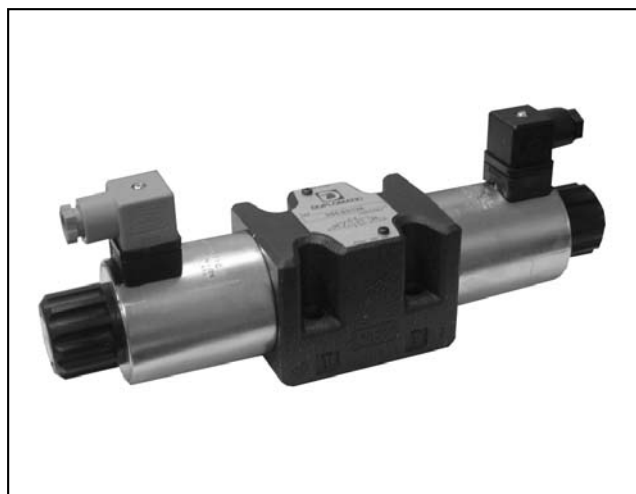


DSE5

DIRECTIONAL VALVE WITH PROPORTIONAL CONTROL SERIES 10

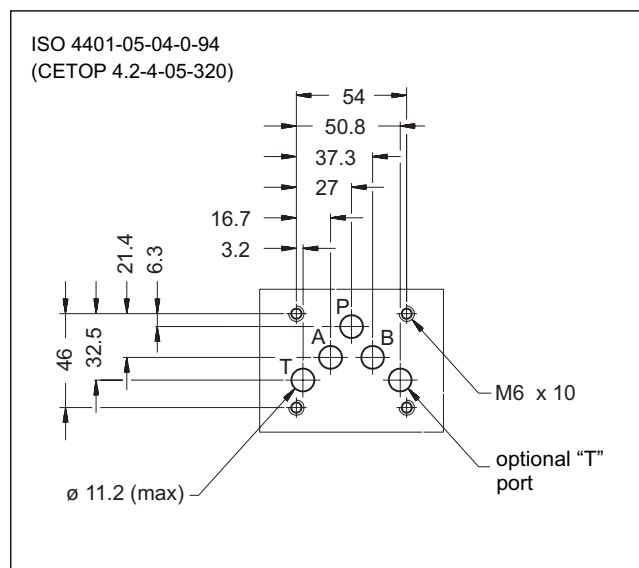


SUBPLATE MOUNTING ISO 4401-05 (CETOP 05)

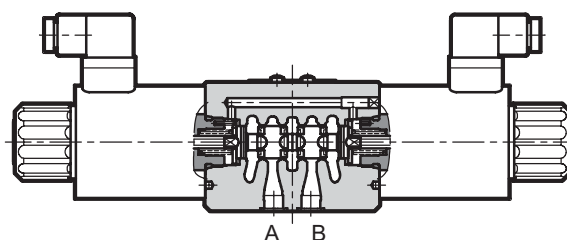
p max 320 bar

Q max 90 l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



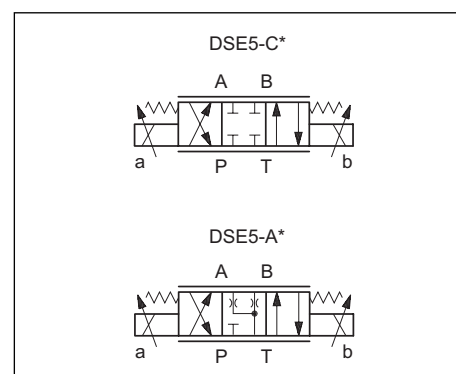
- The DSE5 valve is a directly operated directional control valve with electric proportional control and with ports in compliance with ISO 4401 standards (CETOP RP 121H).
- It is used for directional and speed control of the hydraulic actuators.
- Valve opening and hence flow rate can be modulated continuously in proportion to the current supplied to the solenoid.
- The valve can be controlled directly by a current control supply unit or by means of the relative electronic control units to exploit valve performance to the full (see paragraph 10).
- The DS5 valve is available in special version with Y external subplate drain port (see paragraph 9).

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control cards)

Maximum operating pressure: - P - A - B ports - T port : standard version version with Y port	bar	320 210 320
Maximum flow with Δp 10 bar P-T	l/min	30 - 60
Step response	see paragraph 6	
Hysteresis	% of Q max	< 6%
Repeatability	% of Q max	< $\pm 1,5\%$
Electrical characteristics	see paragraph 5	
Ambient temperature range	°C	-10 / +50
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	4,4 5,9

HYDRAULIC SYMBOLS (typical)



1 - IDENTIFICATION CODE

D	S	E	5	-				/	10		-		K1
---	---	---	---	---	--	--	--	---	----	--	---	--	----

Directly operated directional control valve

Electric proportional control

Size ISO 4401-05 (CETOP 05)

Spool type:
C = closed centers
A = open centers

Spool nominal flow (see table 2)

Solenoid position (omit for configuration with two solenoids):
SA = 1 solenoid on side A
SB = 1 solenoid on side B

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

D12 = Nominal solenoid voltage 12V DC
D24 = Nominal solenoid voltage 24V DC

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

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

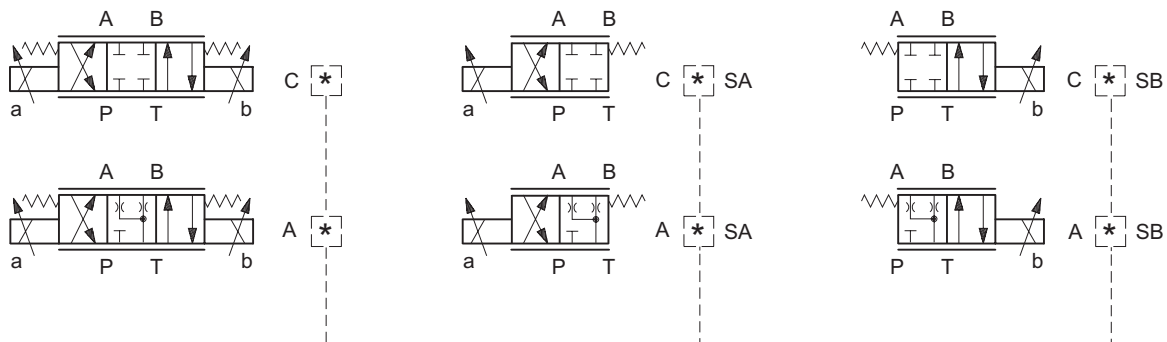
2 - CONFIGURATIONS

Valve configuration depends on the combination of the following elements:
number of proportional solenoids, spool type, nominal flow rate.

2 solenoids configuration:
3 positions with spring centering

"SA" configuration: 1 solenoid on side A.
2 positions (central + external) with spring centering

"SB" configuration: 1 solenoid on side B.
2 positions (central + external) with spring centering

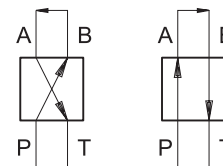


*	Controlled flow with Δp 10 bar P-T
30	30 l/min
60	60 l/min
60/30	60 (P-A) / 30 (B-T) l/min

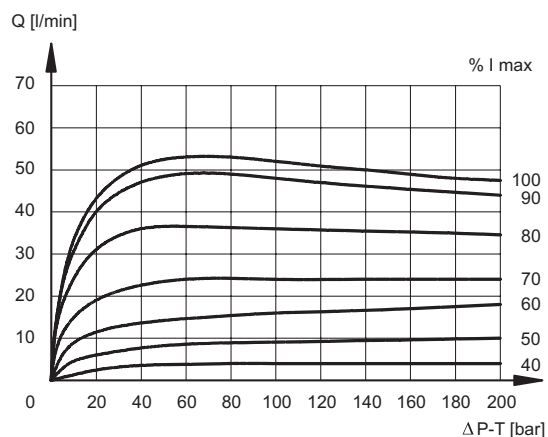
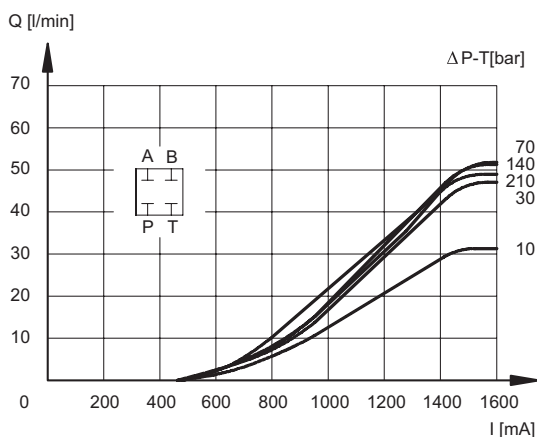
3 - CHARACTERISTIC CURVES (values measured with viscosity of 36 cSt at 50°C with valves connected to the relative electronic control units)

Typical constant flow rate control curves at Δp according to current supply to solenoid (D24 version, maximum current 1600 mA), measured for the various spool types available.

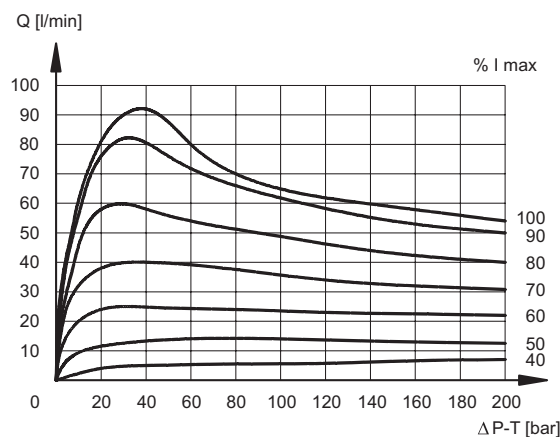
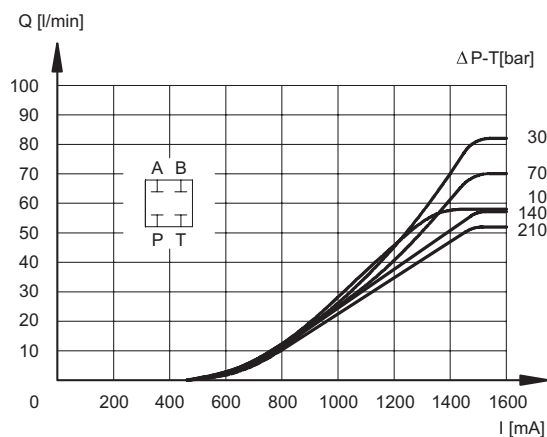
The reference Δp values are measured between ports P and T on the valve.



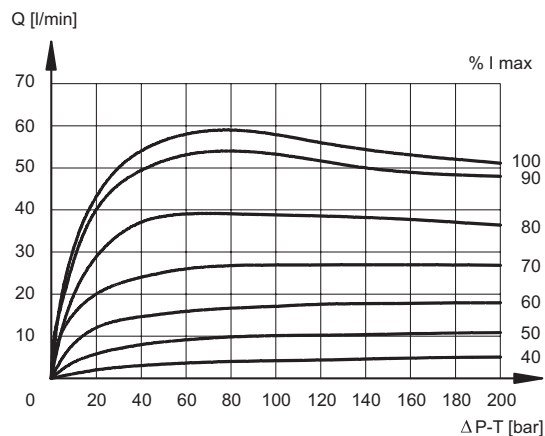
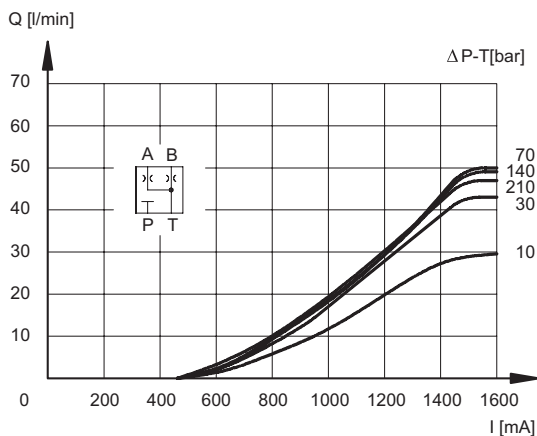
SPOOL TYPE C30



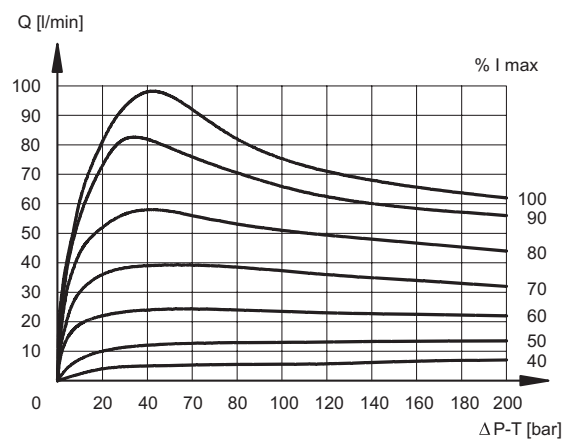
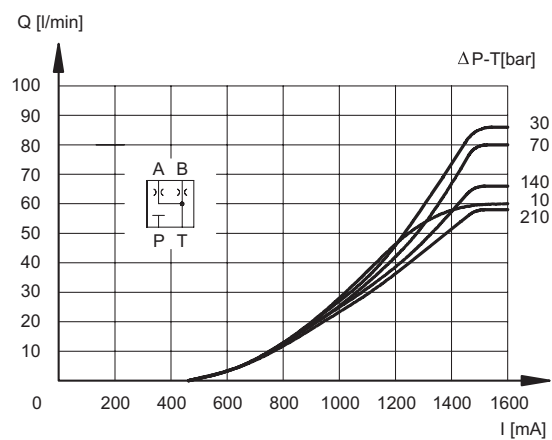
SPOOL TYPE C60



SPOOL TYPE A30



SPOOL TYPE A60



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 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.

5 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut.

It can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	12	24	
RESISTANCE (at 20°C)	Ω	3 - 3.4	8.65	
MAXIMUM CURRENT	A	2.6	1.6	
DUTY CYCLE		100%		
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 89/336 CEE			
emissions				EN 50081-1
immunity				EN 50082-2
CLASS OF PROTECTION: Atmospheric agents (CEI EN 60529)	IP 65			

6 - STEP RESPONSE (measured with mineral oil with viscosity of 36 cSt at 50°C with the relative electronic control units)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

The table shows typical response times tested with spool type C60 and $\Delta p = 20$ bar P-T.

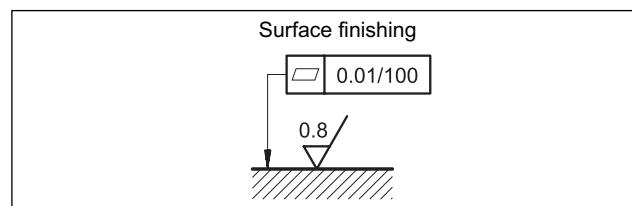
REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms] DSE5-A* DSE5-C*	50	70

7 - INSTALLATION

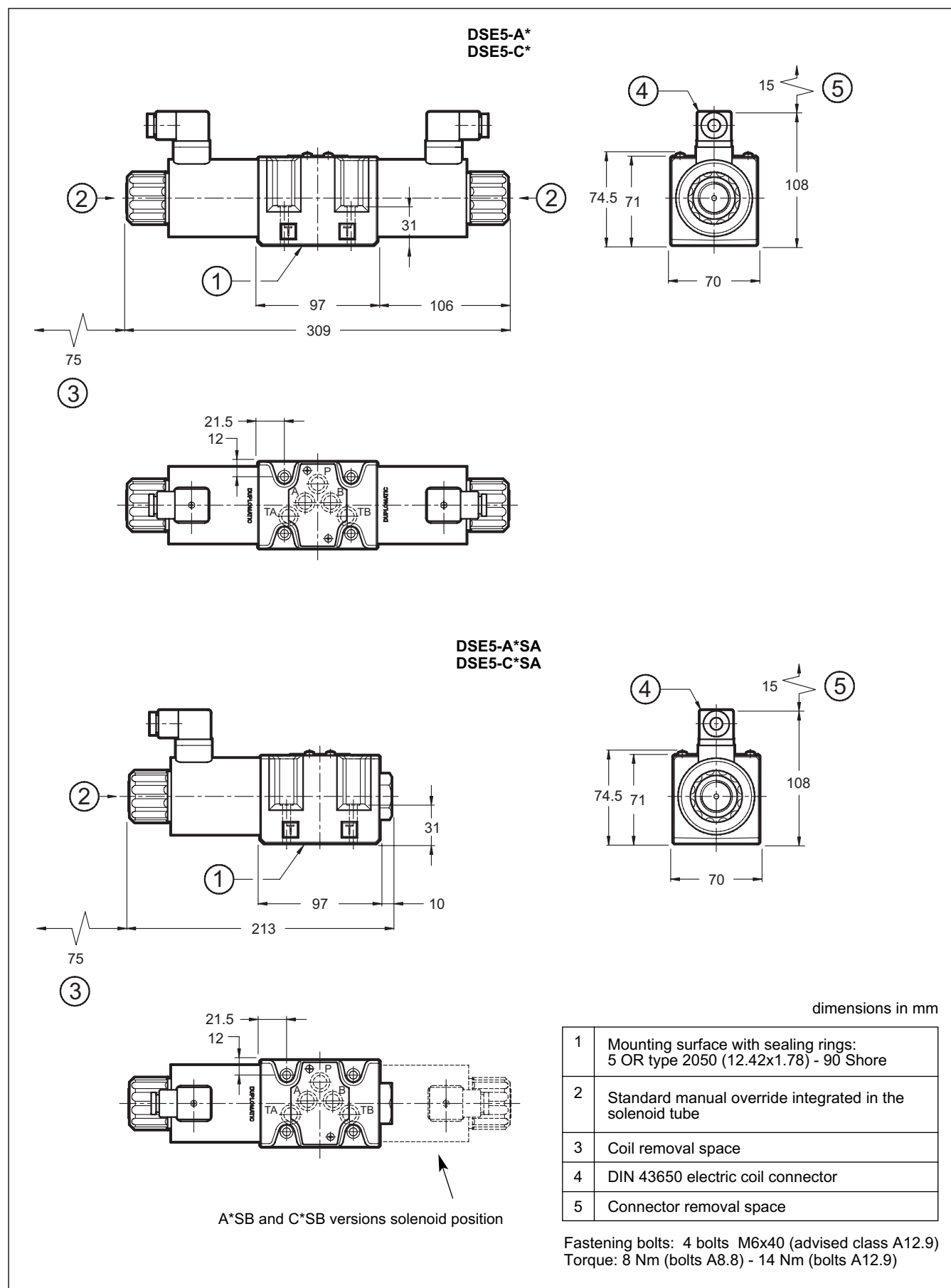
DSE5 valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

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.

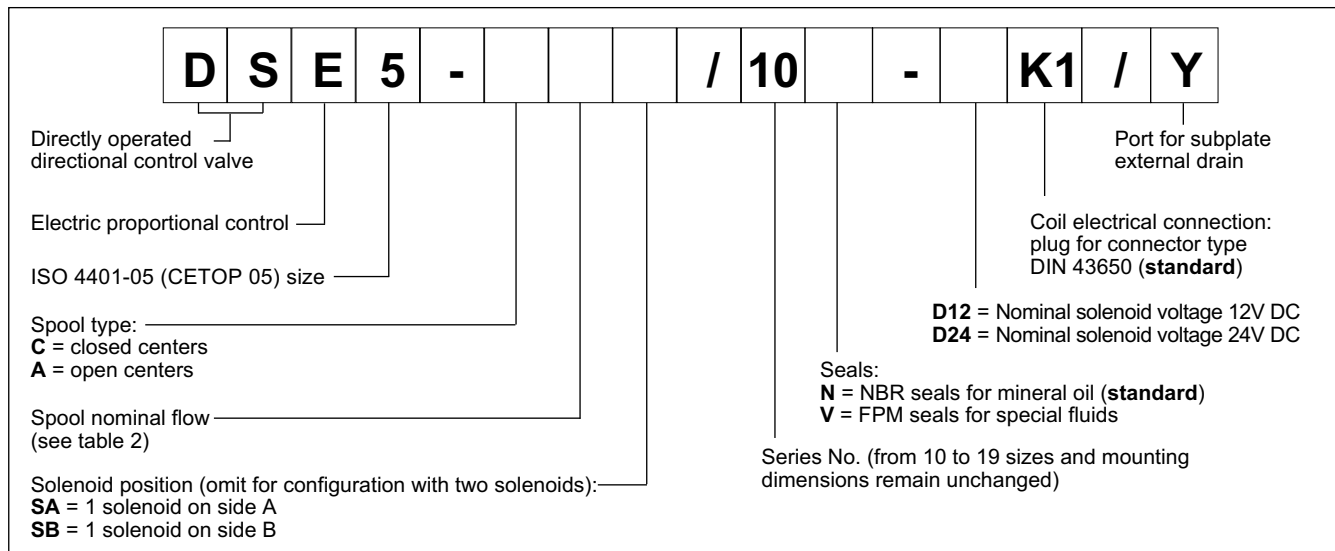


8 - OVERALL AND MOUNTING DIMENSIONS



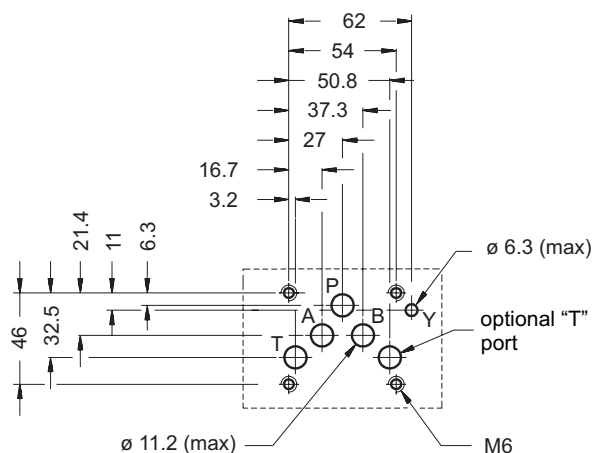
9 - SPECIAL VERSION WITH Y EXTERNAL SUBPLATE DRAIN PORT

Identification Code



This version allows the operation with pressures up to 320 bar on the valve T port.

It is a drain port Y realized on the valve mounting interface in compliance with ISO 4401-05-05-0-94 (CETOP 4.2-4-R05). The Y port is connected with the solenoid chamber: in this way the tubes are not stressed by the pressure operating on the valve T port.



