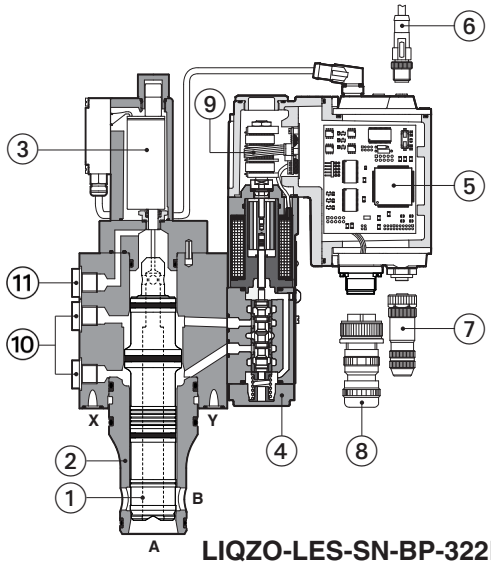
Digital proportional 2-way cartridges high performance

piloted, with on-board driver and two LVDT transducers



① Poppet
② Sleeve
③ Main stage LVDT transducer
④ Pilot valve
⑤ On-board digital driver
⑥ USB connector
⑦ Fieldbus connectors
⑧ Main connector
⑨ Pilot valve LVDT transducer
⑩ Air bleeding
⑪ Air suction port

LIQZO-LES-SN-BP-322L4

LIQZO-LEB, LIQZP-LEB
LIQZO-LES, LIQZP-LES

Digital high performance 2-way proportional cartridges specifically designed for high speed closed loop controls. They are equipped with two LVDT position transducers for best dynamics in not compensated flow regulations. The cartridge execution for blocks installation grants high flow capabilities and minimized pressure drops.

LEB basic execution with analog reference signal and USB port for software functional parameters setting.

LES full execution which includes also optional fieldbus interfaces for functional parameters setting, reference signals and real-time diagnostics.

LIQZO: Size: **16** ÷ **40** - ISO 7368
Max flow: **600** ÷ **2500 l/min**
Max pressure: **350 bar**

LIQZP: Size: **50** ÷ **100** - ISO 7368
Max flow: **4000** ÷ **16000 l/min**
Max pressure: **420 bar**

1 MODEL CODE

LIQZO	-	LES	-	SN	-	NP	-	25	2	L4	/	*	*	/	*

LIQZO
Proportional 2-way cartridge, piloted
LIQZO = size 16 to 40, Pmax 350 bar
LIQZP = size 50 to 100, Pmax 420 bar

LES
LEB = basic on-board digital driver **(1)**
LES = full on-board digital driver

SN
Alternated P/Q controls:
SN = none

NP
Fieldbus interfaces, USB port always present:
NP = Not present
BC = CANopen
BP = PROFIBUS DP
EH = EtherCAT
EW = POWERLINK
EI = EtherNet/IP
EP = PROFINET RT/IRT

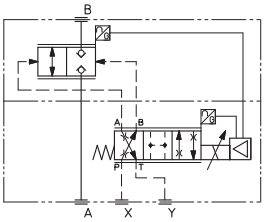
25
Valve size ISO 7368, see section 6 :

LIQZO =	**16**	**25**	**32**	**40**
l/min	250	500	800	1200
LIQZP =	**50**	**63**	**80**	**100**
l/min	2000	3000	4500	7200

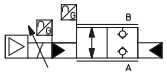
Nominal flow (l/min) at Δp 5 bar

2
Configuration:
2 = 2 way

functional symbol



simplified symbol



L4
Poppet type, regulating characteristics:
L4 = linear

*
Electronics options (2):
F = fault signal
I = current reference input and monitor 4 ÷ 20 mA (omit for std voltage ±10 VDC)
Q = enable signal
Z = double power supply, enable, fault and monitor signals - 12 pin connector **(3)**

*
Series number

*
Seals material, see section 8 :
- = NBR
PE = FKM
BT = HNBR

(1) Only in version **SN-NP**
(2) Possible combined options: /FI, /IQ, /IZ
(3) Double power supply only for **LES**

2 GENERAL NOTES

Atos digital proportionals valves are CE marked according to the applicable directives (e.g. Immunity and Emission EMC Directive).
Installation, wirings and start-up procedures must be performed according to the general prescriptions shown in tech table **FS900** and in the user manuals included in the E-SW-* programming software.

WARNING

To avoid overheating and possible damage of the electronic driver, the valves must be never energized without hydraulic supply to the pilot stage.
In case of prolonged pauses of the valve operation during the machine cycle, it is always advisable to disable the driver (option /Q or /Z).
A safety fuse 2,5 A installed on 24VDC power supply of each valve is always recommended, see also power supply note at sections 13 .

WARNING

The loss of the pilot pressure causes the undefined position of the main poppet.
The sudden interruption of the power supply during the valve operation causes the immediate shut-off of the main poppet.
This could cause pressure surges in the hydraulic system or high decelerations which may lead to machine damages.

3 VALVE SETTINGS AND PROGRAMMING TOOLS

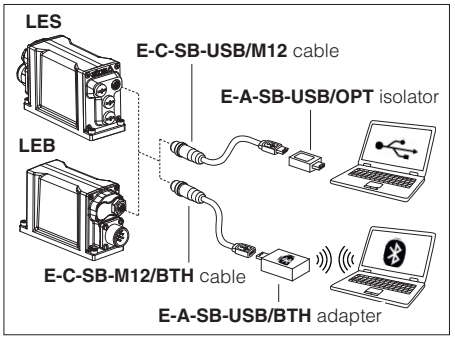
Valve's functional parameters and configurations, can be easily set and optimized using Atos E-SW programming software connected via USB port to the digital driver (see table **FS900**).
For fieldbus versions, the software permits valve's parameterization through USB port also if the driver is connected to the central machine unit via fieldbus.

The software is available in different versions according to the driver's options (see table **GS500**):

E-SW-BASIC	support:	NP (USB)	PS (Serial)	IR (Infrared)
E-SW-FIELDBUS	support:	BC (CANopen)	BP (PROFIBUS DP)	EH (EtherCAT)
		EW (POWERLINK)	EI (EtherNet/IP)	EP (PROFINET)
E-SW-*/PQ	support:	valves with SP, SF, SL alternated control (e.g. E-SW-BASIC/PQ)		

WARNING: drivers USB port is not isolated! For E-C-SB-USB/M12 cable, the use of isolator adapter is highly recommended for PC protection

USB or Bluetooth connection



WARNING: see tech table **GS500** for the list of countries where the Bluetooth adapter has been approved

4 FIELDBUS - only for LES, see tech. table GS510

Fieldbus allows valve direct communication with machine control unit for digital reference, valve diagnostics and settings. These execution allow to operate the valves through fieldbus or analog signals available on the main connector.

