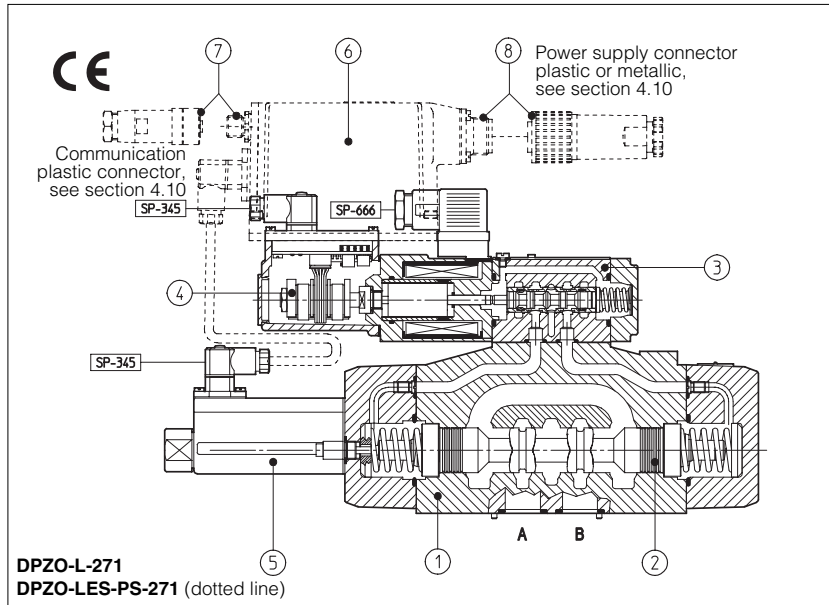


Proportional directional valves type DPZO-L*

high performance, two stage, ISO 4401 sizes 10, 16 and 25



1 MODEL CODE

DPZO -LES -PS -2 7 1 - L 5 / * / ** / *

Piloted proportional directional valve	Synthetic fluids WG = water-glycol PE = phosphate ester
L = with two integral position transducers	Design number
LE = as L plus integral electronics	Options, see section 4:
LES = as L plus integral digital electronics	B = solenoid, integral electronics and position transducer at side of port A
Communication interfaces (only for LES)	G = pressure reducing valve for piloting - standard for DPZO-L*-1
PS = RS232 serial	E = external pilot (through port X)
BC = CANbus	D = internal drain
BP = PROFIBUS-DP	for -LE execution:
Valve size: 1 = 10; 2 = 16; 3 = 25	I = current reference (4+20 mA)
Configuration, see section 2	F = fault signal
5 = external plus central position, spring centered	Q = enable signal
6 = 2 external position, spring offset (only for spool overlapping 0 and type L)	S = with logic state signals (12 poles connector)
7 = 3 position, spring centered	Z = enable, fault and monitor signal (12 poles connector)
Spool overlapping in central position, see section 2	for -LES execution (12 poles connector):
0 = zero overlapping (only for spool type L), see note 4	Z = double power supply, enable and fault
1 = P, A, B, T with positive overlapping	SP = additional closed loop pressure control with multiple PID parameters set - only for -PS
3 = P positive overlapping: A, B, T, negative overlapping	ZP = as SP but with double power supply, enable and fault - only for -BC and -BP
Spool type: L = linear; S = progressive; D = as S, but with P-A = Q, P-B = Q/2	C = remote pressure transducer with current feedback 4-20 mA - only for -LES/SP and -LES/ZP
	Spool size: 3, 5 see section 2 and 6.1