10 - ELECTRONIC CONTROL UNITS

DSE5- **SA (SB)

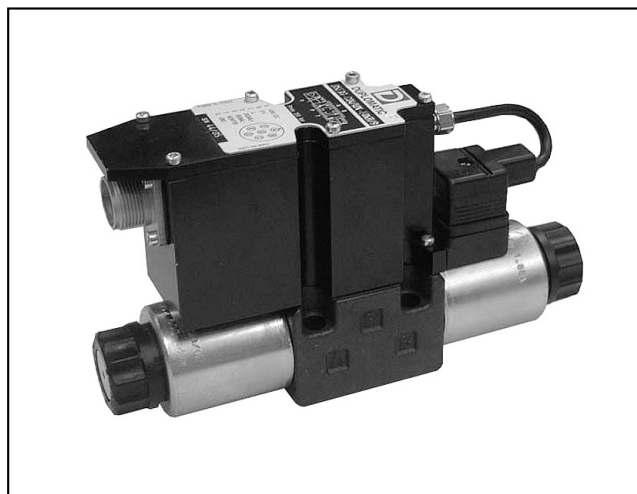
EDM-M131	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250
EDM-M151	for solenoid 12V DC		

DSE5- A* DSE5-C*

EDM-M231	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250
EDM-M251	for solenoid 12V DC		

11 - SUBPLATES (see cat. 51 000)

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



DSE3G

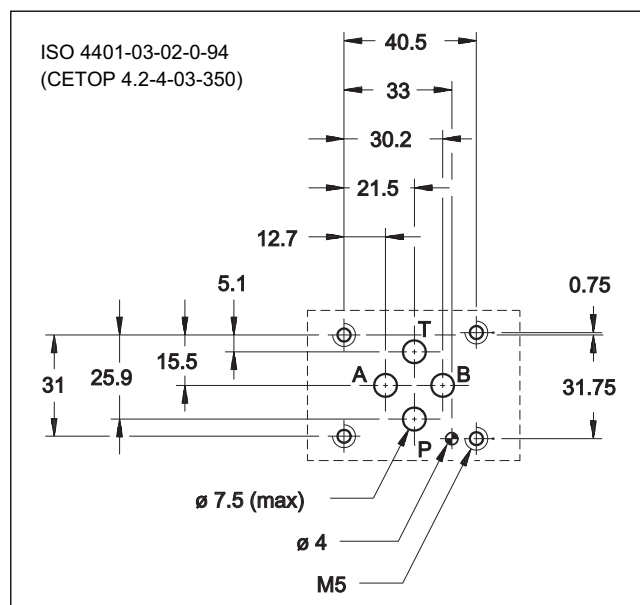
DIRECTIONAL VALVE WITH PROPORTIONAL CONTROL AND INTEGRATED ELECTRONICS SERIES 11

**SUBPLATE MOUNTING
ISO 4401-03 (CETOP 03)**

p max 350 bar

Q max 40 l/min

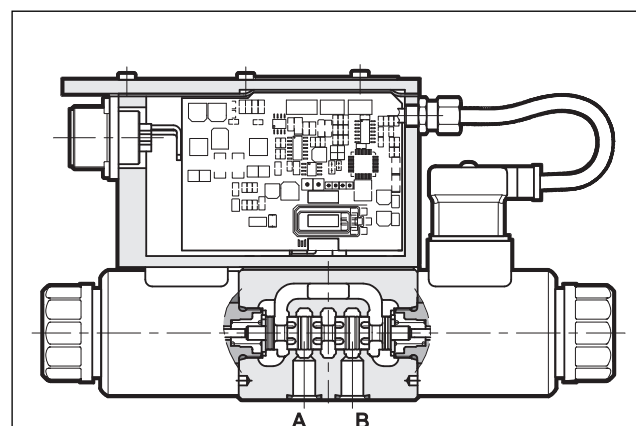
MOUNTING SURFACE



PERFORMANCES (obtained with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronics)

Max operating pressure: - P - A - B ports - T port	bar	350 210
Nominal flow with Δp 10 bar P-T	l/min	4 - 8 - 16 - 26
Response times	see paragraph 4	
Hysteresis	% of Q_{max}	< 3%
Repeatability	% of Q_{max}	< $\pm 1\%$
Electrical characteristics	see paragraph 5	
Ambient temperature range	°C	-10 / +50
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	1,9 2,4

OPERATING PRINCIPLE



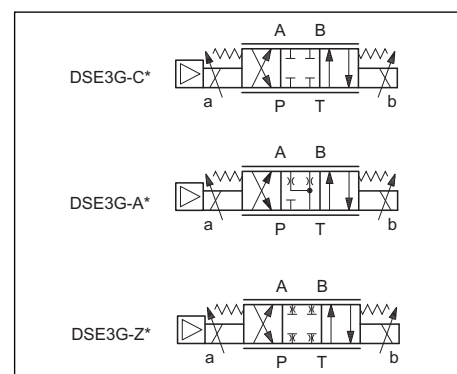
— The DSE3G is a direct operated directional valve with integrated electric proportional control and mounting interface in compliance with ISO 4401 (CETOP RP 121H) standards.

— It is normally used to control the positioning and the speed of hydraulic actuators.

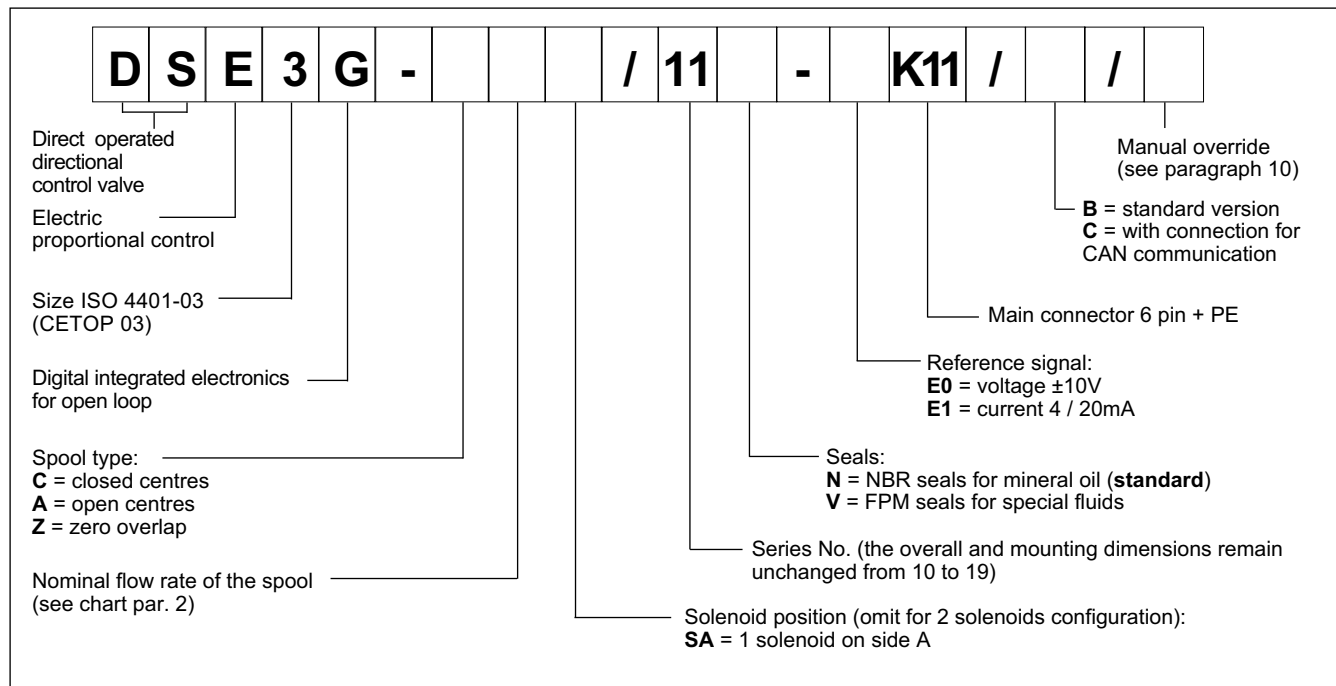
— The valve opening and hence flow rate can be modulated continuously in proportion to the reference signal.

— The valve is controlled directly by an integrated digital amplifier (see par. 5).

HYDRAULIC SYMBOLS (typical)



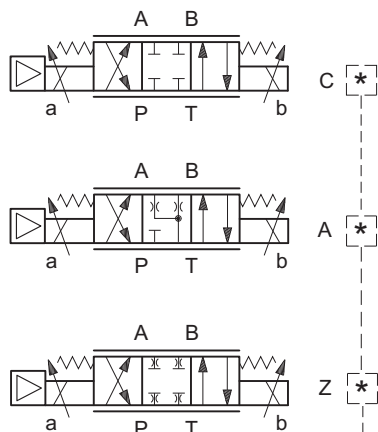
1 - IDENTIFICATION CODE



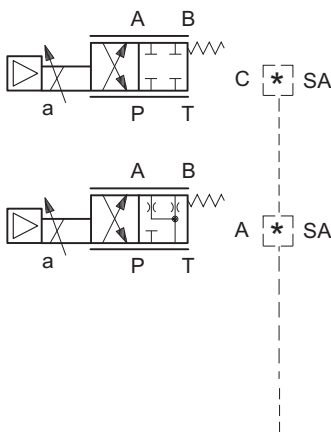
2 - CONFIGURATIONS

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



Configuration 1 solenoid on side A "SA":
2 positions (central + external) with spring centering



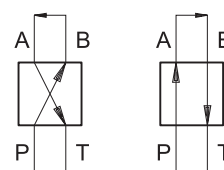
*	Controlled flow with $\Delta p 10$ bar P-T
04	4 l/min
08	8 l/min
16	16 l/min
16/08	16 (P-A) / 08 (B-T) l/min
26	26 l/min
26/13	26 (P-A) / 13 (B-T) l/min

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

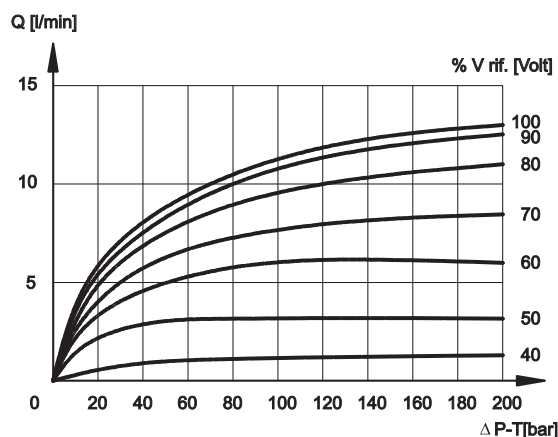
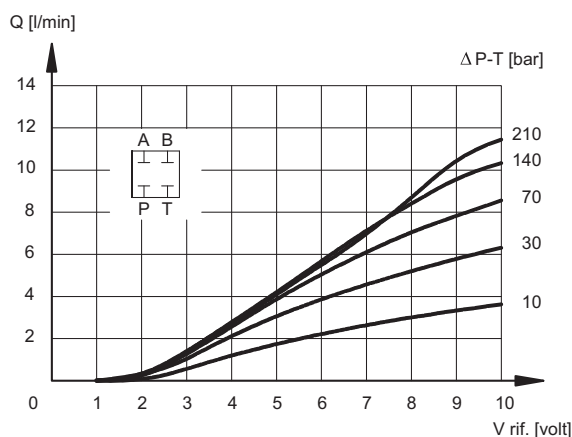
Typical flow rate curves at constant Δp related to the reference signal and measured for the available spools. The Δp values are measured between P and T valve ports.

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

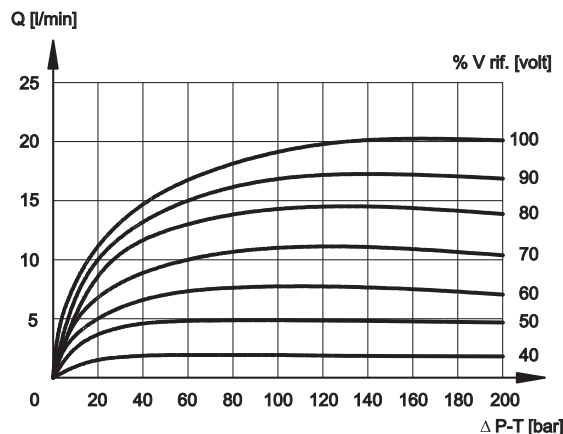
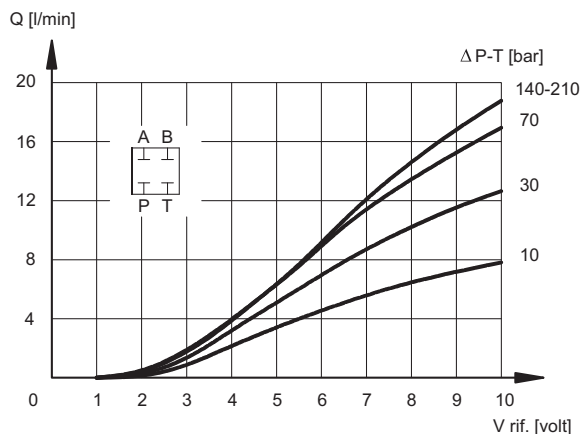
NOTE: for the zero overlap spool (Z), please refer to the characteristic curves of C type spool, considering that the starting flow rate value is approx. 150 mV.



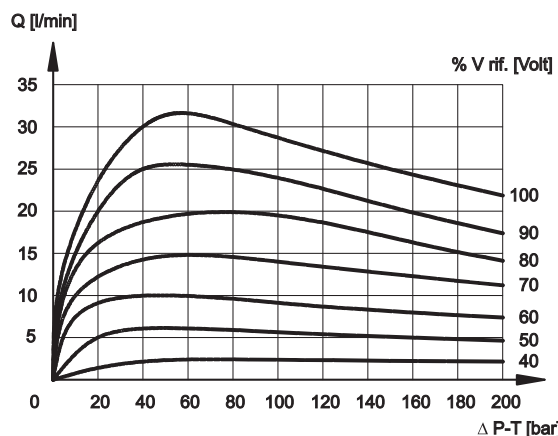
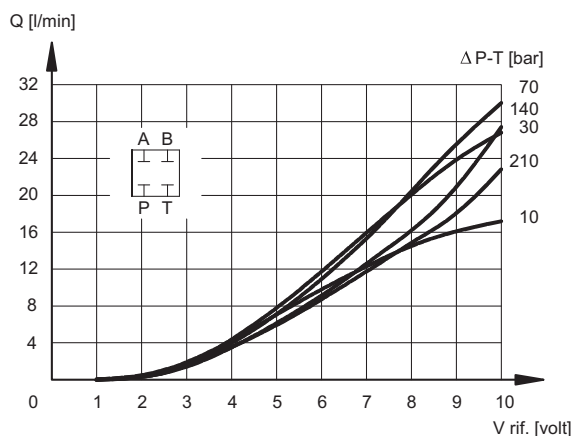
SPOOL TYPE C04



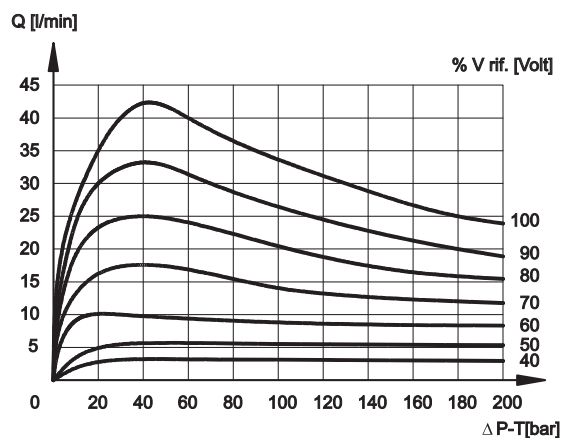
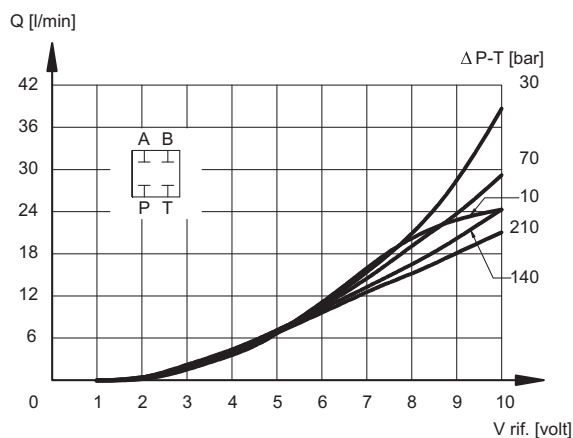
SPOOL TYPE C08



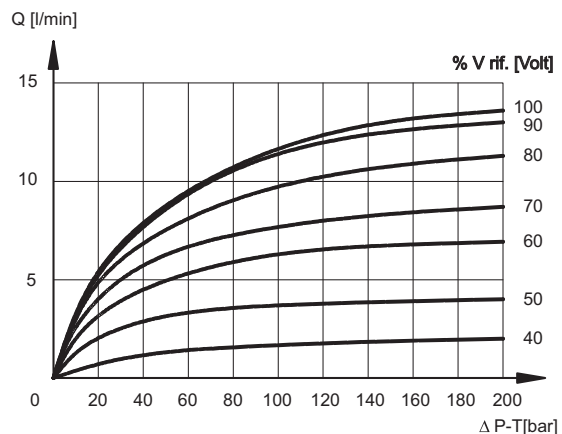
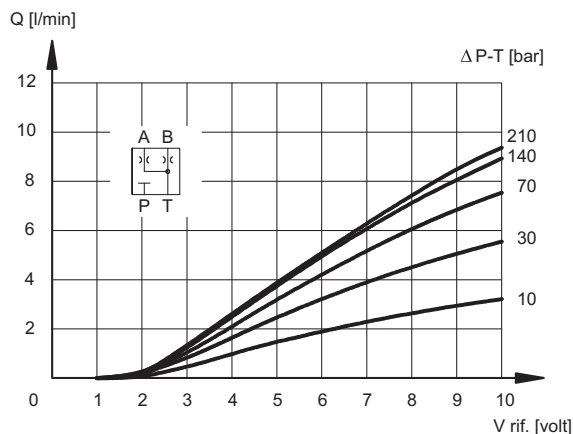
SPOOL TYPE C16



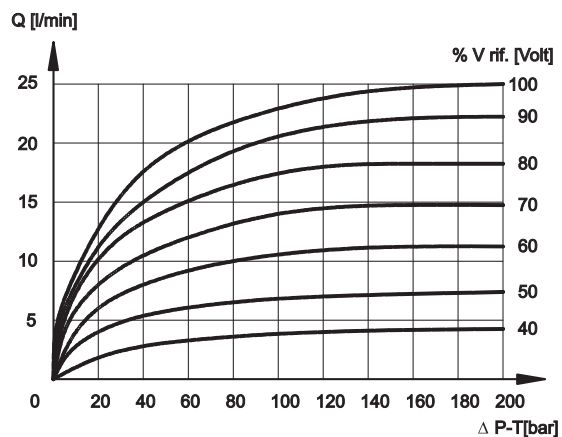
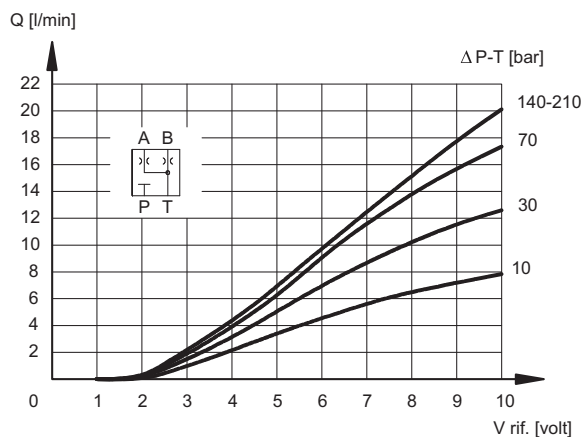
SPOOL TYPE C26



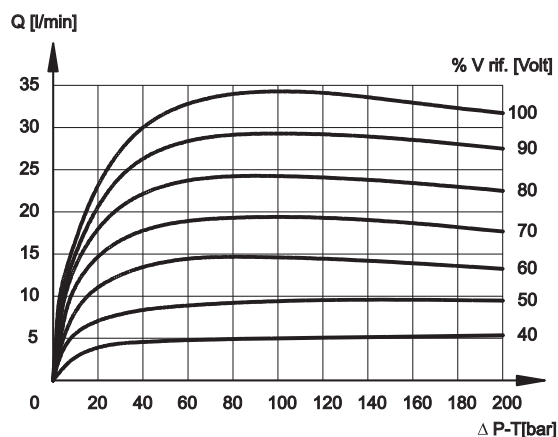
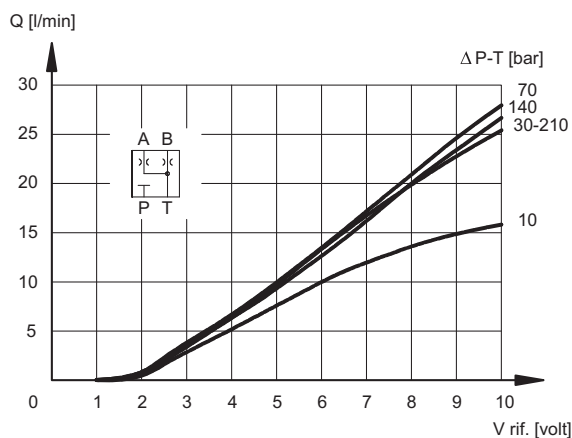
SPOOL TYPE A04



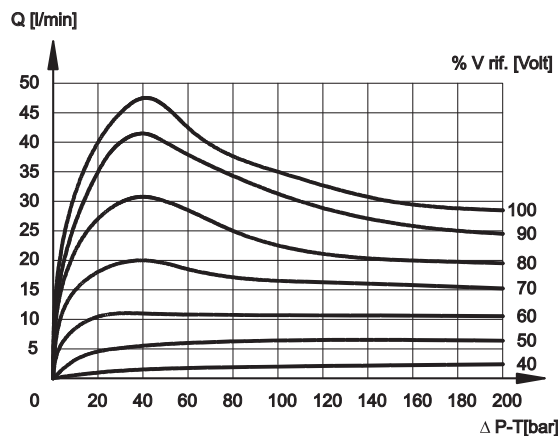
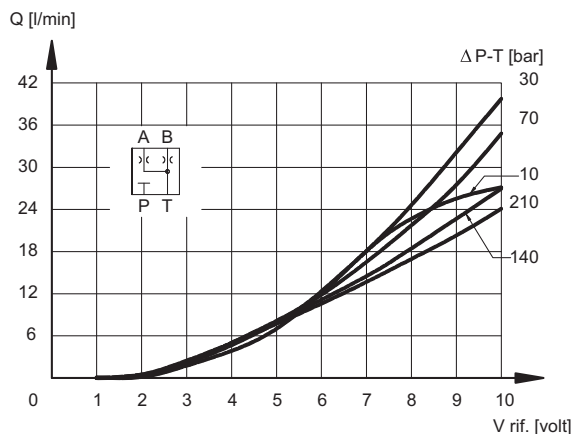
SPOOL TYPE A08



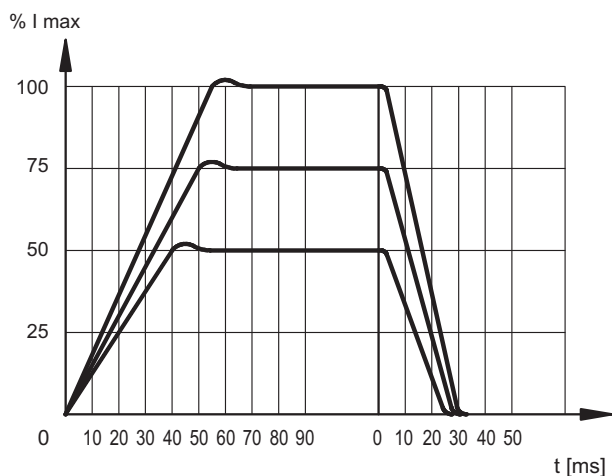
SPOOL TYPE A16



SPOOL TYPE A26



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



With reference time $\pm 100\%$, the rising time is 50 ms, the fall time 25 ms

5 - ELECTRICAL CHARACTERISTICS

5.1 - 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:

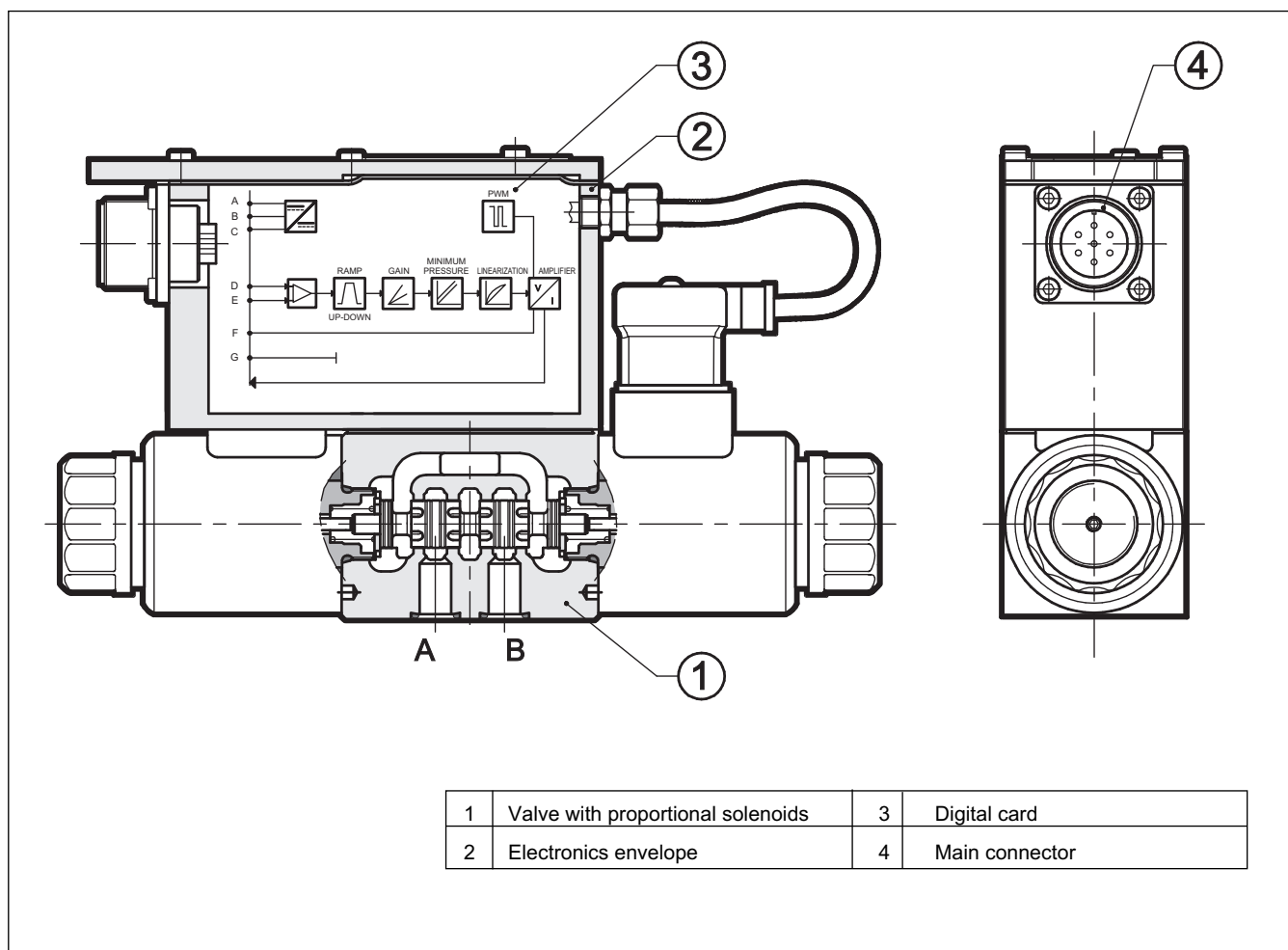
- continuous converting (0,5ms) of the voltage reference signal (E0) or of the current reference signal (E1) in a digital value
- generation of up and down ramps (see note)
- gains limit (see note)
- compensation of the dead band
- linearization of the characteristic curve
- regulation of the current 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. 6.3)

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

5.2 - Functional block diagram



5.3 - 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 (Impedence $R_i > 50\text{ K}\Omega$)
CURRENT SIGNAL (E1)	mA	4 ± 20 (Impedence $R_i = 500\ \Omega$)
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 50081-1	according to 89/336 CEE standards
IMMUNITY	EN 50082-2	
PROTECTION AGAINST ATMOSPHERIC AGENTS		IP67 (CEI EN 60529 standards)

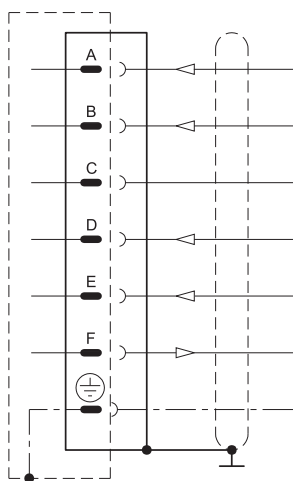
6 - OPERATING MODALITIES

The digital driver of DSE3G valve may be used with different functions and operating modalities, depending on the requested performances.

6.1 -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.

Standard connection scheme with voltage reference signal (E0)

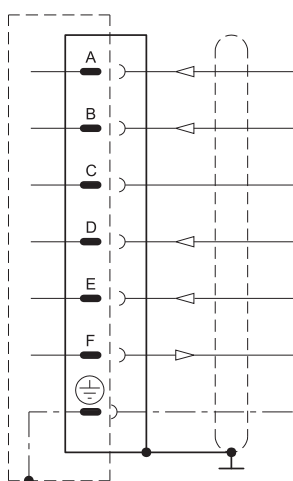


Pin	Values	Function	NOTES
A	24 VDC	Voltage	from 19 to 35 VDC (ripple max 3 Vpp) (see NOTE 3)
B	0 V	Power supply (zero)	0 V
C	----	Not used	----
D	± 10 V	Input rated command	Impedence $R_i > 50$ k Ω (see NOTE 1)
E	0 V	Input rated command	----
F	± 10 V	Coil current	$\pm 100\% I_{MAX}$ (see NOTE 2)
PE	GND	Protective ground	----

6.2 - 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.

Standard connection scheme with current reference signal (E1)



Pin	Values	Function	NOTES
A	24 VDC	Voltage	from 19 to 35 VDC (ripple max 3 Vpp) (see NOTE 3)
B	0 V	Power supply (zero)	0 V
C	----	Not used	----
D	4 ÷ 20 mA	Input signal	Impedence $R_i = 500$ Ω
E	0 V	Zero reference	----
F	± 10 V	Coil current	$\pm 100\% I_{MAX}$ (see NOTE 2)
PE	GND	Protective ground	----

NOTE 1: The input signal is differential type on E0 version only. 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 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.

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

6.3 - 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 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

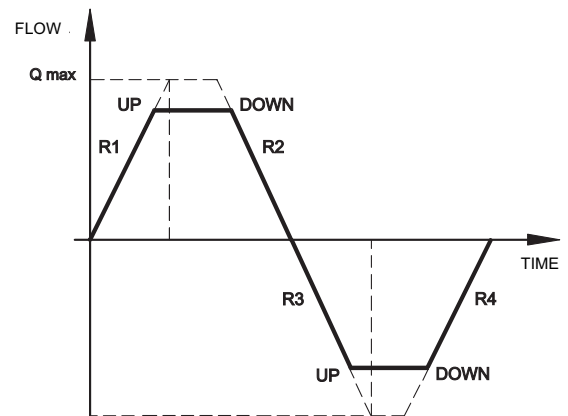
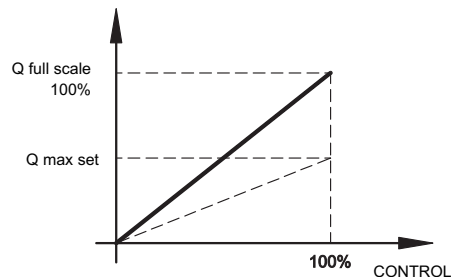
Max time = 40,000 sec

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



6.4 - 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:

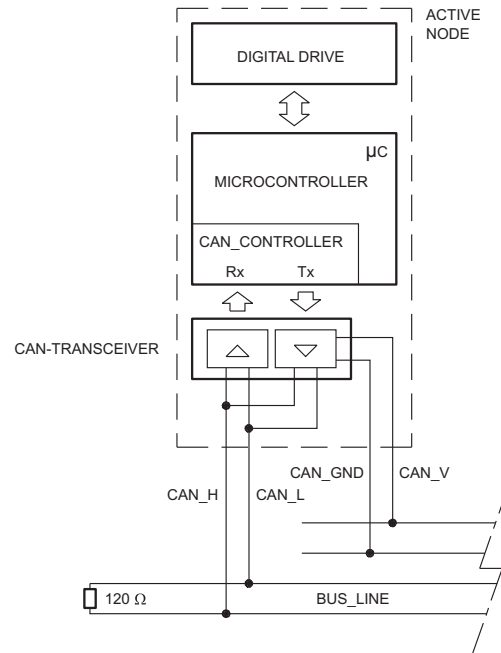
- Parameter storage also in PLC
- Parameters setting in real-time (PDO communication)
- On-line valve diagnostics
- Easy wiring with the serial connection
- Communication program according to international standards

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)

NOTE: If the valve is the closing node of the CAN web, insert a 120 Ω resistance on the connector pins n° 4 and 5.



7 - INSTALLATION

DSE3G valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

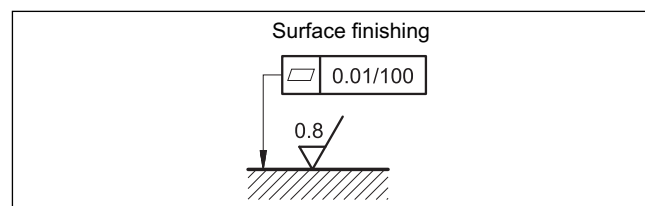
Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.

8 - HYDRAULIC FLUIDS

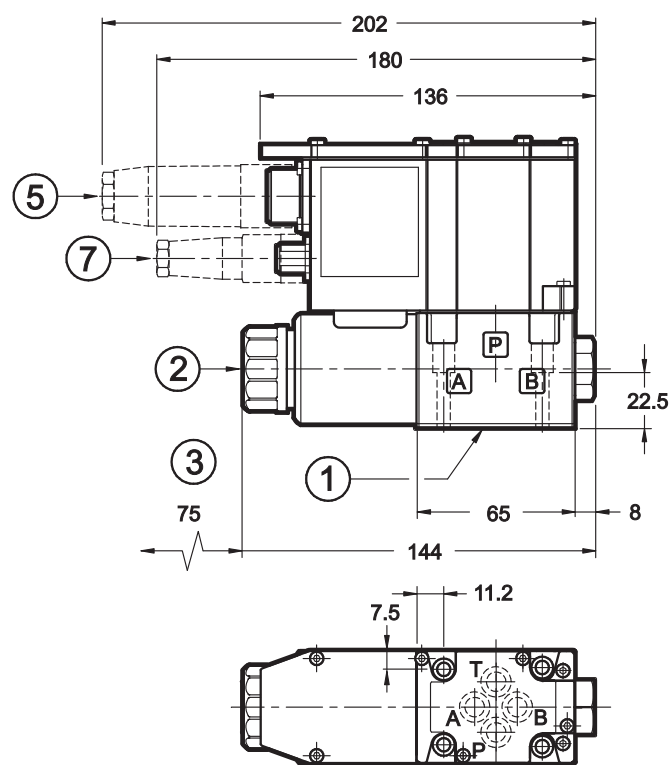
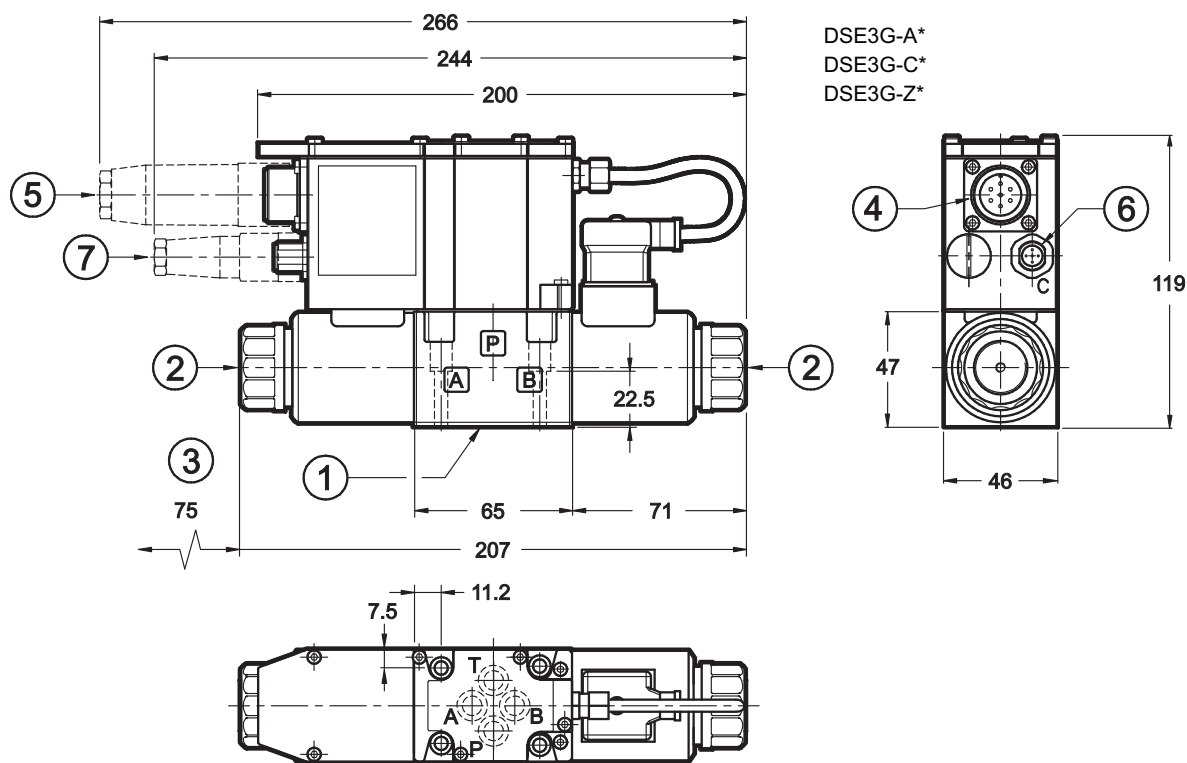
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

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



9 - OVERALL AND MOUNTING DIMENSIONS



DSE3G-A* SA
DSE3G-C* SA

dimensions in mm

1	Mounting surface with sealing rings: 4 OR type 2037 - 90 shore (9.25 x 1.78)
2	Standard manual override embedded in the pipe of the solenoid (included in the supply)
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)

Fastening bolts: 4 bolts M5x30

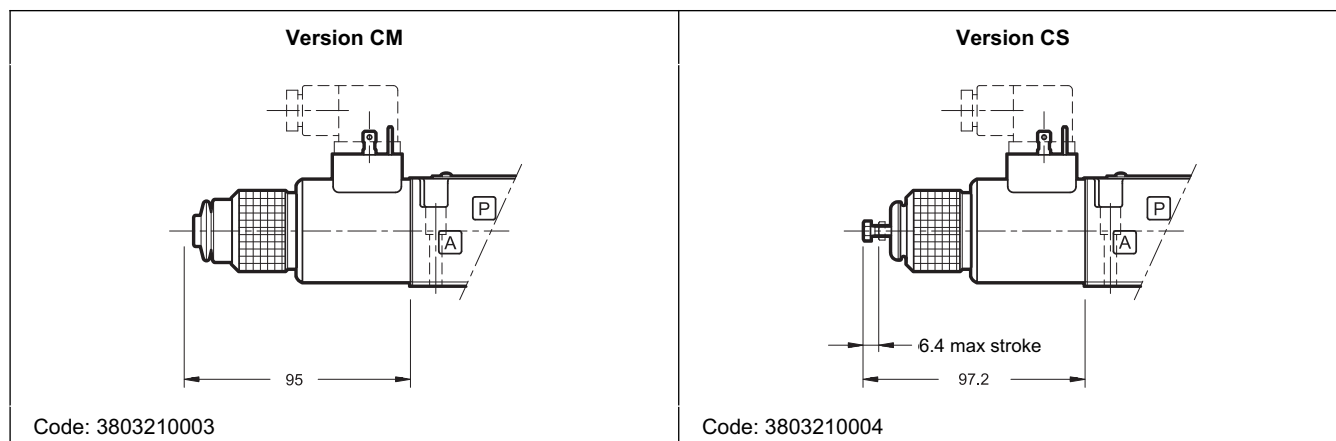
Torque: 5 Nm

10 - MANUAL OVERRIDE

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

Two different manual override version are available upon request:

- **CM** version, manual override belt protected.
- **CS** version, with metal ring nut provided with a M4 screw and a blocking locknut to allow the continuous mechanical operations.



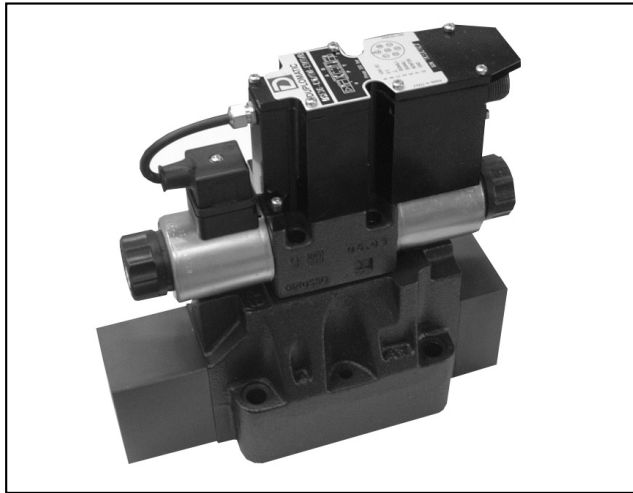
11 - SUBPLATES (See catalogue 51 000)

PMMD-AI3G rear ports
PMMD-AL3G side ports
Ports dimensions: P, T, A, B: 3/8" BSP



DUPLOMATIC OLEODINAMICA SpA

20025 LEGNANO (MI) - P.le Bozzi, 1 / Via Edison
Tel. 0331/47211 - Fax 0331/548328



DSPE*G

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

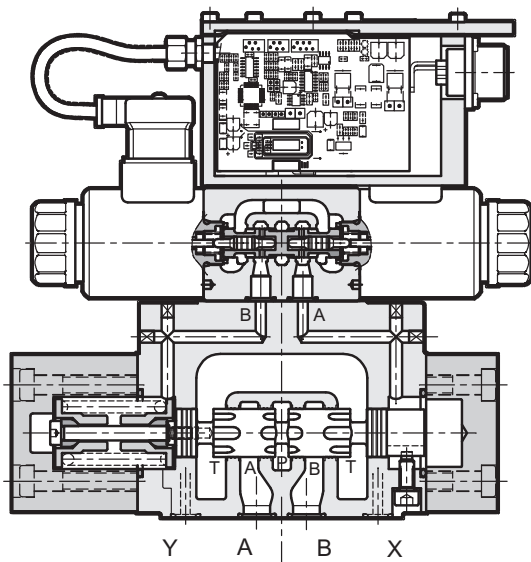
SUBPLATE MOUNTING

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

p max (see performance table)

Q max (see performance table)

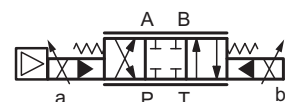
OPERATING PRINCIPLE



- The DSPE*G are pilot operated directional control valves with electric proportional control and integrated electronics and with mounting interface in compliance with ISO 4401 (CETOP RP121H) standards.
- The valve opening and hence the flow rate can be modulated continuously in proportion to the current supplied to the proportional solenoids of the pilot valve.
- They are controlled directly by an integrated digital amplifier (see par. 6).
- They are available in CETOP P05, ISO 4401-05 (CETOP R05), ISO 4401-07 (CETOP 07) and ISO 4401-08 (CETOP 08) sizes. Every size can be supplied with different controlled flow rates, up to 300 l/min.

PERFORMANCES (obtained with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronics)		DSPE5G DSPE5RG	DSPE7G	DSPE8G
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}	< ± 1%		
Electrical characteristics		see paragraph 6		
Ambiente temperature range	°C	-10 / +50		
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

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)

Integrated electronics for open loop

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

Spool nominal flow rate (see table par. 2)

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

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)

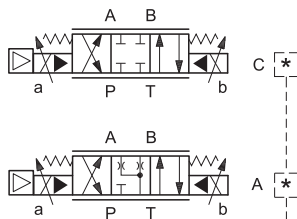
Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

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

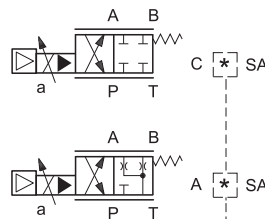
2 - AVAILABLE CONFIGURATIONS

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

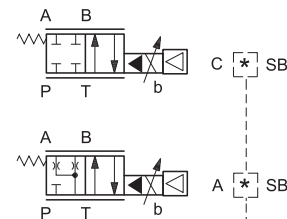
Configuration 2 solenoids:
 3 positions with spring centering



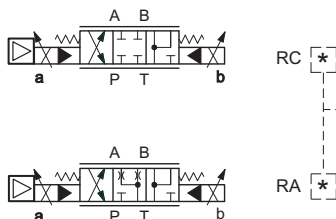
1 solenoid for cross configuration "SA":
 2 positions (central + external) with spring centering (**not available for DSPE8G**)



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



valve type	*	Nominal flow rate 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
	150/75	150 (P-A) / 75 (B-T) l/min
DSPE8G	200	200 l/min
	300	300 l/min
	300/150	300 (P-A) / 150 (B-T) l/min

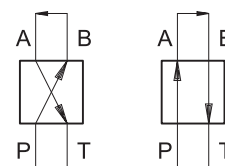


valve type	*	Nominal flow rate with Δp 10 bar P-T
DSPE7G	150/75	150 (P-A) / 75 (B-T) l/min
DSPE8G	300/150	300 (P-A) / 150 (B-T) l/min

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

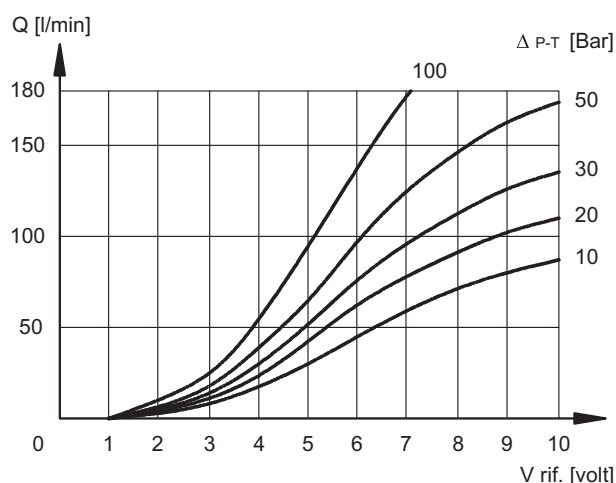
Typical flow rate curves at constant Δp related to the reference signal and measured for the available spools. The Δp values are measured between P and T valve ports.

