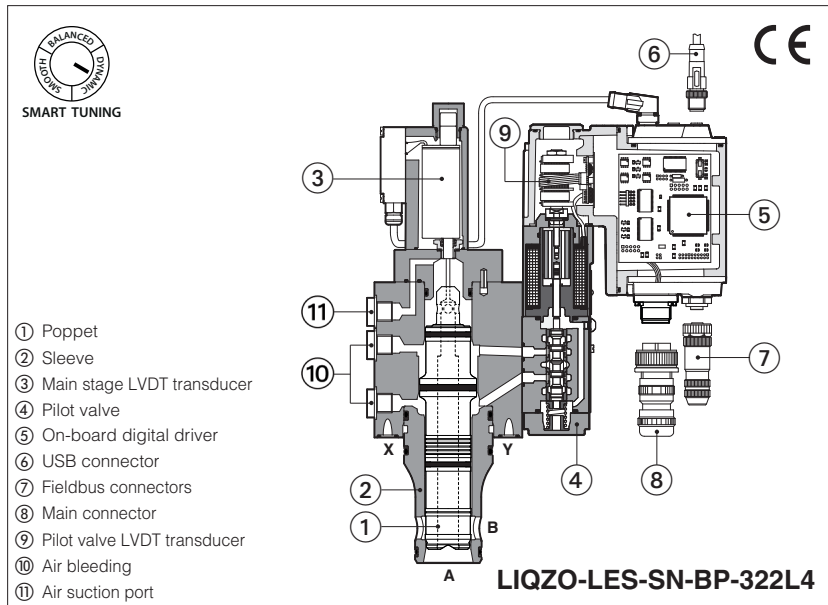


Digital proportional 2-way cartridges high performance

piloted, with on-board driver and two LVDT transducers



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 ÷ 125** - ISO 7368
Max flow: **4000 ÷ 22000 l/min**
Max pressure: **420 bar**

1 MODEL CODE

LIQZO Proportional 2-way cartridge, piloted LIQZO = size 16 to 40, Pmax 350 bar LIQZP = size 50 to 125, Pmax 420 bar	-	LES	-	SN	-	NP	-	25	2	L4 /	*	/	*	/	*
--	---	------------	---	-----------	---	-----------	---	-----------	----------	-------------	---	---	---	---	---

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

Alternated P/Q controls:
SN = none

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

Valve size ISO 7368, see section 7:

LIQZO =	16	25	32	40	
l/min	250	500	800	1200	
LIQZP =	50	63	80	100	125
l/min	2000	3000	4500	7200	9350

Nominal flow (l/min) at Δp 5 bar

(1) Only in version **SN-NP**

(2) Possible combined options: /FI, /IQ, /IZ

Seals material, see section 9:
- = NBR
PE = FKM
BT = HNBR

Series number

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)

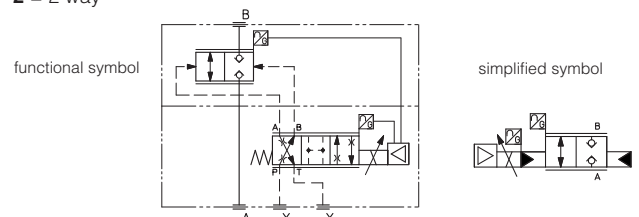
Poppet type, regulating characteristics:

L4 = linear



Configuration:

2 = 2 way



(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 **14**.

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. 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.

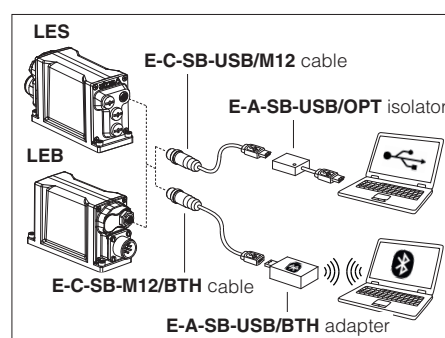
The software is available in different versions according to the driver's options (see table **GS500**):

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

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

USB or Bluetooth connection



4 SMART TUNING

Smart tuning allows to adjust the cartridge dynamic response in order to match different performance requirements.

The cartridge is provided with 3 factory settings for the poppet control:

- **dynamic** fast response time and high sensitivity for best dynamic performances. Default factory setting for cartridges
- **balanced** average response time and sensitivity suitable for major applications
- **smooth** attenuated response time and sensitivity to improve control stability in critical applications or in environments with electrical disturbances

Smart tuning setting can be switched from Dynamic (default) to Balanced or Smooth via software or fieldbus; if requested, performances can be further customized directly tuning each single control parameter. For details consult related manuals E-MAN-RI-* and Quickstart, see section **21**.

For Response time and Bode diagrams see section **10**.

5 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.

6 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 2015/863/EU REACH Regulation (EC) n°1907/2006

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

Size		16	25	32	40	50	63	80	100	125
Nominal flow Δp A-B [l/min]	$\Delta p = 5$ bar	250	500	800	1200	2000	3000	4500	7200	9350
	$\Delta p = 10$ bar	350	700	1100	1700	2800	4250	6350	10200	13200
	Max permissible flow	600	1200	1800	2500	4000	6000	10000	16000	22000
Max pressure [bar]	LIQZO	Ports A, B = 350 X = 350 Y \leq 10								
	LIQZP	Ports A, B = 420 X = 350 Y \leq 10								
Nominal flow of pilot valve at $\Delta p = 70$ bar [l/min]		4	8	20	40	40	100	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	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	124,9
Piloting flow (1) [l/min]		4	5,3	14	19	35,5	56	60	60	88,1
Response time 0 ÷ 100% step signal (2) [ms]		24	25	28	30	30	35	40	50	90
Hysteresis [% of the max regulation]		$\leq 0,1$								
Repeatability [% of the max regulation]		$\pm 0,1$								
Thermal drift		zero point displacement < 1% at $\Delta T = 40^\circ C$								

(1) With step reference input 0÷100%

(2) With pilot pressure = 140 bar, see detailed diagrams in section 10.2

8 ELECTRICAL CHARACTERISTICS

Power supplies	Nominal : +24 VDC Rectified and filtered : $V_{RMS} = 20 \div 32 V_{MAX}$ (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) Current: range ± 20 mA		Input impedance: $R_i > 50$ k Ω Input impedance: $R_i = 500$ 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: $R_i > 10$ k Ω			
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 poppet transducer malfunctions, alarms history storage function			
Insulation class	H (180°) Due to the occurring 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; poppet position control by P.I.D. with rapid solenoid switching; protection against reverse polarity of power supply			
Communication interface	USB	CANopen	PROFIBUS DP	EtherCAT, POWERLINK, EtherNet/IP, PROFINET IO RT / IRT EC 61158
	Atos ASCII coding	EN50325-4 + DS408	EN50170-2/IEC61158	
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 17			