2 HYDRAULIC CHARACTERISTICS (based on mineral oil ISO VG 46 at 50 °C) (3)

Valve model	DPZO-L-1, DPZO-LE-1			DPZO-L-2, DPZO-LE-2			DPZO-L-3, DPZO-LE-3					
Pressure limits, see sect. 6.7 [bar]	ports P, A, B, X = 350; T = 250; Y = 0											
Spool type and size	L5	S5	D5	L3	S3	L5	S5	D5	L5	S5	D5	
Max flow: (1) [l/min]												
at Δp = 10 bar	80	80	80 : 50	130	130	200	180	180 : 130	390	360	360 : 220	
at Δp = 30 bar	135	135	135 : 85	225	225	340	310	310 : 220	680	680	620 : 380	
at Δp max = (...) bar	170 (315)	170 (315)	170 (315)	550 (180)	550 (180)	770 (150)	640 (130)	640 (130)	1450 (140)	1350 (140)	1350 (140)	
Response time [ms] (2)	spool overlapping 0 < 25			spool overlapping 1-3 < 50			spool overlapping 0 < 25			spool overlapping 1-3 < 75		
Hysteresis [%]	≤ 0,1%			≤ 0,1%			≤ 0,1%			≤ 0,1%		
Repeatability	± 0,1%			± 0,1%			± 0,1%			± 0,1%		

Above performance data refer to valves coupled with Atos electronic drivers, see section 2.

- (1) For different Δp, the max flow is in accordance to the diagrams in section 6.2.
- (2) Response times at step signal (0%→100%) are measured from 10% to 90% of step value and are strictly referred to valve regulation.
- (3) In case of long interruption of the hydraulic supply to the pilot valve, the driver has to be switched off to avoid its overheating.
- (4) For zero overlapping spool **0L5** and **0L3**, the valve offset position (with switch-off power supply) is 1 ± 6% P-B/A-T

DPZO-L* are two stage proportional valves which provide both directional and non compensated flow control according to electronic reference signal.

They operate in association with electronic drivers, see section 2, which supply the proportional valves with proper current to align valve regulation to the reference signal supplied to the electronic driver.

They are high performance valves particularly used in positioning or speed control with high dynamics.

They are available in different executions:

- -L, with two position transducers ④, ⑤;
- -LE, -LES as -L plus analogue (LE) or digital (LES) integral electronics.

The 4-way spool ②, sliding into a 5-chambers body ①, is piloted by the high performance proportional directional valve ③ provided of high precision sleeve and LVDT position transducer ④ for maximum regulating accuracy and dynamic response. It is controlled in double closed loop position by means of the LVDT position transducers ④ and ⑤.

The integral electronics ⑥ ensures factory presetting, fine functionality plus valve-to-valve interchangeability and simplified wiring and installation.

Following communication interfaces ⑦ are available for the digital -LES execution:

- -PS, RS232 serial communication interface. The valve reference signal is provided with analogue commands via the 7 (or 12) pins connector ⑧.
 - -BC, CANbus interface
 - -BP, PROFIBUS-DP interface
- In the -BC and -BP interfaces the valve reference signal is provided via fieldbus; during start up or maintenance, the valves can be operated with analogue signals via the 7 (or 12) pins connector ⑧.

The coils are fully plastic encapsulated (insulation class H) and the valves have antivibration, antishock and weather-proof features.

Mounting surface: ISO 4401 sizes 10, 16 and 25

Max flow respectively up to 135 l/min, 340 l/min and 680 l/min with valve differential pressure Δp = 30 bar, see table 2.

Max pressure: 350 bar.

3 MAIN CHARACTERISTICS OF PROPORTIONAL DIRECTIONAL VALVES TYPE DPZO-L*

Assembly position	Any position
Subplate surface finishing	Roughness index, $\sqrt{0.4}$ flatness ratio 0,01/100 (ISO 1101)
Ambient temperature	-20°C ÷ +70°C for -L execution; -20°C ÷ +60°C for -LE and -LES executions
Fluid	Hydraulic oil as per DIN 51524 ... 535 for other fluids see section I
Recommended viscosity	15 ÷ 100 mm ² /s at 40°C (ISO VG 15÷100)
Fluid contamination class	ISO 18/15 achieved with in line filters of 10 µm and $\beta_{10} \geq 75$ (recommended)
Fluid temperature	-20°C +60°C (standard and /WG seals) -20°C +80°C (/PE seals)

3.1 Coils characteristics

Coil resistance R at 20°C	3 ÷ 3,3 Ω
Max. solenoid current	2,6 A
Max. power	35 Watt
Protection degree (CEI EN-60529)	IP65 for -L execution; IP65÷67 for -LE and -LES executions, depending to the connector type (see sect. 4.10)
Duty factor	Continuous rating (ED=100%)

