

# 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	bar	350	320	350	350	350
T port		210	see operating limits at paragraph 7.2			
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	kg					
single solenoid valve		1,8	6,8	8,6	15,5	52
double solenoid valve		2,8	7,8	9,6	16,5	53

**1 - IDENTIFICATION OF DIRECT OPERATED SOLENOID VALVES DS3KD2**

**1.1 - Identification code**

	<b>D</b>	<b>S</b>	<b>3</b>	<b>KD2</b>	<b>-</b>	<b>/</b>	<b>10</b>	<b>-</b>	<b>K9</b>	<b>/</b>	
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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)

<b>S*</b>	<b>TA</b>	<b>TB</b>	<b>RK</b>
<b>SA*</b>	<b>TA02</b>	<b>TB02</b>	
<b>SB*</b>	<b>TA23</b>	<b>TB23</b>	

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

<b>D12</b> = 12 V	}	continuous current (DC)
<b>D24</b> = 24 V		
<b>D48</b> = 48 V		
<b>D110</b> = 110 V	}	rectified current (RAC)
<b>R120</b> = 120 V		
<b>R240</b> = 240 V		

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

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

**NOTE:** zinc-nickel standard finishing surface treatment.

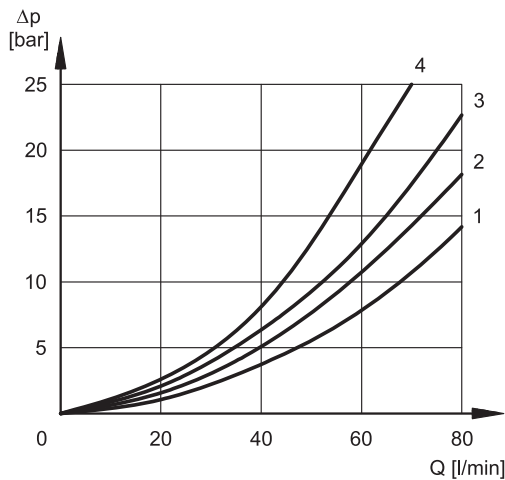
**1.2 - Available spools**

<p><b>Version S*:</b> 2 solenoids - 3 positions with spring centering</p> <div style="text-align: center; margin-bottom: 10px;"> </div> <table style="width: 100%; border-collapse: collapse;"> <tr><td style="width: 20px;">S1</td><td></td></tr> <tr><td>S2</td><td></td></tr> <tr><td>S3</td><td></td></tr> <tr><td>S4</td><td></td></tr> <tr><td>S9</td><td></td></tr> </table>	S1		S2		S3		S4		S9		<p><b>Version SA*:</b> 1 solenoid side A 2 positions (central + external) with spring centering</p> <div style="text-align: center; margin-bottom: 10px;"> </div> <table style="width: 100%; border-collapse: collapse;"> <tr><td style="width: 20px;">SA1</td><td></td></tr> <tr><td>SA2</td><td></td></tr> <tr><td>SA3</td><td></td></tr> <tr><td>SA4</td><td></td></tr> <tr><td>SA9</td><td></td></tr> </table>	SA1		SA2		SA3		SA4		SA9		<p><b>Version SB*:</b> 1 solenoid side B 2 positions (central + external) with spring centering</p> <div style="text-align: center; margin-bottom: 10px;"> </div> <table style="width: 100%; border-collapse: collapse;"> <tr><td style="width: 20px;">SB1</td><td></td></tr> <tr><td>SB2</td><td></td></tr> <tr><td>SB3</td><td></td></tr> <tr><td>SB4</td><td></td></tr> <tr><td>SB9</td><td></td></tr> </table>	SB1		SB2		SB3		SB4		SB9	
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<p><b>Version RK:</b> 2 solenoids - 2 positions with mechanical retention</p> <div style="text-align: center; margin-bottom: 10px;"> </div> <table style="width: 100%; border-collapse: collapse;"> <tr><td style="width: 20px;">RK</td><td></td></tr> </table>	RK		<p><b>Version TA:</b> 1 solenoid side A 2 external positions with return spring</p> <div style="text-align: center; margin-bottom: 10px;"> </div> <table style="width: 100%; border-collapse: collapse;"> <tr><td style="width: 20px;">TA</td><td></td></tr> <tr><td>TA02</td><td></td></tr> <tr><td>TA23</td><td></td></tr> </table>	TA		TA02		TA23		<p><b>Version TB:</b> 1 solenoid side B 2 external positions with return spring</p> <div style="text-align: center; margin-bottom: 10px;"> </div> <table style="width: 100%; border-collapse: collapse;"> <tr><td style="width: 20px;">TB</td><td></td></tr> <tr><td>TB02</td><td></td></tr> <tr><td>TB23</td><td></td></tr> </table>	TB		TB02		TB23																	
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**NOTE:** TA02/TB02 spool is not available for RAC solenoid valves.

### 2 - CHARACTERISTIC CURVES AND PERFORMANCES OF DIRECT OPERATED SOLENOID VALVES DS3KD2

#### 2.1 - Pressure drops $\Delta p$ -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

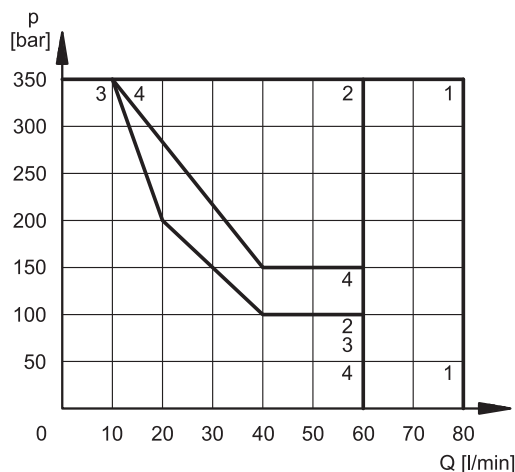
#### PRESSURE DROPS WITH VALVE IN DE-ENERGIZED POSITION

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 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.



