

DSPE*G

PILOT OPERATED DIRECTIONAL VALVE WITH PROPORTIONAL CONTROL AND INTEGRATED ELECTRONICS SERIES 11



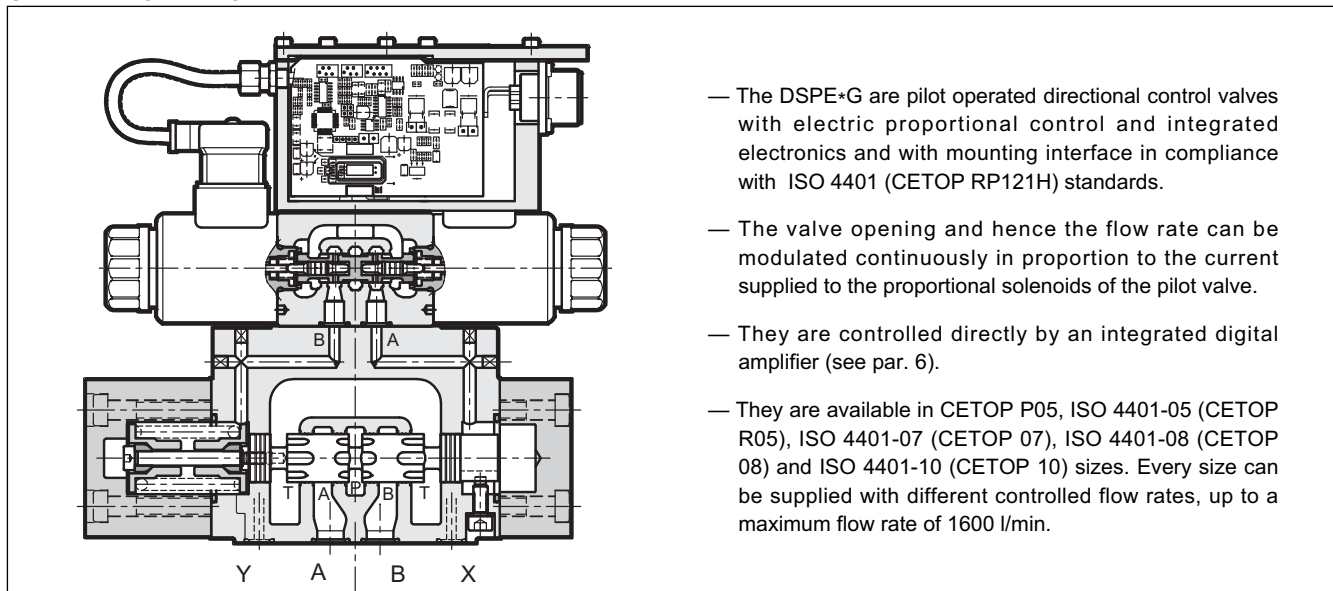
SUBPLATE MOUNTING

DSPE5G	CETOP P05
DSPE5RG	ISO 4401-05 (CETOP R05)
DSPE7G	ISO 4401-07 (CETOP 07)
DSPE8G	ISO 4401-08 (CETOP 08)
DSPE10G	ISO 4401-10 (CETOP 10)

p max (see performance table)

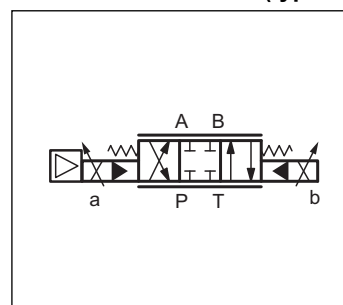
Q max (see performance table)

OPERATING PRINCIPLE



PERFORMANCES (obtained with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronics)		DSPE5G DSPE5RG	DSPE7G	DSPE8G	DSPE10G
Max operating pressure: P - A - B ports T port	bar	350 see paragraph 10			
Controlled flow with Δp 10 bar P-T	l/min	see paragraph 2			
Step response		see paragraph 5			
Hysteresis	% Q max	< 2%			
Repeatability	% Q max	< \pm 1%			
Electrical characteristics		see paragraph 6			
Ambient temperature range	°C	-20 / +60			
Fluid temperature range	°C	-20 / +80			
Fluid viscosity range	cSt	10 ÷ 400			
Fluid contamination degree		According to ISO 4406:1999 class 18/16/13			
Recommended viscosity	cSt	25			
Mass: single solenoid valve double solenoid valve	kg	7,4 7,9	9,6 10,1	15,9 16,4	52,8 53,3

HYDRAULIC SYMBOL (typical)



1 - IDENTIFICATION CODE

D	S	P	E	G	-		/	11	-		/	K11	/	
----------	----------	----------	----------	----------	---	--	---	-----------	---	--	---	------------	---	--

Pilot operated directional control valve
Electric proportional control

Nominal 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)

Integrated electronics for open loop

Spool type:
C = closed centres
A = open centres
RC = regenerative closed centers
RA = regenerative open centers

Configurations for single solenoid version (omit for double solenoid version):
SA = 1 solenoid for cross configuration (not available for DSPE8G and DSPE10G)
SB = 1 solenoid for parallel configuration (for DSPE8G and DSPE10G only)

Spool nominal flow rate (see table par. 2)

B = standard version
C = with CAN connection

Main connector
6 pin + PE

Reference signal:
E0 = voltage ± 10 V
E1 = current 4/20 mA

Drainage: **I** = internal
E = external

Piloting: **I** = internal
E = external
Z = internal piloting with 30 bar fixed adjustment pressure reducing valve (see par. 10)

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

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

2 - AVAILABLE CONFIGURATIONS

The valve configuration depends on the combination of the following elements:
number of proportional solenoids, spool type, rated flow.

Configuration 2 solenoids:
3 positions with spring centering

1 solenoid for cross configuration "SA":
2 positions (central + external) with spring centering (not available for DSPE8G and DSPE10G)

1 solenoid for parallel configuration "SB":
2 positions (central + external) with spring centering (for DSPE8G and DSPE10G only)

valve type	*	Nominal flow with Δp 10 bar P-T
DSPE5G	80	80 l/min
DSPE5RG	80/40	80 (P-A) /40 (B-T) l/min
DSPE7G	100	100 l/min
	150	150 l/min
DSPE8G	150/75	150 (P-A) /75 (B-T) l/min
	200	200 l/min
DSPE10G	300	300 l/min
	300/150	300 (P-A) /150 (B-T) l/min
DSPE10G	350	350 l/min
	500	500 l/min

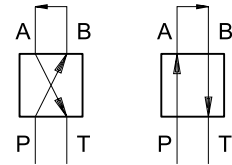
valve type	*	Nominal flow with Δp 10 bar P-T
DSPE7G	150/75	150 (P-A) /75 (B-T) l/min
DSPE8G	300/150	300 (P-A) /150 (B-T) l/min
DSPE10G	500/250	500 (P-A) /250 (B-T) l/min



3 - CHARACTERISTIC CURVES (with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronics)

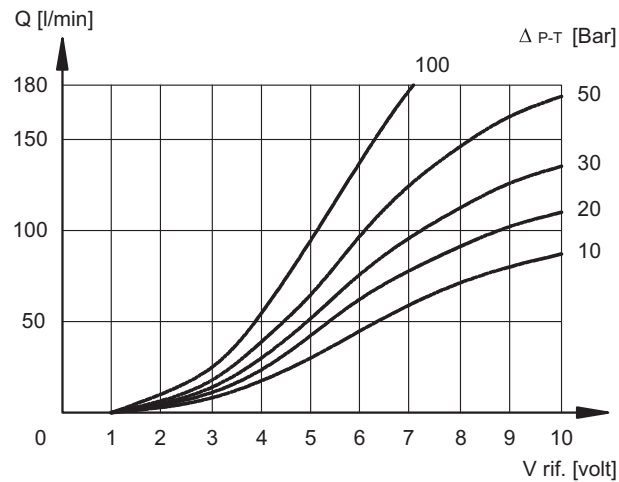
Typical flow rate curves at constant Δp related to the reference signal and measured for the available spools. The Δp values are measured between P and T valve ports.

The curves are obtained after linearization in factory of the characteristic curve through the digital amplifier. The adjustment of the curve is performed with a constant Δp of 30 bar by setting the value of flow start at 10% of the reference signal.