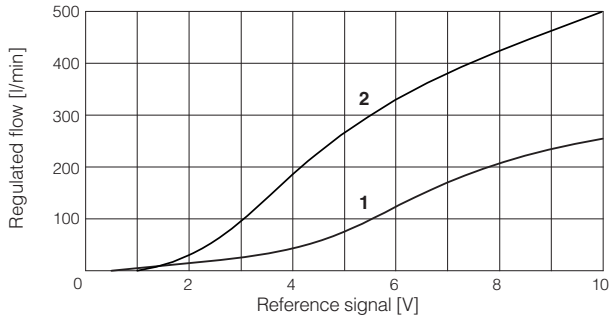
Note: a maximum time of 800 ms (1000 ms just for size 125), depending on communication type, has to be considered between the driver energizing with the 24 Vdc power supply and when the valve is ready to operate. During this time the current to the valve coils is switched to zero.

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

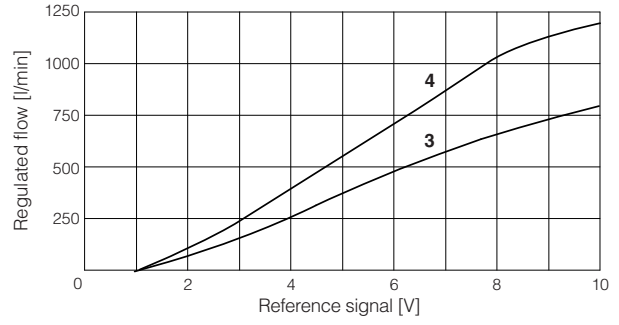
Seals, recommended fluid temperature	NBR seals (standard) = -20°C ÷ +60°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option) = -20°C ÷ +80°C HNBR seals (/BT option) = -40°C ÷ +60°C, with HFC hydraulic fluids = -40°C ÷ +50°C		
Recommended viscosity	20 ÷ 100 mm ² /s - max allowed range 15 ÷ 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	

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

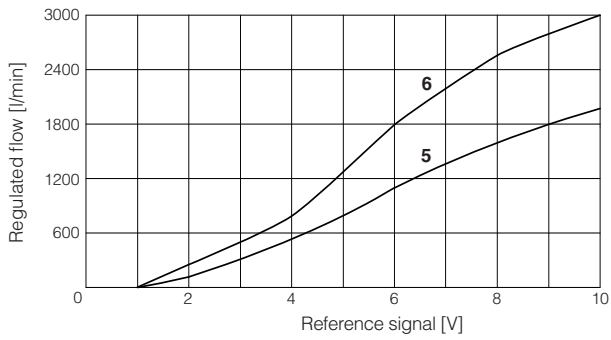
10.1 Regulation diagrams (values measured at Δp 5 bar)