4 INTEGRAL ELECTRONICS OPTIONS AND WIRING

- 4.1 Option /I** It provides the 4÷20 mA current reference signal and the current feedback signals instead of the standard 0÷10V (± 10V). It is normally used in case of long distance between the machine control unit and the valve or where the reference signal can be affected by electrical noise. In case of breakage of the reference signal cable, the valve functioning is disabled.
- 4.2 Option /F** Safety option providing an output signal which switches to zero in case of interruption of the transducer feedback cable. In this condition the valve functioning is disabled.
- 4.3 Option /Q** Safety option providing the possibility to enable or disable the valve functioning without cutting the power supply.
- 4.4 Option /S** Option for diagnostic controls, providing three on-off output signals for the real time monitor of the valve's spool position (central, P→A or P→B). For the electrical wiring of -LE electronics with option /S (12 poles connector), see table G200.
- 4.5 Option /Z** For -LE execution: option providing the same characteristics of /F and /Q plus the monitor signal of the spool position. For -LES execution: safety option, specifically introduced for -BC and -BP fieldbus interfaces, provides two separated power supplies for the digital electronic circuits and for the solenoid power supply stage. The Enable and Fault signals are also available. The option /Z allows to interrupt the valve functioning by cutting the solenoid power supply (e.g. for emergency, as provided by the European Norms EN954-1 for components with safety class 2), but keeping energized the digital electronic circuits, thus avoiding fault conditions of the machine bus controller. For the electrical wiring of -TE and -TES electronics with option /Z (12 poles connector), see tab. G200 and G210.
- 4.6 Option /SP** Option providing in addition to the standard valve functions, a closed loop control of the max pressure, thus realizing a P/Q regulation. A remote pressure transducer must be installed on the system and its feedback has to be interfaced to the valve. If the real value of the pressure in the system remains below the relevant reference signal, the driver regulates in closed loop the valve's spool position, according to the flow reference signal. When the real pressure become close to the relevant reference signal, the driver automatically performs the closed loop control of the pressure. This option permits to realize accurate dynamic pressure profiles. Up to 4 sets of PID pressure parameters can be real time selected during the axis motion via on-off signals to the 12 poles connector to optimize the control performances in the different phases of the machine cycle. For additional information and for the electrical wiring, see tab. G210.
- 4.7 Option /ZP** Integral digital P/Q controller providing the same characteristics of option /SP plus additional double power supply, enable and fault, like -TES/Z. In this option the multiple set of PID pressure parameters can be real time selected during the axis motion through the -BC or -BP interfaces. For additional information and for the electrical wiring, see tab. G210.
- 4.8 Option /C (compatible only with options /SP and /ZP)** The valve electronics is set to receive 4÷20 mA signal from the remote pressure transducer instead of standard 0÷10 V. In case of breakage of the transducer feedback cable the driver functioning is disabled. For additional information and for the electrical wiring, see tab. G210.
- 4.9 Integral electronics wiring**
For the electric wiring shielded cables must be provided: the shield must be connected to the power supply zero on the generator side, see tab. F003

POWER SUPPLY CONNECTOR

PIN	SIGNAL DESCRIPTION	-LE, -LES	-LE/I	-LE/F	-LE/Q
A	Power supply 24 V _{DC}	Stabilized:	+24V _{DC}		
B	Power supply zero	Filtered and rectified:	V _{rms} = 21 ÷ 33 (ripple max 2V _{pp})		
C	Signal zero	Reference 0 V _{DC}	Reference 0 V _{DC}	Reference 0 V _{DC}	Enabling input normal working 9 ÷ 24 V _{DC}
D	Input signal +	0 ÷ 10 V _{DC} (for configuration 5)	4 ÷ 20 V _{DC}	0 ÷ 10 V _{DC} (for configuration 5)	
E	Input signal -	±10 V _{DC} (for configuration 6 and 7)		±10 V _{DC} (for configuration 6 and 7)	
F	Monitor Spool position	0 ÷ 10 V (for configuration 5) ±10 V (for configuration 6 and 7) 1 V = 10% of spool position	4 ÷ 20 mA referred to pin C (signal 0 V _{DC}) 4 ÷ 20 mA = 0÷100% of spool position	Fault signal alarm = 0 V _{DC} Normal working = +24 V _{DC}	0 ÷ 10 V (for configuration 5) ±10 V (for configuration 6 and 7) 1 V = 10% of spool position
G	Earth	Connect only when the power supply is not conform to VDE 0551 (CEI 14/6)			