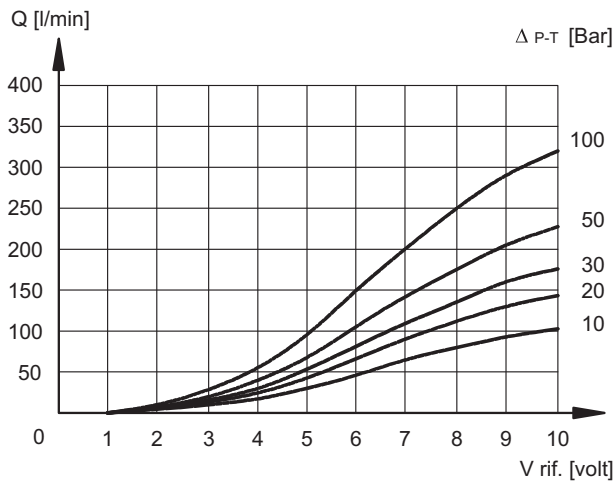
3.1 - Characteristic curves DSPE5G and DSPE5RG

SPOOL C80 - A80

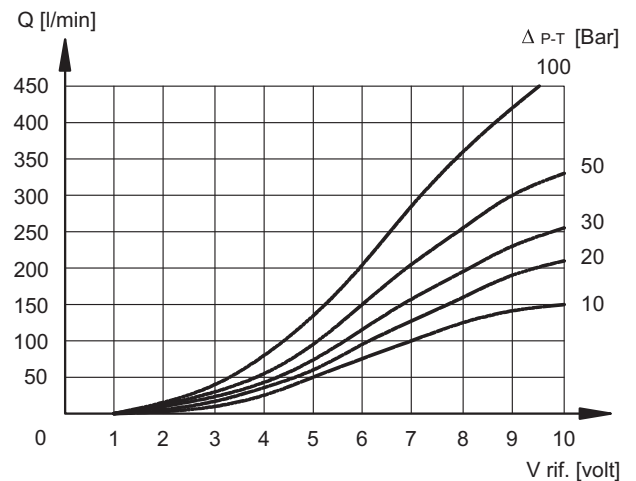


3.2 - Characteristic curves DSPE7G

SPOOL C100 - A100

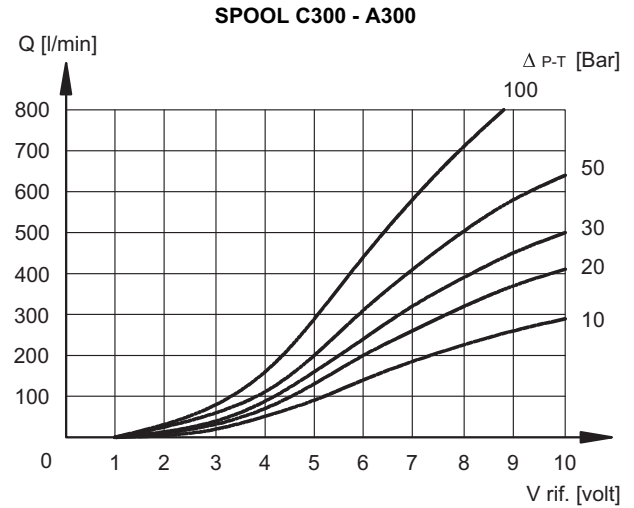
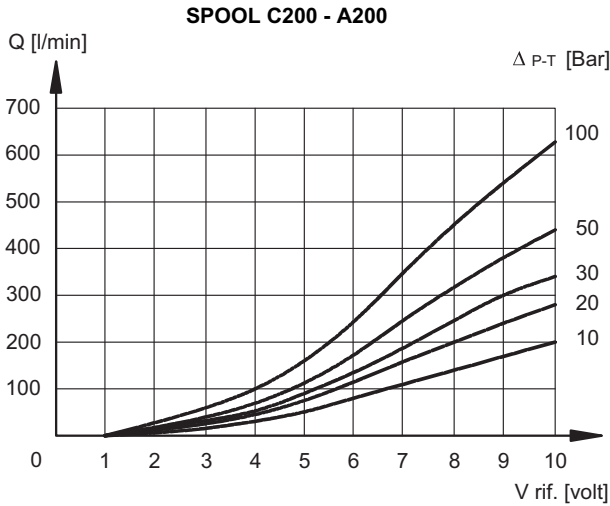


SPOOL C150 - A150

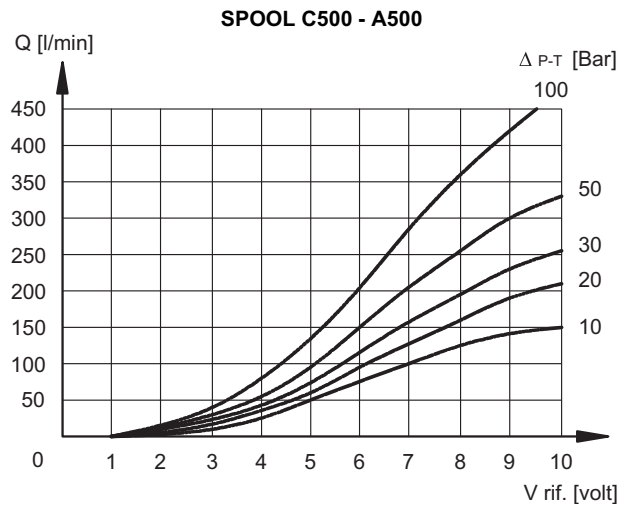
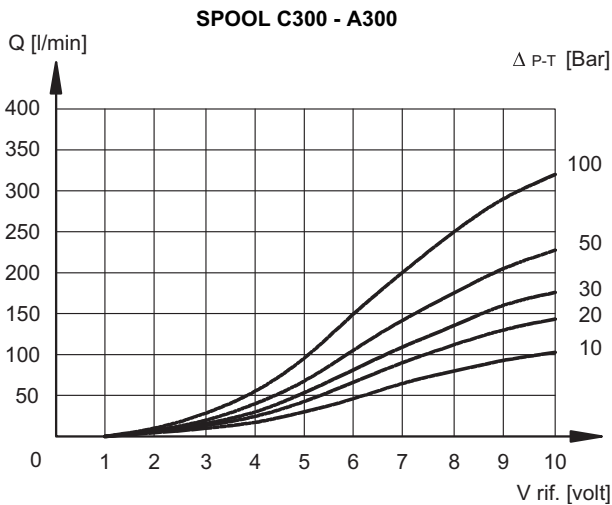




3.3 - Characteristic curves DSPE8G



3.4 - Characteristic curves DSPE10G

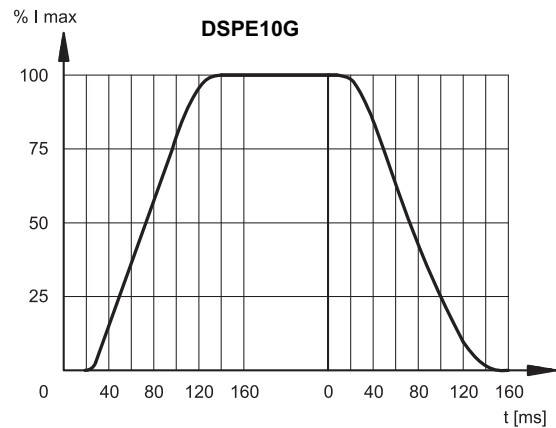
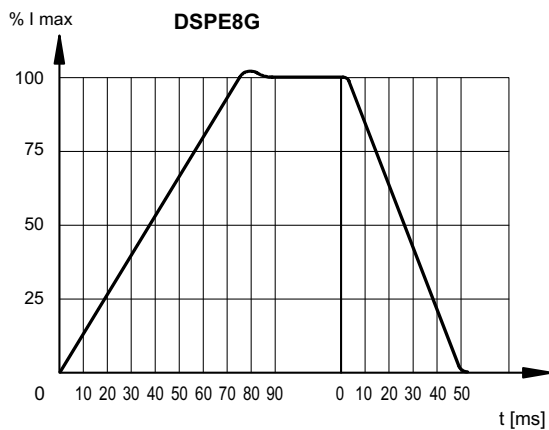
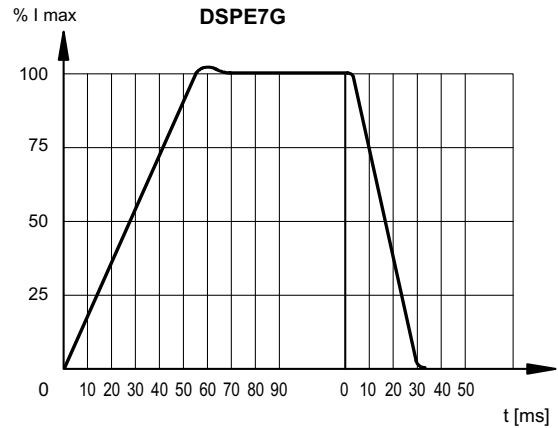
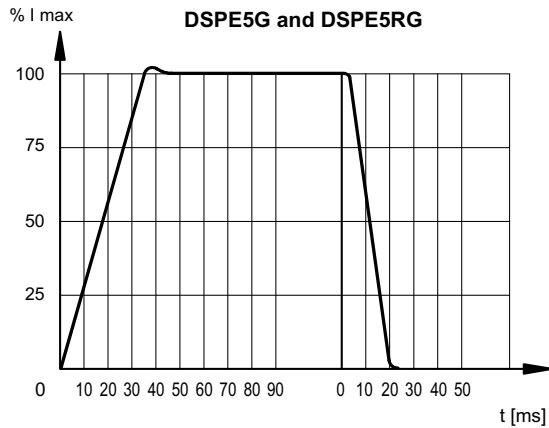


4 - HYDRAULIC CHARACTERISTICS (with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronics)

		DSPE5G DSPER5G	DSPE7G	DSPE8G	DSPE10G
Max flow rate	l/min	180	450	800	1600
Piloting flow requested with operation 0 → 100%	l/min	3,5	6	10,5	15
Piloting volume requested with operation 0 → 100%	cm ³	1,7	3,2	9,1	21,6

5 - STEP RESPONSE (obtained with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronics)

The table shows the typical step response tested with static pressure 100 bar.