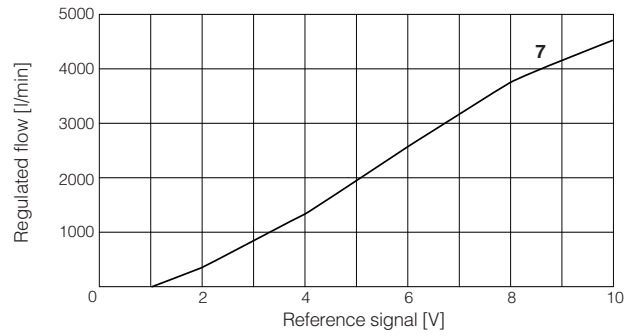
1 = LIQZO-L*-162L4
2 = LIQZO-L*-252L4



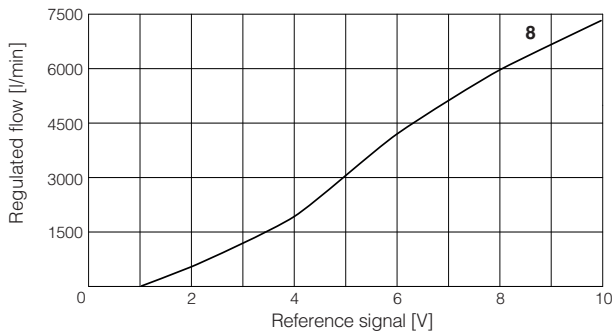
3 = LIQZO-L*-322L4
4 = LIQZO-L*-402L4



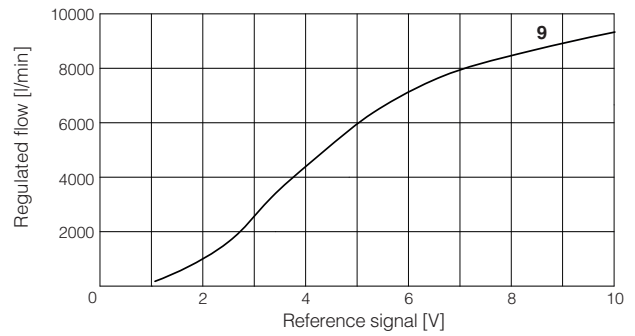
5 = LIQZP-L*-502L4
6 = LIQZP-L*-632L4



7 = LIQZP-L*-802L4



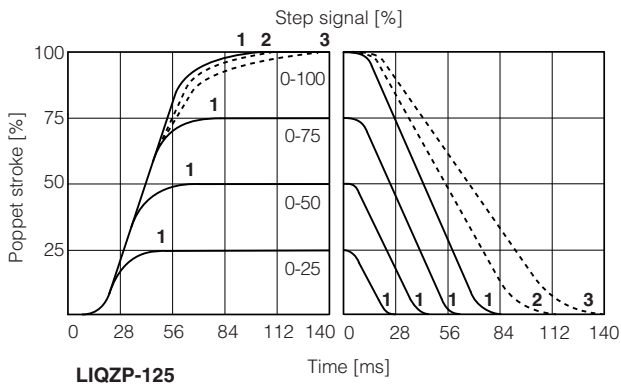
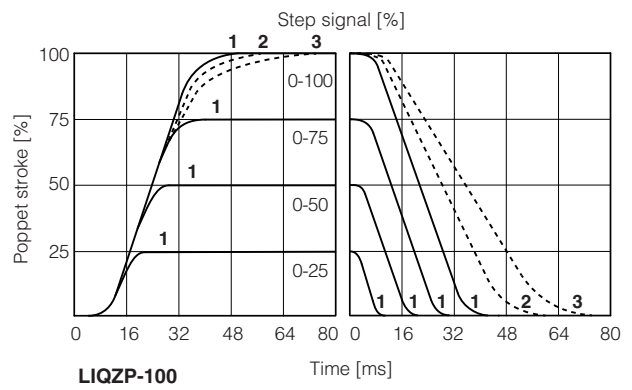
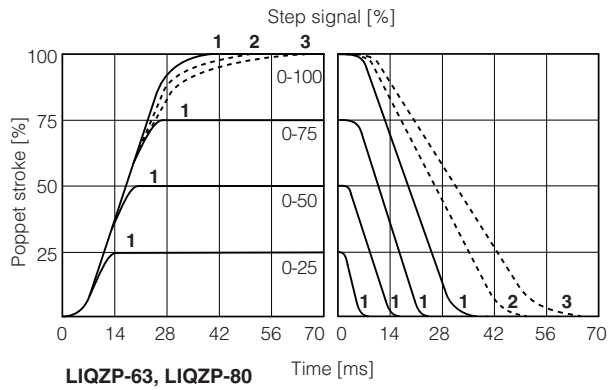
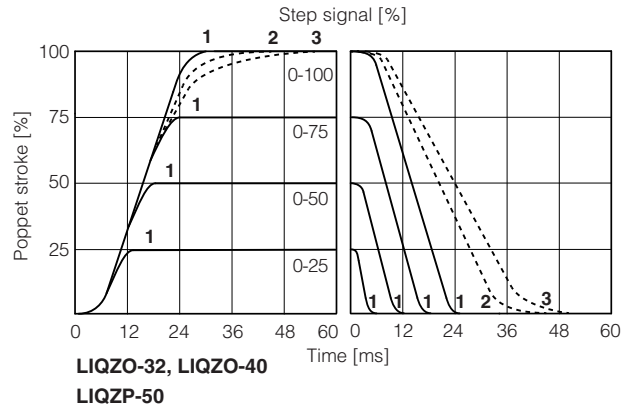
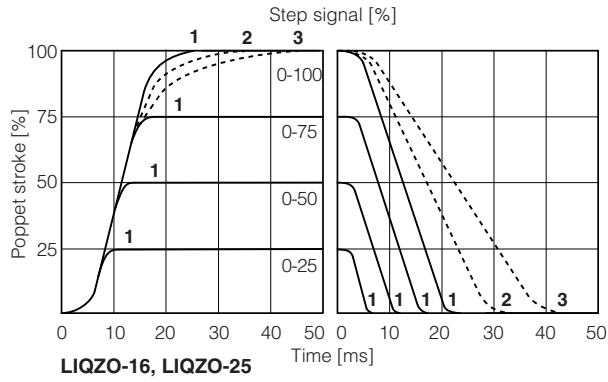
8 = LIQZP-L*-1002L4



9 = LIQZP-L*-1252L4

10.2 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.



1 = dynamic **2** = balanced (*) **3** = smooth (*)

(*) Response time is represented only for 0-100% step; for intermediate steps, the response time increment of presets 2 (balanced) and 3 (smooth) with respect to the preset 1 (dynamic) is proportional to the step amplitude of the reference input signal

10.3 Bode diagrams LIQZO-L*-162L4

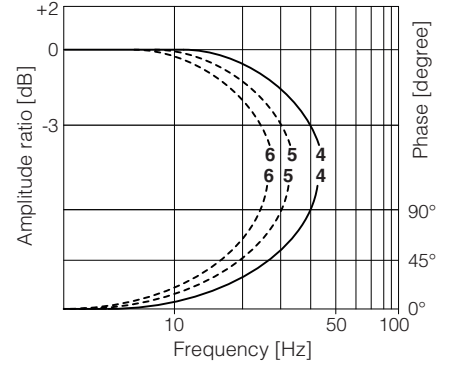
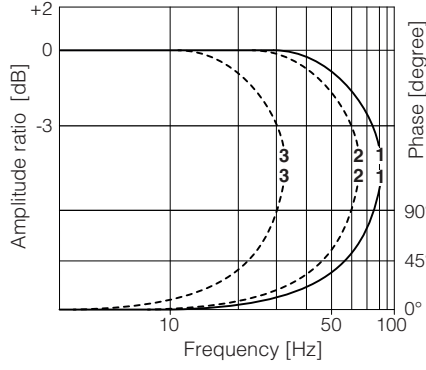
Stated at nominal hydraulic conditions

50% ± 5% nominal stroke:

- 1 = dynamic
- 2 = balanced
- 3 = smooth

10% ↔ 90% nominal stroke:

- 4 = dynamic
- 5 = balanced
- 6 = smooth



10.4 Bode diagrams LIQZO-L*-252L4

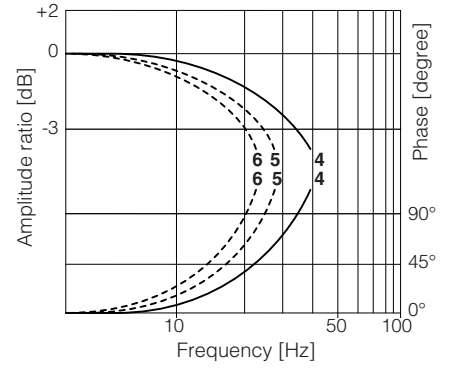
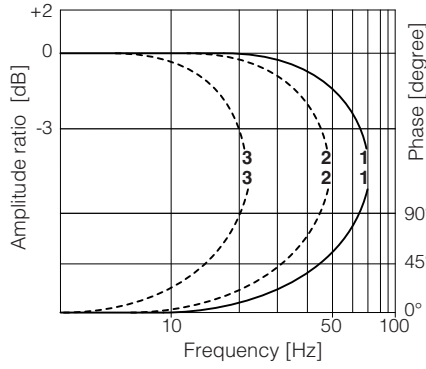
Stated at nominal hydraulic conditions

50% ± 5% nominal stroke:

- 1 = dynamic
- 2 = balanced
- 3 = smooth

10% ↔ 90% nominal stroke:

- 4 = dynamic
- 5 = balanced
- 6 = smooth



10.5 Bode diagrams LIQZO-L*-322L4

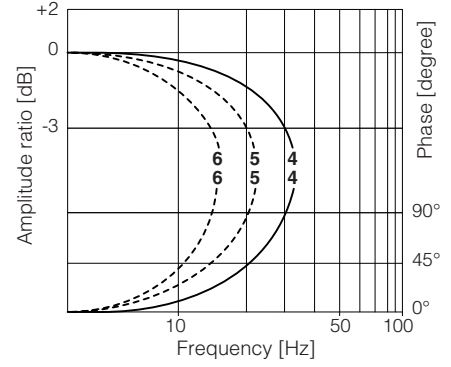
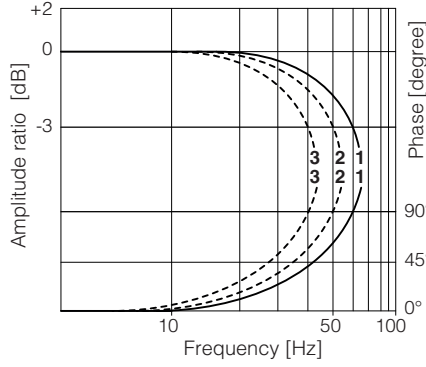
Stated at nominal hydraulic conditions

50% ± 5% nominal stroke:

- 1 = dynamic
- 2 = balanced
- 3 = smooth

10% ↔ 90% nominal stroke:

- 4 = dynamic
- 5 = balanced
- 6 = smooth



10.6 Bode diagrams LIQZO-L*-402L4

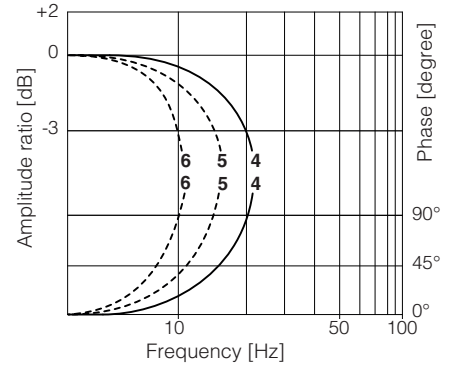
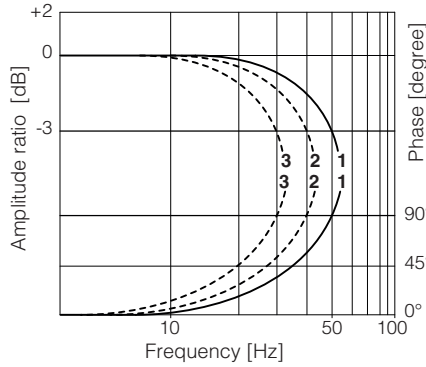
Stated at nominal hydraulic conditions

50% ± 5% nominal stroke:

- 1 = dynamic
- 2 = balanced
- 3 = smooth

10% ↔ 90% nominal stroke:

- 4 = dynamic
- 5 = balanced
- 6 = smooth



10.7 Bode diagrams LIQZP-L*-502L4

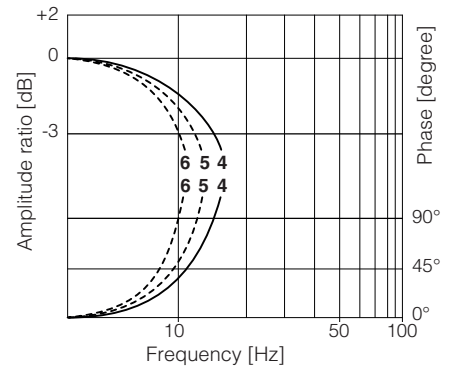
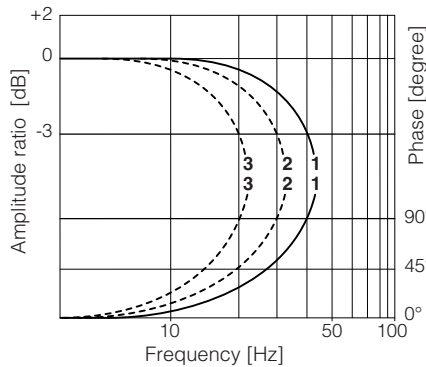
Stated at nominal hydraulic conditions

50% ± 5% nominal stroke:

- 1 = dynamic
- 2 = balanced
- 3 = smooth

10% ↔ 90% nominal stroke:

- 4 = dynamic
- 5 = balanced
- 6 = smooth



10.8 Bode diagrams LIQZP-L*-632L4

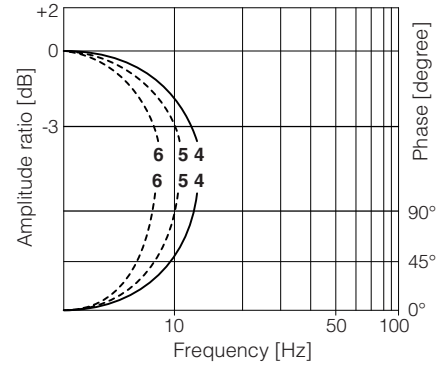
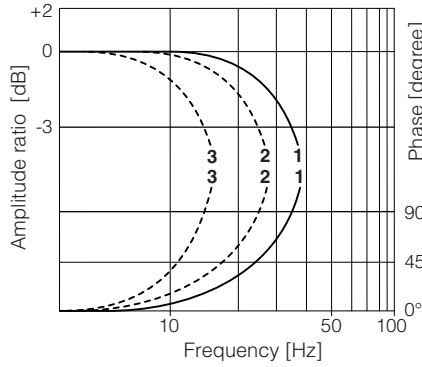
Stated at nominal hydraulic conditions

50% ± 5% nominal stroke:

- 1 = dynamic
- 2 = balanced
- 3 = smooth

10% ↔ 90% nominal stroke:

- 4 = dynamic
- 5 = balanced
- 6 = smooth



10.9 Bode diagrams LIQZP-L*-802L4

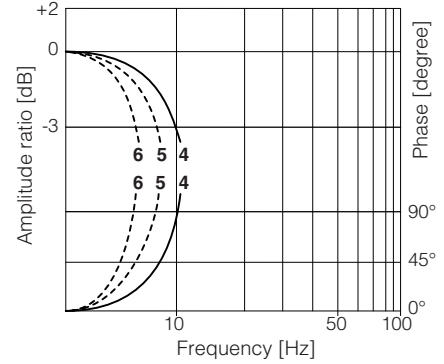
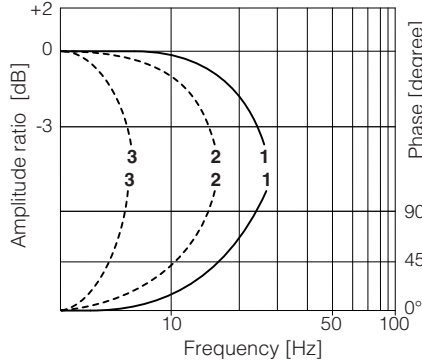
Stated at nominal hydraulic conditions

50% ± 5% nominal stroke:

- 1 = dynamic
- 2 = balanced
- 3 = smooth

10% ↔ 90% nominal stroke:

- 4 = dynamic
- 5 = balanced
- 6 = smooth



10.10 Bode diagrams LIQZP-L*-1002L4

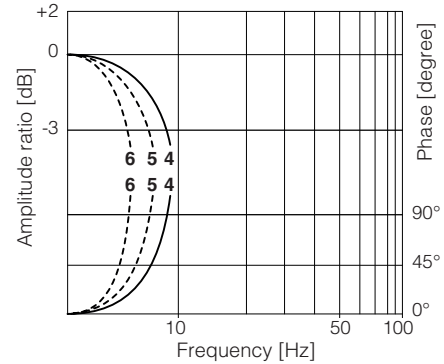
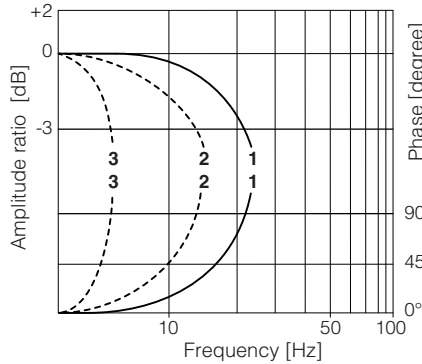
Stated at nominal hydraulic conditions

50% ± 5% nominal stroke:

- 1 = dynamic
- 2 = balanced
- 3 = smooth

10% ↔ 90% nominal stroke:

- 4 = dynamic
- 5 = balanced
- 6 = smooth



10.11 Bode diagrams LIQZP-L*-1252L4

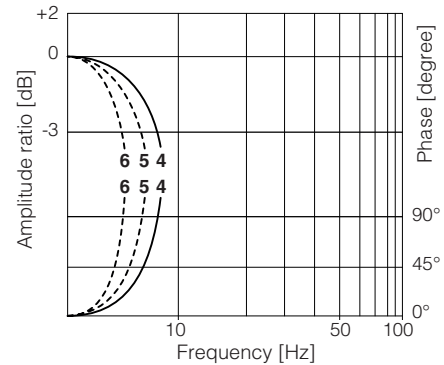
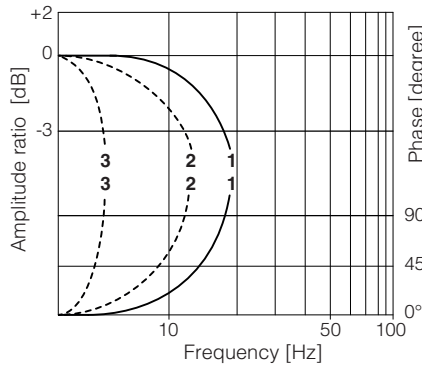
Stated at nominal hydraulic conditions

50% ± 5% nominal stroke:

- 1 = dynamic
- 2 = balanced
- 3 = smooth

10% ↔ 90% nominal stroke:

- 4 = dynamic
- 5 = balanced
- 6 = smooth



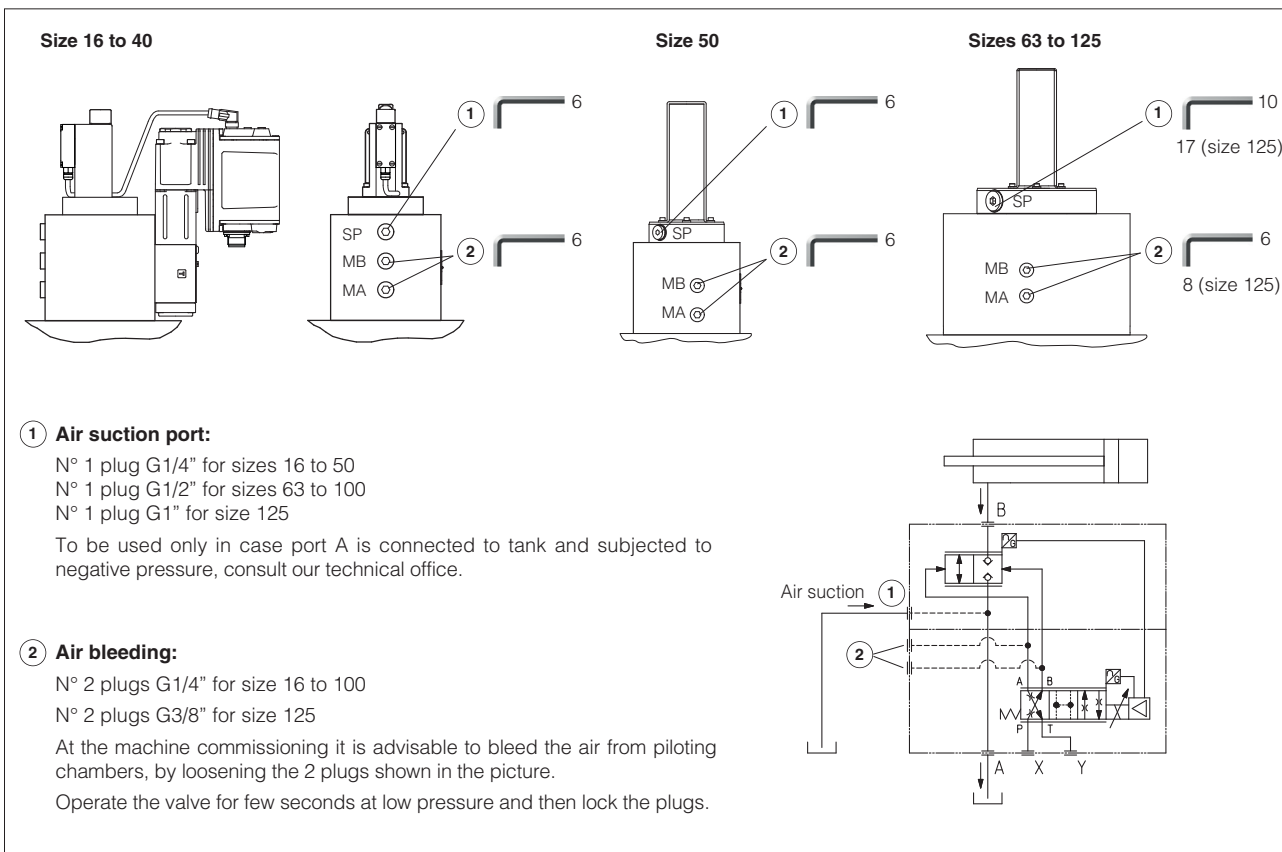
11 ELECTRONICS OPTIONS

- 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, poppet position transducer broken, etc. - see 14.7 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 poppet 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 14.5 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 14.2)