5 GENERAL CHARACTERISTICS

Assembly position	Any position
Subplate surface finishing to ISO 4401	Acceptable roughness index: Ra ≤0,8, recommended Ra 0,4 – Flatness ratio 0,01/100
MTTFd valves according to EN ISO 13849	75 years, see technical table P007
Ambient temperature range	**Standard** = -20°C ÷ +60°C **/PE** option = -20°C ÷ +60°C **/BT** option = -40°C ÷ +60°C
Storage temperature range	**Standard** = -20°C ÷ +70°C **/PE** option = -20°C ÷ +70°C **/BT** option = -40°C ÷ +70°C
Surface protection	Zinc coating with black passivation, galvanic treatment (driver housing)
Corrosion resistance	Salt spray test (EN ISO 9227) > 200 h
Compliance	CE according to EMC directive 2014/30/EU (Immunity: EN 61000-6-2; Emission: EN 61000-6-3) RoHS Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006

6 HYDRAULIC CHARACTERISTICS - based on mineral oil ISO VG 46 at 50 °C

Size		16	25	32	40	50	63	80	100
Nominal flow Δp A-B	[l/min]								
	Δp = 5 bar	250	500	800	1200	2000	3000	4500	7200
	Δp = 10 bar	350	700	1100	1700	2800	4250	6350	10200
	Max permissible flow	600	1200	1800	2500	4000	6000	10000	16000
Max pressure [bar]	**LIQZO**	Ports A, B = **350** X = 350 Y ≤ 10							
	LIQZP	Ports A, B = **420** X = 350 Y ≤ 10							
Nominal flow of pilot valve at Δp = 70 bar [l/min]		4	8	20	40	40	100	100	100
Leakage of pilot valve at P = 100 bar [l/min]		0,2	0,2	0,3	0,7	0,7	1	1	1
Piloting pressure [bar]		min: 40% of system pressure max 350 recommended 140 ÷ 160							
Piloting volume [cm^3]		1,6	2,2	7,0	9,4	17,7	32,5	39,5	49,5
Piloting flow **(1)** [l/min]		4	5,3	14	19	35,5	56	60	60
Response time 0 ÷ 100% step signal **(2)** [ms]		24	25	28	30	30	35	40	50
Hysteresis [% of the max regulation]		≤ 0,1							
Repeatability [% of the max regulation]		± 0,1							
Thermal drift		zero point displacement < 1% at ΔT = 40°C							

(1) With step reference input 0÷100%
(2) With pilot pressure = 140 bar, see datailed diagrams in section 9.2

7 ELECTRICAL CHARACTERISTICS

Power supplies	Nominal : +24 VDC Rectified and filtered : VRMS = 20 ÷ 32 VMAX (ripple max 10 % VPP)			
Max power consumption	50 W			
Max. solenoid current	2,6 A			
Coil resistance R at 20°C	3 ÷ 3,3 Ω			
Analog input signals	Voltage: range ±10 VDC (24 VMAX tollerant) Input impedance: Ri > 50 kΩ Current: range ±20 mA Input impedance: Ri = 500 Ω			
Monitor outputs	Output range: voltage ±10 VDC @ max 5 mA current ±20 mA @ max 500 Ω load resistance			
Enable input	Range: 0 ÷ 5 VDC (OFF state), 9 ÷ 24 VDC (ON state), 5 ÷ 9 VDC (not accepted); Input impedance: Ri > 10 kΩ			
Fault output	Output range: 0 ÷ 24 VDC (ON state > [power supply - 2 V] ; OFF state < 1 V) @ max 50 mA; external negative voltage not allowed (e.g. due to inductive loads)			
Alarms	Solenoid not connected/short circuit, cable break with current reference signal, over/under temperature, valve spool transducer malfunctions, alarms history storage function			
Insulation class	H (180°) Due to the occuring surface temperatures of the solenoid coils, the European standards ISO 13732-1 and EN982 must be taken into account			
Protection degree to DIN EN60529	IP66 / IP67 with mating connectors			
Duty factor	Continuous rating (ED=100%)			
Tropicalization	Tropical coating on electronics PCB			
Additional characteristics	Short circuit protection of solenoid's current supply; 3 leds for diagnostic; spool position control by P.I.D. with rapid solenoid switching; protection against reverse polarity of power supply			
Communication interface	USB Atos ASCII coding	CANopen EN50325-4 + DS408	PROFIBUS DP EN50170-2/IEC61158	EtherCAT, POWERLINK, EtherNet/IP, PROFINET IO RT / IRT EC 61158
Communication physical layer	not insulated USB 2.0 + USB OTG	optical insulated CAN ISO11898	optical insulated RS485	Fast Ethernet, insulated 100 Base TX
Recommended wiring cable	LiYCY shielded cables, see section 16			

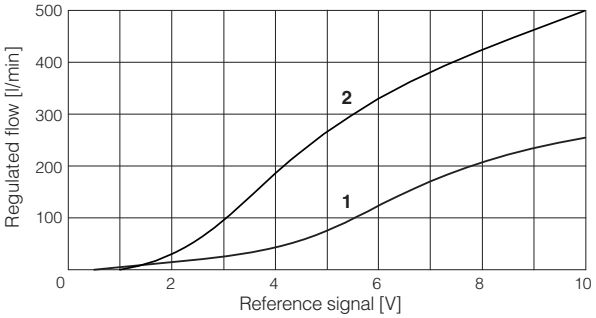
Note: a maximum time of 800 ms (depending on communication type) have be considered between the driver energizing with the 24 VDC power supply and when the valve is ready to operate. During this time the current to the valve coils is switched to zero.

8 SEALS AND HYDRAULIC FLUIDS - for other fluids not included in below table, consult our technical office

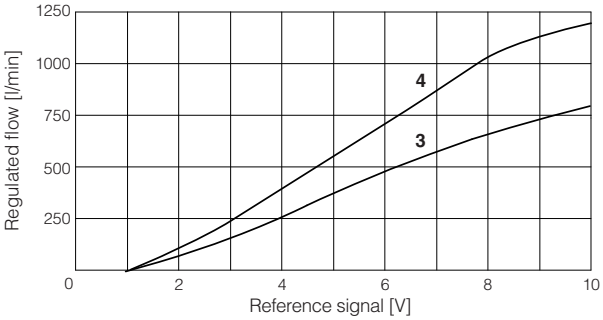
Seals, recommended fluid temperature		NBR seals (standard) = -20°C ÷ +60°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option) = -20°C ÷ +80°C HNBR seals (/BT option) = -40°C ÷ +60°C, with HFC hydraulic fluids = -40°C ÷ +50°C		
Recommended viscosity		20÷100 mm^2/s - max allowed range 15 ÷ 380 mm^2/s		
Max fluid contamination level	normal operation	ISO4406 class 18/16/13 NAS1638 class 7		see also filter section at www.atos.com or KTF catalog
	longer life	ISO4406 class 16/14/11 NAS1638 class 5		
Hydraulic fluid		**Suitable seals type**	**Classification**	**Ref. Standard**
Mineral oils		NBR, FKM, HNBR	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water		FKM	HFDU, HFDR	ISO 12922
Flame resistant with water		NBR, HNBR	HFC	

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

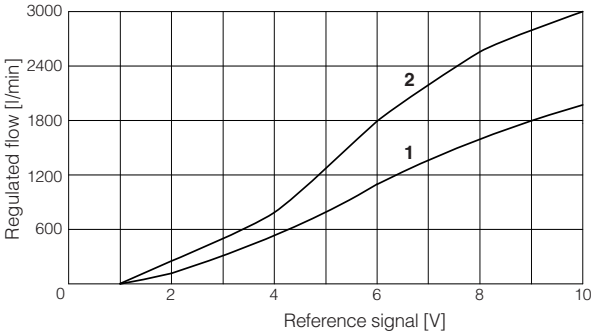
9.1 Regulation diagrams (values measured at Δp 5 bar)