6 - ELECTRICAL CHARACTERISTICS

6.1 - Digital integrated electronics

The proportional valve is controlled by a digital amplifier (driver), which incorporates a microprocessor that controls, via software, all the valve functions, such as:

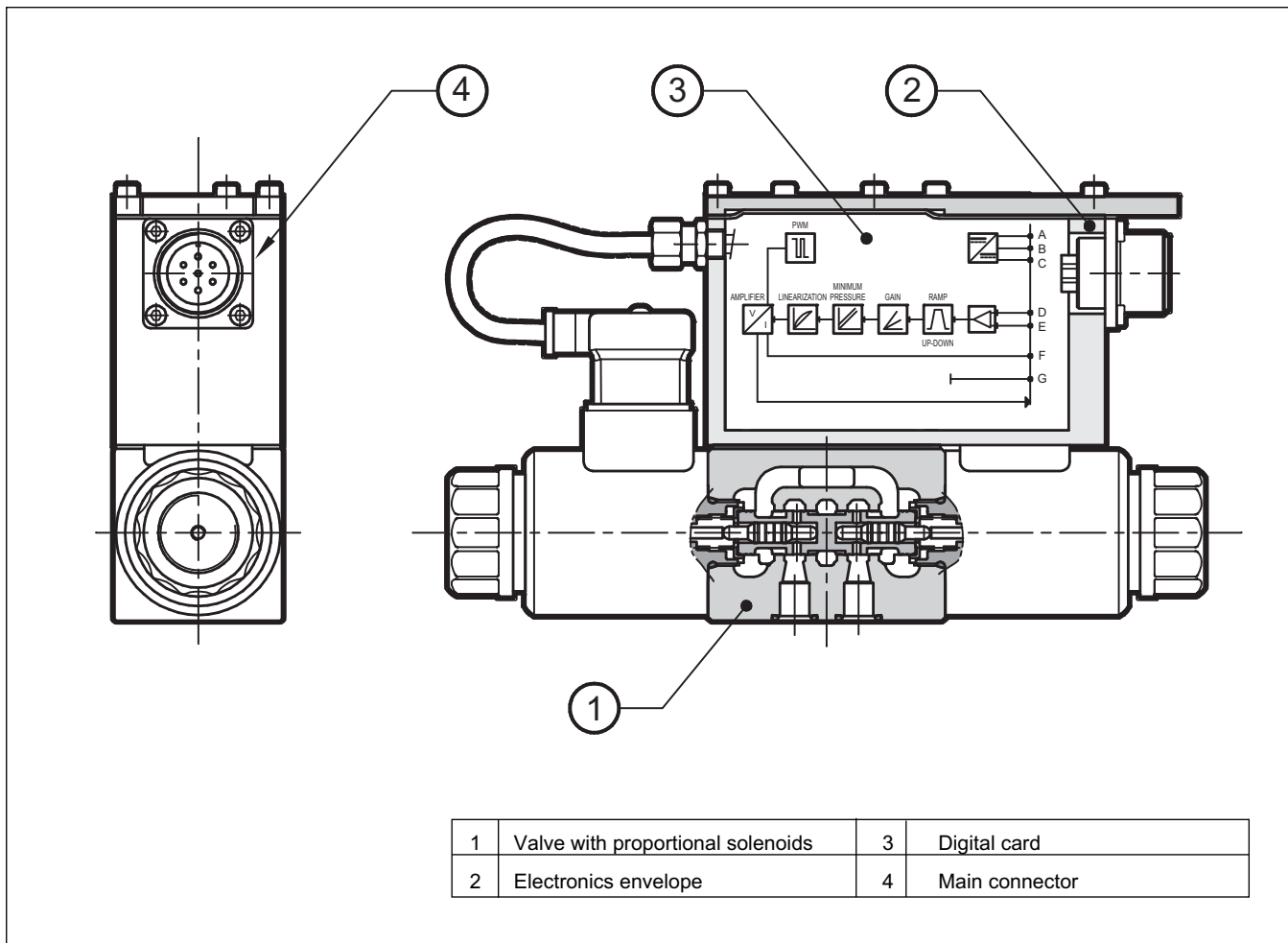
- continuous converting (0,5ms) of the voltage reference signal (E0) or of the current reference signal (E1) in a digital value
- generation of up and down ramps (see **NOTE**)
- gains limit (see **NOTE**)
- compensation of the dead band
- linearization of the characteristic curve
- regulation of the current to the solenoid
- dynamic regulation of PWM frequency
- protection of the solenoid outputs against possible short circuits

NOTE: These parameters can be set through the connection to the CAN connector, by means of a personal computer and relevant software (see par. 7.3)

The digital driver enables the valve to reach better performance compared to the analogic version, such as:

- reduced hysteresis and better repeatability
- reduced response times
- linearization of the characteristic curve which is optimised in factory for each valve
- complete interchangeability in case of valve replacement
- possibility to set, via software, the functional parameters
- possibility to interface a CAN-Open network
- possibility to perform a diagnostic program by means of the CAN connection
- high immunity to electromagnetic troubles

6.2 - Functional block diagram



6.3 - Electrical characteristics

NOMINAL VOLTAGE	VDC	24 VDC (from 19 to 35 VDC, ripple max 3 Vpp)
ABSORBED POWER	W	50
MAXIMUM CURRENT	A	1,88
DUTY CYCLE		100%
VOLTAGE SIGNAL (E0)	VDC	±10 (Impedance Ri > 50 KΩ)
CURRENT SIGNAL (E1)	mA	4 + 20 (Impedance Ri = 500 Ω)
ALARMS		Overload and electronics overheating
COMMUNICATION		Interface of the optoisolated industrial Field-bus type CAN-Bus ISO 11898
MAIN CONNECTOR		7 - pin MIL-C-5015-G (DIN 43563)
CAN-BUS CONNECTOR		M12-IEC 60947-5-2
ELECTROMAGNETIC COMPATIBILITY (EMC)		
EMISSIONS EN 61000-6-4		according to 2004/108/CE standards
IMMUNITY EN 61000-6-2		
PROTECTION AGAINST ATMOSPHERIC AGENTS		IP65 / IP67 (CEI EN 60529 standards)

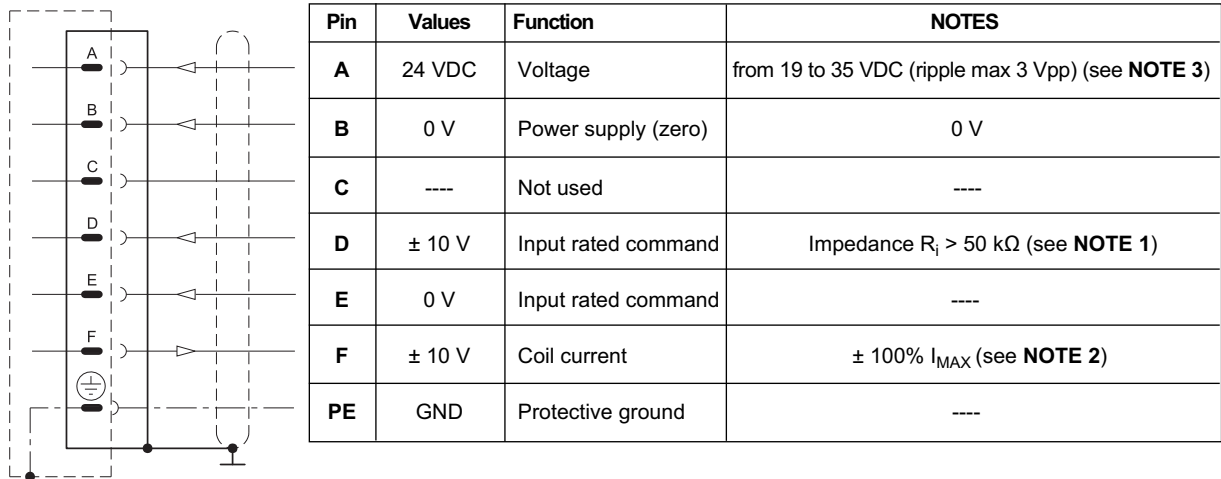
7 - OPERATING MODALITIES

The digital driver of DSPE*G valve may be used with different functions and operating modalities, depending on the requested performances.

