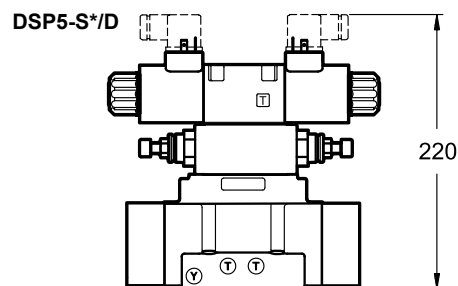
Add **C** in the identification code to order this version (see point 1).



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.

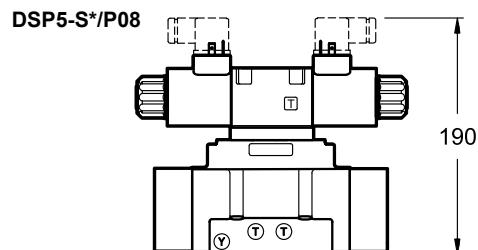
Add **D** in the identification code to order this version (see point 1).



10.3 - P08- 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 $\varnothing 0.8$ calibrated restrictor in the P line between the pilot solenoid valve and the main stage. Subplate thickness: 10 mm.

Add **P08** in the identification code to order this version (see point 1).



10.4 - S2 - Pilot line unloading with the valve in the normal position

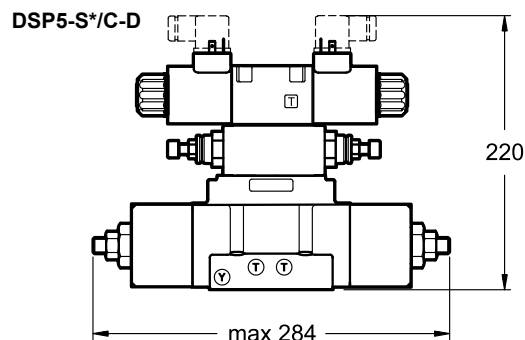
This option allows the pilot line to be unloaded when the valve is in the normal position, ensuring that the hydraulic control signal is fully relieved, as required in certain applications. The function is achieved by using an S2-type pilot stage spool. External pilot supply (E) is required.

Add **S2** to the identification code to order this option (see point 1).

10.5 - 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-P08).

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.

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

NOTE: 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).

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.

11.3.1 - DC coils with diode

K7D coils incorporate a suppression diode providing protection against voltage peaks. During switching, the diode limits the voltage generated by the coil winding to 33 V for the D12 coil and 62 V for the D24 coil.

(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 [V]	Freq. [Hz]	Resistance at 20°C [Ω]	Current consumption at inrush [A]	Current consumption at holding [A]	Power consumption at inrush [VA]	Power consumption at holding [VA]
A24	24	50	1.69	5.81	1.32	139	32
A48	48		6.02	3.78	0.86	182	41
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 - PROTECTION AGAINST ENVIRONMENTAL CONDITIONS

The valve protection against environmental conditions depends on the combination of its individual components (valve body, coils, electrical connection and manual override). This determines both the corrosion resistance level and the IP degree of protection.

12.1 - IP degree of protection

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

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

coil version	electrical connection type	IP rating	
		electrical conn.	valve
standard	K1	IP65	IP65
W, ULW	K1	IP66	IP65
	K2	IP65/IP67	
	K7	IP66/IP68/IP69 IP69K*	
	K7D	IP66/IP68/IP69 IP69K*	
W, ULW + manual override type C*	K1	IP66	IP66
	K2	IP65/IP67	IP65/IP67
	K7	IP66/IP68/IP69 IP69K*	IP66/IP68/IP69 IP69K*
	K7D	IP66/IP68/IP69 IP69K*	IP66/IP68/IP69 IP69K*

(*) The IP69K degree of protection is not covered by IEC 60529 but is defined in ISO 20653.