#### 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

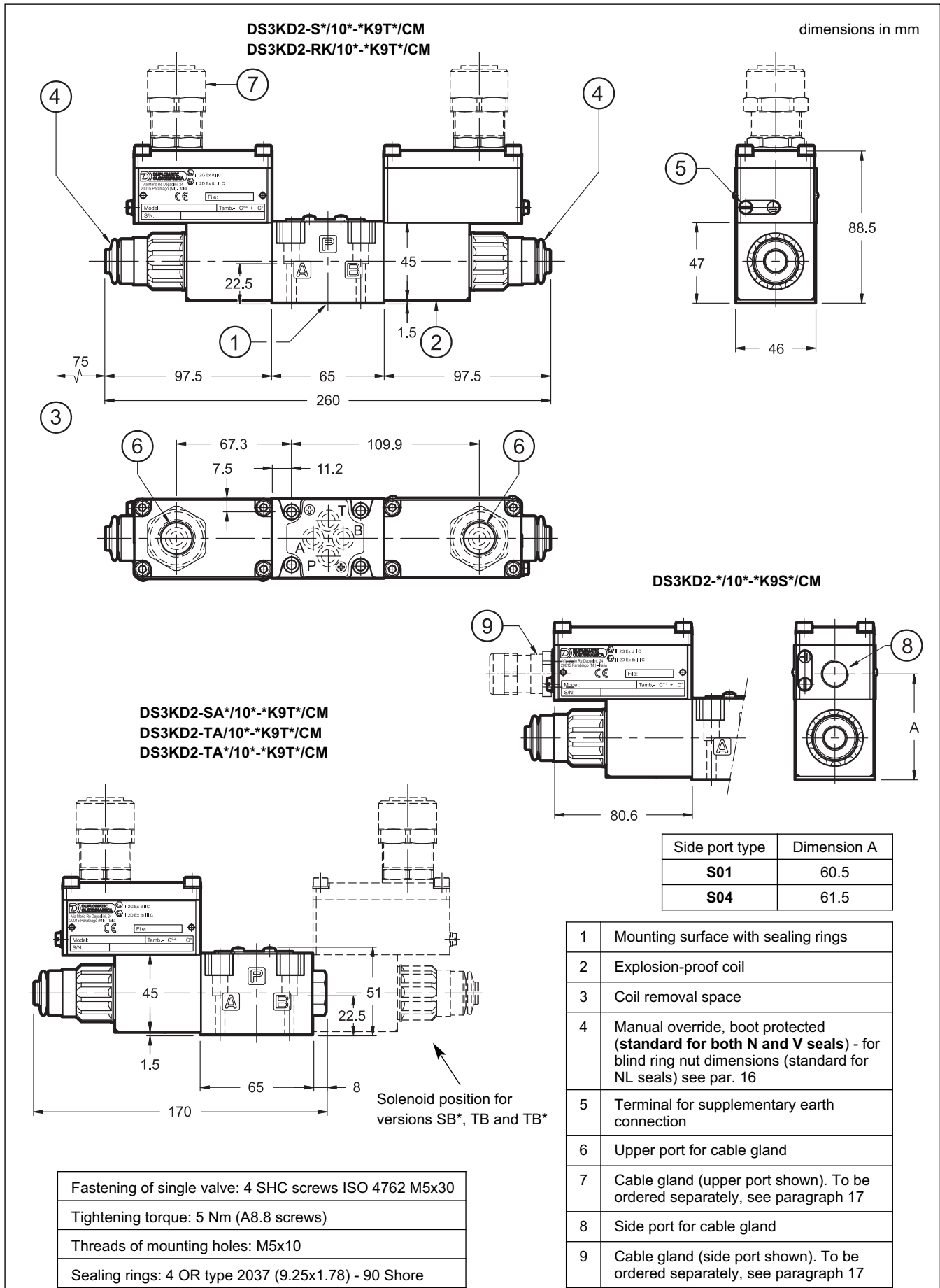
\* not available

#### 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



#### 4 - ATEX CLASSIFICATION, OPERATING TEMPERATURES AND ELECTRICAL CHARACTERISTICS

For valves suitable for application and installation in potentially explosive atmospheres, according to ATEX directive prescriptions, Diplomatic certifies 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:

II 2G IIC T4 Gb (-20°C Ta +80°C)

for NL seals:

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:

II 2D IIIC T154°C Db IP66/IP68 (-20°C Ta +80°C)

for NL seals:

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

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

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]
<b>D12</b>	12	7,2	1,7	20
<b>D24</b>	24	28,7	0,83	20
<b>D48</b>	48	115	0,42	20
<b>D110</b>	110	549	0,2	22

Coil type	Nominal voltage [V]	Freq. [Hz]	Resistance at 20°C [Ω]	Current consumpt. [A]	Power consumpt. [VA]
<b>R120</b>	110V-50Hz	50/60	489,6	0,19	21
	120V-60Hz			0,21	25
<b>R240</b>	230V-50Hz	50/60	2067,7	0,098	22,5
	240V-60Hz			0,1	24

**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.

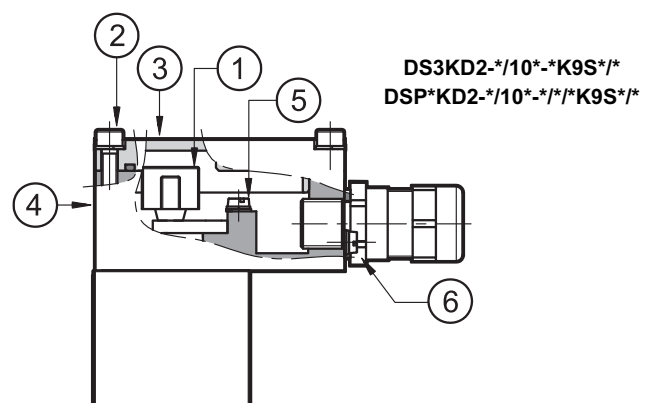
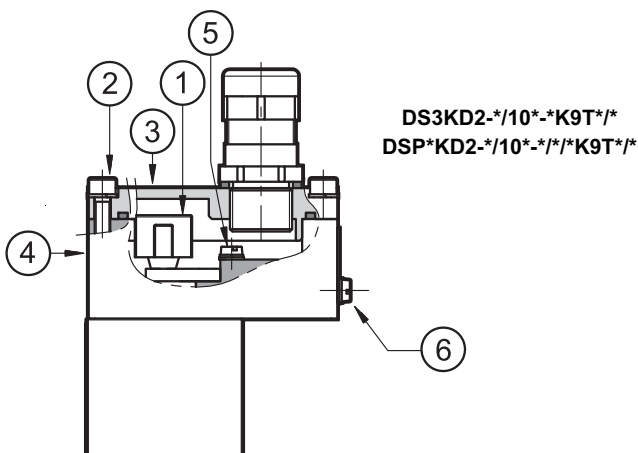
**The electrical connection is polarity-independent.**

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.