7.1 - Standard version with voltage reference signal (E0)

This is the most common version; it makes the valve completely interchangeable with the traditional proportional valves with analogic type integrated electronics. The valve has only to be connected as indicated below. This version doesn't allow the setting of the valve parameters, for example the ramps must be performed in the PLC program, as well as the reference signal limit.

E0 connection scheme (B version - E0)

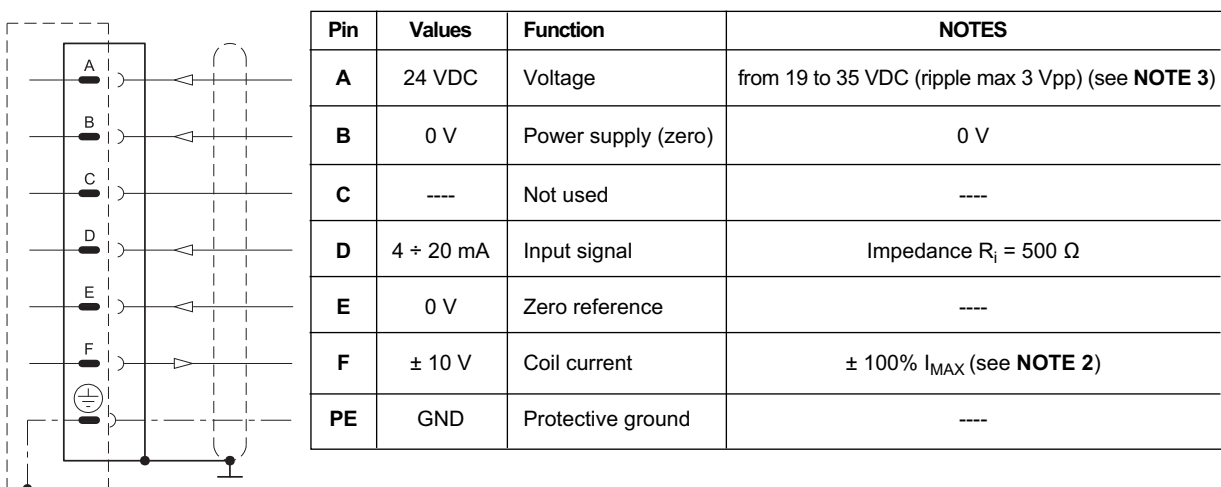


7.2 - Standard version with current reference signal (E1)

This version has characteristics which are similar to the previous one, with the difference that in this case the reference signal is supplied in current 4 - 20 mA. With the 12 mA signal the valve is in central position, with the 20 mA signal the valve performs the configuration P-A and B-T, while with 4 mA the configuration is P-B and A-T. For "SA" single solenoid valves, with reference 20 mA to pin D, the valve full opening is P-B and A-T, while with 4 mA the valve is at rest. This configuration may be modified via software.

If the current to solenoid is lower, than the card shows a BREAKDOWN CABLE error. To reset the error switch-off the supply.

E1 connection scheme (B version - E1)



NOTE 1: The input signal is differential type. For double solenoid valves, with positive reference signal connected to pin D, the valve opening is P - A and B - T. With zero reference signal the valve is in central position. For "SA" single solenoid valves, with positive reference to pin D, the valve opening is P-B and A-T. The spool stroke is proportional to $U_D - U_E$. If only one input signal (single-end) is available, the pin B (0V power supply) and the pin E (0V reference signal) must be connected through a jumper and both connected to GND, electric panel side.

NOTE 2: read the test point pin F in relation to pin B (0V).

NOTE 3: preview on the Pin A (24 VDC) an external fuse for protecting electronics. Fuse characteristics: 5A/50V type fast.

NOTE for the wiring: connections must be made via the 7-pin plug mounted on the amplifier. Recommended cable sizes are 0,75 mm² for cables up to 20m and 1,00 mm² for cables up to 40m, for power supply. The signal cables must be 0,50 mm². A suitable cable would have 7 cores, a separate screen for the signal wires and an overall screen.

7.3 - Version with parameters set by means of CAN connector (version C)

This version enables the setting of some parameters of the valve, by connecting the CAN connector to a traditional computer. To do this, it is necessary to order the interface device for USB port **CANPC-USB/20**, cod. 3898101002, with the relevant configuration software, the communication cable (L=3 meters) and an hardware converter for connecting the valve to the PC USB port. The software is Microsoft Windows Xp[®] compliant.

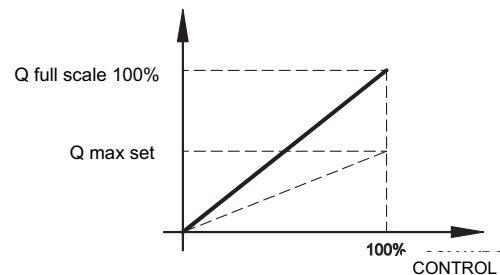
The parameters that can be set are described below:

Maximum current (Gain regulation)

I_{max A} and I_{max B} set the maximum current to the solenoid A corresponding to the positive value of the input reference. This parameter allows the reduction of the valve flow rate with the maximum reference.

Default value = 100% of full scale

Range: from 100% to 50% of full scale



PWM Frequency

Sets the PWM frequency, which is the pulsating frequency of the control current. The PWM decrease improves the valve accuracy, decreasing the regulation stability.

The PWM increase improves the regulation stability, causing a higher hysteresis.

Default value = 300 Hz

Range 50 ÷ 500 Hz

Ramps

Increase time of Ramp R1 - solenoid A: sets the current increase time for a variation from 0 to 100% of the input reference from zero to -10V.

Decrease time of Ramp R2 - solenoid A: sets the current decrease time for a variation from 100 to 0% of the input reference from -10V to zero.

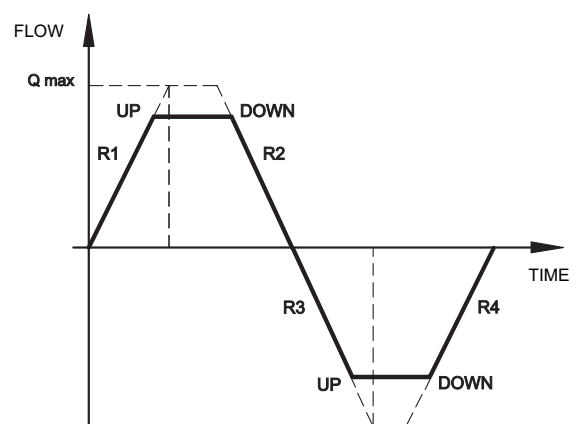
Increase time of Ramp R3 - solenoid B: sets the current increase time for a variation from 0 to 100% of the input reference from zero to -10V.

Decrease time of Ramp R4 - solenoid B: sets the current decrease time for a variation from 100 to 0% of the input reference from -10V to zero.

Min time = 0,001 sec

Max time = 40,000 sec

Default time = 0,001 sec.



Diagnostics

Provides several information parameters, such as:

- The electronic driver status (Working or Broken)
- The active regulation
- Input reference
- Current value

7.4 - Version with CAN-Bus interface (version C)

This version allows the valve piloting through the industrial field bus CAN-Open, according to ISO 11898 standards.

The CAN connector must be connected (see scheme) as a slave node of the CAN-Open bus, while the main connector is wired only for the power supply (pin A and B + earth).

The most important characteristics of a CAN - Open connection are:

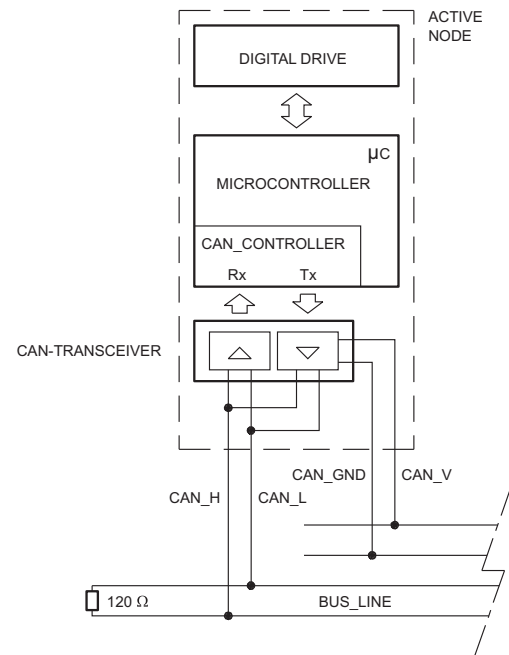
- Parameter storage also in PLC
- Parameters setting in real-time (PDO communication)
- On-line valve diagnostics
- Easy wiring with the serial connection
- Communication program according to international standards

For detailed information on the CAN-Open communication software, see cat. 89 800.