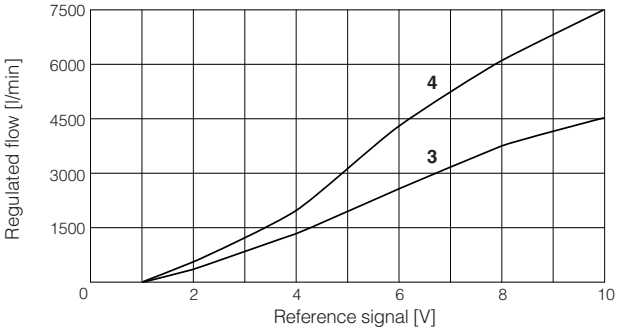
1 = LIQZO-L*-162L4
2 = LIQZO-L*-252L4



3 = LIQZO-L*-322L4
4 = LIQZO-L*-402L4



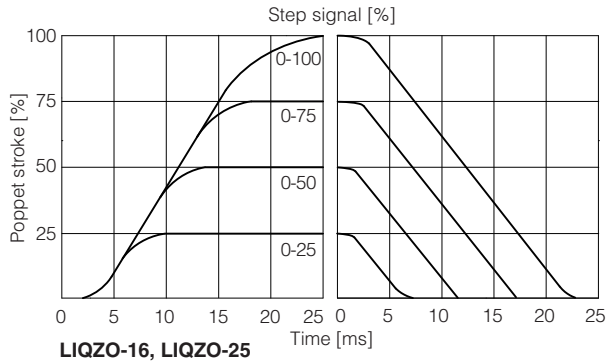
1 = LIQZP-L*-502L4
2 = LIQZP-L*-632L4



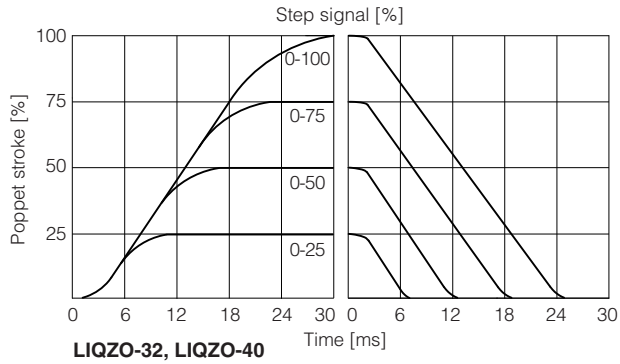
3 = LIQZP-L*-802L4
4 = LIQZP-L*-1002L4

9.2 Response time

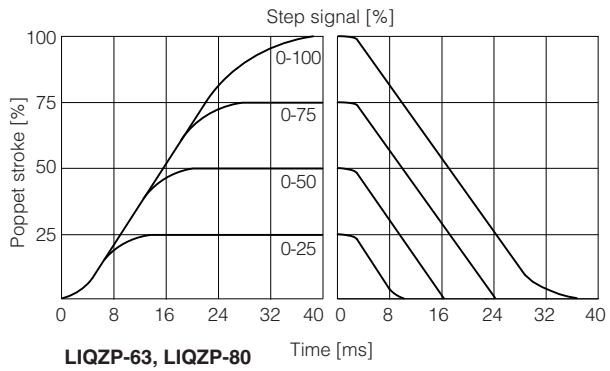
The response times in below diagrams are measured at different steps of the reference input signal. They have to be considered as average values. For the valves with digital electronics the dynamics performances can be optimized by setting the internal software parameters.



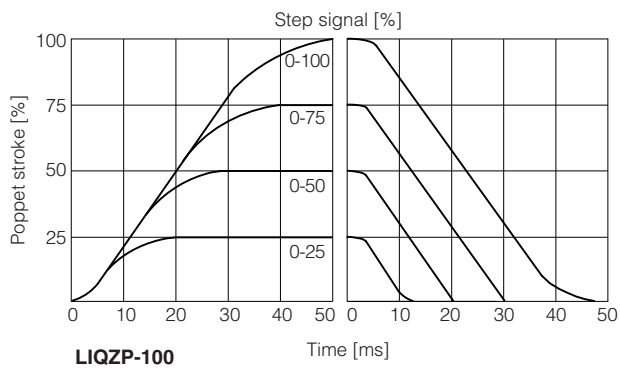
LIQZO-16, LIQZO-25



LIQZO-32, LIQZO-40
LIQZP-50

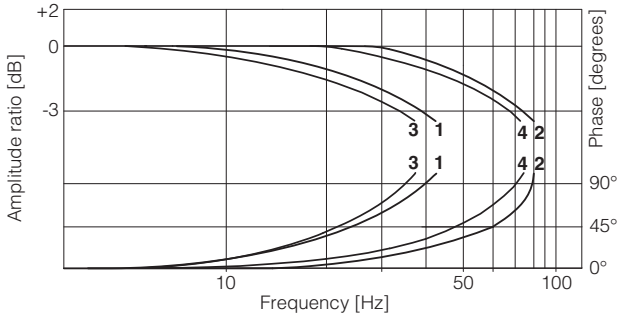


LIQZP-63, LIQZP-80

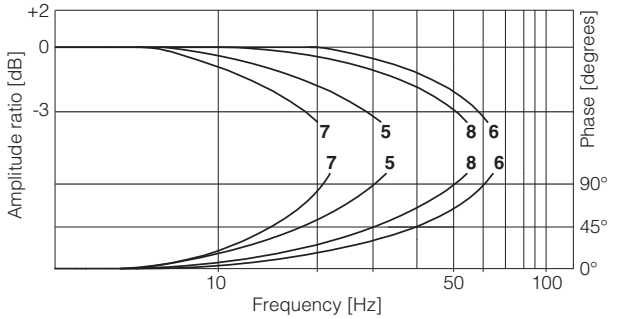


LIQZP-100

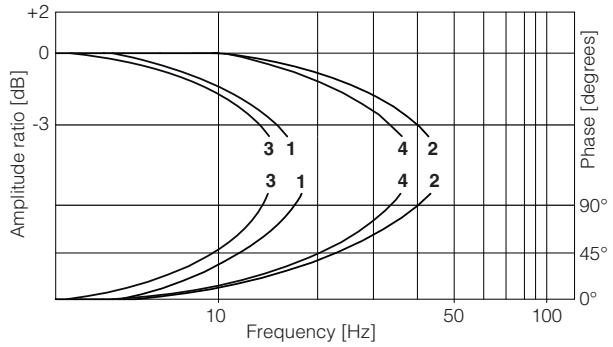
9.3 Bode diagrams - stated at nominal hydraulic conditions



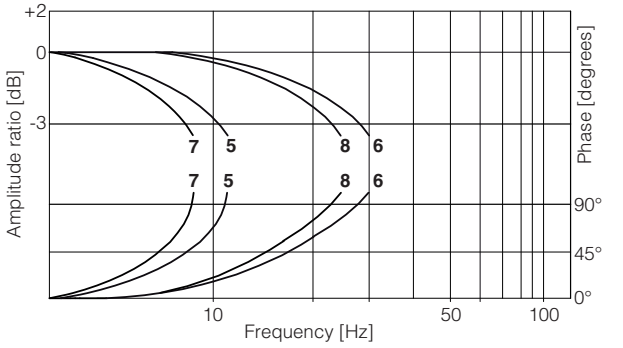
1 = LIQZO-L*-162L4: 10% ↔ 90%
2 = LIQZO-L*-162L4: 50% ± 5%
3 = LIQZO-L*-252L4: 10% ↔ 90%
4 = LIQZO-L*-252L4: 50% ± 5%



5 = LIQZO-L*-322L4: 10% ↔ 90%
6 = LIQZO-L*-322L4: 50% ± 5%
7 = LIQZO-L*-402L4: 10% ↔ 90%
8 = LIQZO-L*-402L4: 50% ± 5%



1 = LIQZP-L*-502L4: 10% ↔ 90%
2 = LIQZP-L*-502L4: 50% ± 5%
3 = LIQZP-L*-632L4: 10% ↔ 90%
4 = LIQZP-L*-632L4: 50% ± 5%



5 = LIQZP-L*-802L4: 10% ↔ 90%
6 = LIQZP-L*-802L4: 50% ± 5%
7 = LIQZP-L*-1002L4: 10% ↔ 90%
8 = LIQZP-L*-1002L4: 50% ± 5%

10 ELECTRONICS OPTIONS

F = This option permits to monitor the eventual fault condition of the driver, as for example the solenoid short circuit/not connected, reference signal cable broken for option /I, spool position transducer broken, etc. - see 13.7 for signal specifications.