<b>VOLTAGE SUPPLY FLUCTUATION (ripple included)</b>	± 10% Vnom
<b>MAX SWITCH ON FREQUENCY</b> 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
<b>DUTY CYCLE</b>	100%
<b>EXPLOSION-PROOF VERSION</b>	According to ATEX 94/9/EC
<b>ELECTROMAGNETIC COMPATIBILITY (EMC) (NOTE)</b>	According to 2004/108/EC
<b>CLASS OF PROTECTION:</b> Atmospheric agents Coil insulation (VDE 0580)	IP66 / IP68 class H

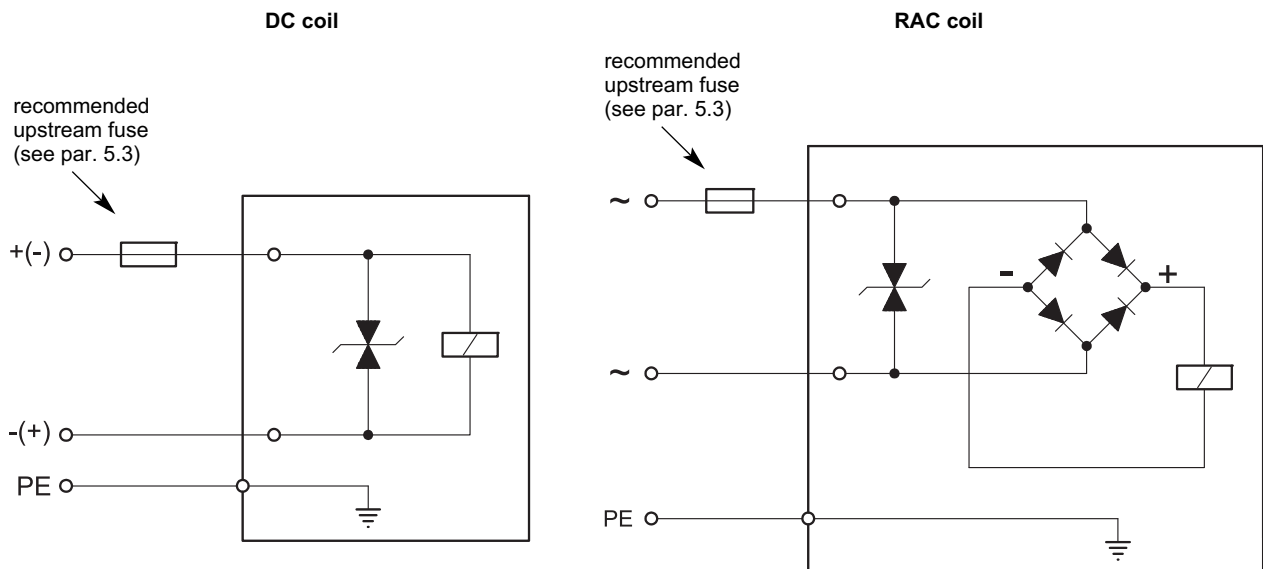
Characteristics of the cables connectable for wiring are indicated in the table below:

Function	Cable section
Operating voltage cables connection	max 2.5 mm <sup>2</sup>
Connection for internal grounding point	max 2.5 mm <sup>2</sup>
Connection for external equipotential grounding point	max 6 mm <sup>2</sup>

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



### 5.3 - Overcurrent fuse and switch-off voltage peak

Upstream of each valve, an appropriate fuse (max 3 x I<sub>n</sub> 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
<b>D12</b>	12	1,7	2,5	- 49	Transient voltage suppressor bidirectional
<b>D24</b>	24	0,83	1,25	- 49	
<b>D48</b>	48	0,42	0,6	- 81	
<b>D110</b>	110	0,2	0,3	- 309	
<b>R120</b>	120	0,21	0,3	- 3	
<b>R240</b>	240	0,1	0,15	- 3	

**6 - IDENTIFICATION OF PILOT OPERATED SOLENOID VALVES DSP\*KD2**

**6.1 - Identification code**

<b>D</b>	<b>S</b>	<b>P</b>	<b>KD2</b>	<b>-</b>	<b>/</b>	<b>10</b>	<b>-</b>	<b>/</b>	<b>/</b>	<b>K9</b>	<b>/</b>	
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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 internal 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

**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 **IW7** 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. DSP5HKD2).

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)

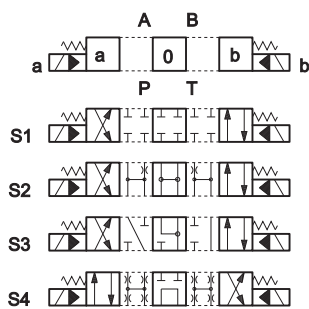
**R120** = 120 V  
**R240** = 240 V    } rectified current (RAC)

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

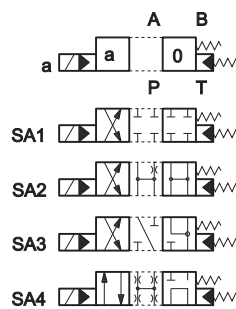


**6.2 - Spool types**

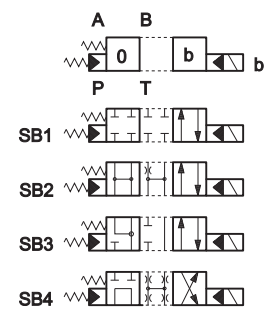
**Version S\*:**  
2 solenoids - 3 positions  
with spring centering



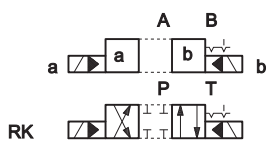
**Version SA\*:**  
1 solenoid side A  
2 positions (central + external)  
with spring centering



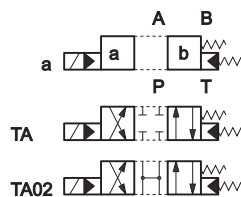
**Version SB\*:**  
1 solenoid side B  
2 positions (central + external)  
with spring centering



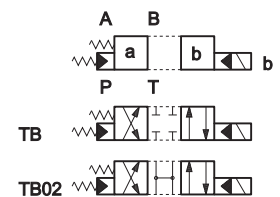
**Version RK:**  
2 solenoids - 2 positions  
with mechanical retention



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



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



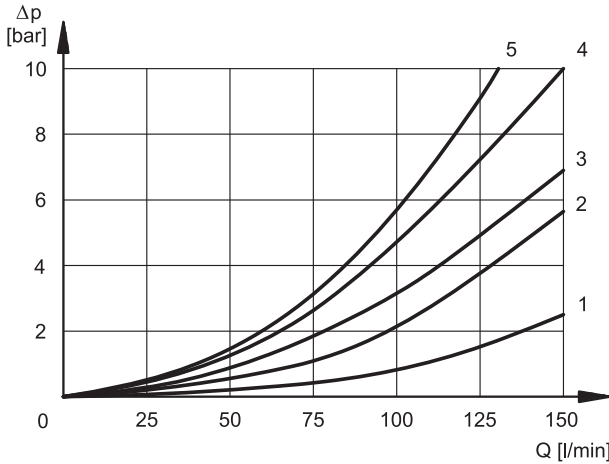


**7 - CHARACTERISTIC CURVES AND PERFORMANCES OF PILOT OPERATED SOLENOID VALVES DSP\*KD2**

**7.1 - Pressure drops  $\Delta p$ -Q** (values obtained with viscosity 36 cSt at 50 °C)

**DSP5KD2 - DSP5RKD2**

**PRESSURE DROPS WITH VALVE IN ENERGIZED POSITION**



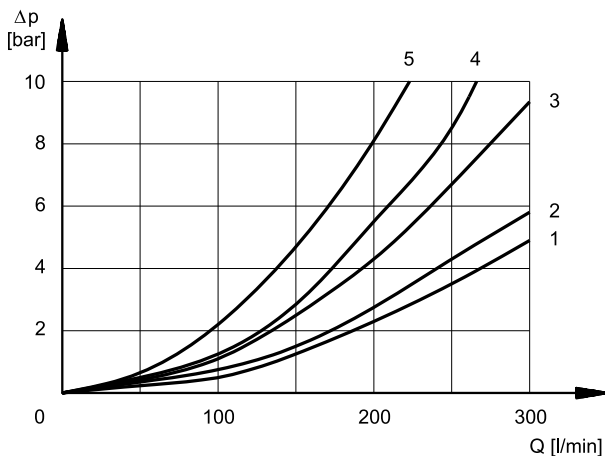
SPOOL	FLOW DIRECTION			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPH			
S1, SA1, SB1	4	4	1	1
S2, SA2, SB2	3	3	1	2
S3, SA3, SB3	4	4	1	1
S4, SA4, SB4	5	5	2	3
TA, TB	4	4	1	1
TA02, TB02	3	3	1	1
RK	4	4	1	1