CAN connector connection scheme

Pin	Values	Function
1	CAN_SHLD	Monitor
2	CAN +24VDC	BUS + 24 VDC (max 30 mA)
3	CAN 0 DC	BUS 0 VDC
4	CAN_H	BUS line (high signal)
5	CAN_L	BUS line (low signal)

N.B. Insert a 120Ω resistance on pin 4 and 5 of the CAN connector when the valve is the closure knot of the CAN network.

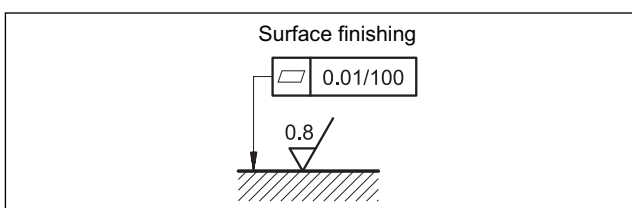


8 - INSTALLATION

The DSPE*G valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit. In particular applications, it can be necessary to vent the air entrapped in the solenoid tube, by using the apposite drain screw in the solenoid tube. Ensure that the solenoid tube is always filled with oil (see par. 11-12-13). At the end of the operation, make sure of having screwed correctly the drain screw.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.



9 - 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.

10 - PILOTING AND DRAINAGE

The DSPE valves are available with piloting and drainage, both internal and external. The version with external drainage allows a higher back pressure on the unloading.

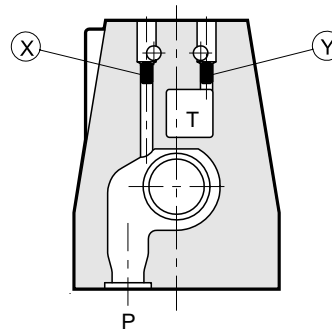
VALVE TYPE	Plug assembly	
	X	Y
IE INTERNAL PILOT AND EXTERNAL DRAIN	NO	YES
II INTERNAL PILOT AND INTERNAL DRAIN	NO	NO
EE EXTERNAL PILOT AND EXTERNAL DRAIN	YES	YES
EI EXTERNAL PILOT AND INTERNAL DRAIN	YES	NO

PRESSURES (bar)

Pressure	MIN	MAX
Piloting pressure on X port	30	210 (NOTE)
Pressure on T port with internal drain	-	10
Pressure on T port with external drain	-	250

NOTE: The version with external pilot with reduced pressure must be used when higher pressures are needed. 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. 1).

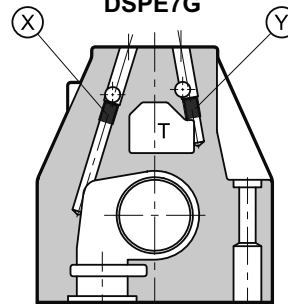
DSPE5G e DSPE5RG



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

P

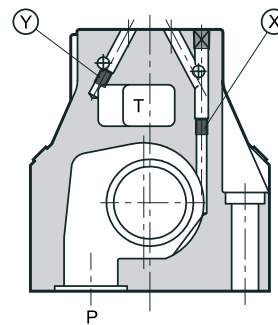
DSPE7G



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

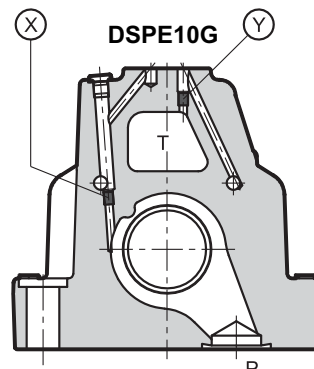
P

DSPE8G



P

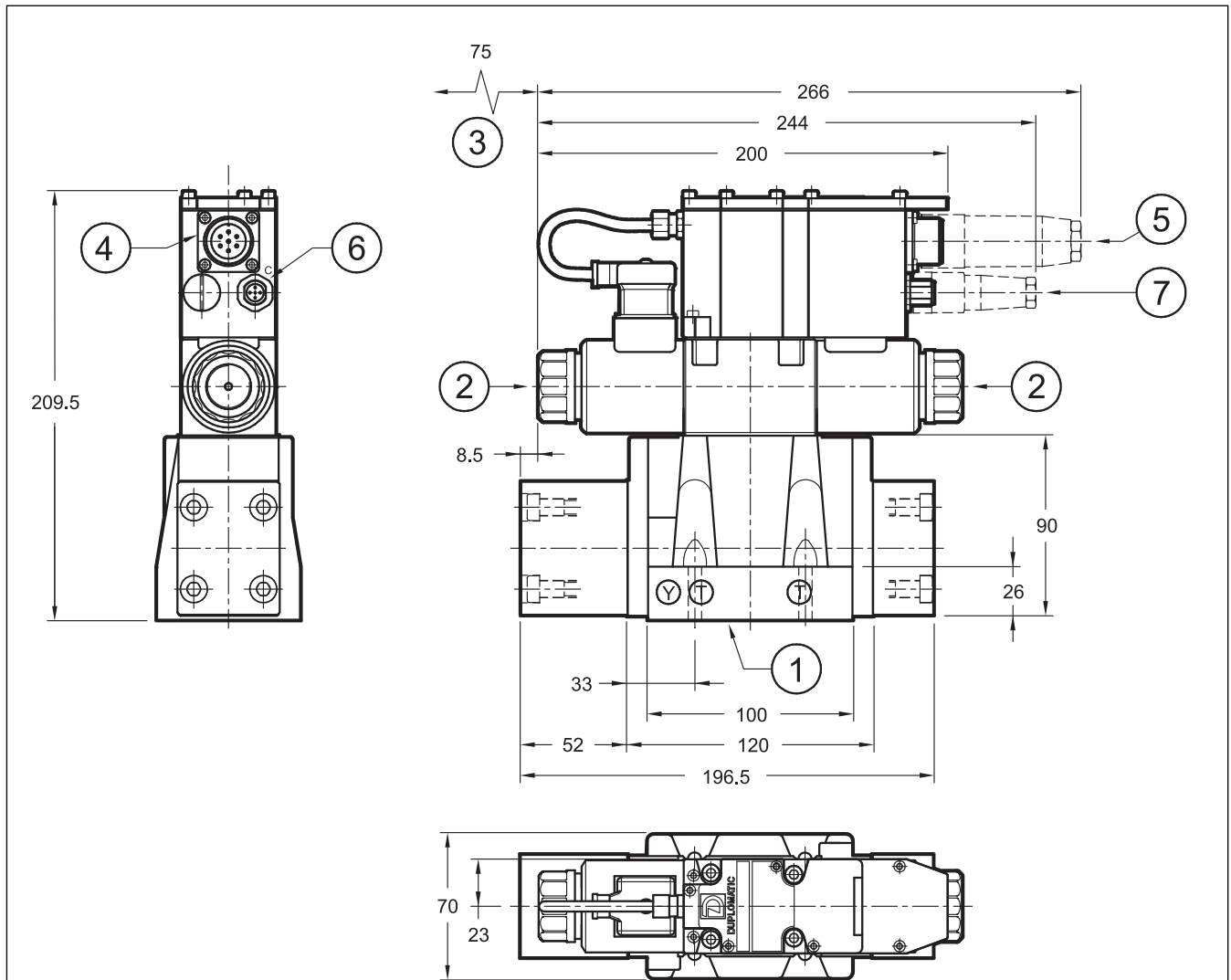
DSPE10G



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

P

11 - OVERALL AND MOUNTING DIMENSIONS DSPE5G and DSPE5RG



NOTES:

- for single solenoid overall dimensions see par. 15.

- for overall dimensions with Z option (fixed adjustment pressure reducing valve) see par. 16.

- for mounting surface see par. 17.