COMMUNICATION CONNECTORS (for -LES)

Communication options	-PS (RS232) male connector	-BC (CAN Bus) male connector	-BP (PROFIBUS-DP) female connector (reverse key)
Pin number Signal description	1 NC Not Connected	CAN_SHLD Shield	+5V Termination voltage
	2 NC Not Connected	Not Connected	LINE-A Bus line (high)
	3 RS_GND Signal zero data line	CAN_GND Signal zero data line	DGND Signal zero data line / termination voltage
	4 RS_RX Valves receiving data line	CAN_H Bus line (high)	LINE-B Bus line (low)
	5 RS_TX Valves transmitting data line	CAN_L Bus line (low)	SHIELD Shield

POSITION TRANSDUCER CONNECTOR (-L)

PIN	Signal description
1	OUTPUT SIGNAL
2	SUPPLY -15 V _{DC}
3	SUPPLY +15 V _{DC}
4	GND

Note:

- electrical signals (e.g. actual - feedback signals) acquired via valve electronics must not be used to switch off the machine safety functions. This is in accordance with the European standards (Safety requirements of fluid technology systems and components - hydraulics, EN-892).
- installation notes with basic information for commissioning and start-up, are always supplied with relevant components, together with the specific technical tables.

4.10 Model codes of power supply and communication connectors

VALVE VERSION	-L		-LE, -LES		-LE/S, -LE/Z -LES/Z, /SP, /ZP	-RS232 (-PS) OR CANBUS (-BC)	PROFIBUS (-BP)	PRESSURE TRANSDUCER only for LES/SP, /ZP
	Power supply	Transducer						
CONNECTOR CODE	SP-666	SP-345	SP-ZH-7P (1)	SP-ZM-7P (1)	SP-ZH-12P (1)	SP-ZH-5P (1)	SP-ZH-5P/BP (1)	SP-ZH-4P-M8/5 (1)(2)
CONNECTOR CODE	IP65	IP65	IP67	IP66	IP65	IP67	IP67	IP67

(1) to be ordered separately (2) M8 connector moulded on cable 5 mt length

5 PROGRAMMING DEVICES

The functional parameters of the digital valves, as the bias, scale, ramp and linearization of the regulation characteristic, can be easily set and optimized with graphic interface by using the following software programming devices suitable for standard PC:

KIT-E-SW-PS for electronics with RS232 interface (option -PS)

KIT-E-SW-BC for electronics with CANbus interface (option -BC)

KIT-E-SW-BP for electronics with PROFIBUS-DP interface (option -BP)

see tab. G500 for complete information about the programming device kits and for the PC minimum requirements.

Only for the -BC and -BP communication options, the functional parameters can be alternatively set via fieldbus through the machine control unit, using the standard communication protocol implemented by Atos.

The protocol operating instructions to be implemented in the standard protocols (DS301V4.02, DSP408 for CANbus and DPVO for PROFIBUS-DP) are described in the user manuals MAN-S-BC (for -BC option) and MAN-S-BP (for -BP option) supplied with the relevant programming device kits.

The above programming devices have to be ordered separately.