**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**



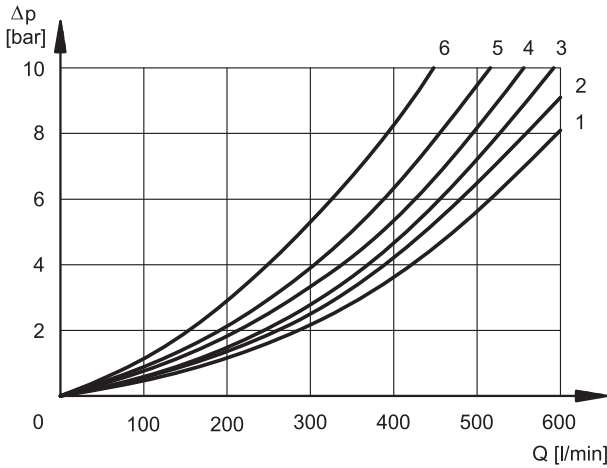
SPOOL	FLOW DIRECTION			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPH			
S1, SA1, SB1	1	1	3	4
S2, SA2, SB2	1	1	4	4
S3, SA3, SB3	1	1	4	4
S4, SA4, SB4	2	2	4	5
TA, TB	1	1	3	4
TA02, TB02	1	1	4	4
RK	1	1	3	4

**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**



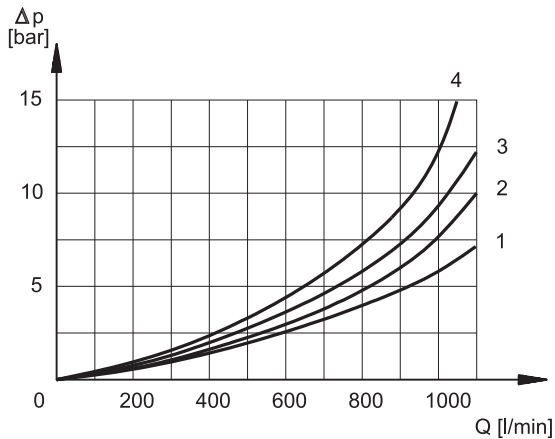
**PRESSURE DROPS WITH VALVE IN ENERGIZED POSITION**

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 <b>NOTE 1</b>	5 ÷ 10	5 ÷ 12	7 ÷ 14	6 ÷ 12
Max piloting pressure <b>NOTE 2</b>	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	[l/min]	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		120	100	200	150	500	450	750 ( <b>NOTE</b> )	600 ( <b>NOTE</b> )
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
<b>DSP5KD2 - DSP5RKD2</b>	70	60	160
<b>DSP7KD2</b>	80	70	170
<b>DSP8KD2</b>	90	70	170
<b>DSP10KD2</b>	120	90	190

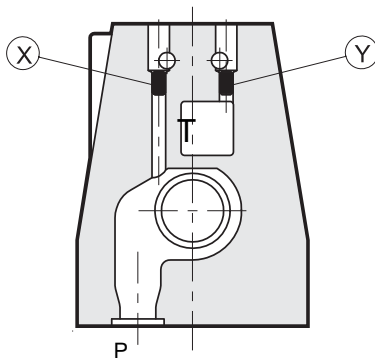
**8 - PILOTING AND DRAINAGE**

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.

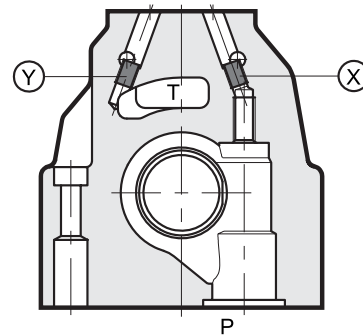
	TYPE OF VALVE	Plug assembly	
		X	Y
<b>IE</b>	INTERNAL PILOT AND EXTERNAL DRAIN	NO	YES
<b>II</b>	INTERNAL PILOT AND INTERNAL DRAIN	NO	NO
<b>EE</b>	EXTERNAL PILOT AND EXTERNAL DRAIN	YES	YES
<b>EI</b>	EXTERNAL PILOT AND INTERNAL DRAIN	YES	NO

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



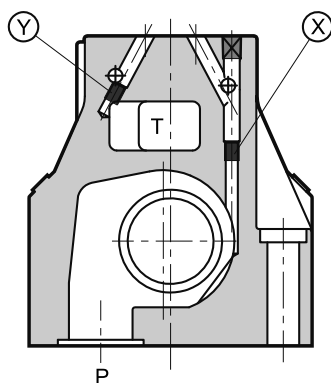
**DSP5KD2**  
**DSP5RKD2**

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



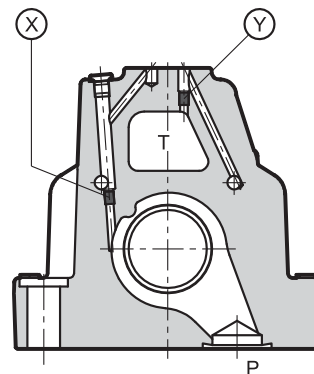
**DSP7KD2**

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



**DSP8KD2**

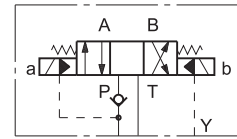
**X:** plug M6x8 for external pilot  
**Y:** plug M6x8 for external drain



**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.



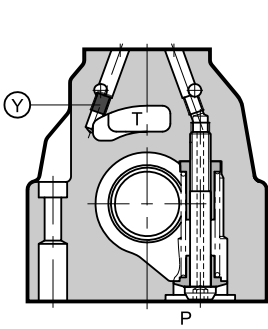
**In the C version the piloting is always internal.**

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

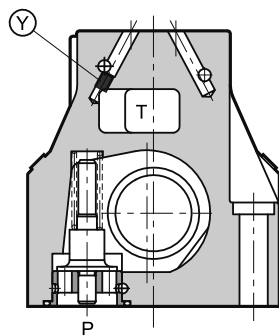
Add **C** to the identification code for this request (see paragraph 6.1).