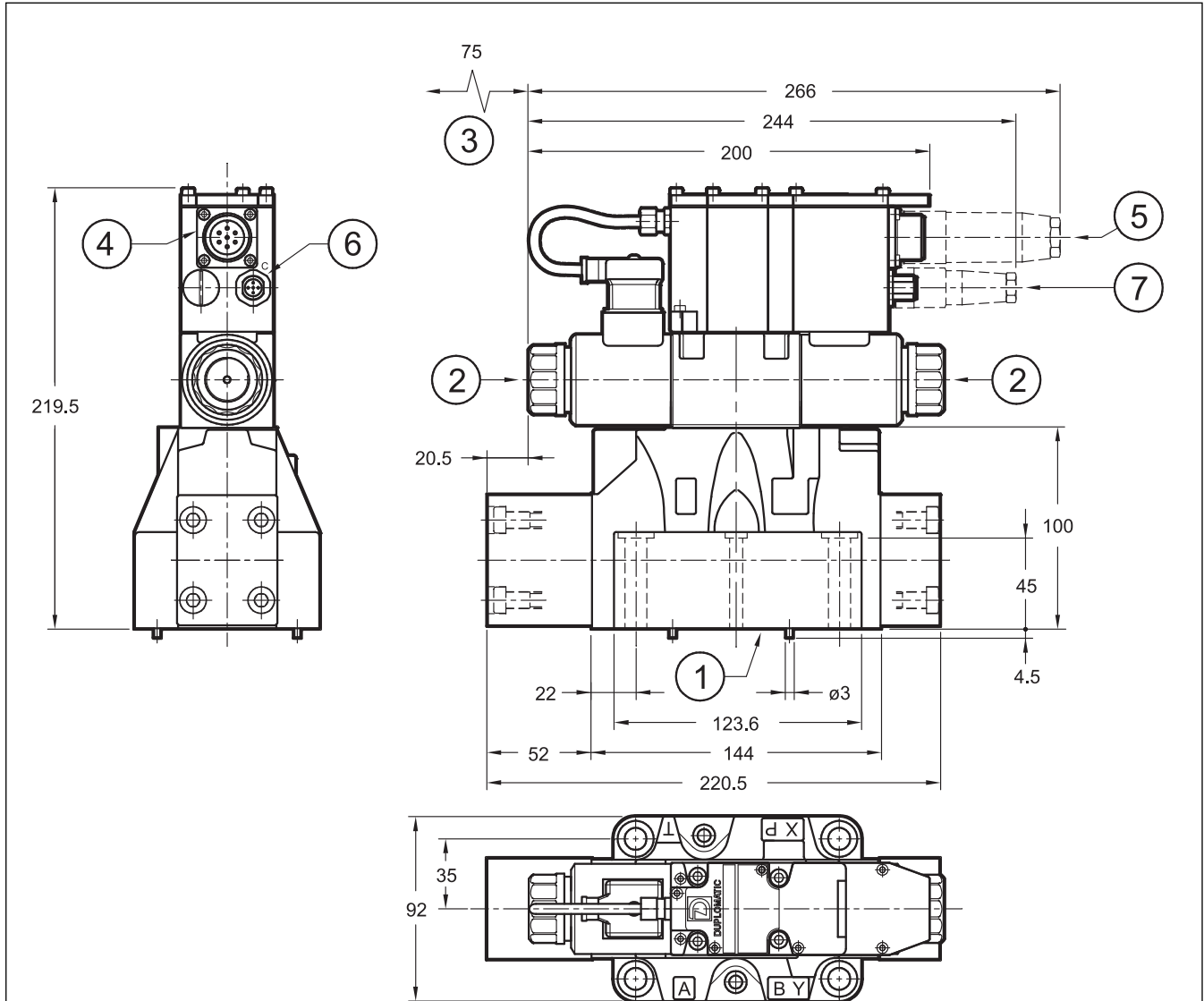
- at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

dimensions in mm

Valve fastening: 4 bolts M6x35 - ISO 4762
Tightening torque: 8 Nm (bolts A 8.8)
Thread of mounting holes: M6x10
Sealing rings: 5 OR type 2050 (12.42x1.78) - 90 Shore 2 OR type 2037 (9.25x1.78) - 90 Shore

1	Mounting surface with sealing rings
2	Breather (male hexagonal spanner 4)
3	Coil removal space
4	Main connection
5	Electrical connector 7 pin DIN 43563 - IP67 PG11 EX7S/L/10 code 3890000003 (to be ordered separately)
6	CAN-Bus connection (only for version C)
7	Electrical connector 5 pin M12 - IP67 PG7 EC5S/M12L/10 code 3491001001 only for version C (to be ordered separately)

12 - OVERALL AND MOUNTING DIMENSIONS DSPE7G



NOTES:

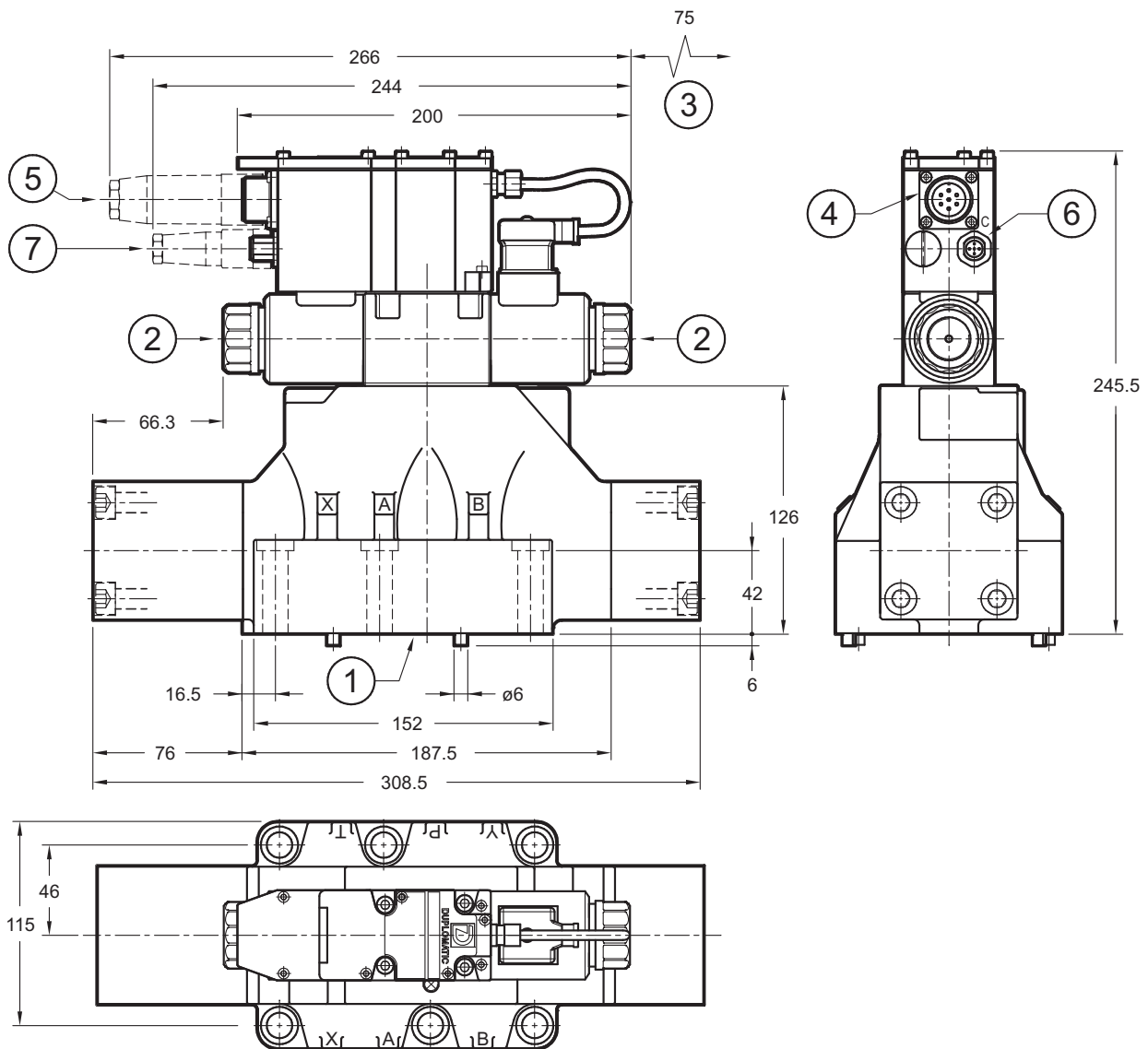
- for single solenoid overall dimensions see par. 15.
- for overall dimensions with Z option (fixed adjustment pressure reducing valve) see par. 16.
- for mounting surface see par. 17.
- at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

dimensions in mm

Valve fastening:	4 bolts M10x60 - ISO 4762 2 bolts M6x60 - ISO 4762
Tightening torque	M10x60: 40 Nm (bolts A 8.8) M6x60: 8 Nm (bolts A 8.8)
Thread of mounting holes:	M6x18; M10x18
Sealing rings:	4 OR type 130 (22.22x2.62) - 90 Shore 2 OR type 2043 (10.82x1.78) - 90 Shore

1	Mounting surface with sealing rings
2	Breather (male hexagonal spanner 4)
3	Coil removal space
4	Main connection
5	Electrical connector 7 pin DIN 43563 - IP67 PG11 EX7S/L/10 code 3890000003 (to be ordered separately)
6	CAN-Bus connection (only for version C)
7	Electrical connector 5 pin M12 - IP67 PG7 EC5S/M12L/10 code 3491001001 only for version C (to be ordered separately)

13 - OVERALL AND MOUNTING DIMENSIONS DSPE8G



NOTES:

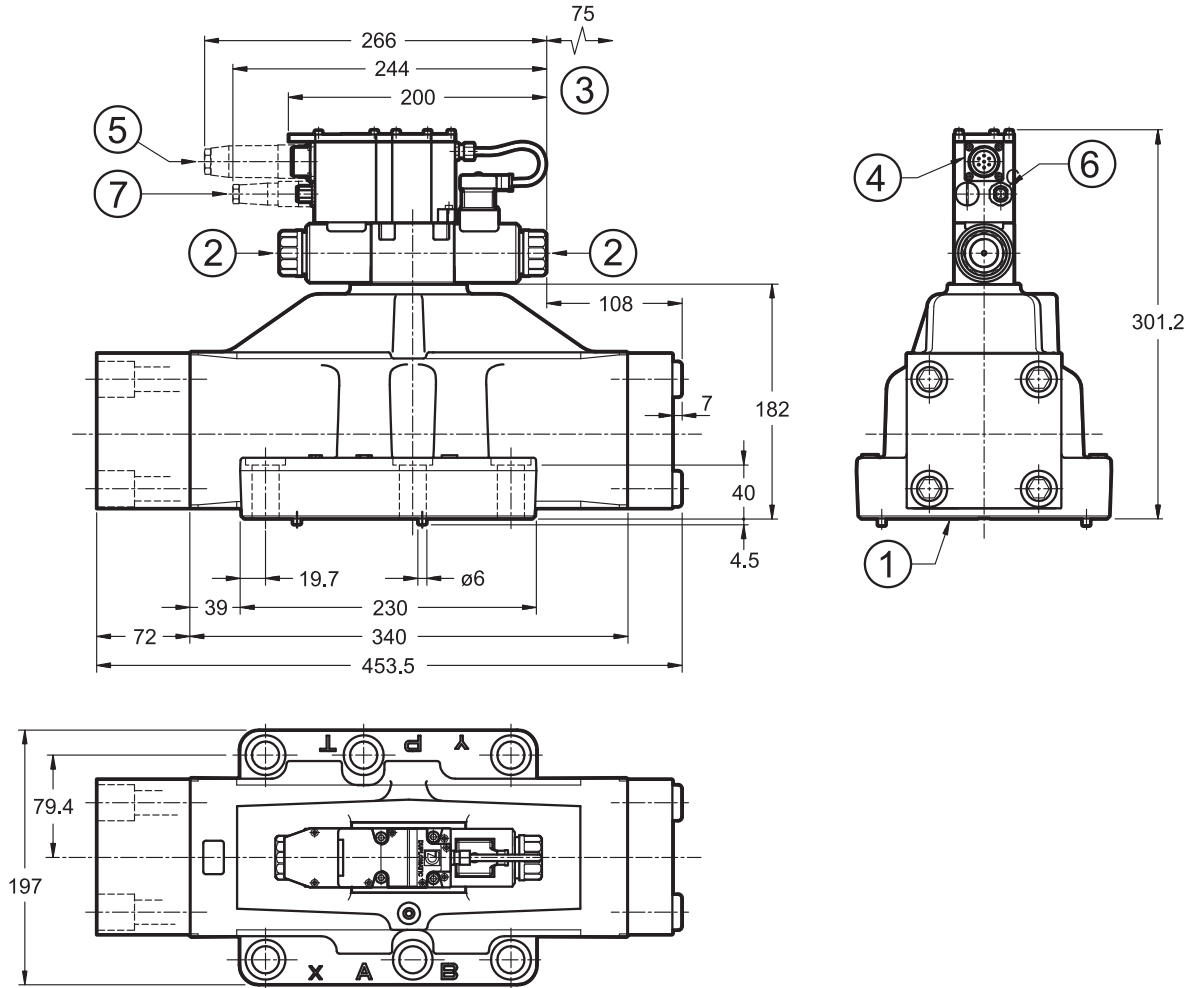
- for single solenoid overall dimensions see par. 15.
- for overall dimensions with Z option (fixed adjustment pressure reducing valve) see par. 16.
- for mounting surface see par. 17.
- at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

dimensions in mm

Valve fastening: 6 bolts M12x60 - ISO 4762
Tightening torque: 69 Nm (bolts A 8.8)
Thread of mounting holes: M12x20
Sealing rings: 4 OR type 3118 (29.82x2.62) - 90 Shore 2 OR type 3081 (20.24x2.62) - 90 Shore

1	Mounting surface with sealing rings
2	Breather (male hexagonal spanner 4)
3	Coil removal space
4	Main connection
5	Electrical connector 7 pin DIN 43563 - IP67 PG11 EX7S/L/10 code 3890000003 (to be ordered separately)
6	CAN-Bus connection (only for version C)
7	Electrical connector 5 pin M12 - IP67 PG7 EC5S/M12L/10 code 3491001001 only for version C (to be ordered separately)

14 - OVERALL AND MOUNTING DIMENSIONS DSPE10G



NOTES:

- for overall dimensions with Z option (fixed adjustment pressure reducing valve) see par. 16.

- for mounting surface see par. 17.

- at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

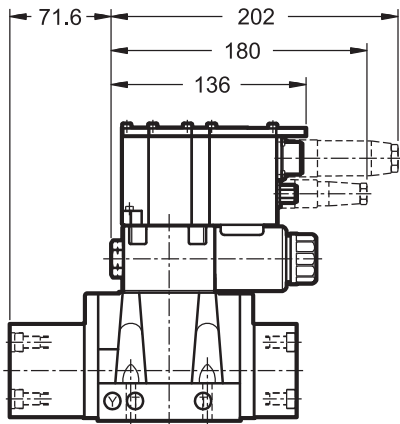
Valve fastening: N. 6 SHC screws M12x70 - ISO 4762
Tightening torque: 330 Nm (A 8.8 bolts)
Thread of mounting holes: M20x40
Sealing rings: N. 4 OR type 4150 (37.59x3.53) - 90 Shore N. 2 OR type 3081 (20.24x2.62) - 90 Shore

1	Mounting surface with sealing rings
2	Breather (male hexagonal spanner 4)
3	Coil removal space
4	Main connection
5	Electrical connector 7 pin DIN 43563 - IP67 PG11 EX7S/L/10 code 3890000003 (to be ordered separately)
6	CAN-Bus connection (only for version C)
7	Electrical connector 5 pin M12 - IP67 PG7 EC5S/M12L/10 code 3491001001 only for version C (to be ordered separately)

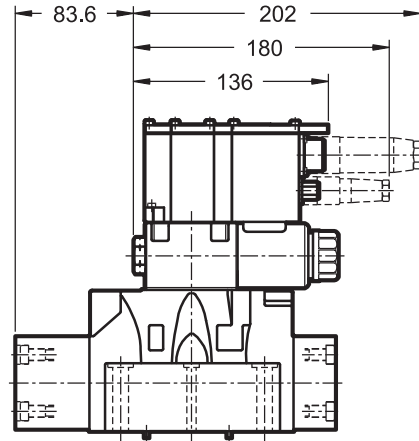
15 - OVERALL AND MOUNTING DIMENSIONS SINGLE SOLENOID VALVES

dimensions in mm

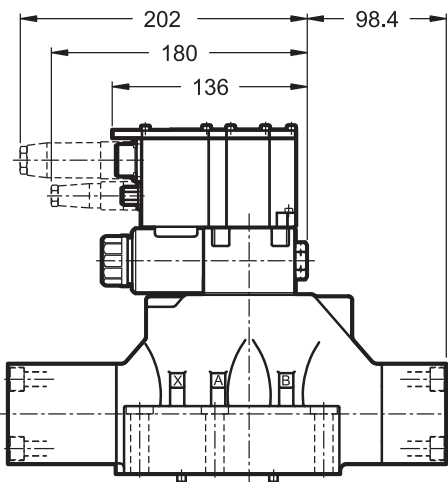
DSPE5G-*SA



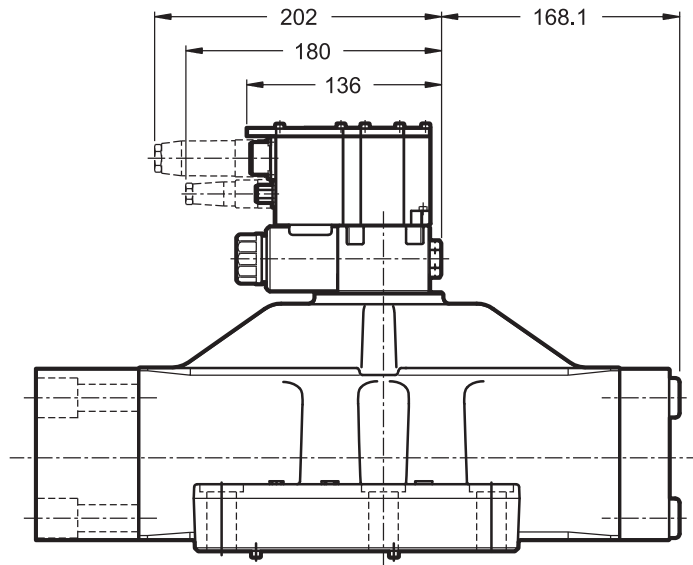
DSPE7G-*SA



DSPE8G-*SB



DSPE10G-*SB

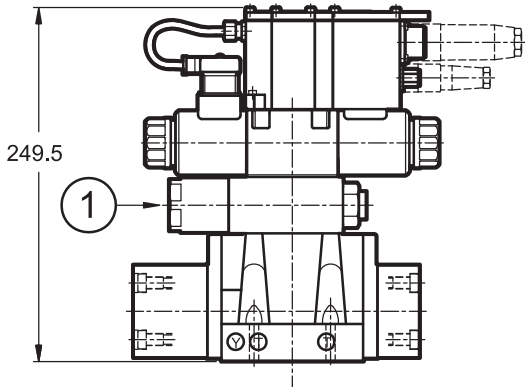


NOTE: for the missing overall dimensions and characteristics see par. 11 - 12 - 13 - 14.