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.



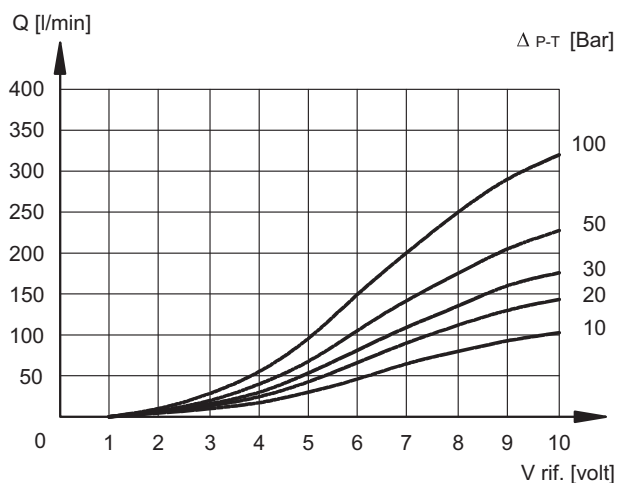
3.1 - Characteristic curves DSPE5G and DSPE5RG

SPOOL C80 - A80

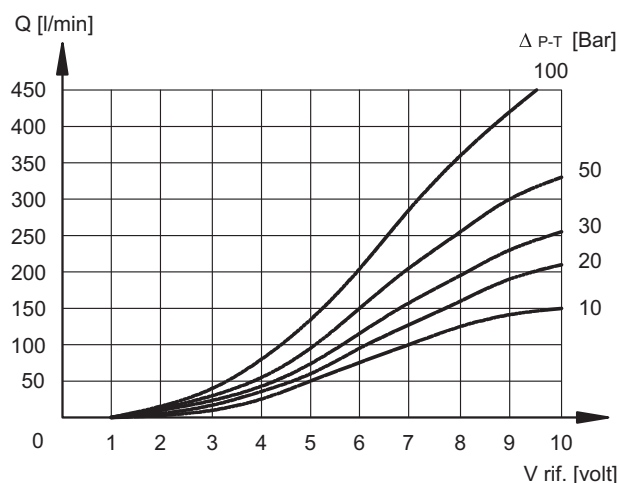


3.2 - Characteristic curves DSPE7G

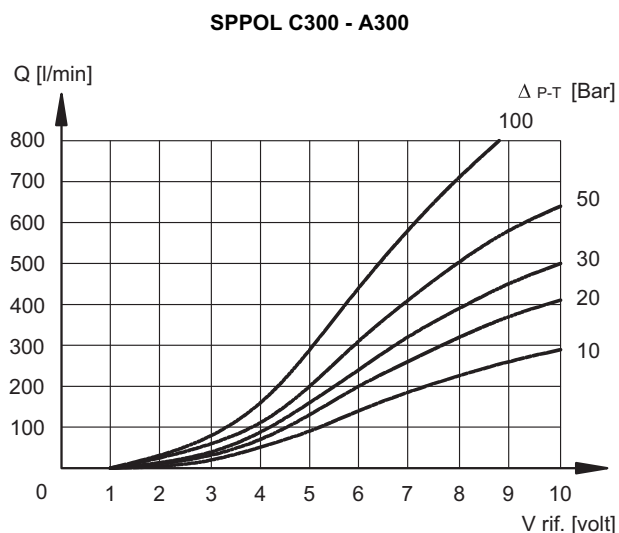
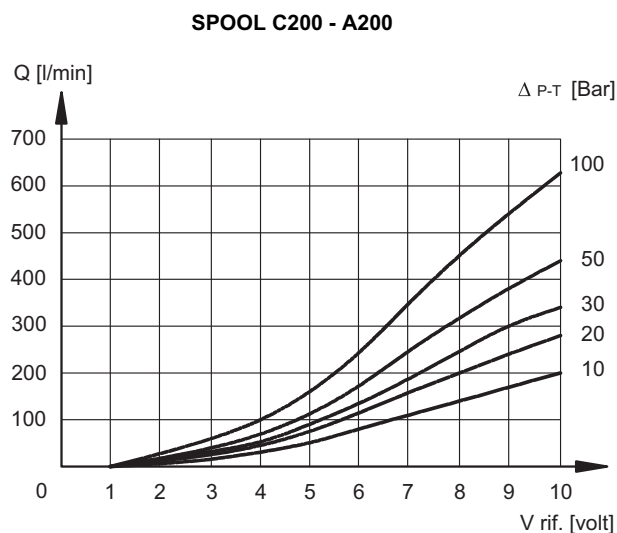
SPOOL C100 - A100



SPOOL C150 - A150



3.3 - Characteristic curves DSPE8G

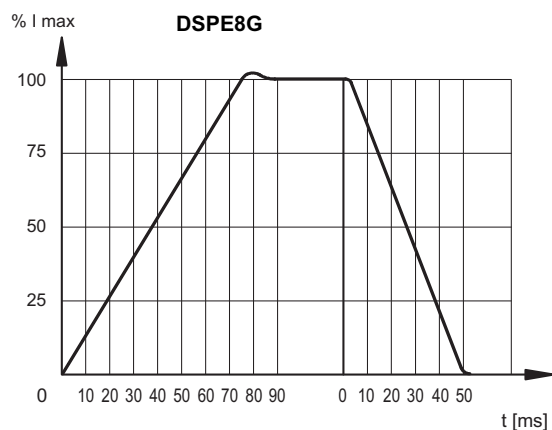
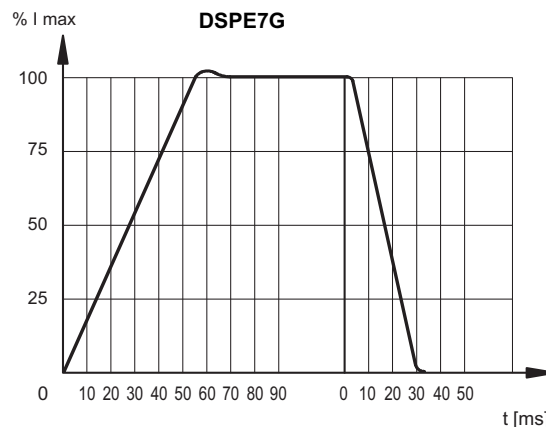
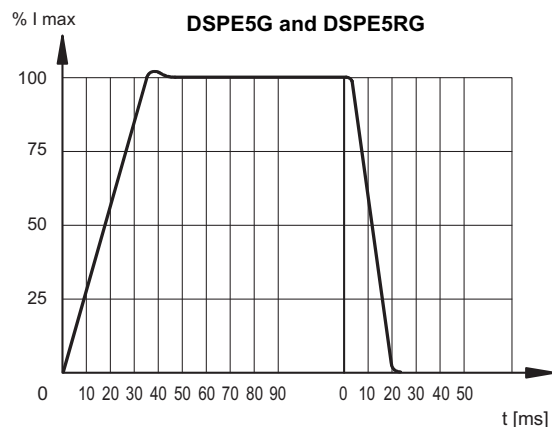


4 - HYDRAULIC CHARACTERISTICS (with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronics)

		DSPE5G DSPE5RG	DSPE7G	DSPE8G
Max flow rate	l/min	180	450	800
Piloting flow requested with operation 0 → 100%	l/min	5,2	9,6	11
Piloting volume requested with operation 0 → 100%	cm ³	1,7	3,2	9,1

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:

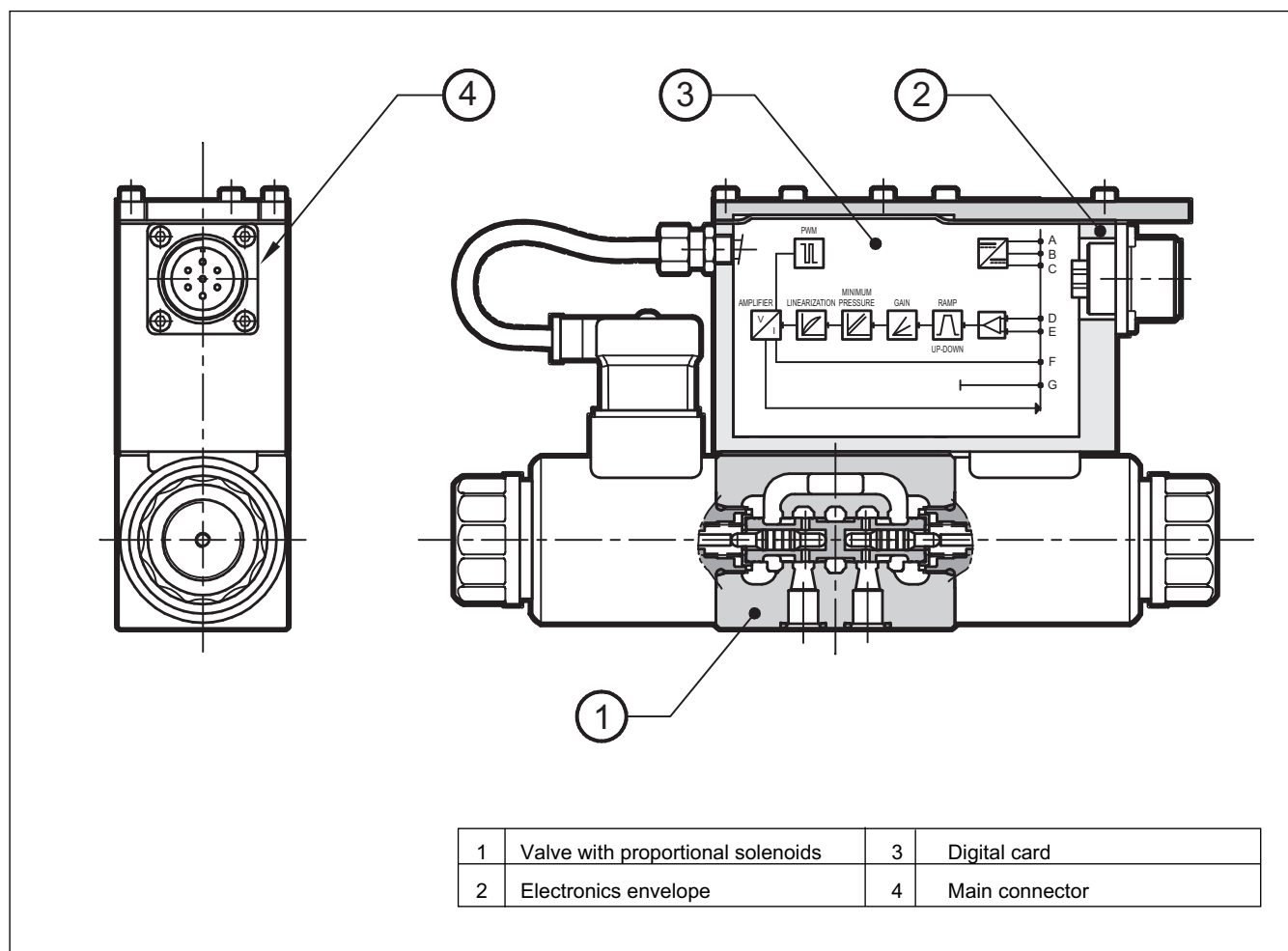
- continuous converting (0,5ms) of the voltage reference signal (E0) or of the current reference signal (E1) in a digital value
- generation of up and down ramps (see **NOTE**)
- gains limit (see **NOTE**)
- compensation of the dead band
- linearization of the characteristic curve
- regulation of the 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 (Impedence Ri > 50 KΩ)
CURRENT SIGNAL (E1)	mA	4 ±20 (Impedence 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 50081-1	according to 89/336 CEE standards
IMMUNITY	EN 50082-2	
PROTECTION AGAINST ATMOSPHERIC AGENTS		IP67 (IEC 144 standards)

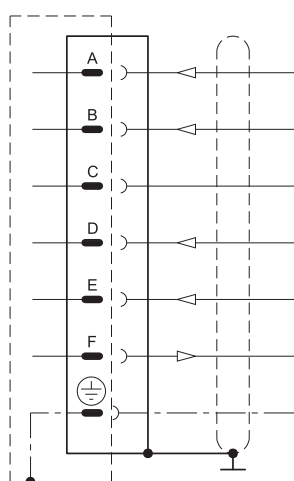
7 - OPERATING MODALITIES

The digital driver of DSE5G valve may be used with different functions and operating modalities, depending on the requested performances.

6.1 - 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.

Standard connection scheme with voltage reference signal (E0)

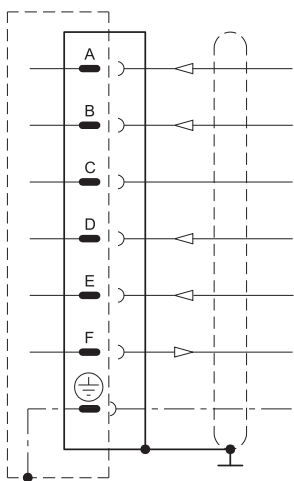


Pin	Values	Function	NOTES
A	24 VDC	Voltage	from 19 to 35 VDC (ripple max 3 Vpp) (see NOTE 3)
B	0 V	Power supply (zero)	0 V
C	----	Not used	----
D	± 10 V	Input rated command	Impedence $R_i > 50 \text{ k}\Omega$ (see NOTE 1)
E	0 V	Input rated command	----
F	± 10 V	Coil current	± 100% I_{MAX} (see NOTE 2)
PE	GND	Protective ground	----

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.

Standard connection scheme with current reference signal (E1)



Pin	Values	Function	NOTES
A	24 VDC	Voltage	from 19 to 35 VDC (ripple max 3 Vpp) (see NOTE 3)
B	0 V	Power supply (zero)	0 V
C	----	Not used	----
D	4 ÷ 20 mA	Input signal	Impedence $R_i = 500 \Omega$
E	0 V	Zero reference	----
F	± 10 V	Coil current	± 100% I_{MAX} (see NOTE 2)
PE	GND	Protective ground	----

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.

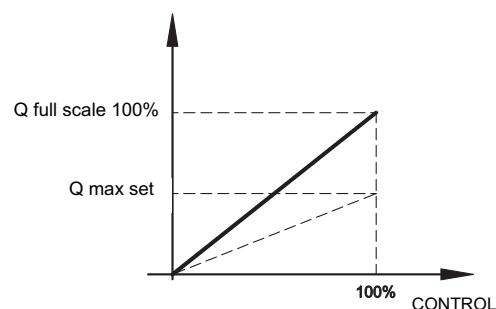
The parameters that can be set are described below:

Maximun current (Gain regulation)

Imax A and Imax 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.

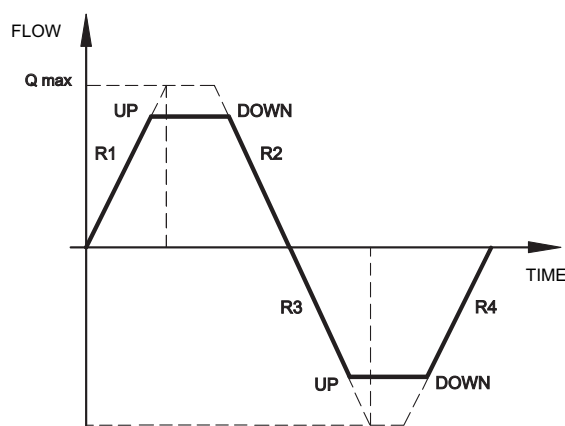
Increase time of Ramp R3 - solenoid B: sets the current increase time for a variation from 0 to 100% of the input reference from zero to -10V.

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:

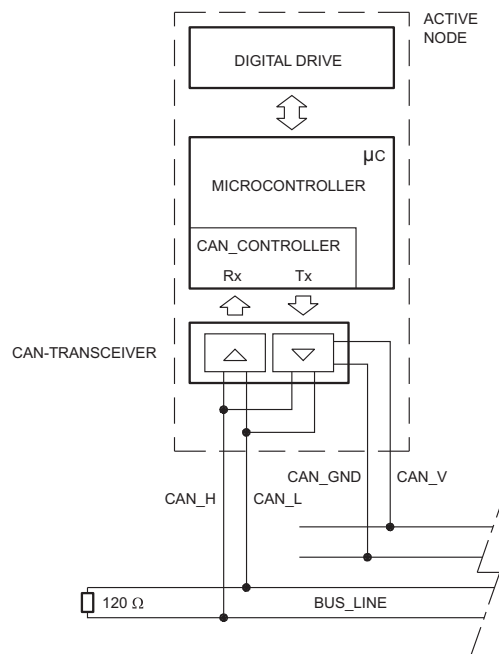
- Parameter storage also in PLC
- Parameters setting in real-time (PDO communication)
- On-line valve diagnostics
- Easy wiring with the serial connection
- Communication program according to international standards

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.

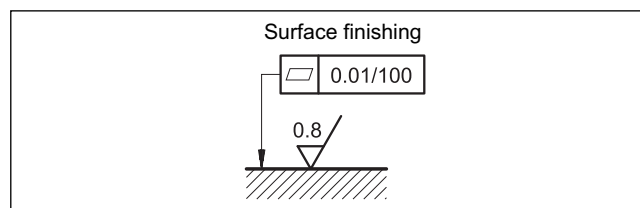


8 - INSTALLATION

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.

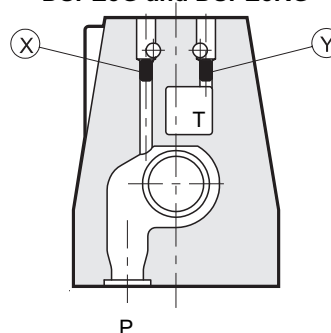
The fluid must be preserved in its physical and chemical characteristics.

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

DSPE5G and DSPE5RG

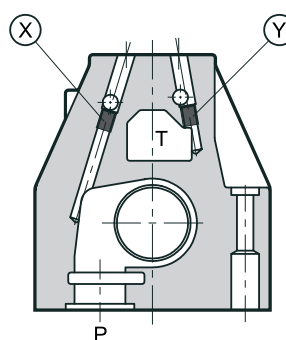


X: M5x6 plug for external pilot
Y: M5x6 plug for external drain

PRESSURES (bar)

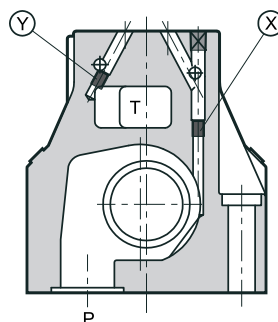
Pressure	MIN	MAX
Piloting pressure on X port	30	210 (NOTE)
Pressure on T port with internal drain	–	10
Pressure on T port with external drain	–	250

DSPE7G



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

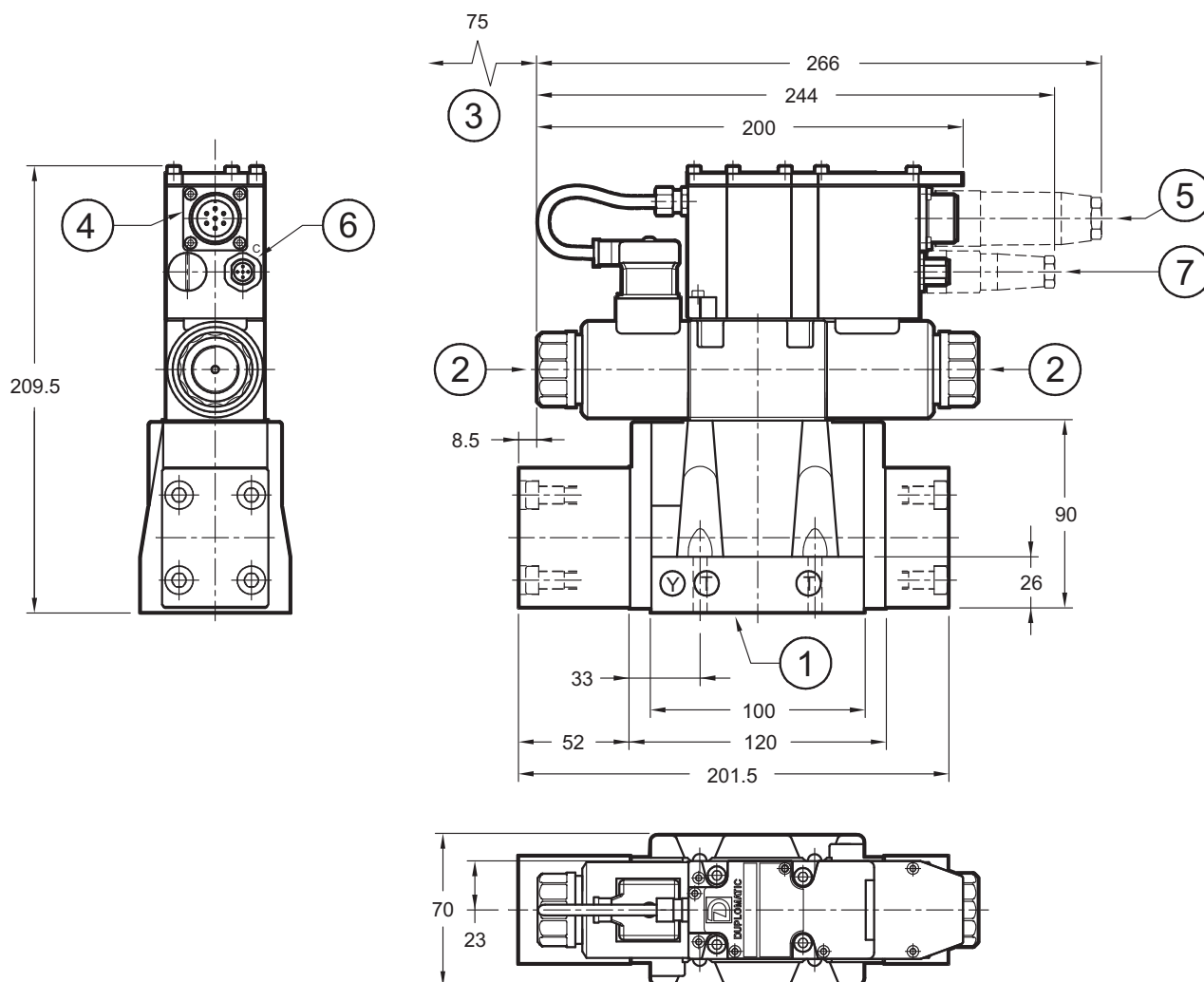
DSPE8G



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

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).