**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.

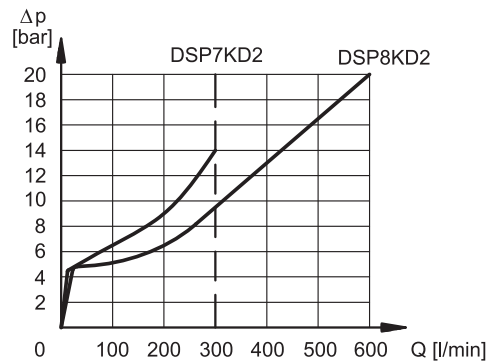
**DSP7KD2**



**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).

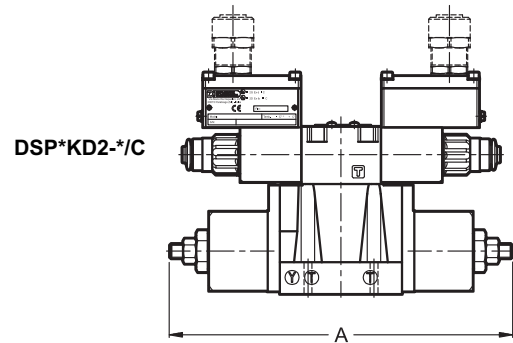
### 9 - OPTIONS

#### 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).



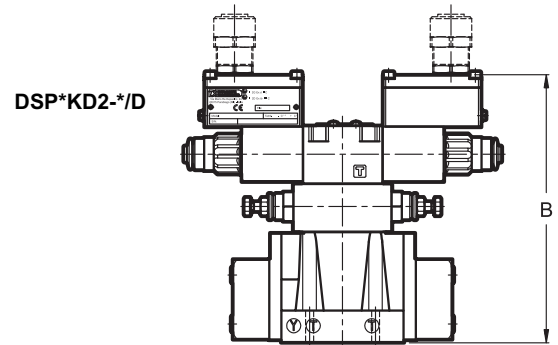
dimensions in mm

	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).



dimensions in mm

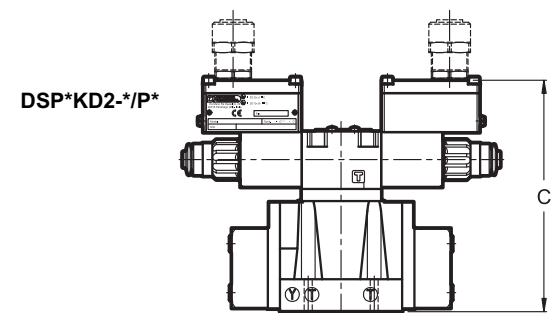
	DSP5KD2 DSP5RKD2	DSP7KD2	DSP8KD2	DSP10KD2
B	218.5	225.5	254.5	310.5

#### 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:  $\varnothing 0.8$  (add the suffix **P08** in the identification code to request this device - paragraph 6.1)

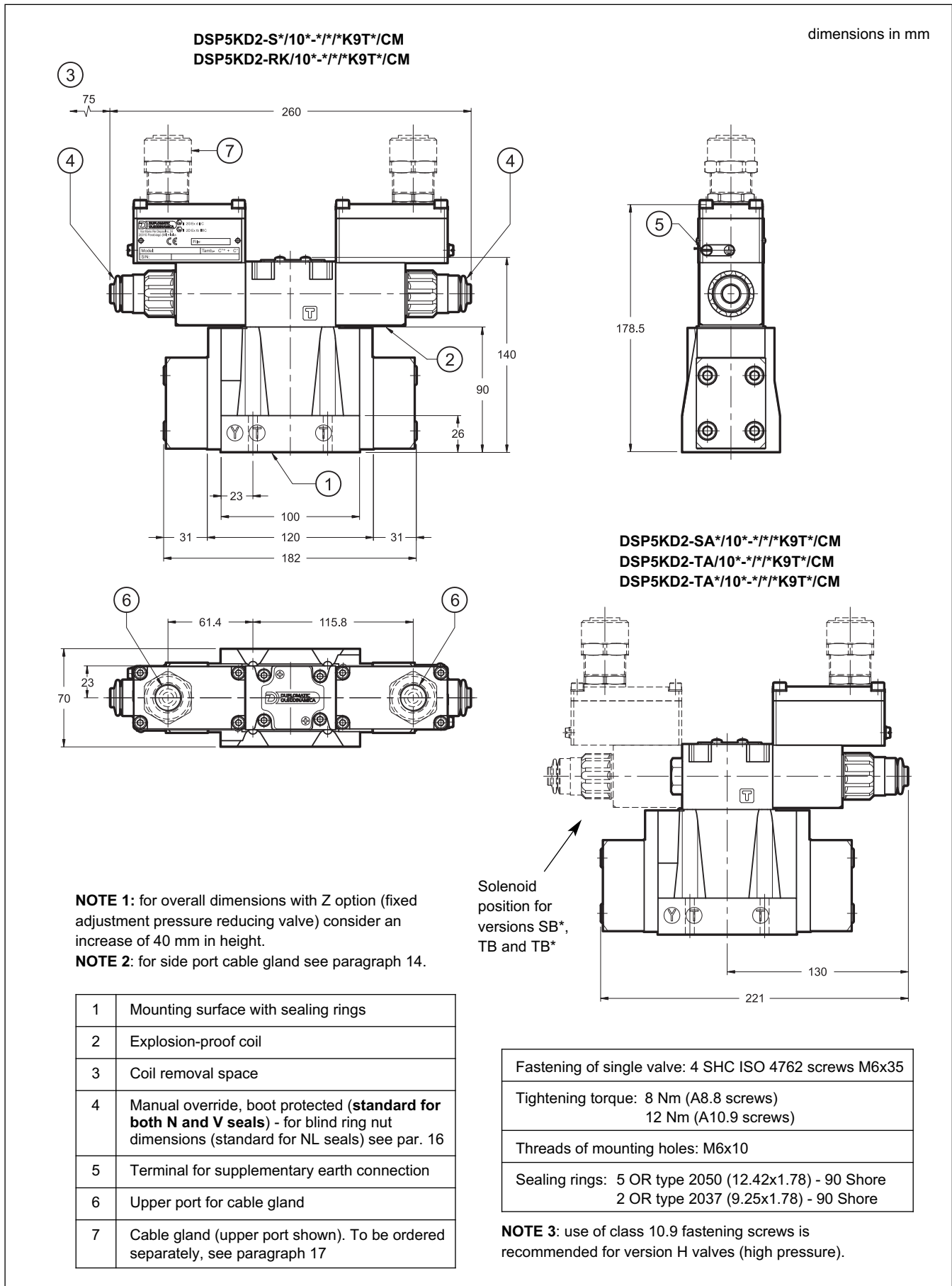
DSP10KD2:  $\varnothing 1.5$  (add the suffix **P15** in the identification code to request this device - paragraph 6.1).