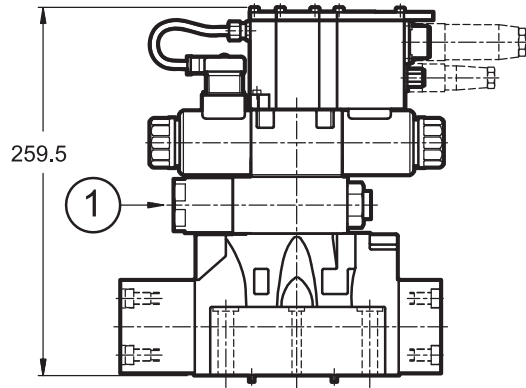
16 - OVERALL AND MOUNTING DIMENSIONS DSPE*G-*/11*-Z*/*

dimensions in mm

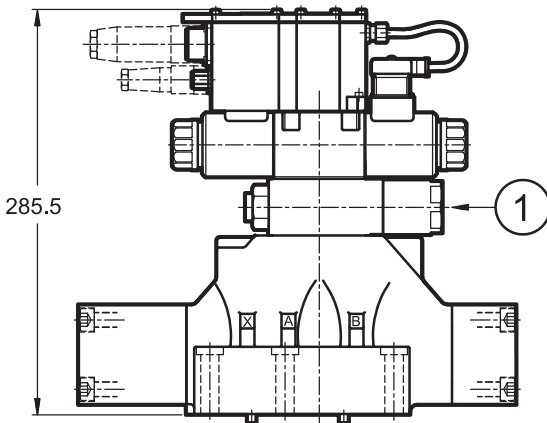
DSPE5G-*/11*-Z*/*



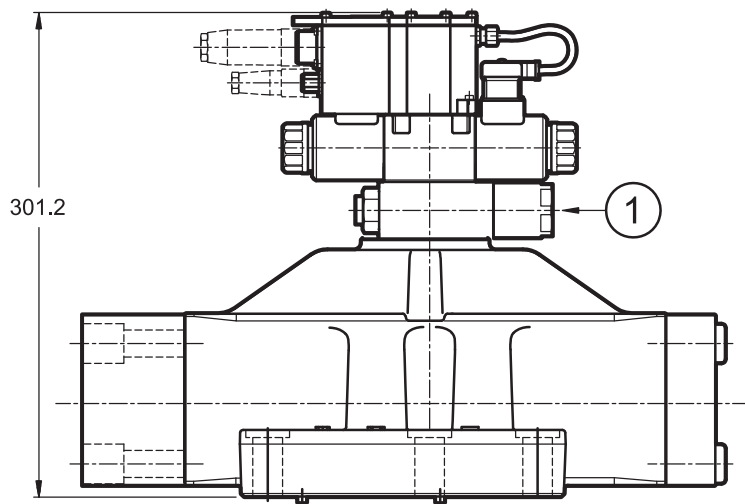
DSPE7G-*/11*-Z*/*



DSPE8G-*/11*-Z*/*



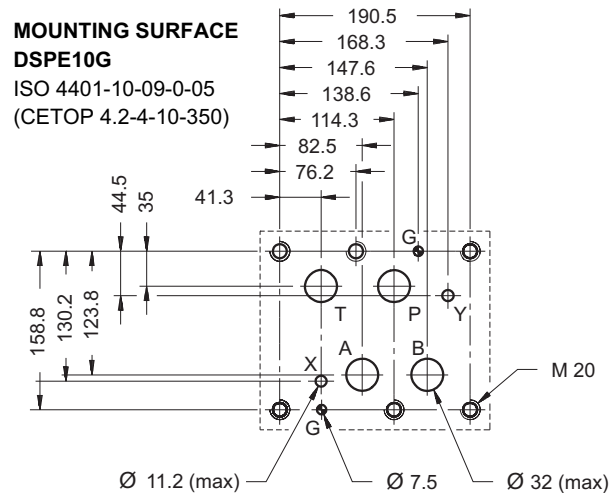
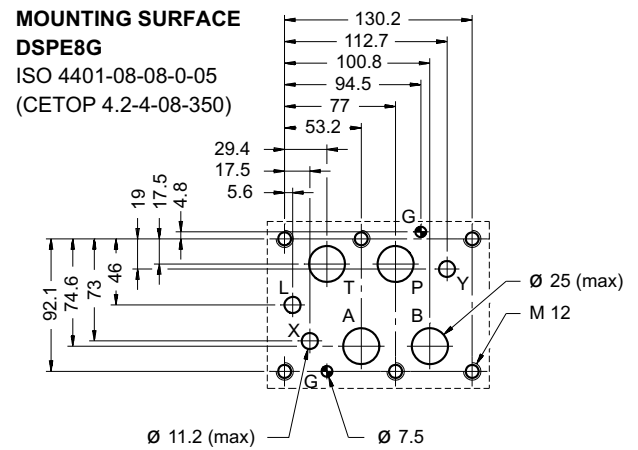
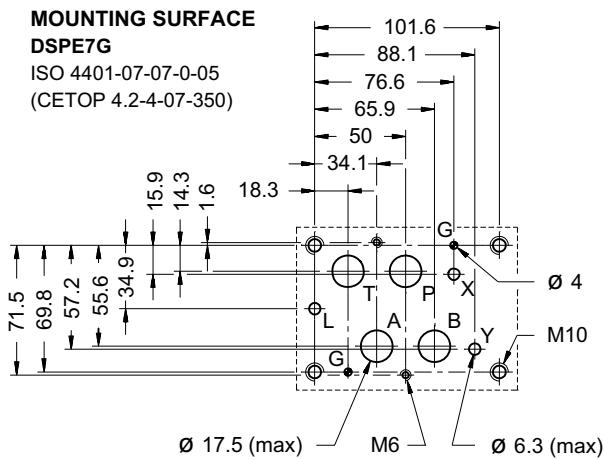
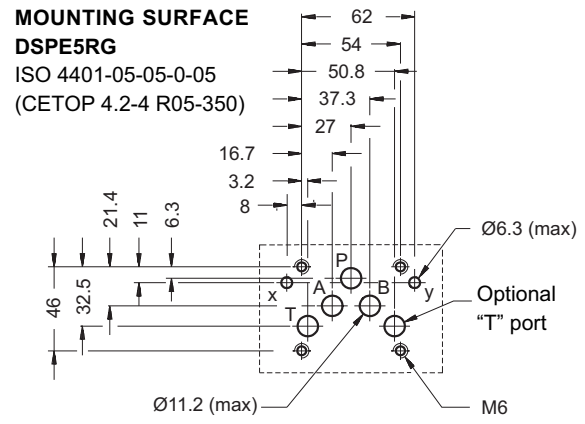
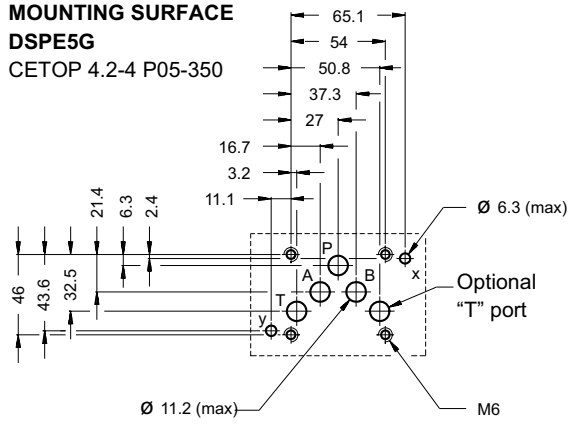
DSPE10G-*/11*-Z*/*



NOTE: for the missing overall dimensions and characteristics see par. 11 - 12 - 13 - 14.

1	30 bar fixed adjustment pressure reducing valve
---	---

17 - MOUNTING SURFACES





18 - SUBPLATES (see catalogue 51 000)

	DSPE5G	DSPE7G	DSPE8G	DSPE10G
Model with rear ports	PME4-AI5G	PME07-AI6G	-	-
Model with side ports	PME4-AL5G	PME07-AL6G	PME5-AL8G	-
Thread of ports: P - T - A - B X - Y	3/4" BSP 1/4" BSP	1" BSP 1/4" BSP	1½" BSP 1/4" BSP	-



DIPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339

www.diplomatic.com • e-mail: sales.exp@diplomatic.com