11 - OVERALL AND MOUNTING DIMENSIONS DSPE5G and DSPE5RG



NOTES:

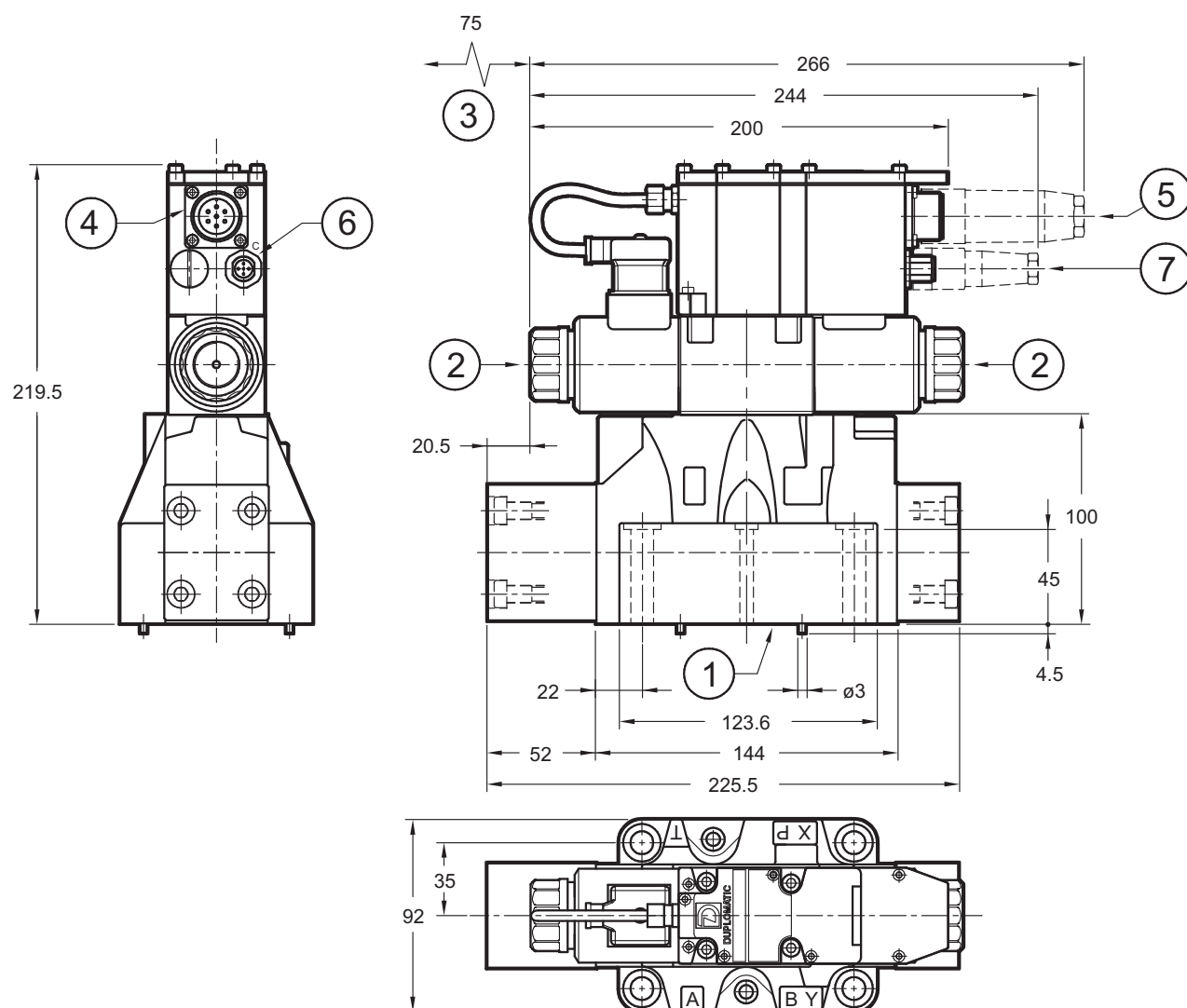
- for single solenoid overall dimensions see par. 14.
- for overall dimensions with Z option (fixed adjustment pressure reducing valve) see par. 15.
- for mounting surface see par. 16.
- at the first start up, or after a long period of no use, it is necessary to vent the air through the breather ② placed at the end of the solenoid tube.

dimensions in mm

Valve fastening: 4 bolts M6x35
Tightening torque: 8 Nm (bolts A 8.8) - 14 Nm (bolts A 12.9)
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:

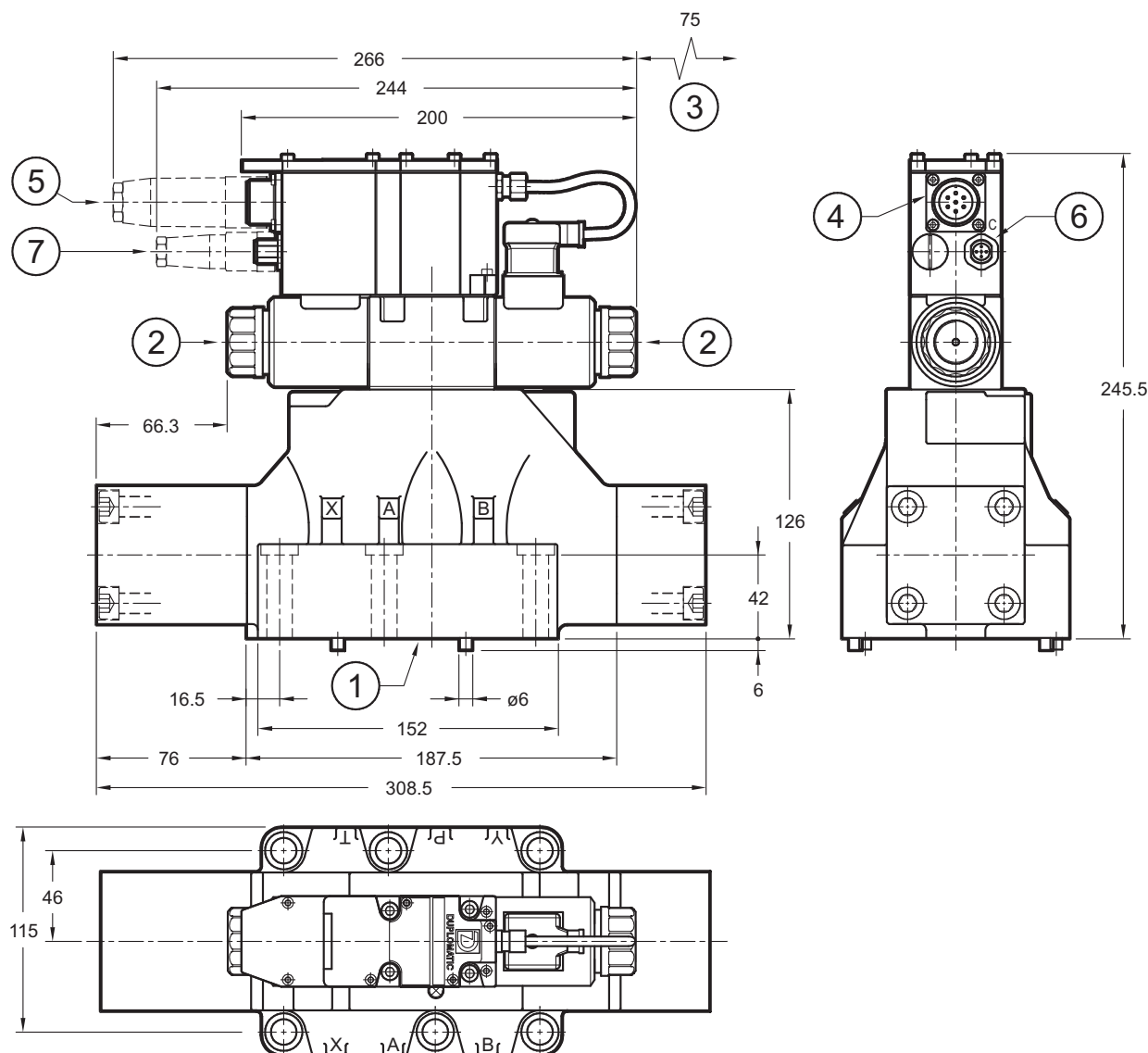
- for single solenoid overall dimensions see par. 14.
- for overall dimensions with Z option (fixed adjustment pressure reducing valve) see par. 15.
- for mounting surface see par. 16.
- at the first start up, or after a long period of no use, it is necessary to vent the air through the breather ② placed at the end of the solenoid tube.

dimensions in mm

Valve fastening:	4 bolts M10x60 2 bolts M6x50
Tightening torque	M10x60: 40 Nm (bolts A 8.8) - 67 Nm (bolts A 12.9) M6x50: 8 Nm (bolts A 8.8) - 14 Nm (bolts A 12.9)
Thread of mounting holes:	M6x12; M10x18
Sealing rings:	4 OR type 130 (22.22x2.62) - 90 Shore 2 OR type 2043 (10.82x1.78) - 90 Shore

1	Mounting surface with sealing rings
2	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 overall dimensions with Z option (fixed adjustment pressure reducing valve) see par. 15.

- for mounting surface see par. 16.

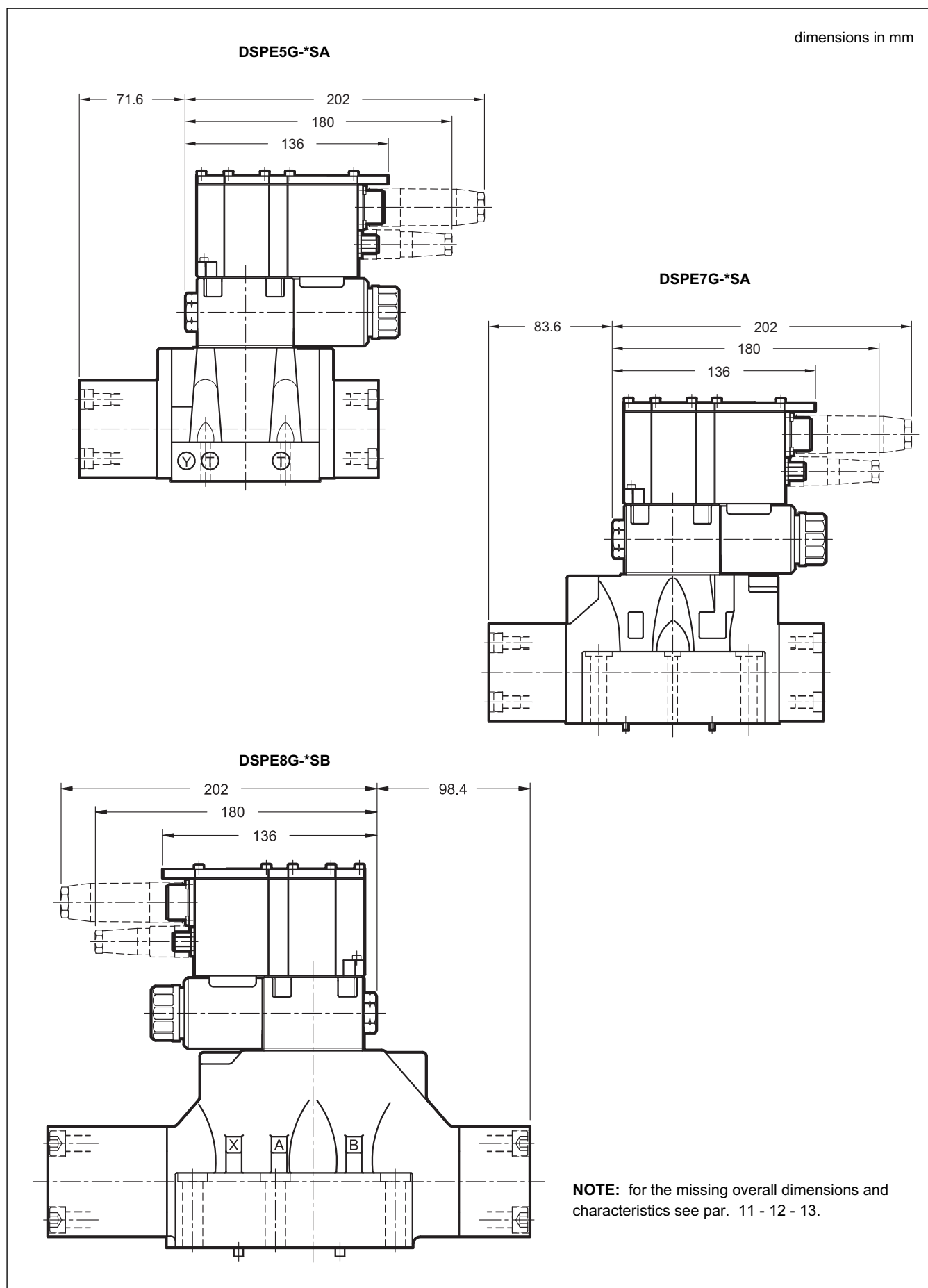
- at the first start up, or after a long period of no use, it is necessary to vent the air through the breather ② placed at the end of the solenoid tube.

dimensions in mm

Valve fastening: 6 bolts M12x60
Tightening torque: 69 Nm (bolts A 8.8) - 115 Nm (bolts A 12.9)
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

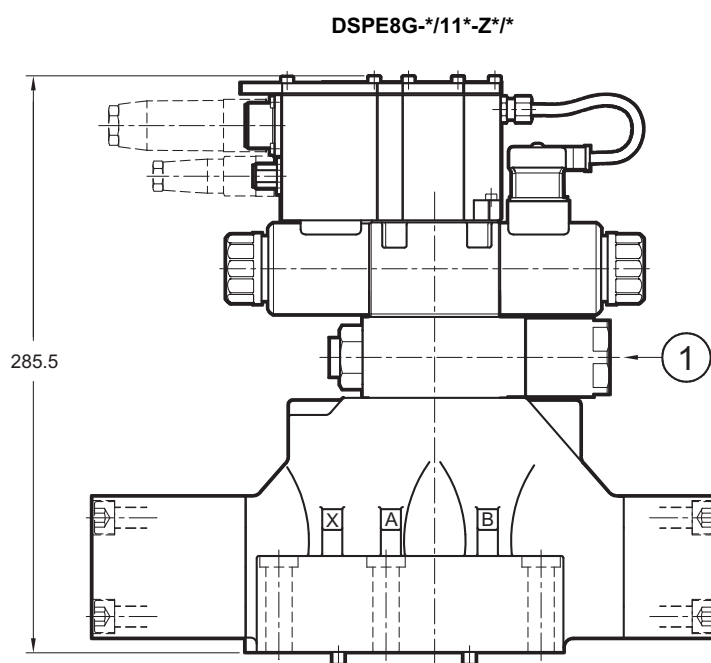
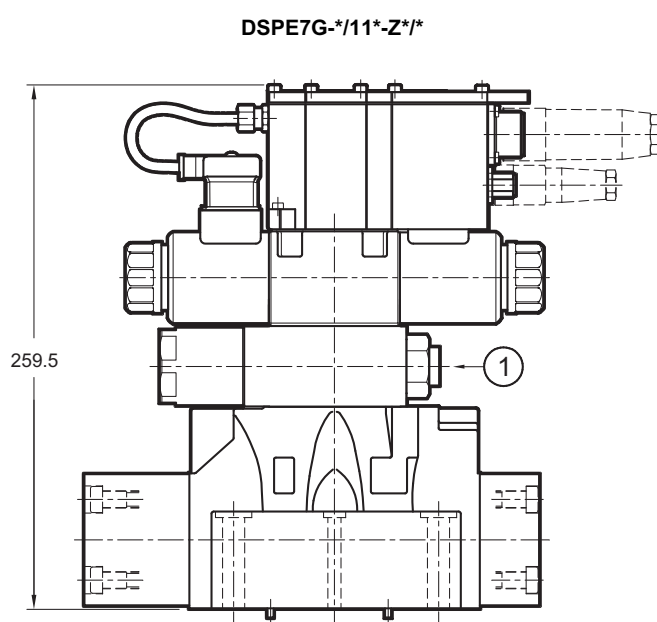
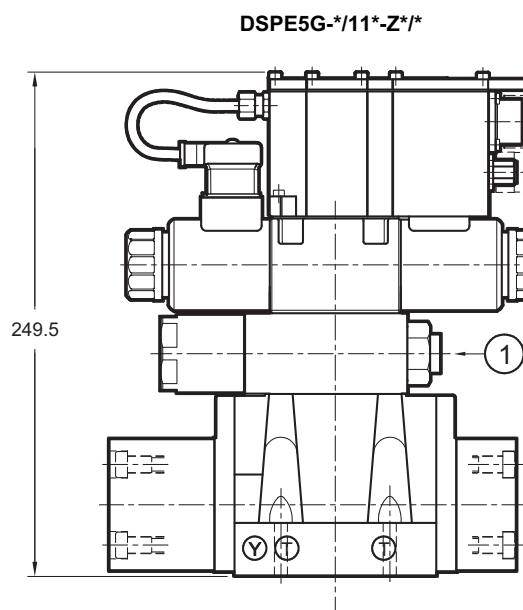
1	Mounting surface with sealing rings
2	Breather (male hexagonal spanner 4)
3	Coil removal space
4	Main connection
5	Electrical connector 7 pin DIN 43563 - IP67 PG11 EX7S/L/10 code 3890000003 (to be ordered separately)
6	CAN-Bus connection (only for version C)
7	Electrical connector 5 pin M12 - IP67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

14 - OVERALL AND MOUNTING DIMENSIONS SINGLE SOLENOID VALVES



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

dimensions in mm

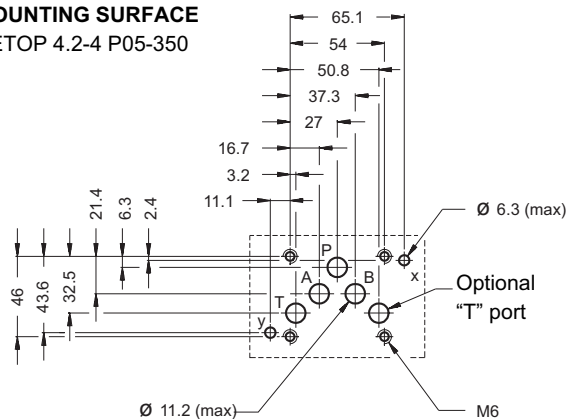


NOTE: for the missing overall dimensions and characteristics see par. 11 - 12 - 13.

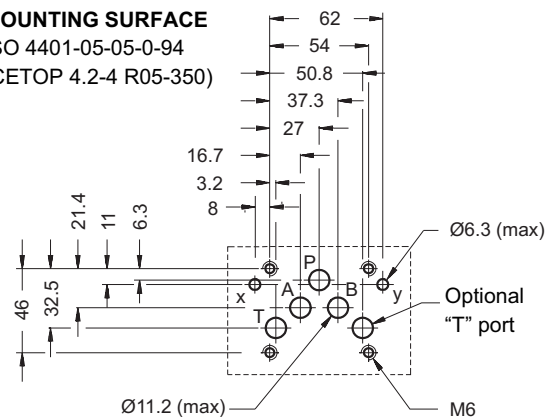
1	30 bar fixed adjustment pressure reducing valve
---	---

16 - MOUNTING SURFACES

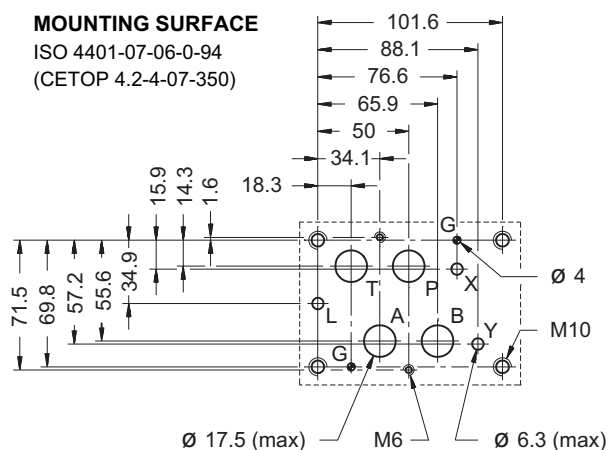
MOUNTING SURFACE
CETOP 4.2-4 P05-350



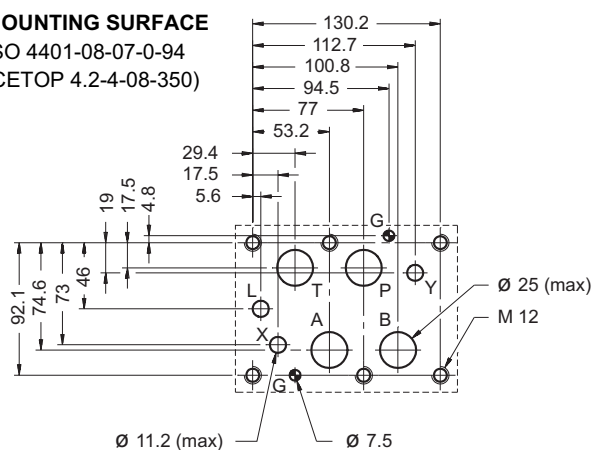
MOUNTING SURFACE
ISO 4401-05-05-0-94
(CETOP 4.2-4 R05-350)



MOUNTING SURFACE
ISO 4401-07-06-0-94
(CETOP 4.2-4-07-350)



MOUNTING SURFACE
ISO 4401-08-07-0-94
(CETOP 4.2-4-08-350)



17 - SUBPLATES (See catalogue 51 000)

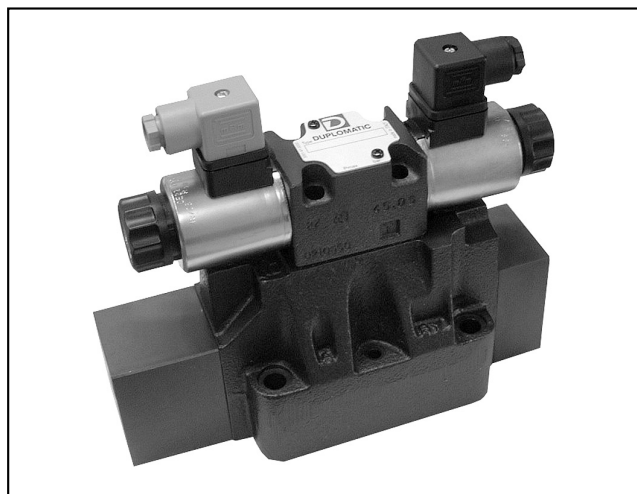
	DSPE5G	DSPE7G	DSPE8G
Type with rear ports	PME4-AI5G	PME07-AI6G	
Type with side ports	PME4-AL5G	PME07-AL6G	PME5-AL8G
Thread of ports P, T, A, B, X, Y	3/4" 1/4" BSP	1" BSP 1/4" BSP	1 1/2" BSP 1/4" BSP