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





### 11 - DSP7KD2 OVERALL AND MOUNTING DIMENSIONS

**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**

dimensions in mm

**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 ( <b>standard for both N and V seals</b> ) - 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)

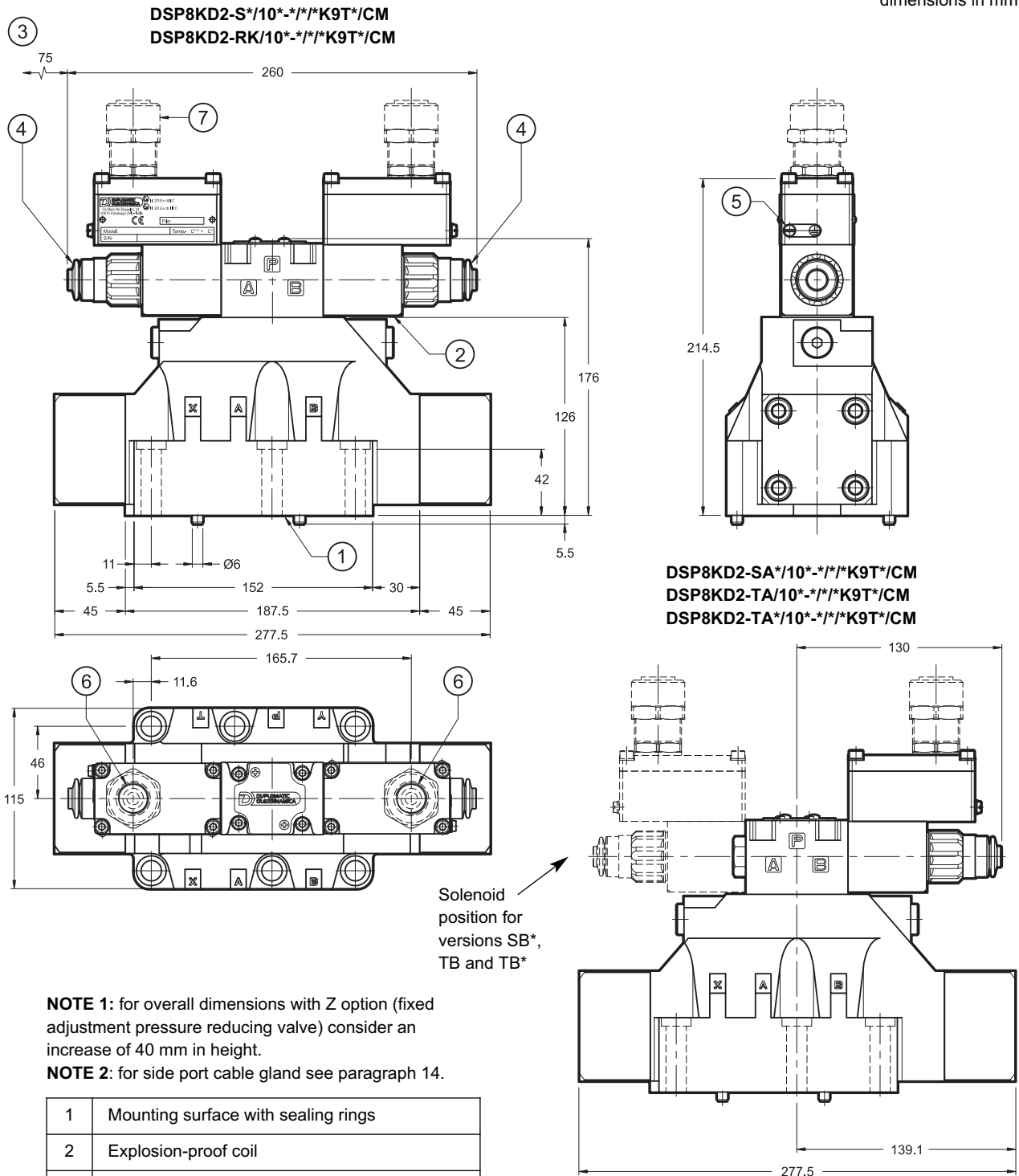
Threads of mounting holes: M6x12; M10x18

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



**NOTE 1:** for overall dimensions with Z option (fixed adjustment pressure reducing valve) consider an increase of 40 mm in height.

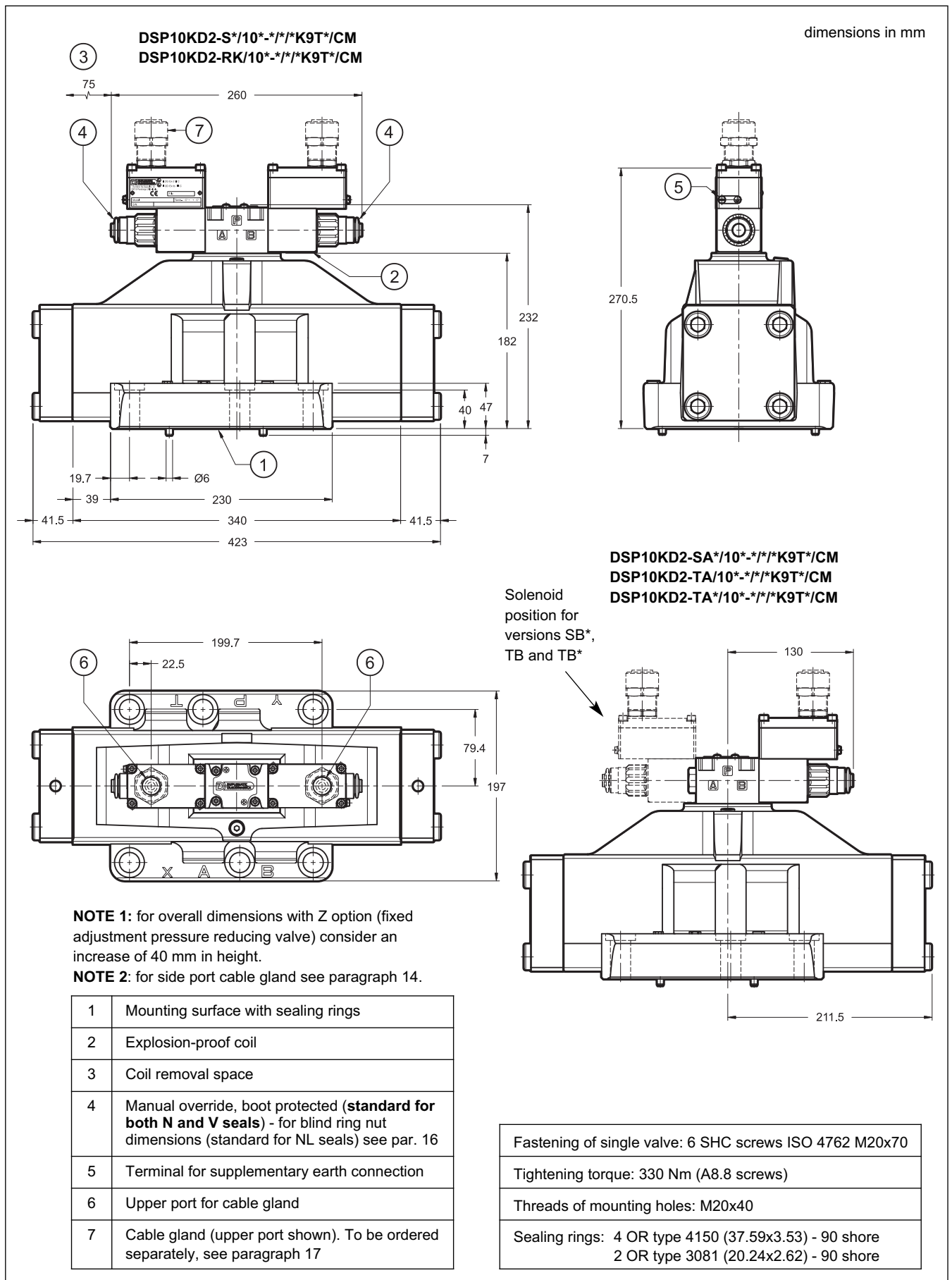
**NOTE 2:** for side port cable gland see paragraph 14.