I = This option provides 4 ÷ 20 mA current reference and monitor signals, instead of the standard 0 ÷ 10 VDC.
Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ±10 VDC or ±20 mA.
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; the valve functioning is disabled in case of reference signal cable breakage.

Q = This option permits to inhibit the valve function without removing the power supply to the driver. Upon disable command the current to the solenoid is zeroed and the valve's spool moves to rest position.
The option /Q is suggested for all cases where the valve has to be frequently inhibited during the machine cycle – see 13.5 for signal specifications.

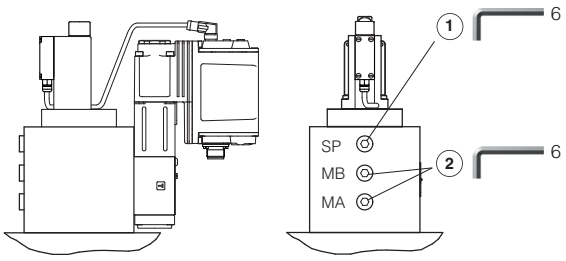
Z = This option provides, on the 12 pin main connector, the following additional features:
Fault output signal - see above option **/F**
Enable input signal - see above option **/Q**
Repeat enable output signal - only for **LEB** (see 13.6)
Power supply for driver's logics and communication - only for **LES** (see 13.2)

11 POSSIBLE COMBINED OPTIONS

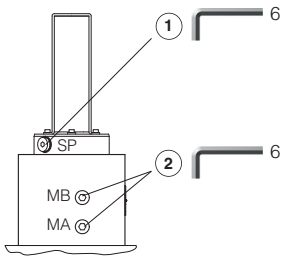
/FI, /IQ, /IZ

12 AIR BLEEDING

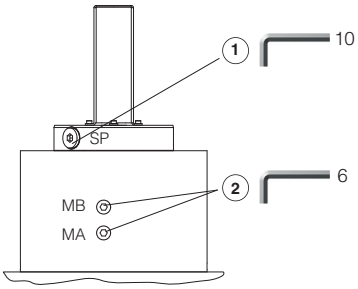
Size 16 to 40



Size 50



Sizes 63 to 100



(1) Air suction port:

N° 1 plug G1/4" for sizes 16 to 50
N° 1 plug G1/2" for sizes 63 to 100

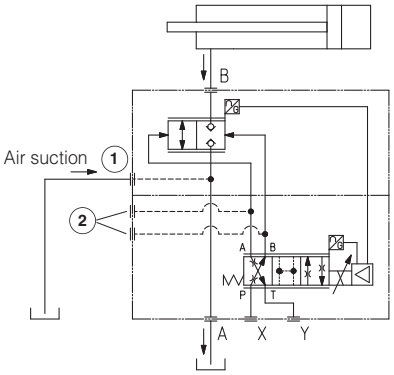
To be used only in case port A is connected to tank and subjected to negative pressure, consult our technical office.

(2) Air bleeding:

N° 2 plugs G1/4"

At the machine commissioning it is advisable to bleed the air from piloting chambers, by loosening the 2 plugs shown in the picture.

Operate the valve for few seconds at low pressure and then lock the plugs.



13 POWER SUPPLY AND SIGNALS SPECIFICATIONS

Generic electrical output signals of the valve (e.g. fault or monitor signals) must not be directly used to activate safety functions, like to switch-ON/OFF the machine's safety components, as prescribed by the European standards (Safety requirements of fluid technology systems and components-hydraulics, ISO 4413).

13.1 Power supply (V+ and V0)

The power supply must be appropriately stabilized or rectified and filtered: apply at least a 10000 µF/40 V capacitance to single phase rectifiers or a 4700 µF/40 V capacitance to three phase rectifiers. In case of separate power supply see 13.2.

⚠ A safety fuse is required in series to each power supply: 2,5 A time lag fuse.

13.2 Power supply for driver's logic and communication (VL+ and VL0) - only for **/Z** option

The power supply for driver's logic and communication must be appropriately stabilized or rectified and filtered: apply at least a 10000 µF/40 V capacitance to single phase rectifiers or a 4700 µF/40 V capacitance to three phase rectifiers.
The separate power supply for driver's logic on pin 9 and 10, allow to remove solenoid power supply from pin 1 and 2 maintaining active the diagnostics, USB and fieldbus communications.

⚠ A safety fuse is required in series to each driver's logic and communication power supply: 500 mA fast fuse.

13.3 Flow reference input signal (Q_INPUT+)

The driver controls in closed loop the valve spool position proportionally to the external reference input signal.
Reference input signal is factory preset according to selected valve code, defaults are 0 ÷ 10 VDC for standard and 4 ÷ 20 mA for /I option.
Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ±10 VDC or ± 20 mA.
Drivers with fieldbus interface can be software set to receive reference signal directly from the machine control unit (fieldbus reference).
Analog reference input signal can be used as on-off commands with input range 0 ÷ 24VDC.

13.4 Flow monitor output signal (Q_MONITOR) - not for **/F**

The driver generates an analog output signal proportional to the actual spool position of the valve; the monitor output signal can be software set to show other signals available in the driver (e.g. analog reference, fieldbus reference, pilot spool position).
Monitor output signal is factory preset according to selected valve code, defaults are 0 ÷ 10 VDC for standard and 4 ÷ 20 mA for /I option.
Output signal can be reconfigured via software selecting between voltage and current, within a maximum range of ±10 VDC or ± 20 mA.

13.5 Enable input signal (ENABLE) - not for standard and **/F**

To enable the driver, supply a 24 VDC on pin 3 (pin C): Enable input signal allows to enable/disable the current supply to the solenoid, without removing the electrical power supply to the driver; it is used to active the communication and the other driver functions when the valve must be disabled for safety reasons. This condition **does not comply** with norms IEC 61508 and ISO 13849.
Enable input signal can be used as generic digital input by software selection.

13.6 Repeat enable output signal (R_ENABLE) - only for **LEB** with **/Z** option

Repeat enable is used as output repeater signal of enable input signal (see 13.5).

13.7 Fault output signal (FAULT) - not for standard and **/Q**

Fault output signal indicates fault conditions of the driver (solenoid short circuits/not connected, reference signal cable broken for 4 ÷ 20 mA input, spool position transducer cable broken, etc.). Fault presence corresponds to 0 VDC, normal working corresponds to 24 VDC.
Fault status is not affected by the Enable input signal. Fault output signal can be used as digital output by software selection.).