IP Ratings: Selection Guide

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

For liquids, three types are distinguished:

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

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

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

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

12.2 - Corrosion resistance

The valve body in the standard version is treated with a black phosphate coating, providing basic corrosion protection.

For applications requiring higher corrosion resistance, a zinc-nickel finish is available for the valve body (option /W7, point 1). When combined with standard coils, the zinc-nickel plated valve body provides corrosion resistance of up to 240 h in salt spray testing.

Complete valve configurations with a zinc-nickel finish on valve body, type W or ULW coils, and a type C* manual override providing solenoid tube protection provide corrosion resistance of up to 600 h in salt spray testing.

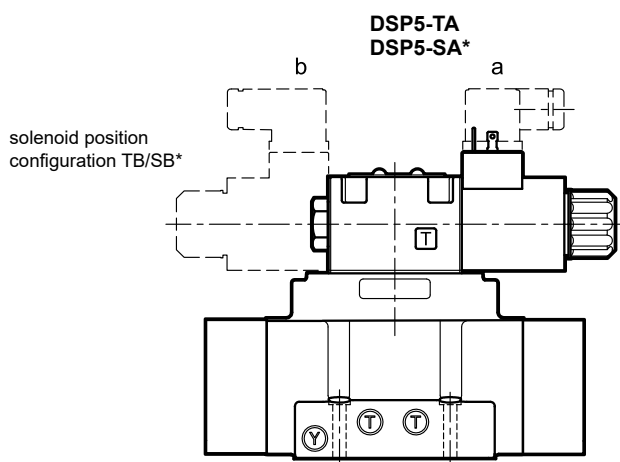
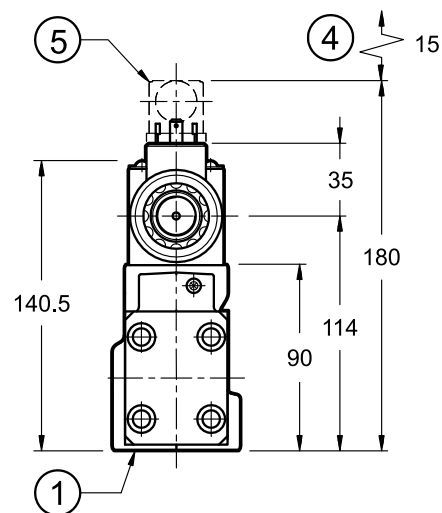
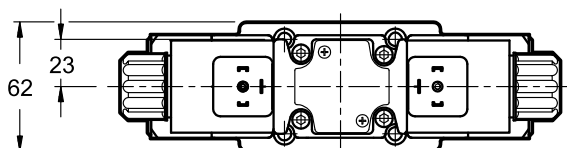
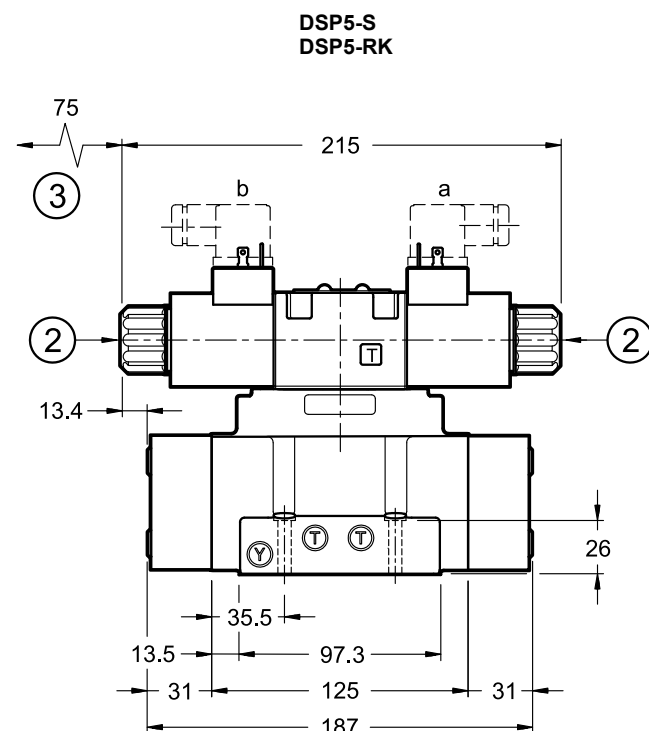
Salt spray tests are carried out in accordance with UNI EN ISO 9227, with results evaluated according to UNI EN ISO 10289.