12 POSSIBLE COMBINED OPTIONS

/FI, /IQ, /IZ

13 AIR BLEEDING



14 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).

14.1 Power supply (V+ and V0)

The power supply must be appropriately stabilized or rectified and filtered: apply at least a 10000 $\mu\text{F}/40\text{ V}$ capacitance to single phase rectifiers or a 4700 $\mu\text{F}/40\text{ V}$ capacitance to three phase rectifiers. In case of separate power supply see 14.2.

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

14.2 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 $\mu\text{F}/40\text{ V}$ capacitance to single phase rectifiers or a 4700 $\mu\text{F}/40\text{ V}$ 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.

14.3 Flow reference input signal (Q_INPUT+)

The driver controls in closed loop the valve poppet position proportionally to the external reference input signal.

Reference input signal is factory preset according to selected valve code, defaults are $0 \pm 10\text{ VDC}$ for standard and $4 \pm 20\text{ mA}$ for /I option.

Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of $\pm 10\text{ VDC}$ or $\pm 20\text{ mA}$.

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 $0 \pm 24\text{VDC}$.

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

The driver generates an analog output signal proportional to the actual poppet 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 poppet position).

Monitor output signal is factory preset according to selected valve code, defaults are $0 \pm 10\text{ VDC}$ for standard and $4 \pm 20\text{ mA}$ for /I option.

Output signal can be reconfigured via software selecting between voltage and current, within a maximum range of $\pm 10\text{ VDC}$ or $\pm 20\text{ mA}$.

14.5 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.

14.6 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 14.5).

14.7 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 $4 \pm 20\text{ mA}$ input, poppet 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.

15 ELECTRONIC CONNECTIONS

15.1 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 \div 10 Vdc for standard and 4 \div 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:			Flow monitor output signal: ± 10 Vdc / ± 20 mA maximum range Defaults are 0 \div 10 Vdc for standard and 4 \div 20 mA for /I option	Output - analog signal Software selectable
	AGND	V0			
			FAULT	Fault (0 Vdc) or normal working (24 Vdc)	Output - on/off signal
G	EARTH			Internally connected to the driver housing	

15.2 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 \div 10 Vdc for standard and 4 \div 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 \div 10 Vdc for standard and 4 \div 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		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

15.3 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) 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)

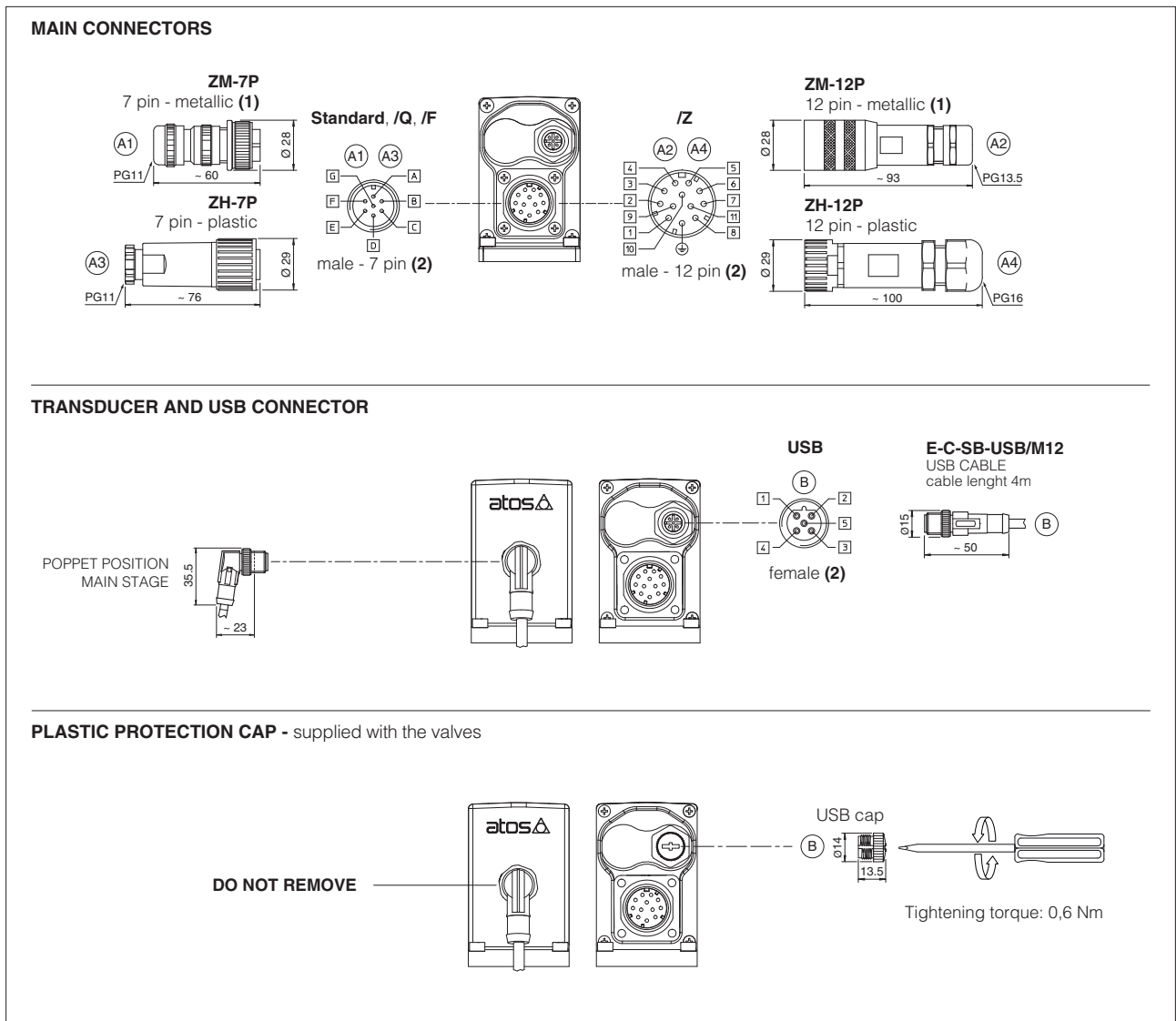
(C1) (C2) BP fieldbus execution, connector - M12 - 5 pin		
PIN	SIGNAL	TECHNICAL SPECIFICATION (1)
1	+5V	Termination supply signal
2	LINE-A	Bus line (high)
3	DGND	Data line and termination signal zero
4	LINE-B	Bus line (low)
5	SHIELD	