DUPLOMATIC
HYDRAULICS

DUPLOMATIC OLEODINAMICA SpA

20025 LEGNANO (MI) - P.le Bozzi, 1 / Via Edison
Tel. 0331/472111 - Fax 0331/548328



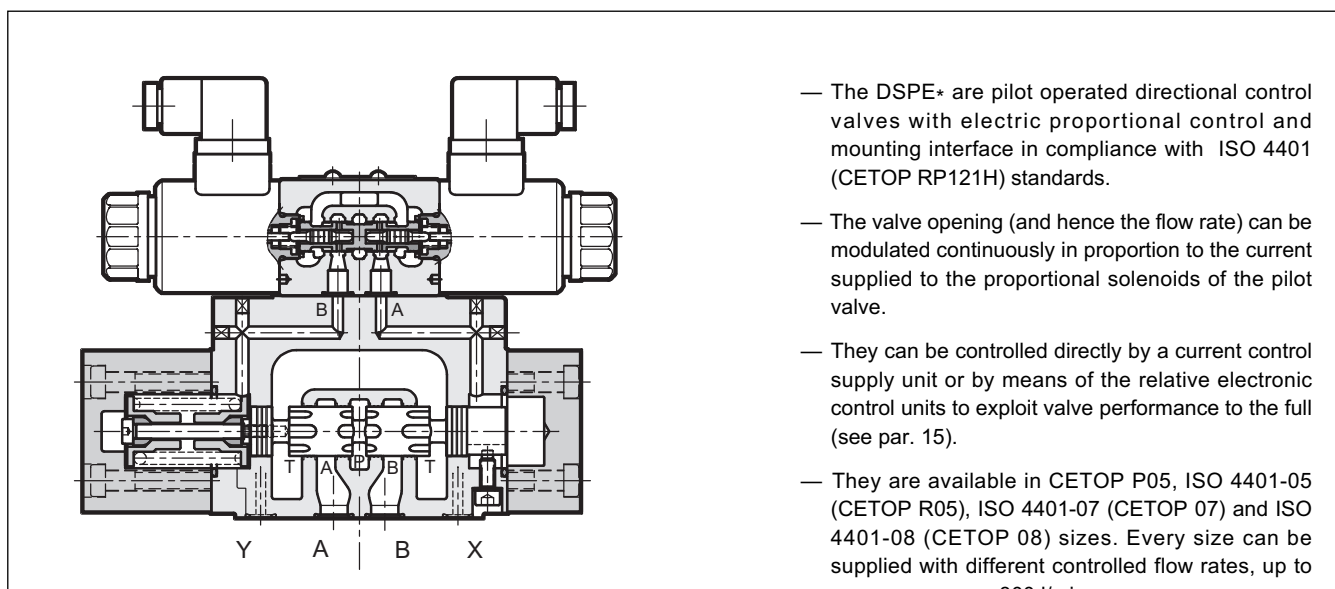
DSPE* PILOT OPERATED DIRECTIONAL VALVE WITH PROPORTIONAL CONTROL SERIES 11

DSPE5 **CETOP P05**
DSPE5R **ISO 4401-05 (CETOP R05)**
DSPE7 **ISO 4401-07 (CETOP 07)**
DSPE8 **ISO 4401-08 (CETOP 08)**

p max (see performances table)

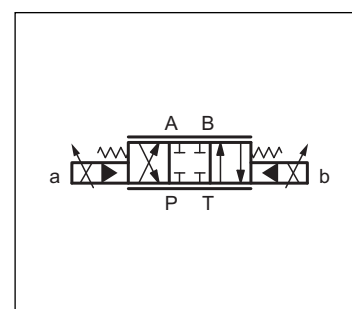
Q max (see performances table)

OPERATING PRINCIPLE



PERFORMANCES (obtained with viscosity of 36 cSt at 50°C with the relative electronic control units)		DSPE5 DSPE5R	DSPE7	DSPE8
Max operating: - P - A - B ports - T port	bar	350 see paragraph 6		
Controlled flow rate with Δp 10 bar P-T	l/min	see paragraph 2		
Step response		see paragraph 8		
Hysteresis	% Q _{max}	< 4%		
Repeatability	% Q _{max}	< ±2%		
Electrical characteristics		see paragraph 7		
Ambient temperature range	°C	-10 / +50		
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	7,1 7,5	9,3 9,7	15,6 16

HYDRAULIC SYMBOL (typical)



1 - IDENTIFICATION CODE

D	S	P	E	-		/	11	-		/	K1	/	
---	---	---	---	---	--	---	----	---	--	---	----	---	--

Pilot operated directional control valve

Electric proportional control

Nominal size:
5 = CETOP P05 (**NOTE**)
5R = ISO 4401-05 (CETOP R05)
7 = ISO 4401-07 (CETOP 07)
8 = ISO 4401-08 (CETOP 08)

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

Spool nominal flow rate (see table par. 2)

Configurations for single solenoid version (omit for double solenoid version):
SA = 1 solenoid for cross configuration
SB = 1 solenoid for parallel configuration

NOTE: This version is interchangeable with the model E4E Diplomatic

Manual override: (see par. 14)

Coil electrical connection: for connector type DIN 43650 (**standard**)
D12 = voltage 12V DC
D24 = voltage 24V DC

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

Piloting: **I** = internal
E = external
Z = internal piloting with 30 bar fixed adj. pressure reducing valve (see par. 6)

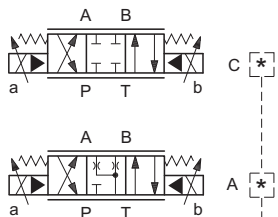
Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

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

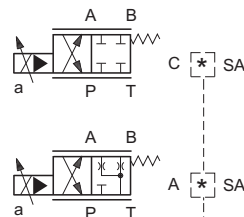
2 - AVAILABLE CONFIGURATIONS

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

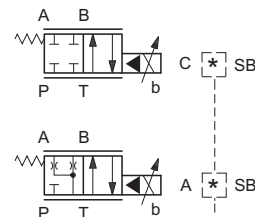
Configuration 2 solenoids:
 3 positions with spring centering



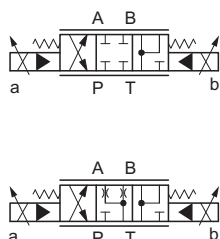
1 solenoid for cross configuration "SA":
 2 positions (central + external) with spring centering



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



valve type	*	nominal flow rate with Δp 10 bar P-T
DSPE5	80	80 l/min
DSPE5R	80/40	80 (P-A) / 40 (B-T) l/min
DSPE7	100	100 l/min
	150	150 l/min
	150/75	150 (P-A) / 75 (B-T) l/min
DSPE8	200	200 l/min
	300	300 l/min
	300/150	300 (P-A) / 150 (B-T) l/min



RC *

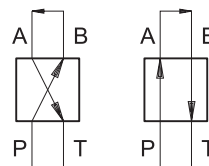
RA *

valve type	*	nominal flow rate with Δp 10 bar P-T
DSPE7	150/75	150 (P-A) / 75 (B-T) l/min
DSPE8	300/150	300 (P-A) / 150 (B-T) l/min

3 - CHARACTERISTIC CURVES (values measured with viscosity of 36 cSt at 50°C with valves in conjunction with the relative electronic control units)

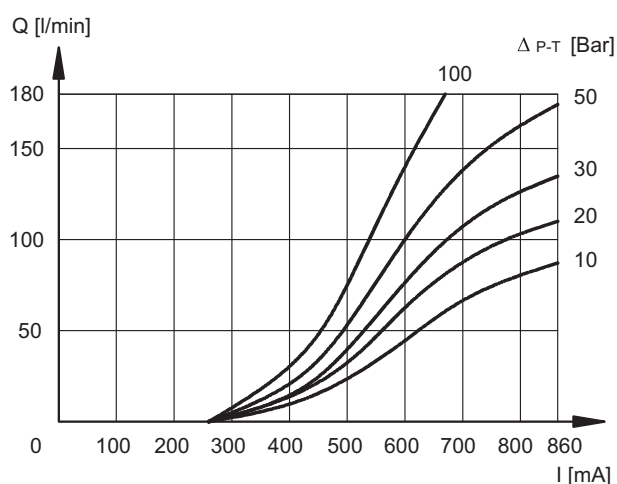
Typical flow rate control curves at constant Δp according to current supply to the solenoid (D24 version, 860 mA max current), measured for the available spool types.

The reference Δp values are measured between valve ports P and T.



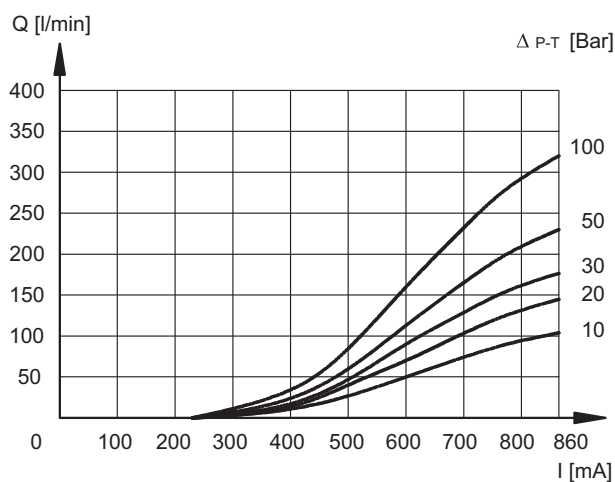
3.1 - Characteristic curves DSPE5 e DSPE5R

SPOOL C80 - A80

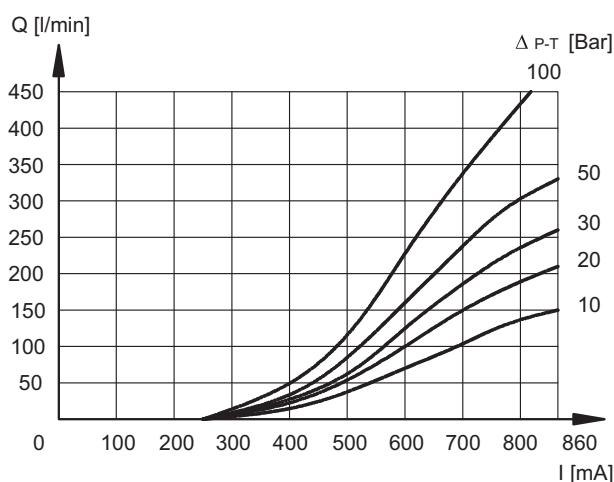


3.2 - Characteristic curves DSPE7

SPOOL C100 - A100

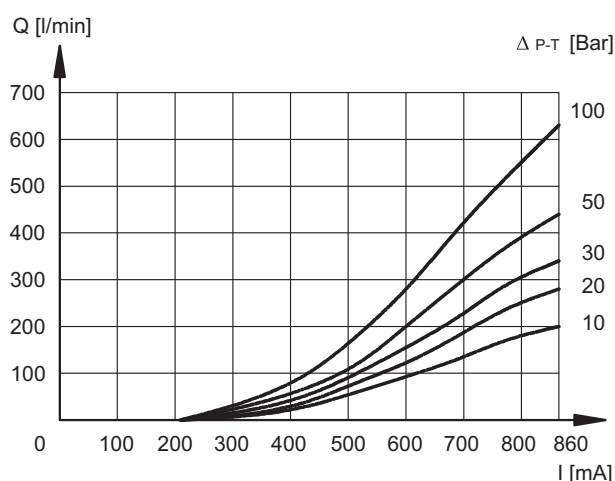


SPOOL C150 - A150

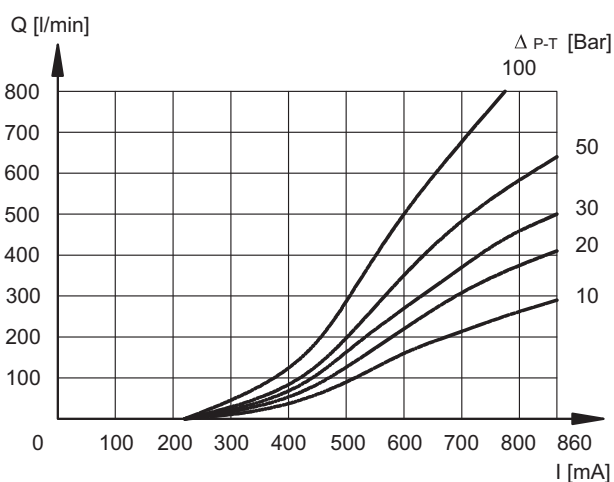


3.3 - Characteristic curves DSPE8

SPOOL C200 - A200



SPOOL C300 - A300



4 - HYDRAULIC CHARACTERISTICS (values measured with viscosity of 36 cSt at 50°C with valves in conjunction with the relative electronic control units)

		DSPE5 DSPE5	DSPE7	DSPE8
Max flow rate	l/min	180	450	800
Piloting flow requested with operation 0 → 100%	l/min	5,2	9,6	11
Piloting volume requested with operation 0 → 100%	cm ³	1,7	3,2	9,1

5 - 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.

6 - PILOTING AND DRAINAGE

The DSPE valves are available with piloting and drainage, both internal and external.

The version with external drainage allows a higher backpressure 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)

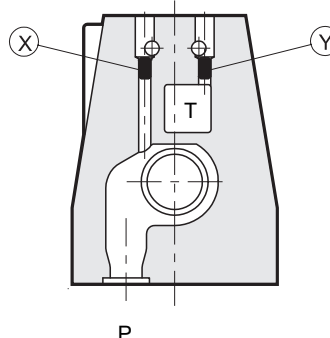
Pressure	MIN	MAX
Piloting pressure on X port	30	210 (NOTE)
Pressure on T port with internal drain	–	10
Pressure on T port with external drain	–	250

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).

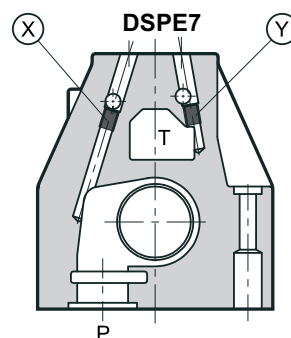
DSPE5 and DSPE5



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

P

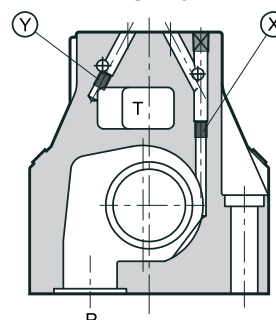
DSPE7



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

P

DSPE8



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

P

7 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut. It can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	VCC	12	24
RESISTANCE (at 20°C)	Ω	3,66	17,6
MAXIMUM CURRENT	A	1,88	0,86
DUTY CYCLE	100%		
ELECTROMAGNETIC COMPATIBILITY (EMC) - EMISSIONS EN 50081-1 - IMMUNITY EN 50082-2	in compliance with 89/336 CEE		
PROTECTION TO ATMOSPHERIC AGENTS (according to IEC 144 standards)	IP 65		

8 - STEP RESPONSE (measured with mineral oil with viscosity of 36 cSt at 50°C in conjunction with the relative electronic control units)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

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

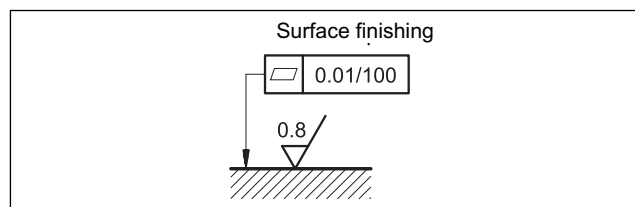
Reference signal step	0 → 100%	100 → 0%
	Step response [ms]	
DSPE5 and DSPE5R	50	30
DSPE7	80	50
DSPE8	100	70

9 - INSTALLATION

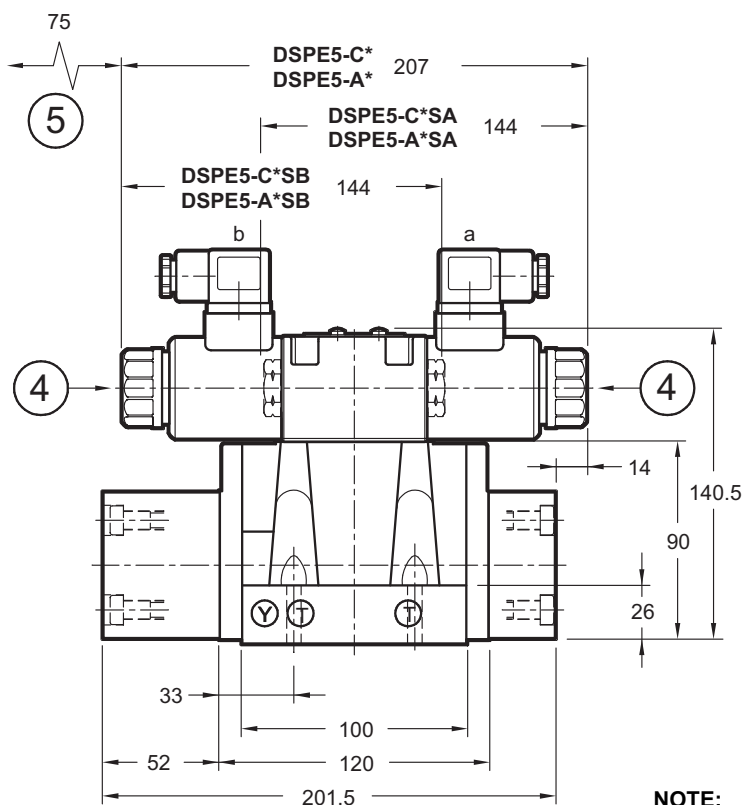
The DSPE* valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

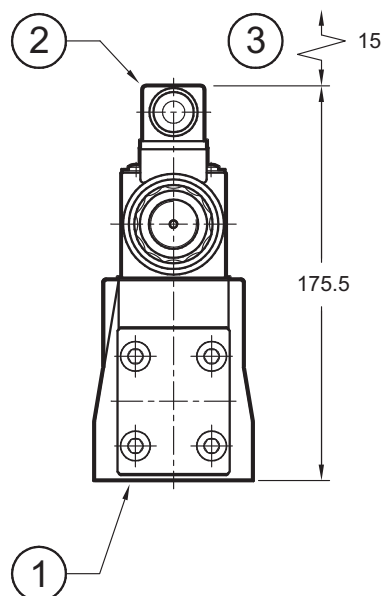
Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.



10 - OVERALL AND MOUNTING DIMENSIONS DSPE5 AND DSPE5R

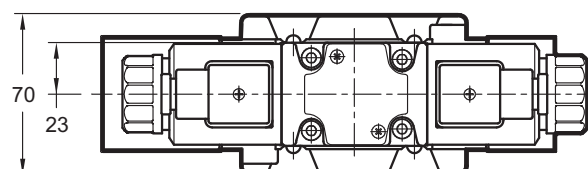


dimensions in mm



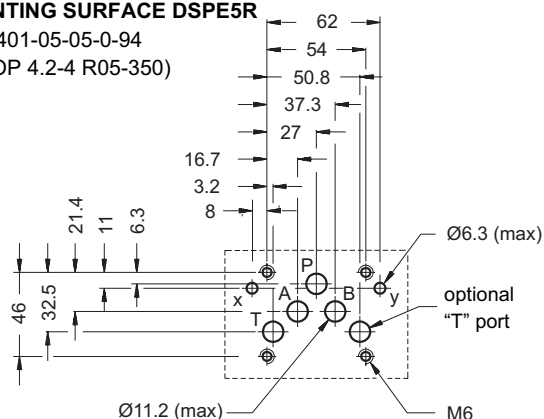
NOTE:

for overall dimensions with Z option (fixed adjustment pressure reducing valve) see par. 13.



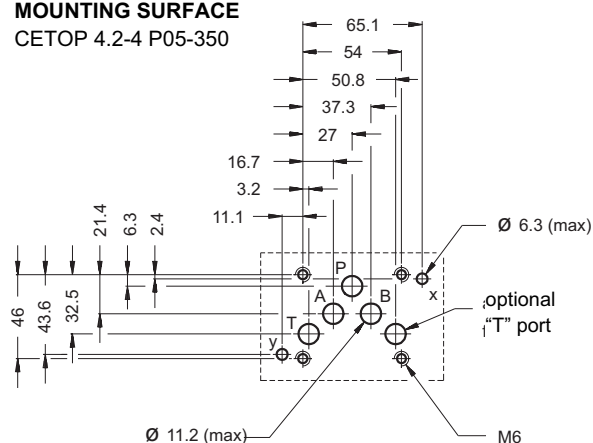
MOUNTING SURFACE DSPE5R

ISO 4401-05-05-0-94
(CETOP 4.2-4 R05-350)



MOUNTING SURFACE

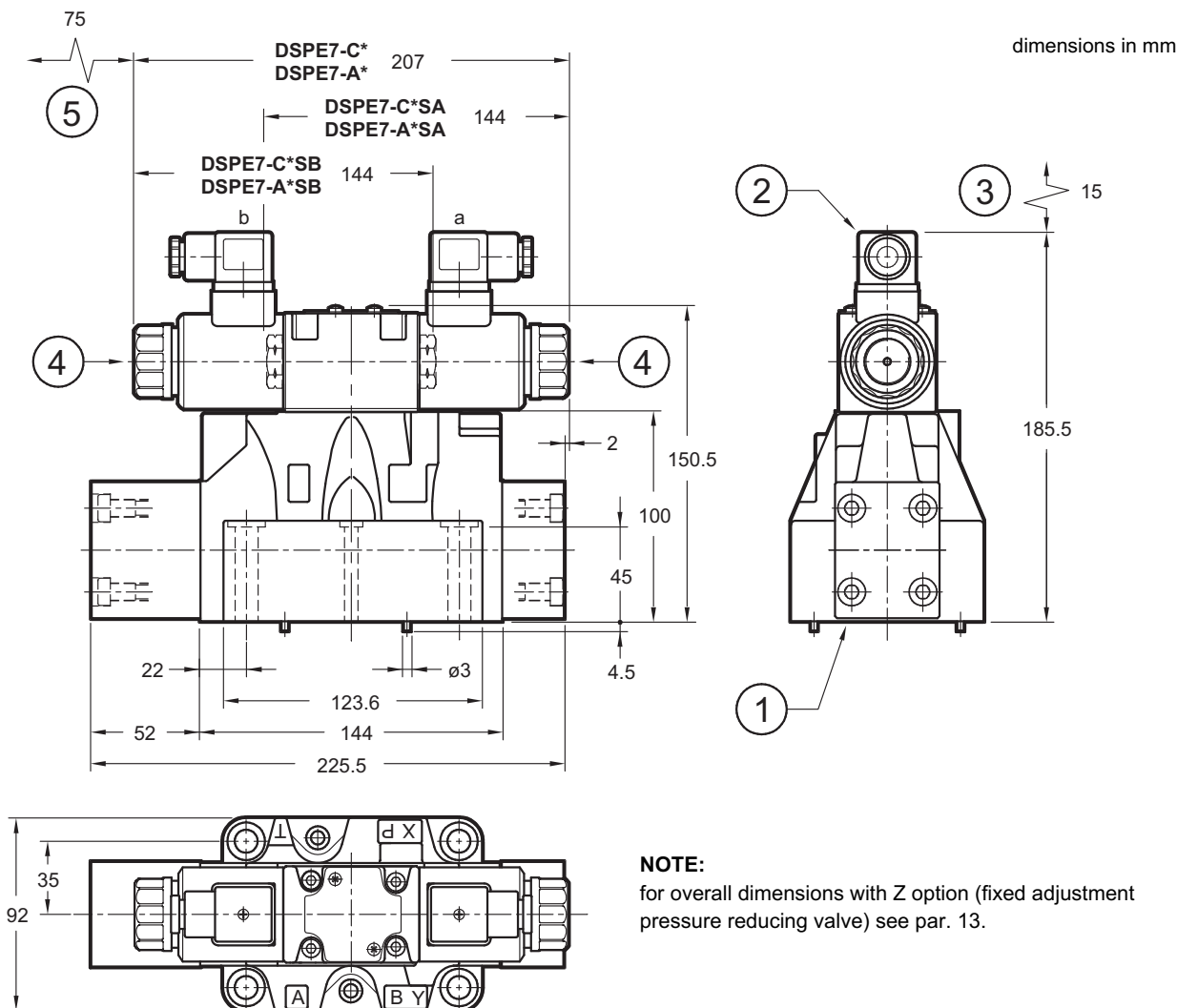
CETOP 4.2-4 P05-350



Valve fastening: N. 4 bolts TCEI M6x35
Tightening torque: 8 Nm (A 8.8 bolts) 14 Nm (A 12.9 bolts)
Thread of mounting holes: M6x10
Sealing rings: N. 5 OR type 2050 (12.42x1.78) - 90 Shore N. 2 OR type 2037 (9.25x1.78) - 90 Shore