14 ELECTRONIC CONNECTIONS

14.1 Main connector signals - 7 pin (A1) **Standard**, **/Q** and **/F** options

PIN	Standard	/Q	/F	TECHNICAL SPECIFICATIONS	NOTES
A	**V+**			Power supply 24 VDC	Input - power supply
B	**V0**			Power supply 0 VDC	Gnd - power supply
C	**AGND**		**AGND**	Analog ground	Gnd - analog signal
		ENABLE		Enable (24 VDC) or disable (0 VDC) the valve, referred to V0	Input - on/off signal
D	**Q_INPUT+**			Flow reference input signal: ±10 VDC / ±20 mA maximum range Defaults are 0 ÷ 10 VDC for standard and 4 ÷ 20 mA for /I option	Input - analog signal **Software selectable**
E	**INPUT-**			Negative reference input signal for Q_INPUT+	Input - analog signal
F	**Q_MONITOR** referred to: AGND / V0			Flow monitor output signal: ±10 VDC / ±20 mA maximum range Defaults are 0 ÷ 10 VDC for standard and 4 ÷ 20 mA for /I option	Output - analog signal **Software selectable**
			FAULT	Fault (0 VDC) or normal working (24 VDC)	Output - on/off signal
G	**EARTH**			Internally connected to the driver housing	

14.2 Main connector signals - 12 pin (A2) **/Z** option

PIN	LEB-SN /Z	LES-SN /Z	TECHNICAL SPECIFICATIONS	NOTES
1	**V+**		Power supply 24 VDC	Input - power supply
2	**V0**		Power supply 0 VDC	Gnd - power supply
3	**ENABLE** referred to: V0 / VL0		Enable (24 VDC) or disable (0 VDC) the valve	Input - on/off signal
4	**Q_INPUT+**		Flow reference input signal: ±10 VDC / ±20 mA maximum range Defaults are 0 ÷ 10 VDC for standard and 4 ÷ 20 mA for /I option	Input - analog signal **Software selectable**
5	**INPUT-**		Negative reference input signal for Q_INPUT+	Input - analog signal
6	**Q_MONITOR** referred to: AGND / VL0		Flow monitor output signal: ±10 VDC / ±20 mA maximum range Defaults are 0 ÷ 10 VDC for standard and 4 ÷ 20 mA for /I option	Input - analog signal **Software selectable**
7	**AGND**		Analog ground	Output - analog signal
		NC	Do not connect	Gnd - analog signal
8	**R_ENABLE**		Repeat enable, output repeter signal of enable input, referred to V0	Output - on/off signal
		NC	Do not connect	
9	**NC**		Do not connect	
		VL+	Power supply 24 VDC for driver's logic and communication	Input - power supply
10	**NC**		Do not connect	
		VL0	Power supply 0 VDC for driver's logic and communication	Gnd - power supply
11	**FAULT** referred to: V0 / VL0		Fault (0 VDC) or normal working (24 VDC)	Output - on/off signal
PE	**EARTH**		Internally connected to the driver housing	

Note: do not disconnect VL0 before VL+ when the driver is connected to PC USB port

14.3 Communications connectors (B) - (C)

(B) **USB connector - M12 - 5 pin** always present		
PIN	**SIGNAL**	**TECHNICAL SPECIFICATION** (1)
1	**+5V_USB**	Power supply
2	**ID**	Identification
3	**GND_USB**	Signal zero data line
4	**D-**	Data line -
5	**D+**	Data line +

(C1) (C2) **BP fieldbus execution, connector - M12 - 5 pin**		
PIN	**SIGNAL**	**TECHNICAL SPECIFICATION** (1)
1	**+5V**	Termination supply signal
2	**LINE-A**	Bus line (high)
3	**DGND**	Data line and termination signal zero
4	**LINE-B**	Bus line (low)
5	**SHIELD**	

(1) Shield connection on connector's housing is recommended

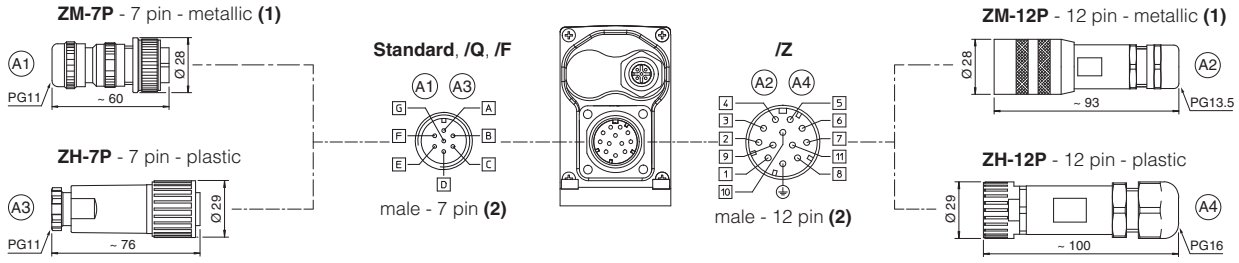
(C1) (C2) **BC fieldbus execution, connector - M12 - 5 pin**		
PIN	**SIGNAL**	**TECHNICAL SPECIFICATION** (1)
1	**CAN_SHLD**	Shield
2	**not used**	(C1) - (C2) pass-through connection (2)
3	**CAN_GND**	Signal zero data line
4	**CAN_H**	Bus line (high)
5	**CAN_L**	Bus line (low)

(C1) (C2) **EH, EW, EI, EP fieldbus execution, connector - M12 - 4 pin**		
PIN	**SIGNAL**	**TECHNICAL SPECIFICATION** (1)
1	**TX+**	Transmitter
2	**RX+**	Receiver
3	**TX-**	Transmitter
4	**RX-**	Receiver
Housing	**SHIELD**	

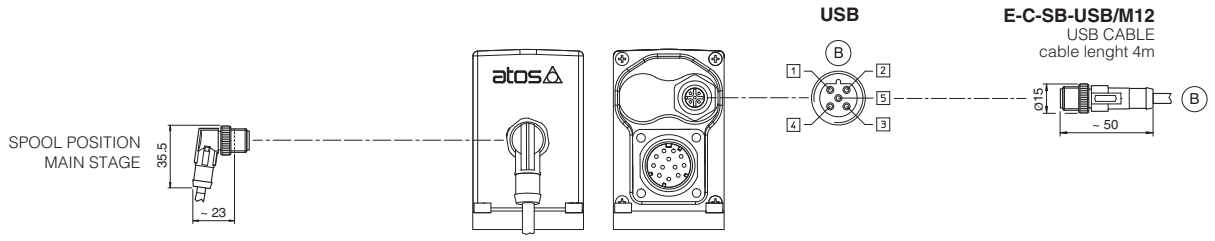
(2) Pin 2 can be fed with external +5V supply of CAN interface