The availability of the various protection levels depends on the combination of design options selected and may vary according to supply voltage, electrical connection type and manual override selected (see availability table, point 1).

body type	configurations	resistance
standard (black phosphated)	Any configuration	-
W7 (zinc-nickel finish)	+ standard coil (zinc-plated)	240 h
	+ W or ULW coil	240 h
	+ W or ULW coil + type C* manual override	600 h

13 - DSP5 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



solenoid position
configuration TB/SB*

NOTE: For DS*5H valves (high pressure versions) fastening, A10.9 class screws are required.

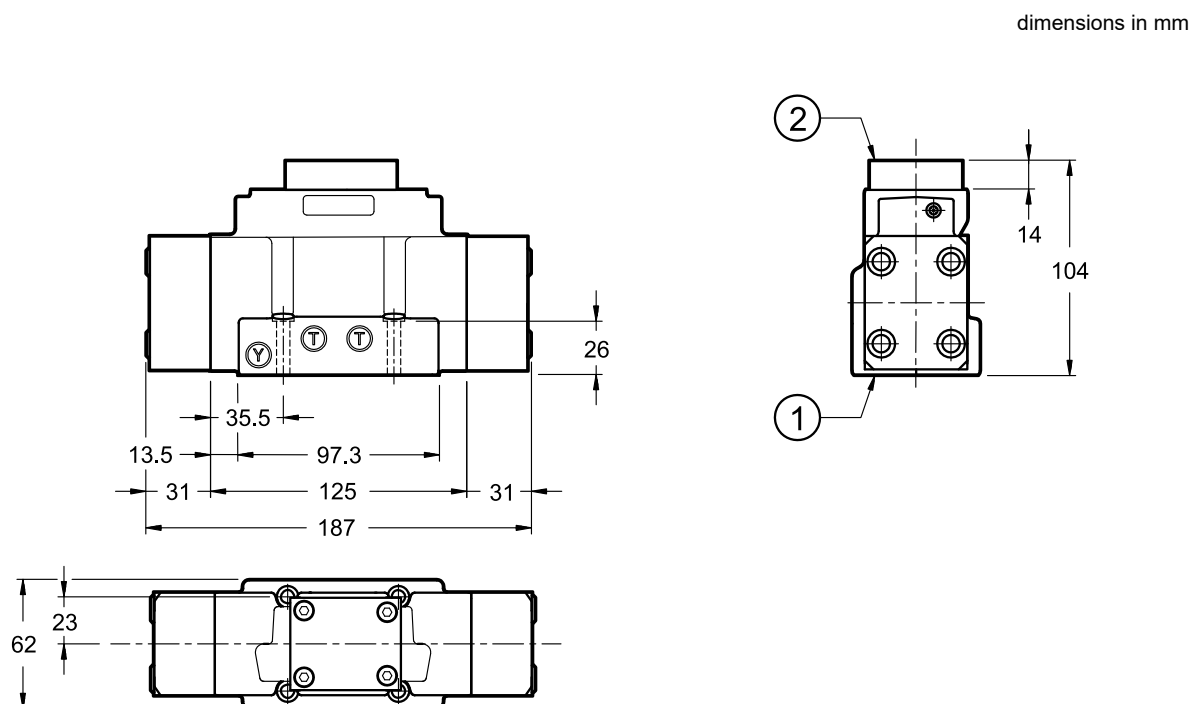
Valve fastening: N. 4 SHC screws - ISO 4762 M6x35