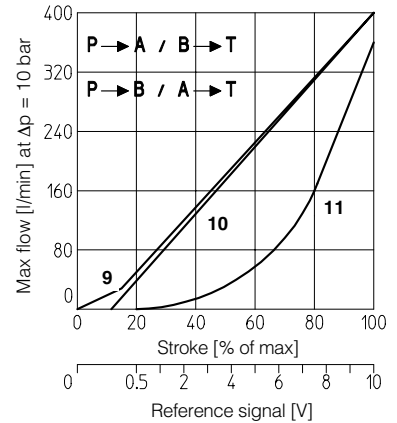
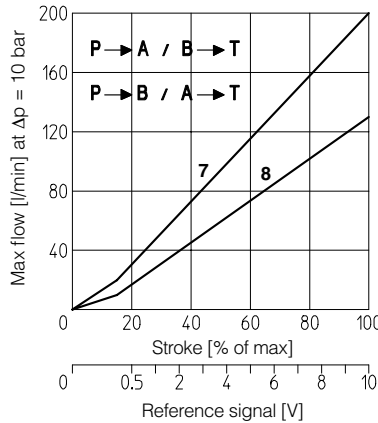
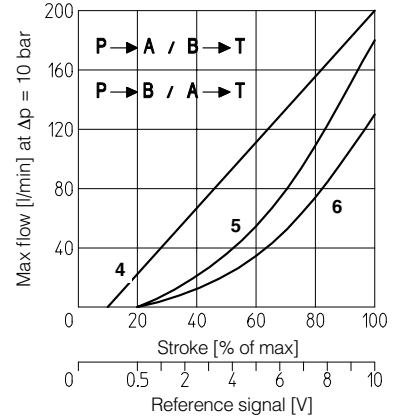
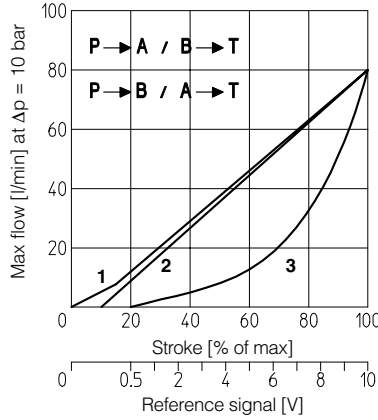
6 DIAGRAMS (based on mineral oil ISO VG 46 at 50 °C)

6.1 Regulation diagrams

- DPZO-1:
1 = 0L5
2 = 1L5, 3L5
3 = 1S5, 1D5, 3S5, 3D5
- DPZO-2:
4 = 1L5, 3L5
5 = 1S5, 1D5, 3S5, 3D5
6 = 1S3, 1D3, 3S3, 3D3
7 = 0L5
8 = 0L3
- DPZO-3:
9 = 0L5
10 = 1L5, 3L5
11 = 1S5, 1D5, 3S5, 3D5

Note:

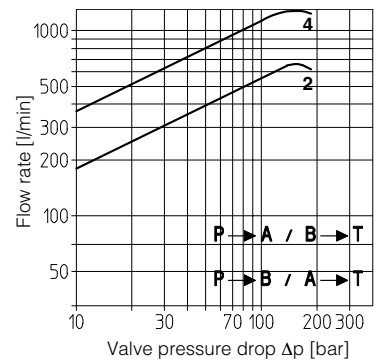
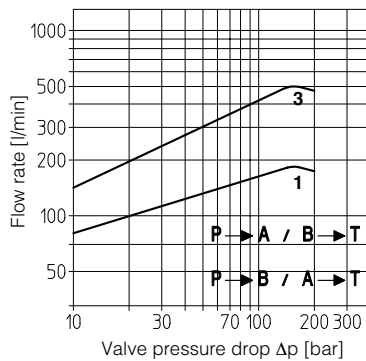
- 1) For the valves with digital electronics -LES, the regulation characteristic can be modified by setting the internal software parameters, see tab. G500.
- 2) Hydraulic configuration vs. reference signal: (for double solenoid valves)
- | | | |
|------------------|------------|----------------------|
| Reference signal | 0 ÷ +10 V | P → A / B → T |
| | 12 ÷ 20 mA | (also for option /B) |
| Reference signal | 0 ÷ -10 V | P → B / A → T |
| | 4 ÷ 12 mA | (also for option /B) |



6.2 Operating diagrams

Flow /Δp diagram
 stated at 100% of spool stroke

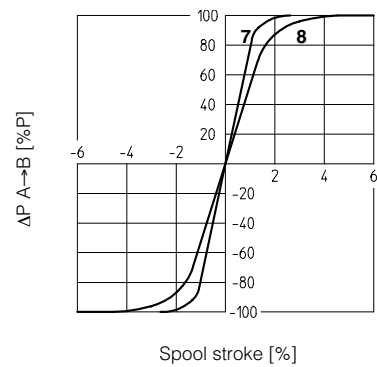
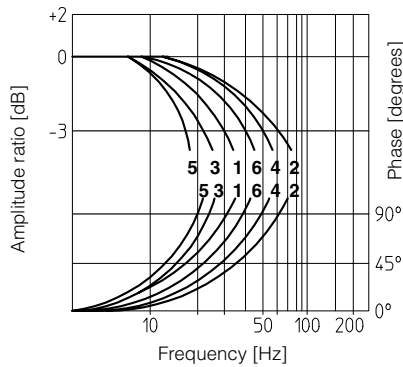
- DPZO-1:
1 = spools L5, S5
- DPZO-2:
2 = spools L5, S5
3 = spool S3
- DPZO-3:
4 = spools L5, S5