14.4 LEB connections layout

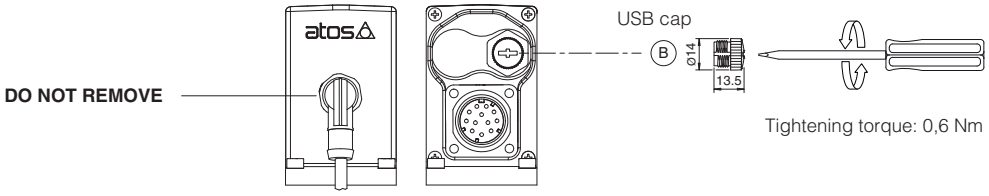
MAIN CONNECTORS



TRANSDUCER AND USB CONNECTOR



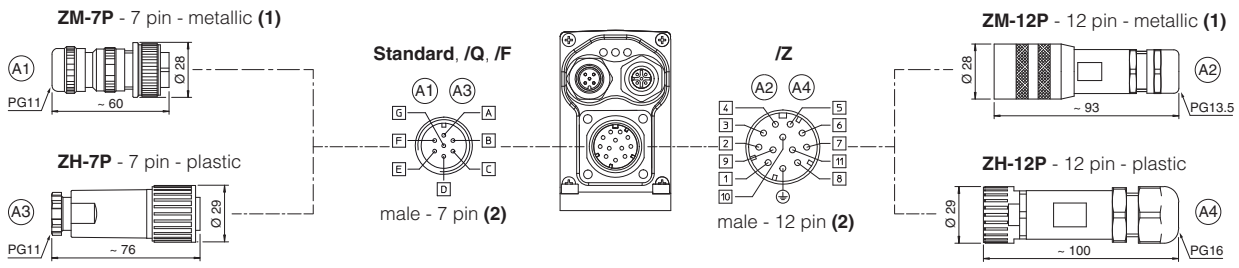
PLASTIC PROTECTION CAP - supplied with the valves



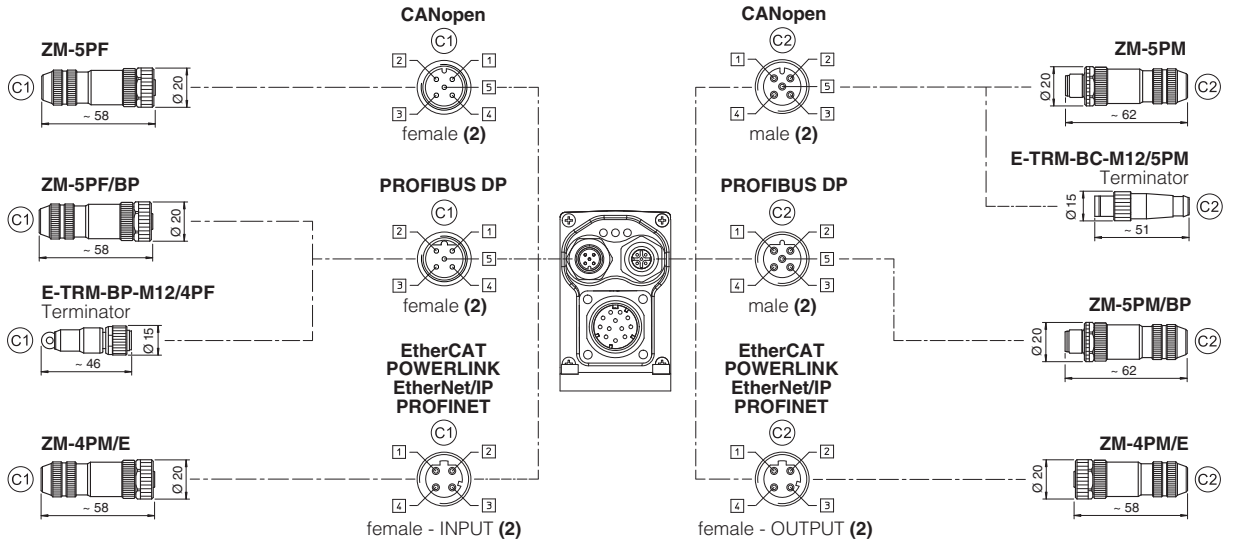
(1) Use of metallic connectors is strongly recommended in order to fulfill EMC requirements **(2)** Pin layout always referred to driver's view

14.5 LES connections layout

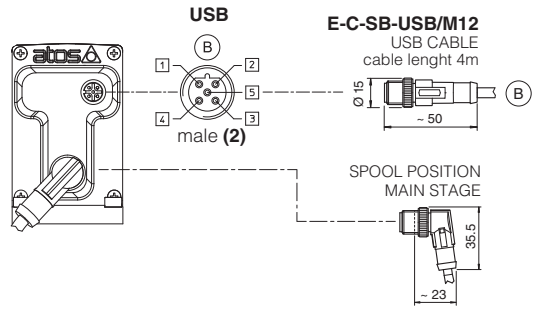
MAIN CONNECTORS



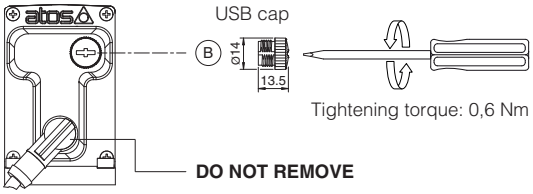
FIELDBUS CONNECTORS



TRANSDUCER AND USB CONNECTORS



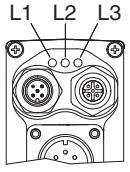
PLASTIC PROTECTION CAP - supplied with the valves



(1) Use of metallic connectors is strongly recommended in order to fulfill EMC requirements **(2)** Pin layout always referred to driver's view

14.6 Diagnostic LEDs - only for **LES**

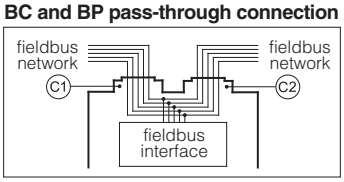
Three leds show driver operative conditions for immediate basic diagnostics. Please refer to the driver user manual for detailed information.

FIELDBUS / LEDS	NP Not Present	BC CANopen	BP PROFIBUS DP	EH EtherCAT	EW POWERLINK	EI EtherNet/IP	EP PROFINET	L1 L2 L3
L1	VALVE STATUS			LINK/ACT				
L2	NETWORK STATUS			NETWORK STATUS				
L3	SOLENOID STATUS			LINK/ACT				

15 IN / OUT FIELDBUS COMMUNICATION CONNECTORS

Two fieldbus communication connectors are always available for digital drivers executions BC, BP, EH, EW, EI, EP. This features allows considerable technical advantages in terms of installation simplicity, wirings reduction and also avoid the usage expensive T-connectors.
For BC and BP executions the fieldbus connectors have an internal pass-through connection and can be used like end point of the fieldbus network, using an external terminator (see tech table **GS500**).
For EH, EW, EI and EP executions the external terminators are not required: each connector is internally terminated.

BC and BP pass-through connection



16 CONNECTORS CHARACTERISTICS - to be ordered separately

16.1 Main connectors - 7 pin

CONNECTOR TYPE	POWER SUPPLY	POWER SUPPLY
CODE	(A1) **ZM-7P**	(A3) **ZH-7P**
Type	7pin female straight circular	7pin female straight circular
Standard	According to MIL-C-5015	According to MIL-C-5015
Material	Metallic	Plastic reinforced with fiber glass
Cable gland	PG11	PG11
Recommended cable	LiYCY 7 x 0,75 mm² max 20 m (logic and power supply) or LiYCY 7 x 1 mm² max 40 m (logic and power supply)	LiYCY 7 x 0,75 mm² max 20 m (logic and power supply) or LiYCY 7 x 1 mm² max 40 m (logic and power supply)
Conductor size	up to 1 mm² - available for 7 wires	up to 1 mm² - available for 7 wires
Connection type	to solder	to solder
Protection (EN 60529)	IP 67	IP 67