Tightening torque: 8 Nm (A8.8) - 12 Nm (A10.9)

Thread of mounting holes: M6x10

1	Mounting surface with sealing rings N. 5 OR type 2050 (12.42x1.78) - 90 Shore N. 2 OR type 2037 (9.25x1.78) - 90 Shore
2	Manual override
3	Coil removal space
4	Connector removal space
5	Electric connector to be ordered separately (see cat. 49 000)

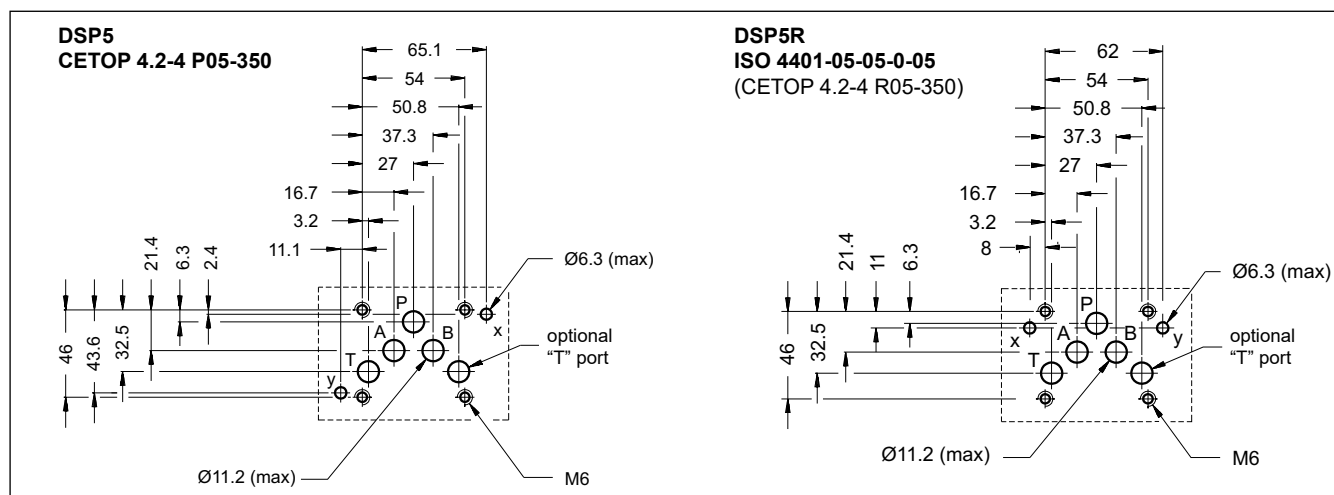
14 - DSC5 - OVERALL AND MOUNTING DIMENSIONS



NOTE: For DS*5H valves (high pressure versions) fastening, A10.9 class screws are required.

Valve fastening: N. 4 SHC screws - ISO 4762 M6x35	1	Mounting surface with sealing rings N. 5 OR type 2050 (12.42x1.78) - 90 Shore N. 2 OR type 2037 (9.25x1.78) - 90 Shore
Tightening torque: 8 Nm (A8.8) - 12 Nm (A10.9)		
Thread of mounting holes: M6x10		

15 - MOUNTING INTERFACES

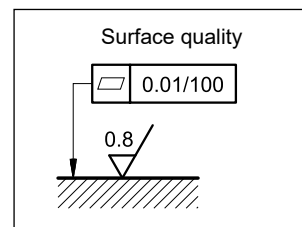


16 - INSTALLATION

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

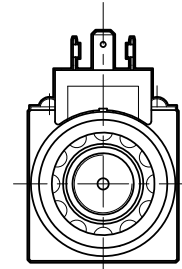
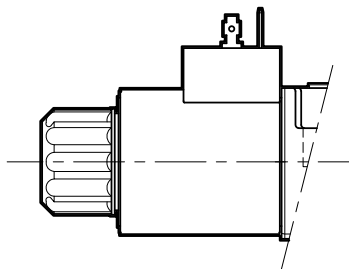
Valve fastening takes place by means of screws or tie rods, laying the valve on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing. If the minimum values of planarity or smoothness are not met, fluid leakages between valve and mounting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

NOTE: DS*5H valves (high pressure versions) need screws class A 10.9 for fastening.