1	Mounting surface with sealing rings
2	DIN 43650 electrical connector
3	Connector removal space
4	Standard manual override integrated inside the solenoid tube (included in the supply - see par. 14).
5	Coil removal space

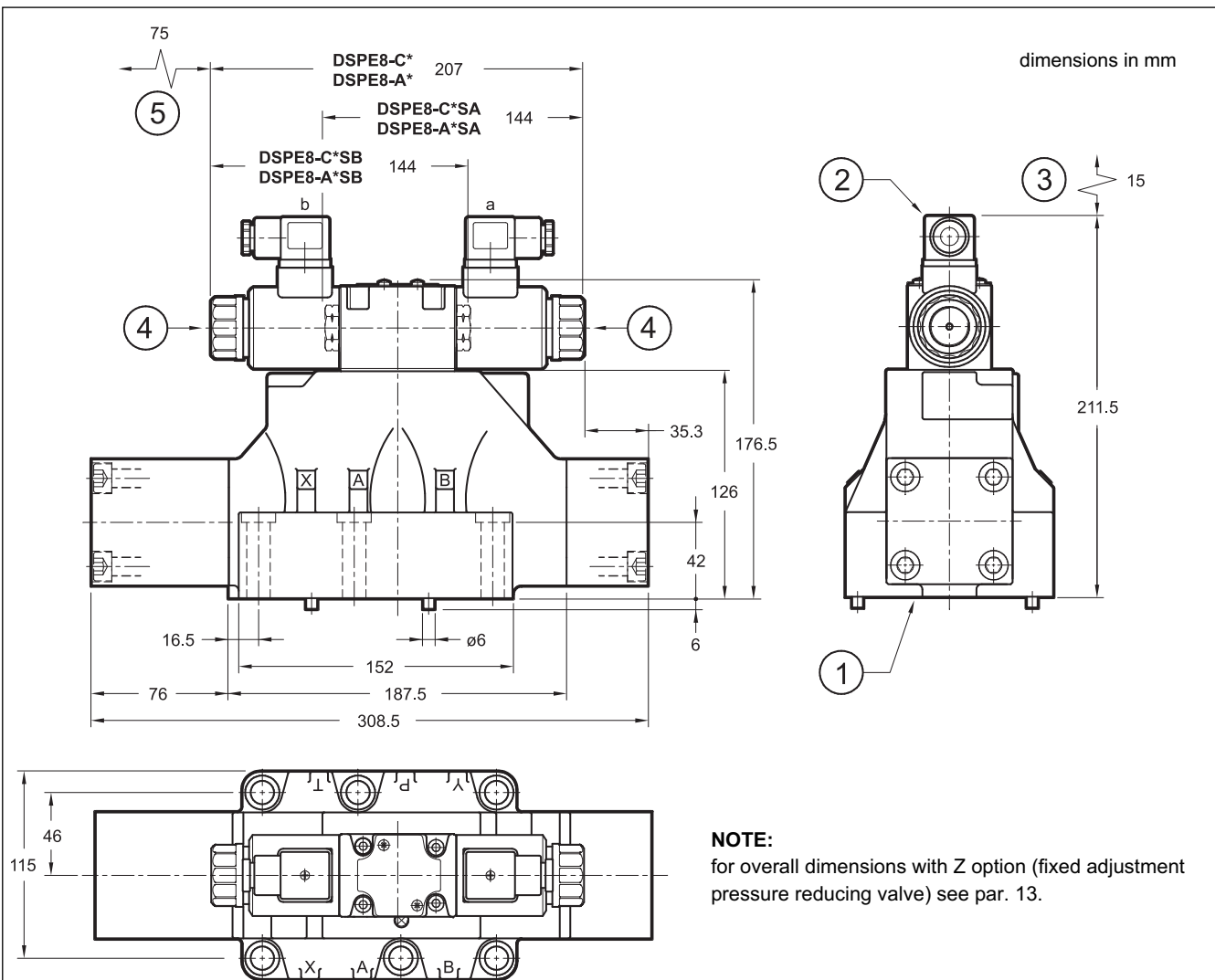
11 - OVERALL AND MOUNTING DIMENSIONS DSPE7



Single valve fastening:	N. 4 TCEI M10x60 bolts N. 2 TCEI M6x50 bolts
Tightening torque M10x60:	40 Nm (A 8.8 bolts) - 67 Nm (A 12.9 bolts) M6x50: 8 Nm (A 8.8 bolts) - 14 Nm (A 12.9)
Thread of mounting holes:	M6x12; M10x18
Sealing rings:	N. 4 OR type 130 (22.22x2.62) - 90 Shore N. 2 OR type 2043 (10.82x1.78) - 90 Shore

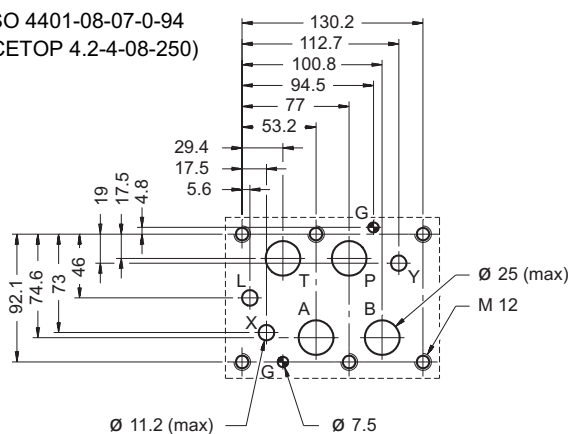
1	Mounting surface with sealing rings
2	DIN 43650 electrical connector
3	Connector removal space
4	Standard manual override integrated inside the solenoid tube (included in the supply - see par. 14).
5	Coil removal space

12 - OVERALL AND MOUNTING DIMENSIONS DSPE8



MOUNTING SURFACE

ISO 4401-08-07-0-94
(CETOP 4.2-4-08-250)



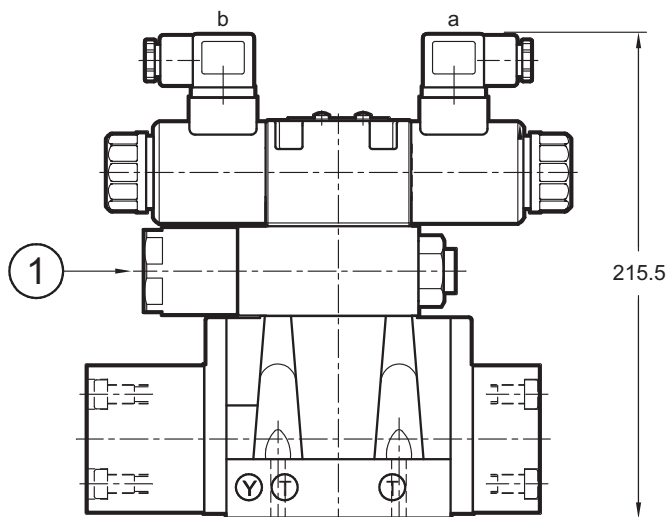
Valve fastening: N. 6 TCEI M12x60 bolts
Tightening torque: 69 Nm (A 8.8 bolts) 115 Nm (A 12.9 bolts)
Thread of mounting holes: M12x20
Sealing rings: N. 4 OR type 3118 (29.82x2.62) - 90 Shore N. 2 OR type 3081 (20.24x2.62) - 90 Shore

1	Mounting surface with sealing rings
2	DIN 43650 electrical connector
3	Connector removal space
4	Standard manual override integrated inside the solenoid tube (included in the supply - see par. 14).
5	Coil removal space

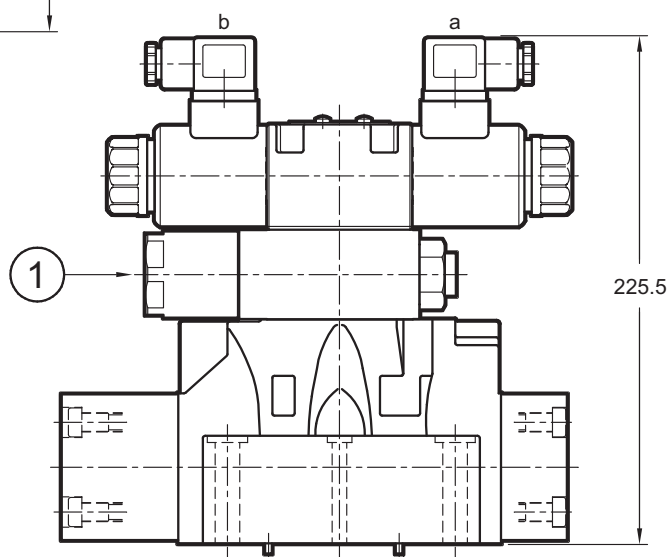
13 - OVERALL AND MOUNTING DIMENSIONS DSPE*-*/10*-Z*/*

dimensions in mm

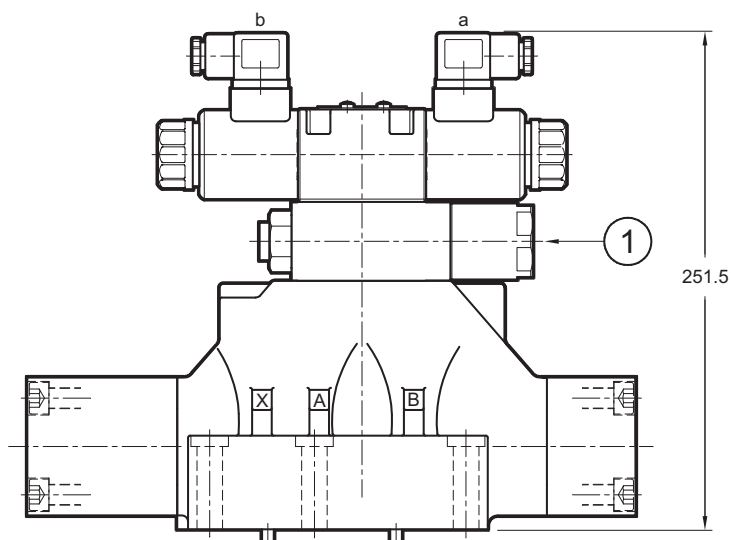
DSPE5*-*/10*-Z*/*



DSPE7*-*/10*-Z*/*



DSPE8*-*/10*-Z*/*



NOTE: for missing overall dimensions and characteristics see par. 10 - 11 - 12.

1	30 bar fixed adjustment pressure reducing valve
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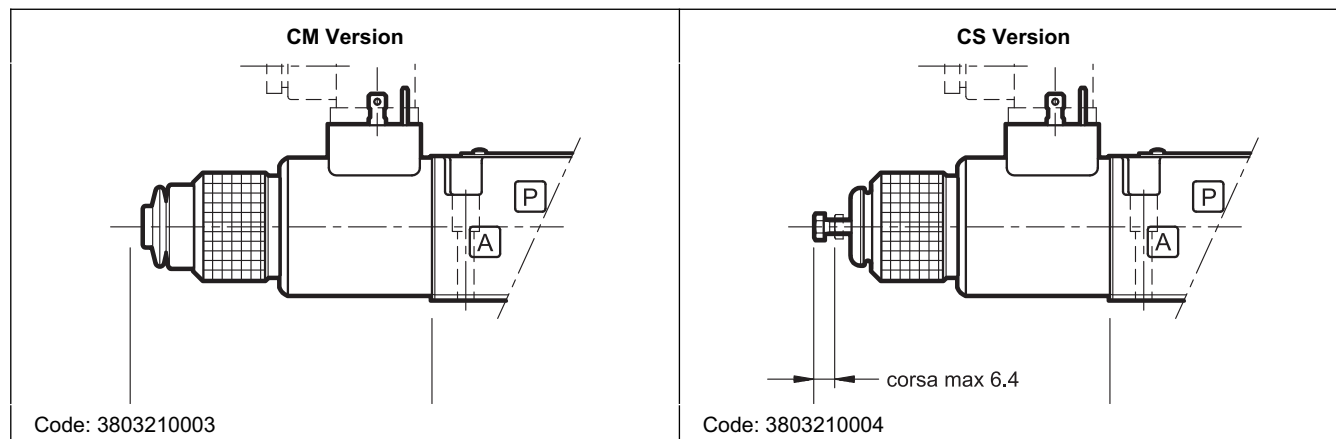
14 - MANUAL OVERRIDE

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

Two different manual override version are available upon request:

- CM version, manual override belt protected
- CS version, with metal ring nut provided with a M4 screw and a blocking locknut to allow the continuous mechanical operations.

NOTE: The manual override use doesn't allow any proportional regulation; in fact using this kind of override, the main stage spool will open completely and the valve will behave as an on-off valve.



15 - ELECTRONIC CONTROL UNITS

DSPE* - ** SA (SB)

EDC-112	for solenoid 24V DC	plug version	see cat.89 120
EDM-M111	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250
EDM-M141	for solenoid 12V DC		
UEIK-11	for solenoid 24V DC	Eurocard type	see cat. 89 300

DSPE* - A* DSPE* - C*

EDM-M211	for solenoid 24V DC	rail mounting DIN EN 50022	see cat. 89 250
EDM-M241	for solenoid 12V DC		
UEIK-21	for solenoid 24V DC	Eurocard format	see cat. 89 320

16 - SUBPLATES (See catalogue 51 000)

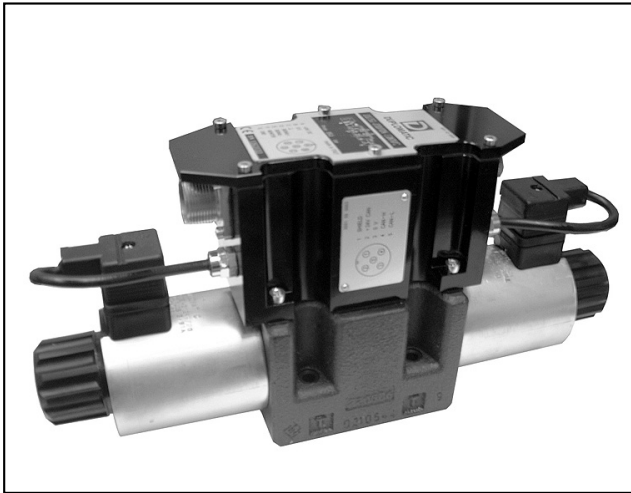
	DSPE5	DSPE7	DSPE8
Model with rear ports	PME4-AI5G	PME07-AI6G	
Model with side ports	PME4-AL5G	PME07-AL6G	PME5-AL8G
Thread of ports:	P - T - A - B X - Y	3/4" BSP 1/4" BSP	1" BSP 1/4" BSP



**DUPLOMATIC
HYDRAULICS**

DUPLOMATIC OLEODINAMICA SpA

20025 LEGNANO (MI) - P.le Bozzi, 1 / Via Edison
Tel. 0331/472111 - Fax 0331/548328



DSE5G

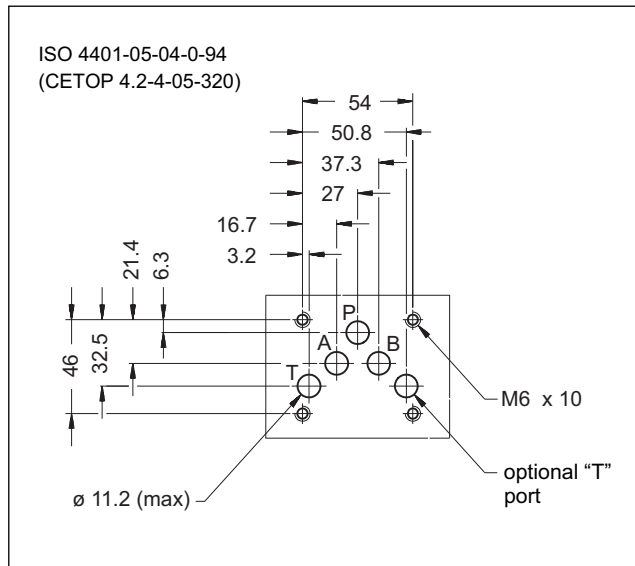
DIRECTIONAL VALVE WITH PROPORTIONAL CONTROL AND INTEGRATED ELECTRONICS

SERIES 10

SUBPLATE MOUNTING
ISO 4401-05 (CETOP 05)

p max **320** bar
Q max **90** l/min

MOUNTING SURFACE

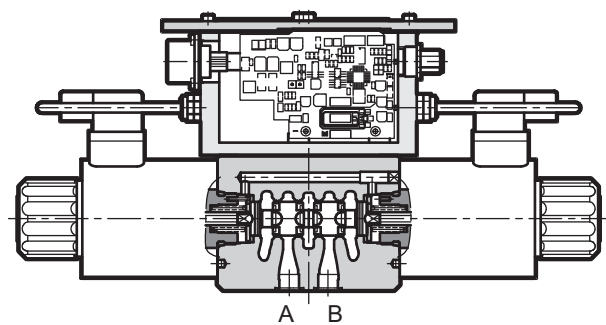


PERFORMANCES

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

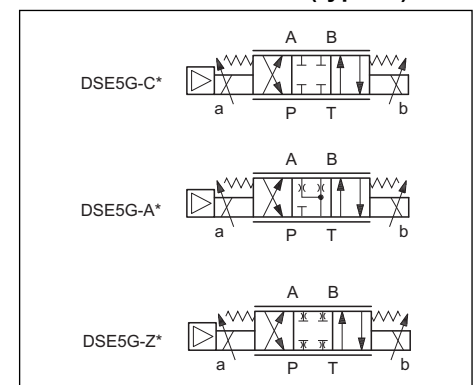
Maximum operating pressure: - P - A - B ports - T port	bar	320 140
Maximum flow with Δp 10 bar P-T	l/min	30 - 60
Response times	see paragraph 4	
Hysteresis	% of Q max	< 3%
Repeatability	% of Q max	< $\pm 1\%$
Electrical characteristics	see paragraph 5	
Ambient temperature range	°C	-10 / +50
Fluid temperature 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	5,1 6,6

OPERATING PRINCIPLE



- The DSE5G is a direct operated directional valve with integrated electric proportional control and mounting interface in compliance with ISO 4401 (CETOP RP 121H) standards.
- It is normally used to control the positioning and the speed of hydraulic actuators.
- The valve opening and hence flow rate can be modulated continuously in proportion to the reference signal.
- The valve is controlled directly by an integrated digital amplifier (see par. 5).

HYDRAULIC SYMBOLS (typical)



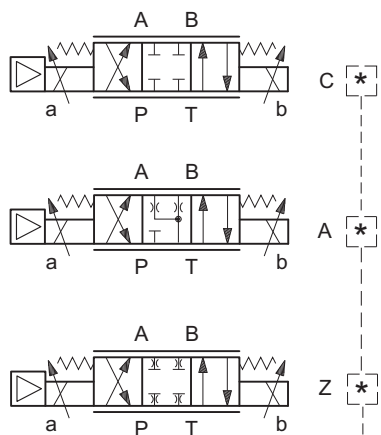
1 - IDENTIFICATION CODE

D	S	E	5	G	-				/ 10	-		K11	/	
Direct operated directional control valve												B = standard version C = with CAN connector		
Electric proportional control												Main connector 6 pin + PE		
Size ISO 4401-05 (CETOP 05)												Reference signal: E0 = voltage $\pm 10V$ E1 = current 4 / 20mA		
Digital integrated electronics for open loop												Seals: N = NBR seals for mineral oil (standard) V = FPM seals for special fluids		
Spool type: C = closed centres A = open centres Z = zero overlap												Series No. (the overall and mounting dimensions remain unchanged from 10 to 19)		
Nominal flow rate of the spool (see chart par. 2)												Solenoid position (omit for 2 solenoids configuration): SA = 1 solenoid on side A		

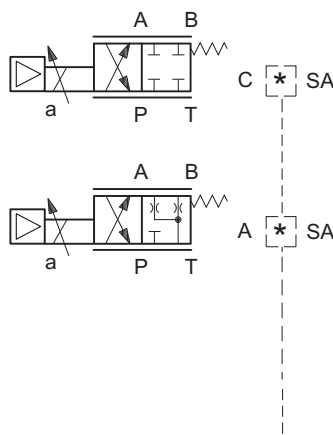
2 - CONFIGURATION

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



Configuration 1 solenoid on side A "SA":
2 positions (central + external) with spring centering



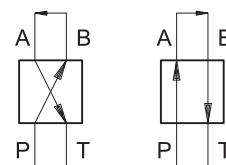
*	Controlled flow with 10 bar P-T
30	30 l/min
60	60 l/min
60/30	60 (P-A) / 30 (B-T) l/n

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

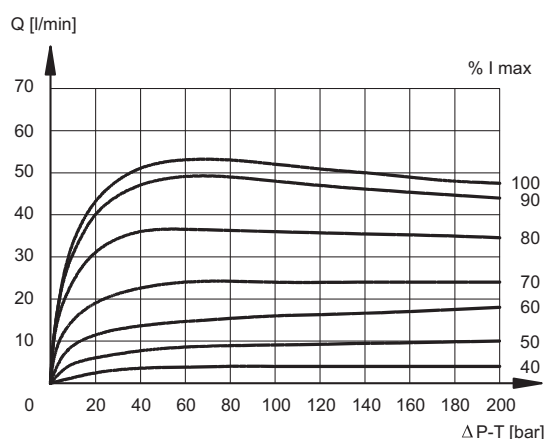
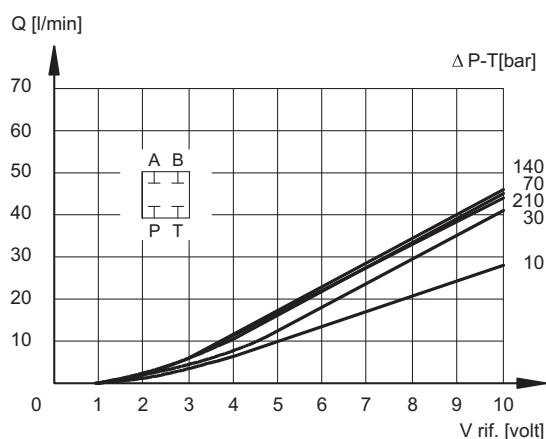
Typical flow rate curves at constant Δp related to the reference signal and measured for the available spools. The Δp values are measured between P and T valve ports.