1	Mounting surface with sealing rings
2	Explosion-proof coil
3	Coil removal space
4	Manual override, boot protected ( <b>standard for both N and V seals</b> ) - 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



### 14 - DSP\*KD2-\*/10\*-\*/\*\*K9S\*/\* (SIDE CONNECTION) OVERALL AND MOUNTING DIMENSIONS

**DSP5KD2-\*/10\*-\*/\*\*K9S\*/\***  
**DSP5RKD2-\*/10\*-\*/\*\*K9S\*/\***

Side port type	Dimension A
<b>S01</b>	150.5
<b>S04</b>	151.5

**DSP7KD2-\*/10\*-\*/\*\*K9S\*/\***

Side port type	Dimension A
<b>S01</b>	157.5
<b>S04</b>	158.5

**DSP8KD2-\*/10\*-\*/\*\*K9S\*/\***

Side port type	Dimension A
<b>S01</b>	186.5
<b>S04</b>	187.5

**DSP10KD2-\*/10\*-\*/\*\*K9S\*/\***

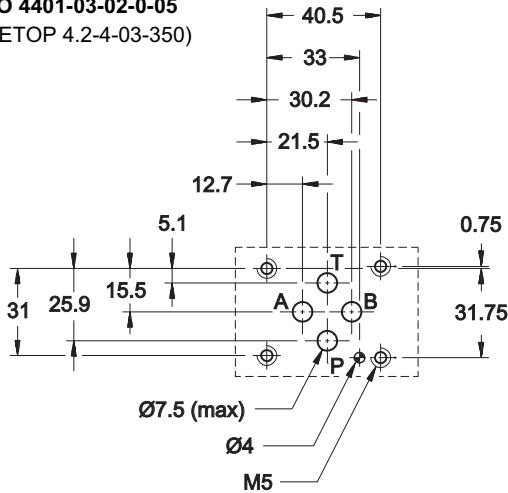
Side port type	Dimension A
<b>S01</b>	242.5
<b>S04</b>	243.5

dimensions in mm

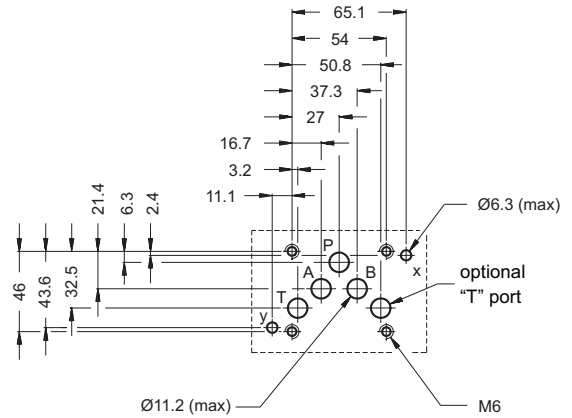
8	Side port
9	Cable gland (side port shown). To be ordered separately, see par. 17

### 15 - MOUNTING SURFACES

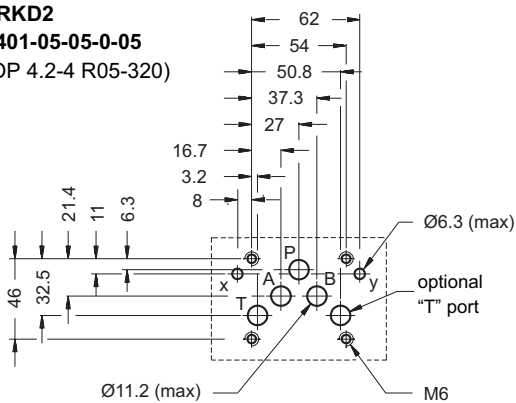
**DS3KD2**  
**ISO 4401-03-02-0-05**  
 (CETOP 4.2-4-03-350)



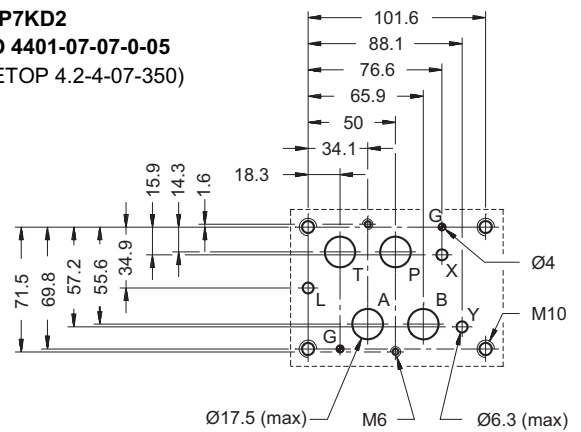
**DSP5KD2**  
**CETOP 4.2-4 P05-320**



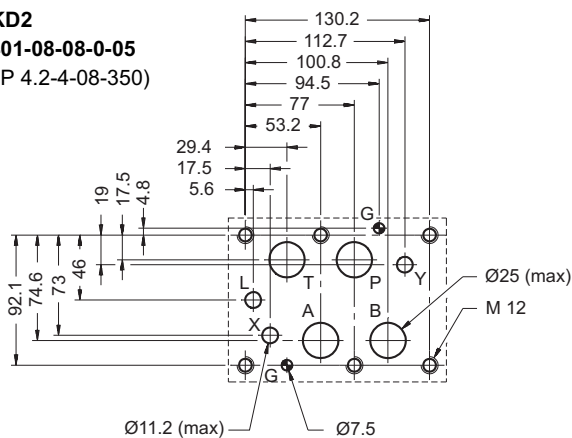
**DSP5RKD2**  
**ISO 4401-05-05-0-05**  
 (CETOP 4.2-4 R05-320)