16.2 Main connectors - 12 pin

CONNECTOR TYPE	POWER SUPPLY	POWER SUPPLY
CODE	(A2) **ZM-12P**	(A4) **ZH-12P**
Type	12pin female straight circular	12pin female straight circular
Standard	DIN 43651	DIN 43651
Material	Metallic	Plastic reinforced with fiber glass
Cable gland	PG13,5	PG16
Recommended cable	LiYCY 12 x 0,75 mm² max 20 m (logic and power supply)	LiYCY 10 x 0,14mm² max 40 m (logic) LiYY 3 x 1mm² max 40 m (power supply)
Conductor size	0,5 mm² to 1,5 mm² - available for 12 wires	0,14 mm² to 0,5 mm² - available for 9 wires 0,5 mm² to 1,5 mm² - available for 3 wires
Connection type	to crimp	to crimp
Protection (EN 60529)	IP 67	IP 67

16.3 Fieldbus communication connectors

CONNECTOR TYPE	BC CANopen (1)		BP PROFIBUS DP (1)		EH EtherCAT, EW POWERLINK, EI EtherNet/IP, EP PROFINET (2)
CODE	(C1) **ZM-5PF**	(C2) **ZM-5PM**	(C1) **ZM-5PF/BP**	(C2) **ZM-5PM/BP**	(C1) (C2) **ZM-4PM/E**
Type	5 pin female straight circular	5 pin male straight circular	5 pin female straight circular	5 pin male straight circular	4 pin male straight circular
Standard	M12 coding A – IEC 61076-2-101		M12 coding B – IEC 61076-2-101		M12 coding D – IEC 61076-2-101
Material	Metallic		Metallic		Metallic
Cable gland	Pressure nut - cable diameter 6÷8 mm		Pressure nut - cable diameter 6÷8 mm		Pressure nut - cable diameter 4÷8 mm
Cable	CANbus Standard (DR 303-1)		PROFIBUS DP Standard		Ethernet standard CAT-5
Connection type	screw terminal		screw terminal		terminal block
Protection (EN 60529)	IP67		IP 67		IP 67

(1) E-TRM-** terminators can be ordered separately - see tech table **GS500**

(2) Internally terminated

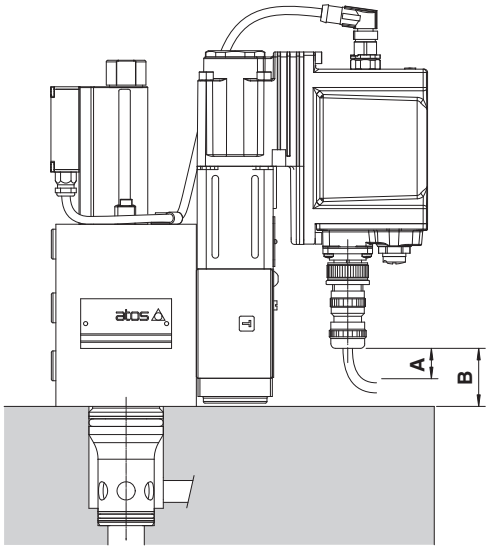
17 FASTENING BOLTS AND VALVE MASS

Type	Size	Fastening bolts (1)	Mass [kg]
LIQZO	16	4 socket head screws M8x90 class 12.9 Tightening torque = 35 Nm	5,6
	25	4 socket head screws M12x100 class 12.9 Tightening torque = 125 Nm	8,2
	32	4 socket head screws M16x60 class 12.9 Tightening torque = 300 Nm	10,9
	40	4 socket head screws M20x70 class 12.9 Tightening torque = 600 Nm	16,7
LIQZP	50	4 socket head screws M20x80 class 12.9 Tightening torque = 600 Nm	23,9
	63	4 socket head screws M30x120 class 12.9 Tightening torque = 2100 Nm	44,0
	80	8 socket head screws M24x80 class 12.9 Tightening torque = 1000 Nm	71,6
	100	8 socket head screws M30x120 class 12.9 Tightening torque = 2100 Nm	122,5

(1) Fastening bolts supplied with the valve

18 MAIN CONNECTORS INSTALLATION DIMENSIONS

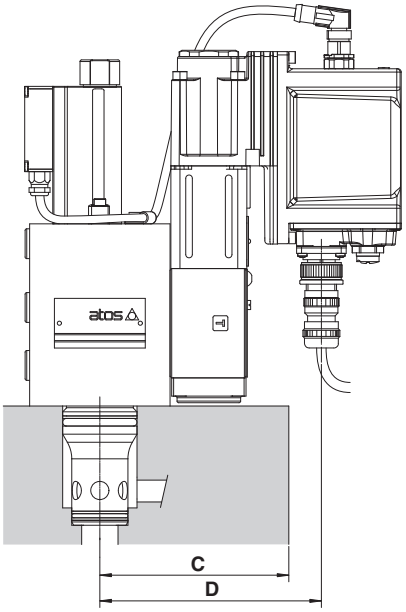
Installation 1 - possible interference between manifold and main connector



A = 15 mm space to remove the 7 or 12 pin main connectors

B = Clearance between main connector to valve's mounting surface. See the below table to verify eventual interferences, depending to the valve size and connector type

Installation 2 - no interference



C = Max manifold dimension to avoid interference with the main connector, see below table

Reference dimension	Main connector code	Valve size							
		16	**25**	**32**	**40**	**50**	**63**	**80**	**100**
B	ZM-7P	32	32	32	32	45	68	68	80
	ZH-7P	**(1)**	**(1)**	**(1)**	**(1)**	29	52	52	64
	ZM-12P	**(1)**	**(1)**	**(1)**	**(1)**	**(1)**	35	35	47
	ZH-12P	**(1)**	**(1)**	**(1)**	**(1)**	**(1)**	**(1)**	**(2)**	40
C (max)	-	104	114	121	134	141	172	202	229
D	-	124	134	141	154	161	192	222	249

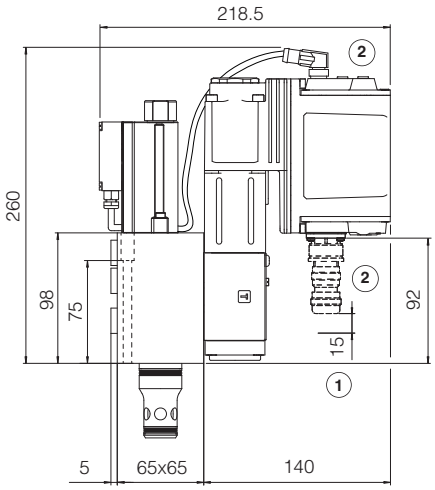
Above dimenions refer to the main connector fully screwed to driver's connector. The space **A** = 15 mm to remove the connector must be considered

(1) The connector installation can be performed only if the valve's driver protrudes from the edge of the relevant mounting manifold as rapresented in above "Installation 2"

(2) The connector installation may be critic, depending to the cable size and bending radius

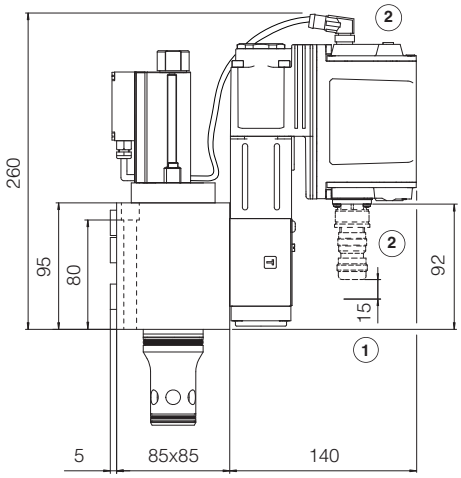
19 INSTALLATION DIMENSIONS [mm]