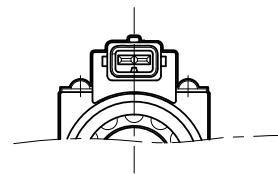
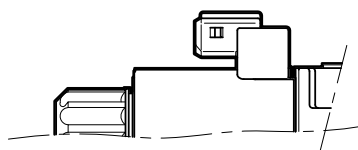


17 - ELECTRIC CONNECTIONS

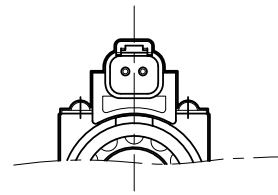
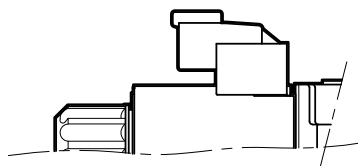
connection for EN 175301-803
(ex DIN 43650) connector
code **K1**
code **WK1**
code **ULWK1**



connection for
AMP JUNIOR connector
code **ULWK2**



connection for
DEUTSCH DT06-2S male connector
code **ULWK7**
code **WK7D** (with diode)



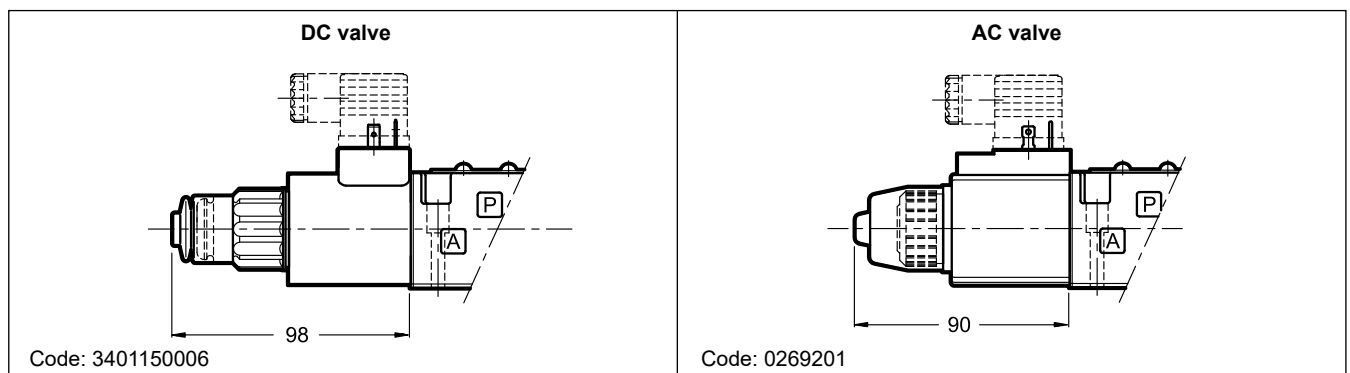
18 - ELECTRIC CONNECTORS

Solenoid operated valves are delivered without connectors. Connectors type EN 175301-803 (ex DIN 43650) for K1 connections can be ordered separately. See catalogue 49 000.

19 - 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).





20 - SUBPLATES

(see catalogue 51 000)

Subplates are supplied with phosphating black surface treatment. These subplates are not suitable for DS*5H high pressure valves.

Type with rear ports	PME4-AI5G
Type with side ports	PME4-AL5G
P, T, A, B port dimensions	3/4" BSP
X, Y port dimensions	1/4" BSP