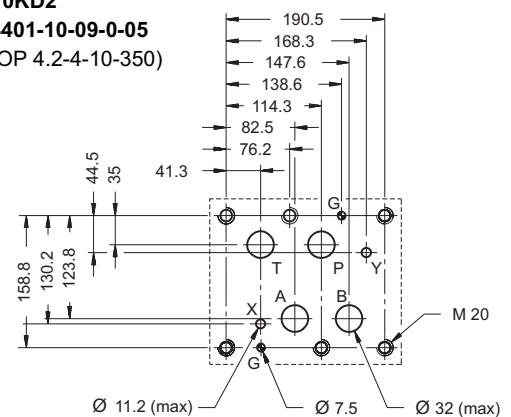
**DSP7KD2**  
**ISO 4401-07-07-0-05**  
 (CETOP 4.2-4-07-350)



**DSP8KD2**  
**ISO 4401-08-08-0-05**  
 (CETOP 4.2-4-08-350)

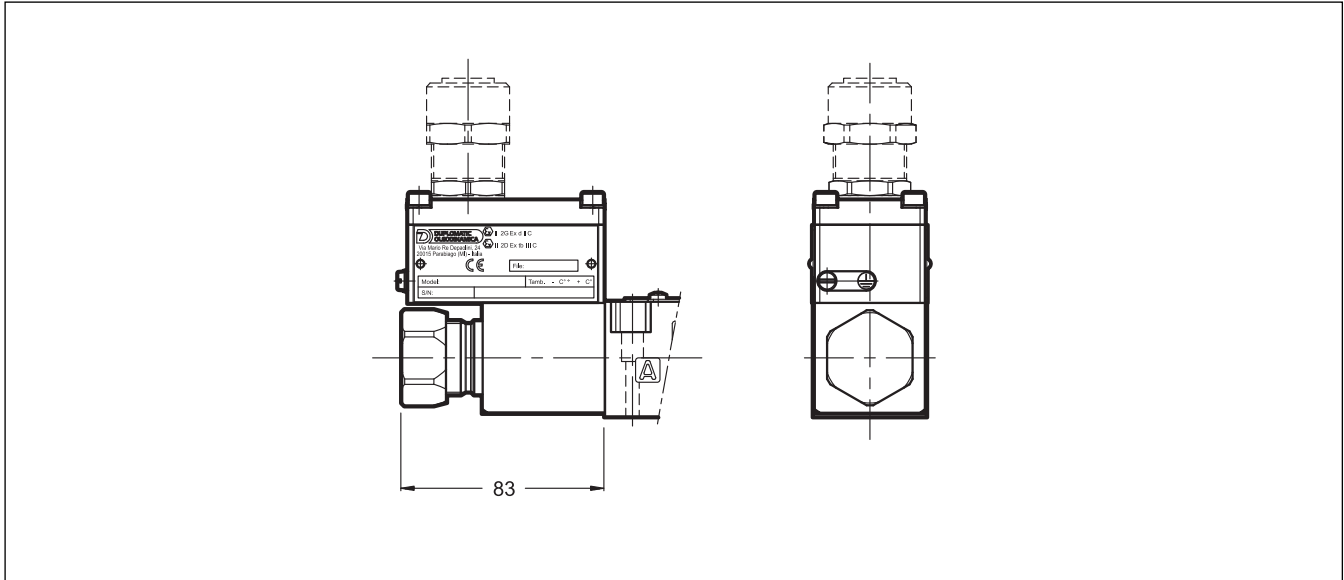


**DSP10KD2**  
**ISO 4401-10-09-0-05**  
 (CETOP 4.2-4-10-350)

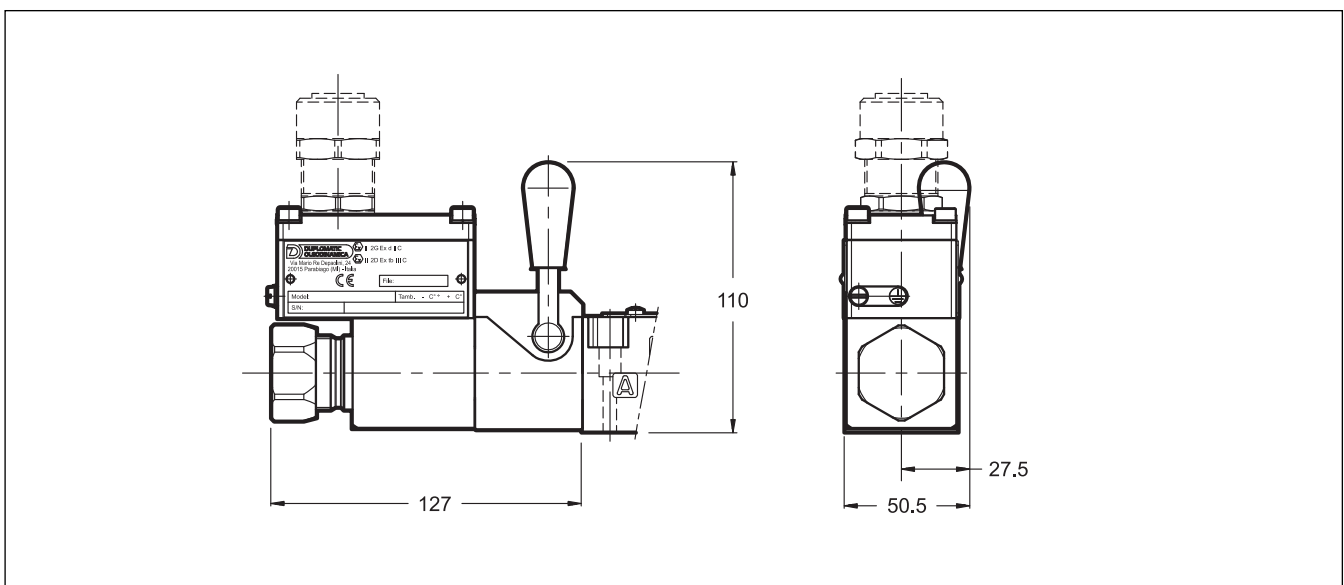


**16 - MANUAL OVERRIDE**

**16.1 - CB - Blind ring nut**



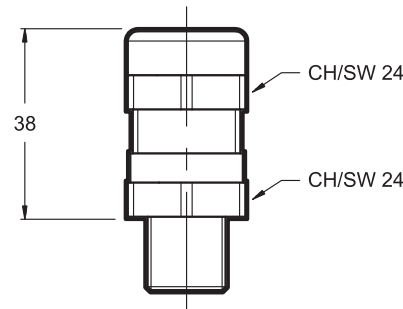
**16.2 - CH - Lever manual override**



## 17 - CABLE GLANDS

Cable glands must be ordered separately; Diplomatic 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: -70°C ÷ +220°C
- 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

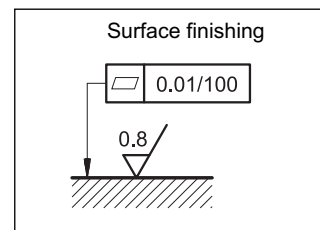
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures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

	<b>DS3KD2</b>	<b>DSP5KD2</b>	<b>DSP7KD2</b>	<b>DSP8KD2</b>
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 1/2" 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.