6.3 Bode diagrams

Stated at nominal hydraulic conditions.

- DPZO-1:
1 = 160 and 170 ± 100%
2 = 160 and 170 ± 5%
- DPZO-2:
3 = 260 and 270 ± 100%
4 = 260 and 270 ± 5%
- DPZO-3:
5 = 360 and 370 ± 100%
6 = 360 and 370 ± 5%



6.4 Pressure gain

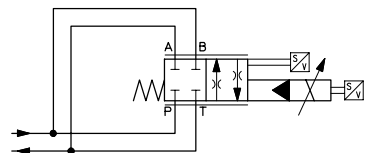
- 7** = for DPZO-L(*)-1 *60 and *70
8 = for DPZO-L(*)-2 and DPZO-L(*)-3 *60 and *70

6.5 Dynamic response

The response times in section 2 have to be considered as average values. For the valves with digital electronics the dynamics performances can be optimized by setting the internal software parameters.

6.6 Operation as throttle valve

Single solenoid valves (*51) can be used as simple throttle valves: Pmax = 250 bar

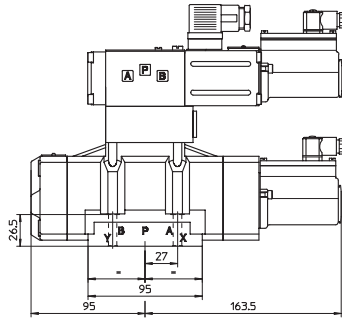


	DPZO-L(*)-1	DPZO-L(*)-2	DPZO-L(*)-3
Max flow [l/min]	300	650	1050

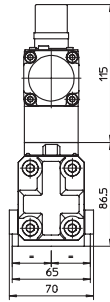
6.7 Oil ports configuration

The standard configuration is internal pilot through port P and external drain through port Y. If the working pressure is over 100 bar, select option /G to reduce the piloting pressure or select the external pilot (option /E). The minimum piloting pressure is 30 bar. In case the system pressure could drop at values lower than 30 bar, select the external pilot (option /E). The internal drain, option /D, can be selected only if the backpressure on port T is < 1 bar.

DPZO-L(*)-1



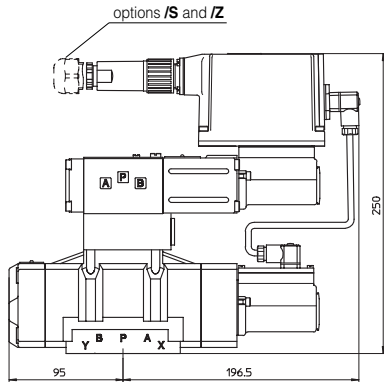
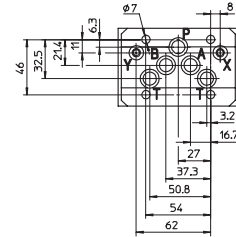
DPZO-L-1



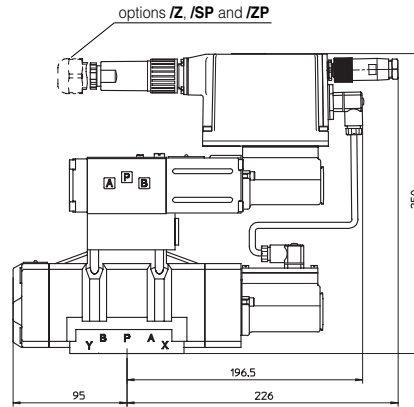
Mounting surface

ISO 4401-AC-05-4 size 10

Fastening bolts: 4 socket head screws M6x40
 Seals: 5 OR 2050; 2 OR 108
 Diameter of ports A, B, P, T: $\varnothing = 11$ mm;
 Diameter of ports X, Y: $\varnothing = 5$ mm;