LIQZO-LEB-162
LIQZO-LES-162



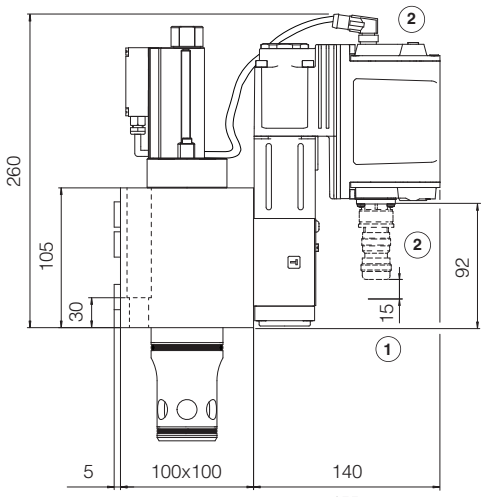
for **EW** - POWERLINK,
EI - EtherNet/IP,
EP- PROFINET IRT

LIQZO-LEB-252
LIQZO-LES-252



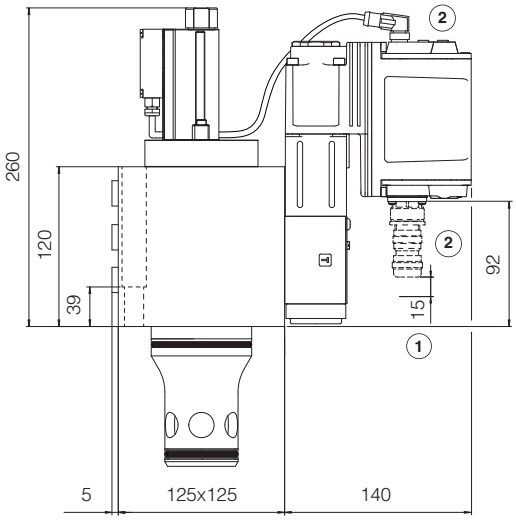
for **EW** - POWERLINK,
EI - EtherNet/IP,
EP- PROFINET IRT

LIQZO-LEB-322
LIQZO-LES-322



for **EW** - POWERLINK,
EI - EtherNet/IP,
EP- PROFINET IRT

LIQZO-LEB-402
LIQZO-LES-402



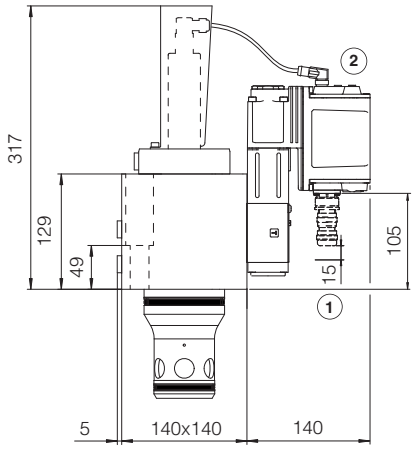
for **EW** - POWERLINK,
EI - EtherNet/IP,
EP- PROFINET IRT

(1) = Space to remove the connectors

(2) = The dimensions of all connectors must be considered, see section 14.4 and 14.5
For main connectors installation, see also section [18].

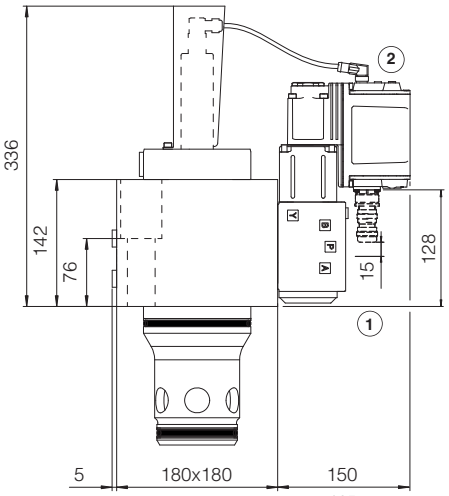
Note: for mounting surface and cavity dimensions, see table P006

LIQZP-LEB-502
LIQZP-LES-502



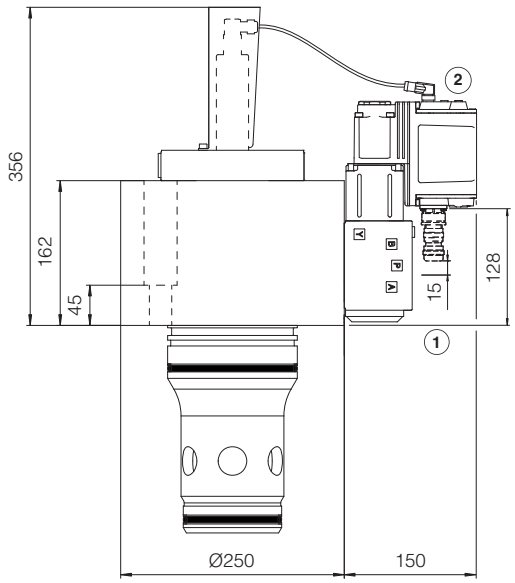
for **EW** - POWERLINK,
EI - EtherNet/IP,
EP- PROFINET IRT

LIQZP-LEB-632
LIQZP-LES-632



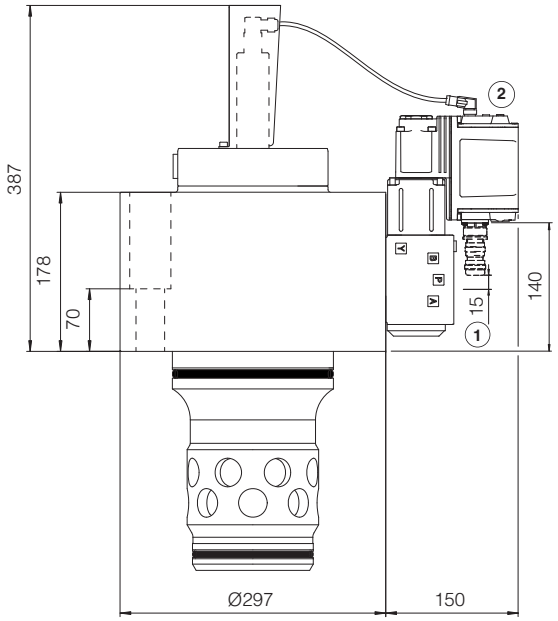
for **EW** - POWERLINK,
EI - EtherNet/IP,
EP- PROFINET IRT

LIQZP-LEB-802
LIQZP-LES-802



for **EW** - POWERLINK,
EI - EtherNet/IP,
EP- PROFINET IRT

LIQZP-LEB-1002
LIQZP-LES-1002



for **EW** - POWERLINK,
EI - EtherNet/IP,
EP- PROFINET IRT

(1) = Space to remove the connectors

(2) = The dimensions of all connectors must be considered, see section 14.4 and 14.5
For main connectors installation, see also section 18 .

Note: for mounting surface and cavity dimensions, see table P006

20 RELATED DOCUMENTATION

FS001	Basics for digital electrohydraulics	**K800**	Electric and electronic connectors
FS900	Operating and maintenance information for proportional valves	**P006**	Mounting surfaces and cavities for cartridge valves
GS500	Programming tools	**QB340**	Quickstart for LEB valves commissioning
GS510	Fieldbus	**QF340**	Quickstart for LES valves commissioning