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

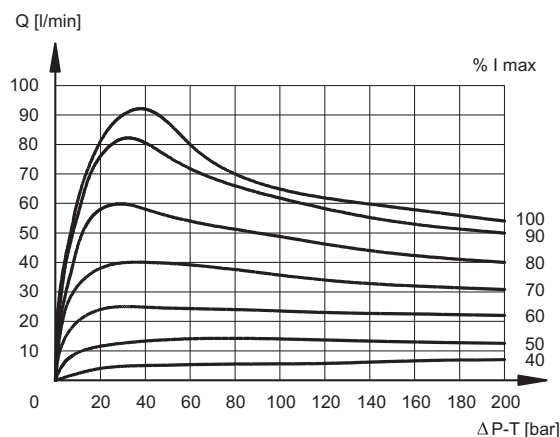
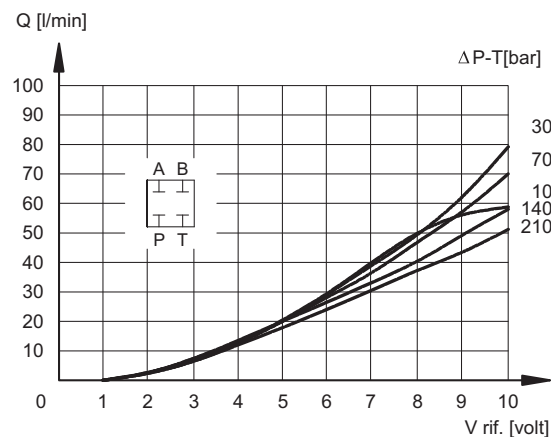
NOTE: for the zero overlap spool (Z), please refer to the characteristic curves of C type spool, considering that the starting flow rate value is approx. 150 mV.



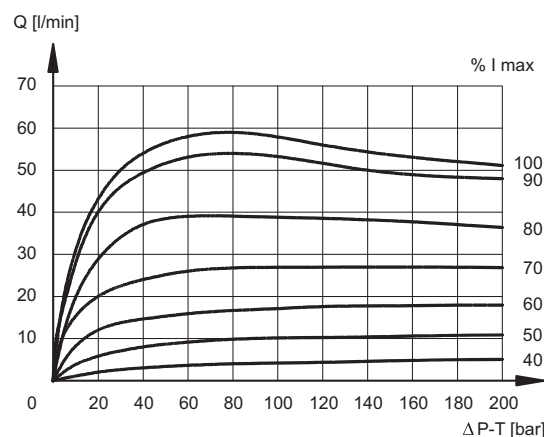
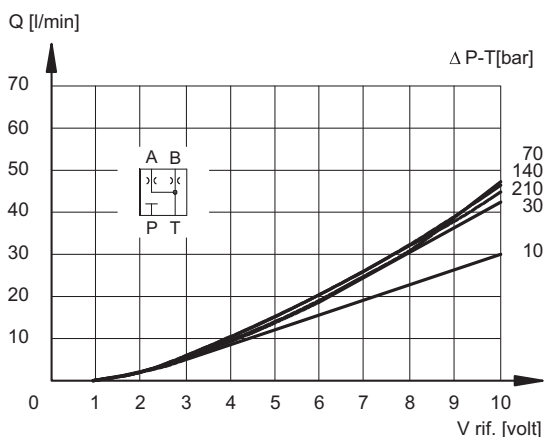
SPOOL TYPE C30



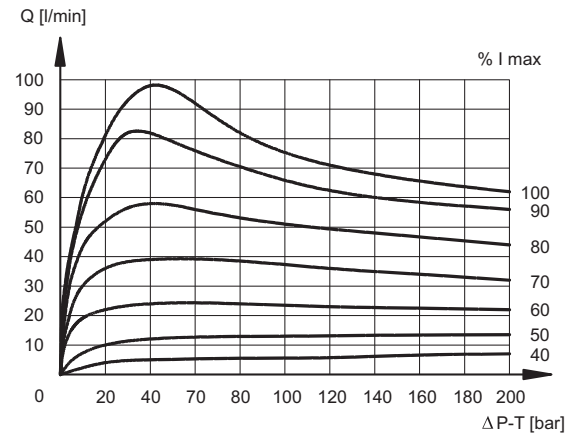
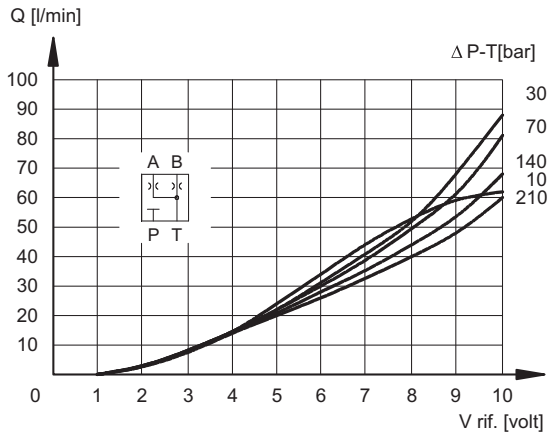
SPOOL TYPE C60



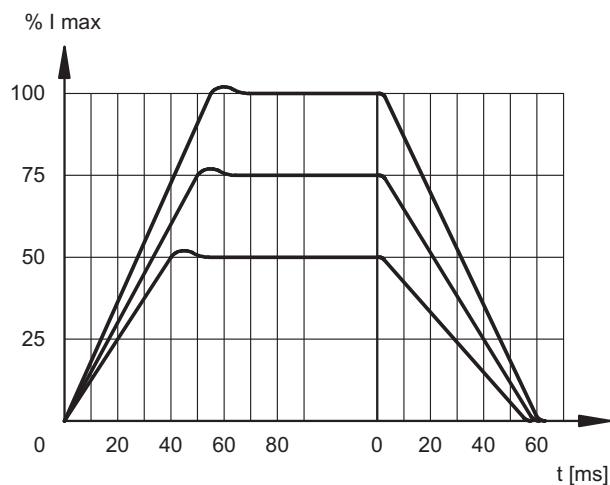
SPOOL TYPE A30



SPOOL TYPE A60



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



5 - ELECTRICAL CHARACTERISTICS

5.1 - 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:

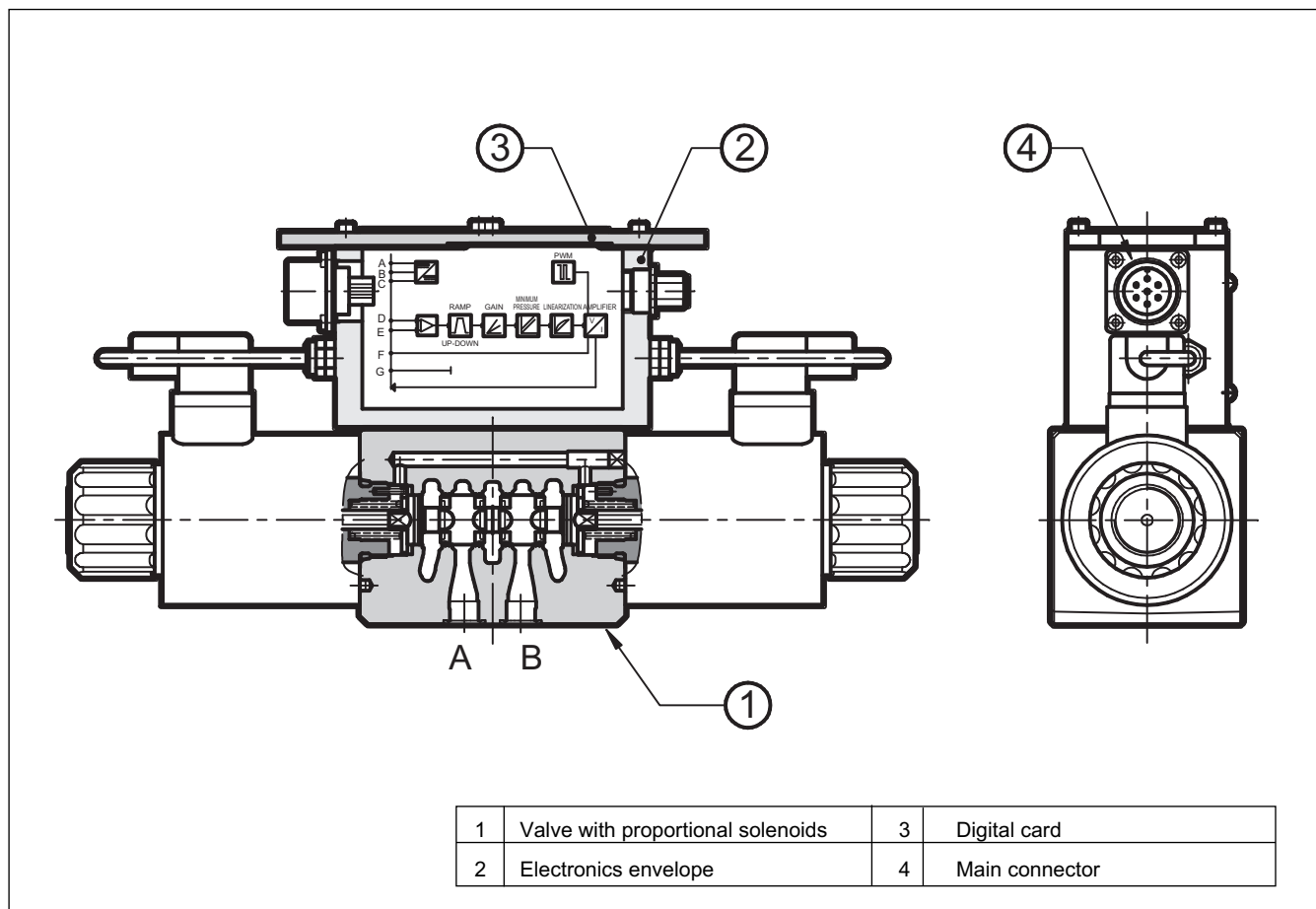
- continuous converting (0,5 ms) of the voltage reference signal (E0) or of the current reference signal (E1) in a digital value
- generation of up and down ramps (see **NOTE**)
- gains limit (see **NOTE**)
- compensation of the dead band
- linearization of the characteristic curve
- regulation of the 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 paragraph 6.3)

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

- reduced hysteresis and improved 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

5.2 - Functional block diagram



5.3 - Electrical characteristics

NOMINAL VOLTAGE	VDC	24V DC (from 19 to 35 VDC, ripple max 3 Vpp)
ABSORBED POWER	W	70
MAXIMUM CURRENT	A	2,60
DUTY CYCLE		100%
VOLTAGE SIGNAL (E0)	VDC	±10 (Impedence Ri > 50 KΩ)
CURRENT SIGNAL (E1)	mA	4 ÷ 20 (Impedence 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 50081-1		according to 89/336 CEE standards
IMMUNITY EN 50082-2		
PROTECTION AGAINST ATMOSPHERIC AGENTS		IP67 (CEI EN 60529 standards)

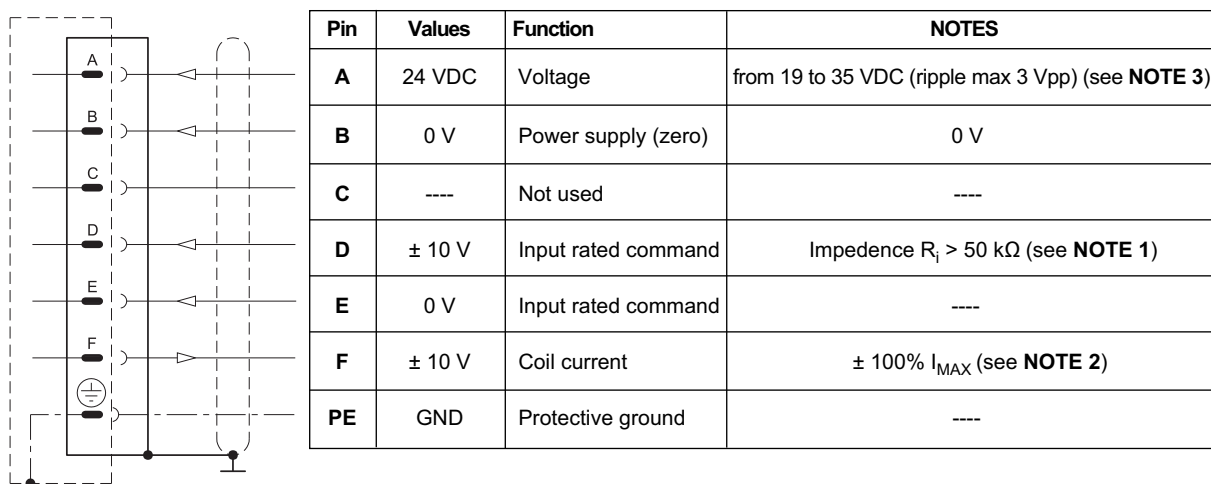
6 - OPERATING MODALITIES

The digital driver of DSE5G valve may be used with different functions and operating modalities, depending on the requested performances.

6.1 - 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 analog 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.

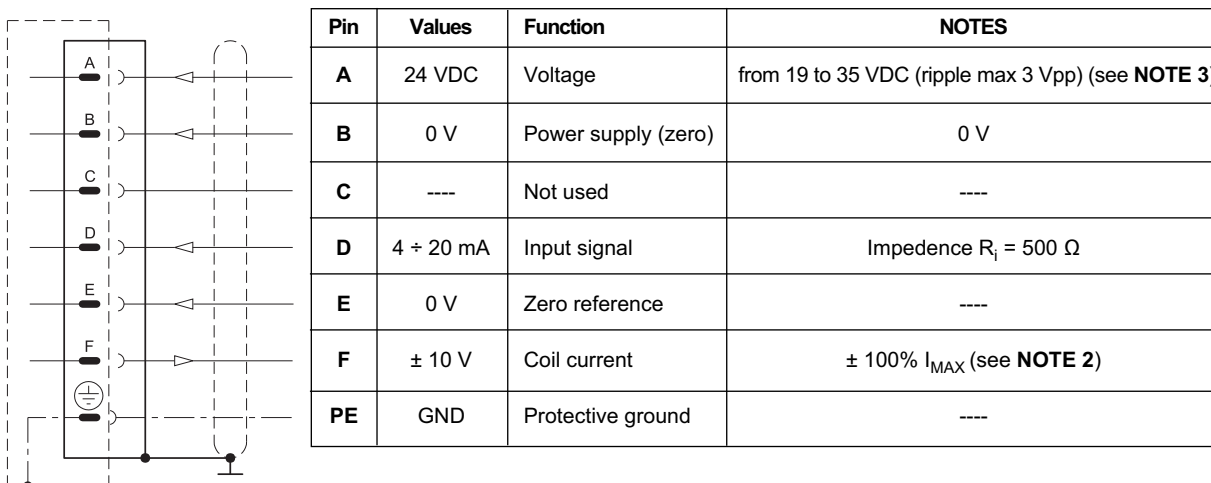
Standard connection scheme with voltage reference signal (E0)



6.2 - 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.

Standard connection scheme with current reference signal (E1)



NOTE 1: Only on version E0 (with voltage reference signal) 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.

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

This version allow to set some parameters of the valve connecting a PC to the CAN connector.

To do this, you have to order the interface device for USB port **CANPC-USB/20** (code 3898101002), complete of the configuration software, a communication cable (length 3 mt) and a hardware converter needed to connect the valve to the USB port.

The parameters that can be set are described below:

Maximum current (Gain regulation)

Imax A and Imax B set the maximum current to the solenoid A corresponding to the positive value of the input reference. With this parameter is possible to reduce the valve flow 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 = 200 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

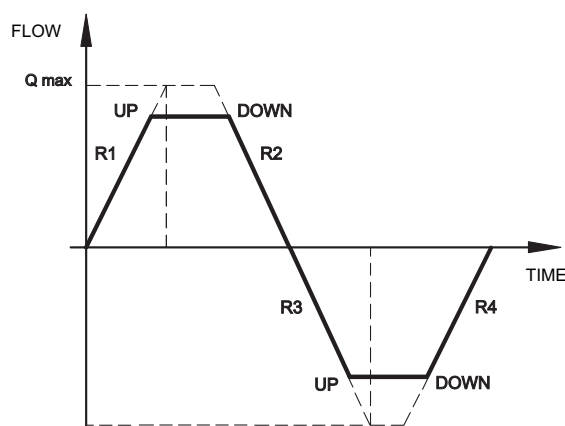
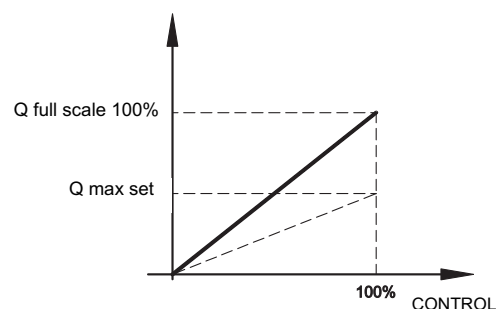
Max time = 40,000 sec

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



6.4 - 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:

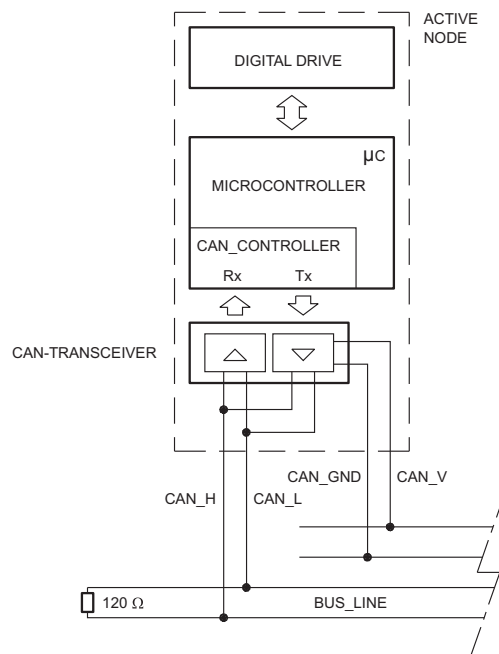
- Parameter storage also in PLC
- Parameters setting in real-time (PDO communication)
- On-line valve diagnostics
- Easy wiring with the serial connection
- Communication program according to international standards

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



7 - INSTALLATION

DSE5G valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

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.

8 - HYDRAULIC FLUIDS

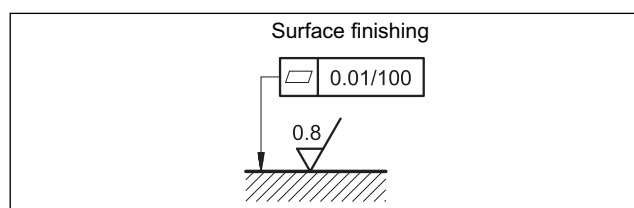
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N).

For fluids HFDR type (phosphate esters) use FPM seals (code V).

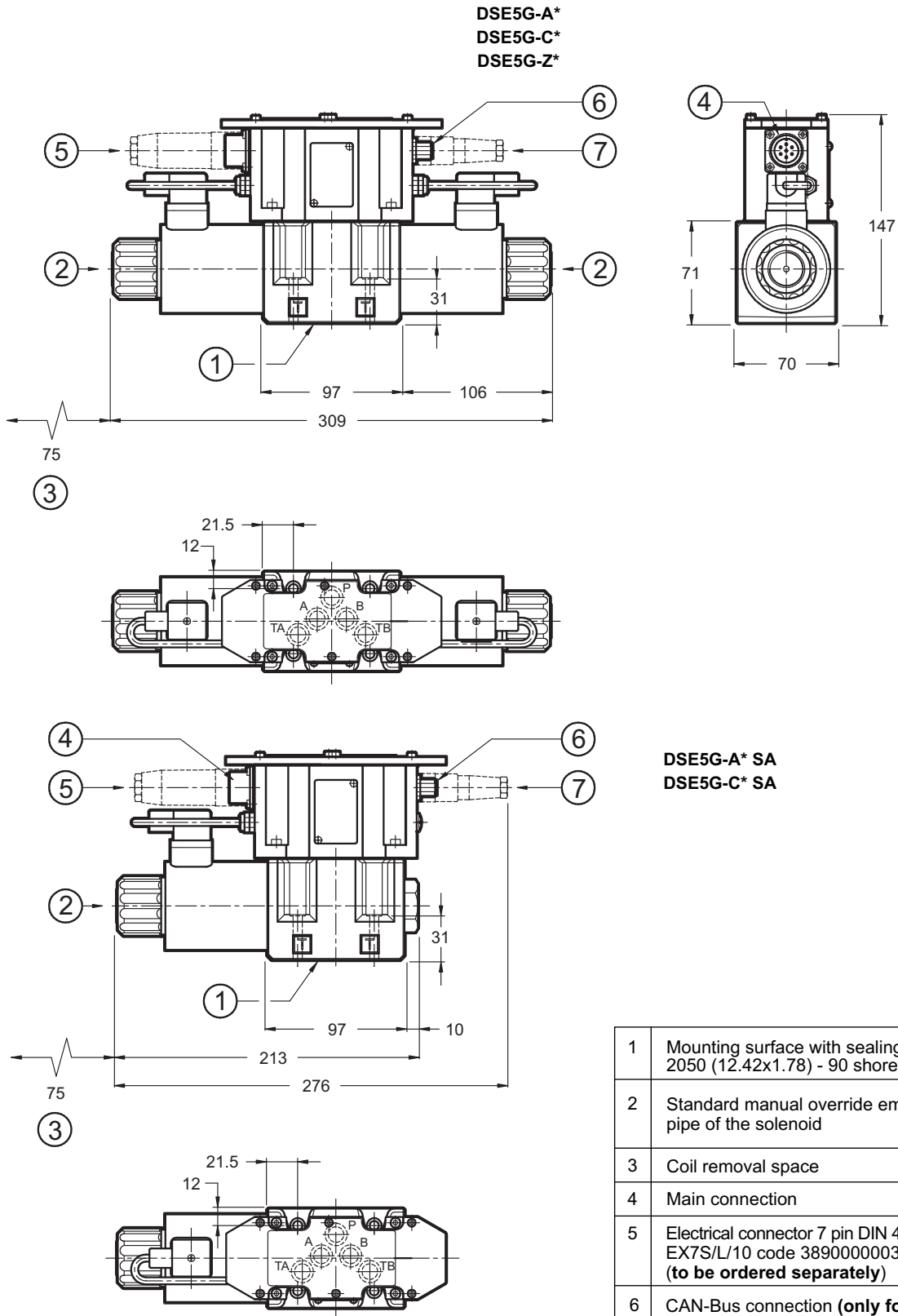
For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

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.



9 - OVERALL AND MOUNTING DIMENSIONS



DSE5G-A* SA
DSE5G-C* SA

dimensions in mm

1	Mounting surface with sealing rings: 5 OR type 2050 (12.42x1.78) - 90 shore
2	Standard manual override embedded in the pipe of the solenoid
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)

10 - SUBPLATES (See catalogue 51 000)

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



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