DPZO-LE-1



DPZO-LES*-1

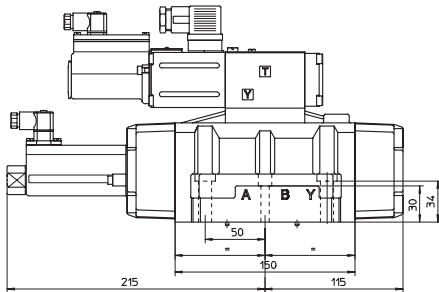
- P** = PRESSURE PORT
- A,B** = USE PORT
- T** = TANK PORT
- X** = EXTERNAL PILOT PORT
- Y** = DRAIN PORT

Mass [kg]

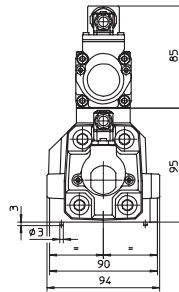
DPZO-L-1	9
DPZO-LE-1	9,7
DPZO-LES-1	

NOTE: for option /B the proportional solenoid and the electronics (in case of execution -LE and -LES) are at side of port B of the main stage

DPZO-L(*)-2



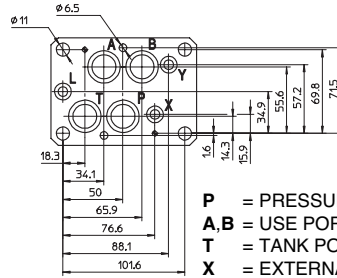
DPZO-L-2



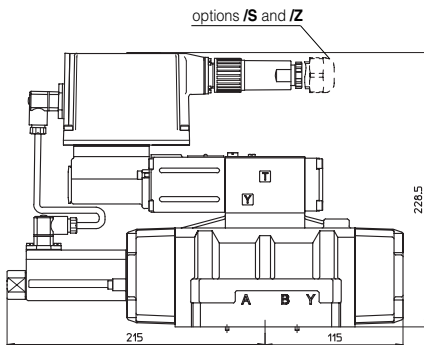
Mounting surface

ISO 4401-AD-07-4 size 16

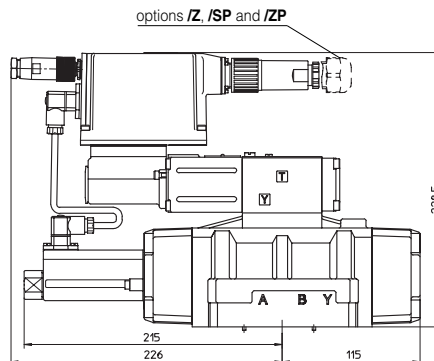
Fastening bolts: 4 socket head screws M10x50
 2 socket head screws M6x40
 Seals: 4 OR 130; 3 OR 109
 Diameter of ports A, B, P, T: $\varnothing = 20$ mm;
 Diameter of ports X, Y: $\varnothing = 7$ mm;



- P** = PRESSURE PORT
- A,B** = USE PORT
- T** = TANK PORT
- X** = EXTERNAL PILOT PORT
- Y** = DRAIN PORT
- L** (not used)



DPZO-LE-2



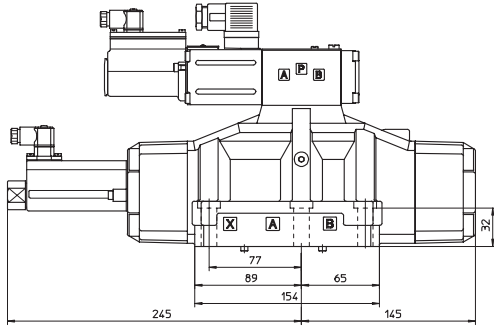
DPZO-LES*-2

Mass [kg]