(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	

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

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

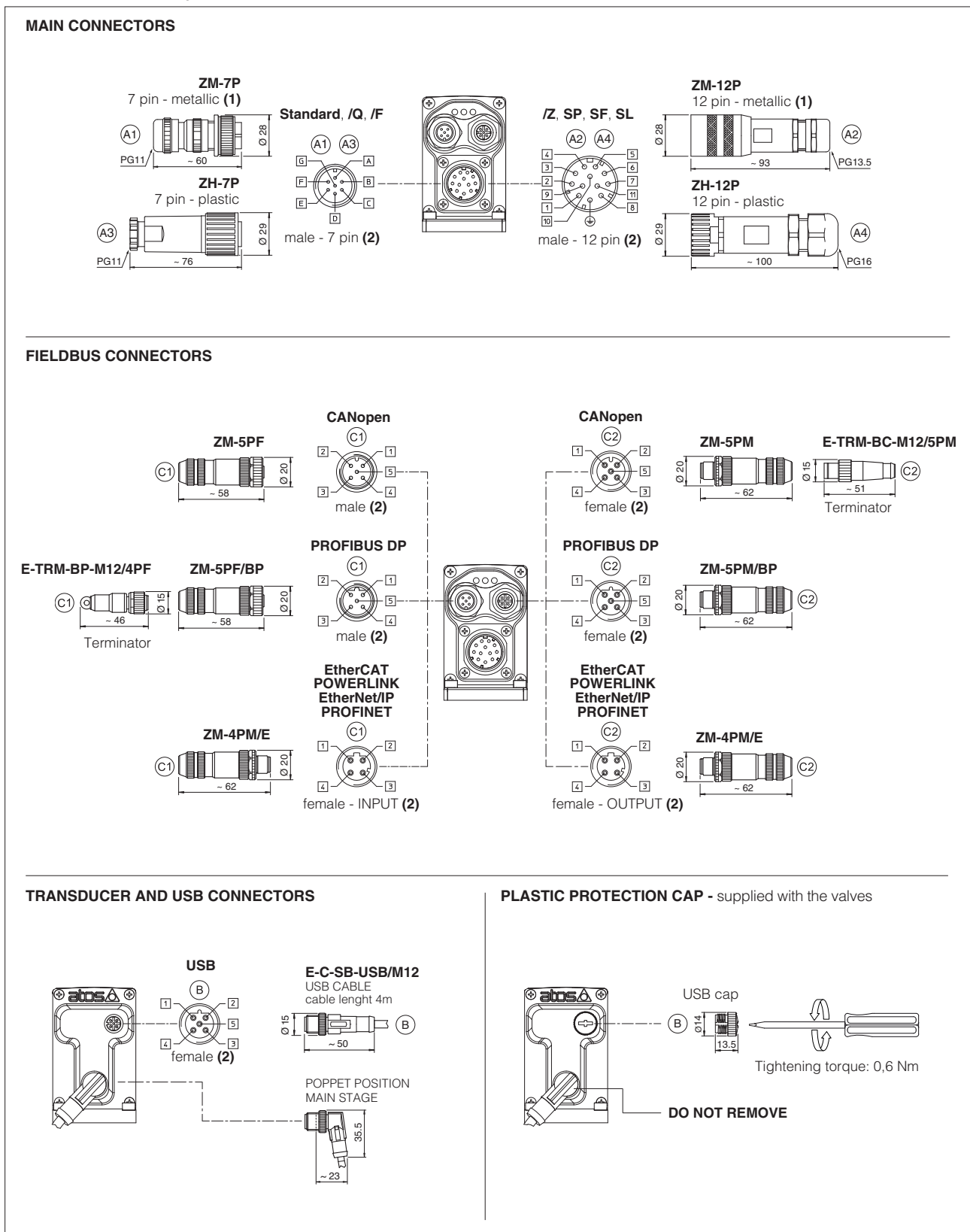
15.4 LEB connections layout



(1) Use of metallic connectors is strongly recommended in order to fulfill EMC requirements

(2) Pin layout always referred to driver's view

15.5 LES connections layout



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

15.6 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			

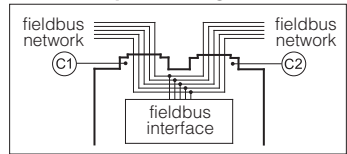
16 IN / OUT FIELDBUS COMMUNICATION CONNECTORS

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



17 CONNECTORS CHARACTERISTICS - to be ordered separately

17.1 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 mm ² max 20 m (logic and power supply) or LiYCY 7 x 1 mm ² max 40 m (logic and power supply)	LiYCY 7 x 0,75 mm ² max 20 m (logic and power supply) or LiYCY 7 x 1 mm ² max 40 m (logic and power supply)
Conductor size	up to 1 mm ² - available for 7 wires	up to 1 mm ² - available for 7 wires
Connection type	to solder	to solder
Protection (EN 60529)	IP 67	IP 67

17.2 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 mm ² max 20 m (logic and power supply)	LiYCY 10 x 0,14mm ² max 40 m (logic) LiYY 3 x 1mm ² max 40 m (power supply)
Conductor size	0,5 mm ² to 1,5 mm ² - available for 12 wires	0,14 mm ² to 0,5 mm ² - available for 9 wires 0,5 mm ² to 1,5 mm ² - available for 3 wires
Connection type	to crimp	to crimp
Protection (EN 60529)	IP 67	IP 67