DPZO-L-2	13,5
DPZO-LE-2	14,2
DPZO-LES-2	

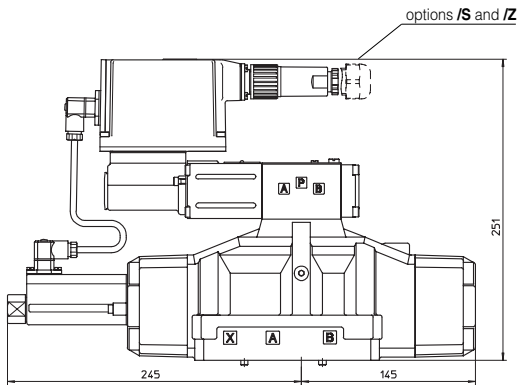
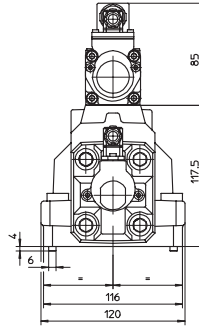
NOTE: The overall height is increased by 30 mm for /G option (0,9 kg)
 For option /B the proportional solenoid and the electronics (in case of execution -LE and -LES) are at side of port B of the main stage

DPZO-L(*)-3

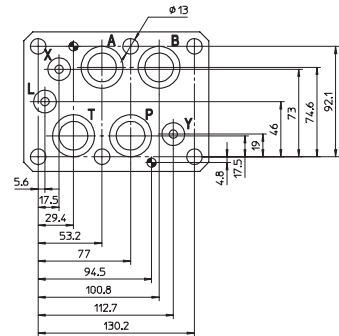


DPZO-L-3

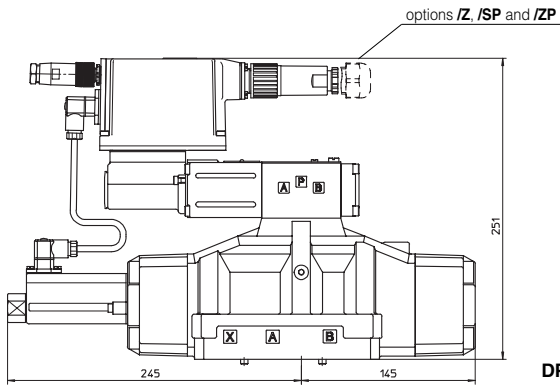
Mounting surface
ISO 4401-AE-08-4 size 25
 Fastening bolts: 6 socket head screws M12x50
 Seals: 4 OR 4112; 3 OR 3056
 Diameter of ports A, B, P, T: $\varnothing = 24$ mm;
 Diameter of ports X, Y: $\varnothing = 7$ mm;



DPZO-LE-3



P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
X = EXTERNAL PILOT PORT
Y = DRAIN PORT
L (not used)



DPZO-LES-3

Mass [kg]

DPZO-L-3	18,4
DPZO-LE-3	19,1
DPZO-LES-3	

NOTE: The overall height is increased by 30 mm for /G option (0,9 kg)
 For option /B the proportional solenoid and the electronics (in case of execution -LE and -LES) are at side of port B of the main stage

9 **ELECTRONIC DRIVERS FOR DPZO-L***

Valve model	-L	-LE	-LES
Drivers model	E-ME-L	E-RI-LE	E-RI-LES
Data sheet	G150	G200	G210

For complete information about the drivers characteristics and relevant options, see the technical data sheet specified in the table.

10 **MOUNTING SUBPLATES FOR DPZO-L(E)-1, DPZO-L(E)-2 AND DPZO-L(E)-3**

Size	Model	Ports locations	Gas ports		Ø Counterbore [mm]		Mass [Kg]
			A, B, P, T	X, Y	A, B, P, T	X, Y	
10	BA-428	Ports A, B, P, T, X, Y underneath;	3/4"	1/4"	36,5	21,5	5,6
	BA-434	Ports P, T, X, Y underneath; ports A, B on lateral side	3/4"	1/4"	36,5	21,5	5,5
16	BA-418	Ports A, B, P, T, X, Y underneath;	3/4"	1/4"	36,5	21,5	3,5
	BA-519	Ports P, T, X, Y underneath; ports A, B on lateral side	1"	1/4"	46	21,5	8
25	BA-508	Ports A, B, P, T, X, Y underneath;	1"	1/4"	46	21,5	7
	BA-509	Ports P, T, X, Y underneath; ports A, B on lateral side	1"	1/4"	46	21,5	12,5