17.3 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

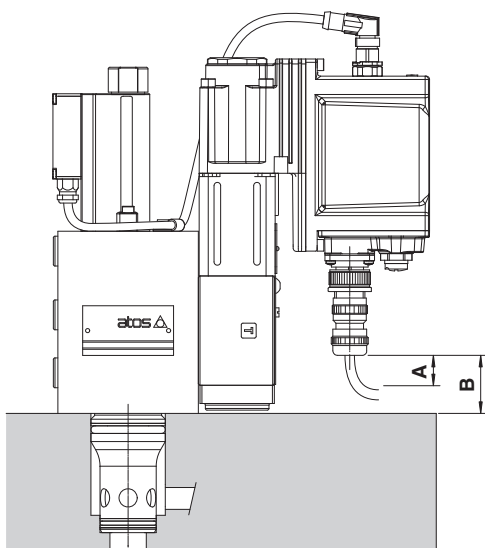
18 FASTENING BOLTS AND VALVE MASS

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
	125	8 socket head screws M36x260 class 12.9 Tightening torque = 3600 Nm	375

(1) Fastening bolts supplied with the valve

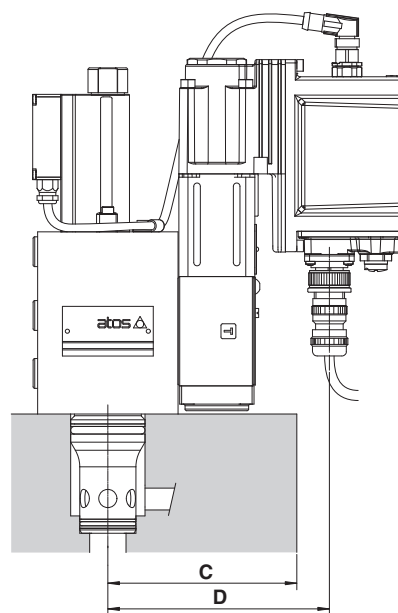
19 MAIN CONNECTORS INSTALLATION DIMENSIONS

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



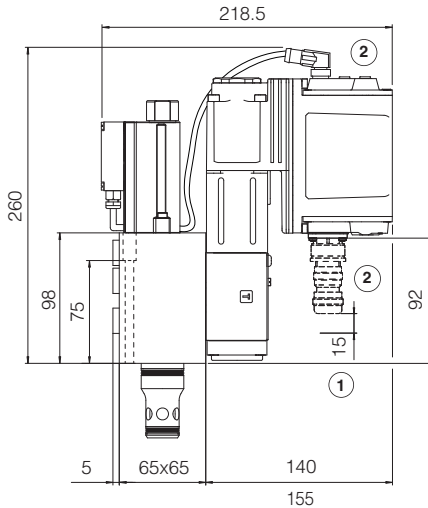
C = Max manifold dimension to avoid interference with the main connector, see below table

Reference dimension	Main connector code	Valve size								
		16	25	32	40	50	63	80	100	125
B	ZM-7P	32	32	32	32	45	68	68	80	142
	ZH-7P	(1)	(1)	(1)	(1)	29	52	52	64	125
	ZM-12P	(1)	(1)	(1)	(1)	(1)	35	35	47	108
	ZH-12P	(1)	(1)	(1)	(1)	(1)	(1)	(2)	40	101
C (max)	-	104	114	121	134	141	172	202	229	271
D	-	124	134	141	154	161	192	222	249	291

Above dimensions 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 represented in above "Installation 2"
(2) The connector installation may be critical, depending to the cable size and bending radius

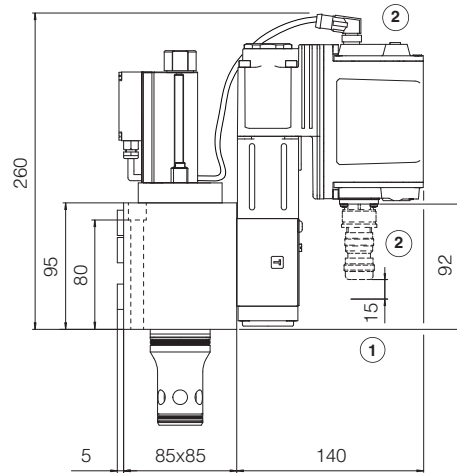
20 INSTALLATION DIMENSIONS [mm]

LIQZO-LEB-162
LIQZO-LES-162



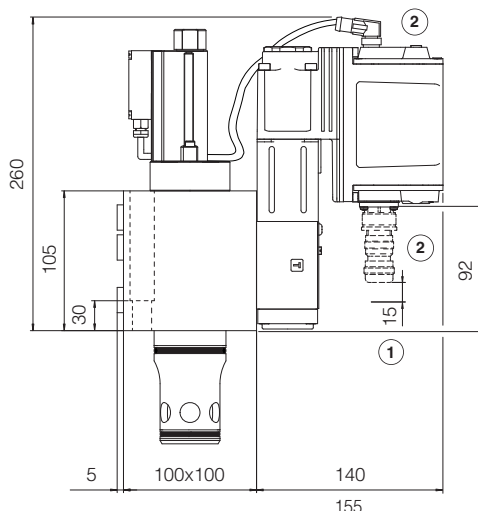
for **EW** - POWERLINK,
EI - EtherNet/IP,
EP - PROFINET IRT

LIQZO-LEB-252
LIQZO-LES-252



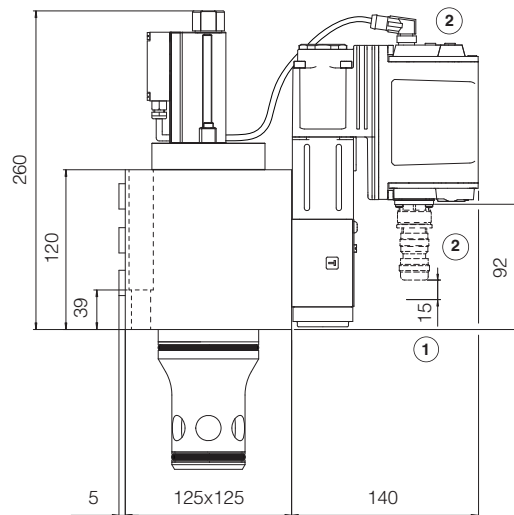
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EI - EtherNet/IP,
EP - PROFINET IRT

LIQZO-LEB-322
LIQZO-LES-322



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

LIQZO-LEB-402
LIQZO-LES-402



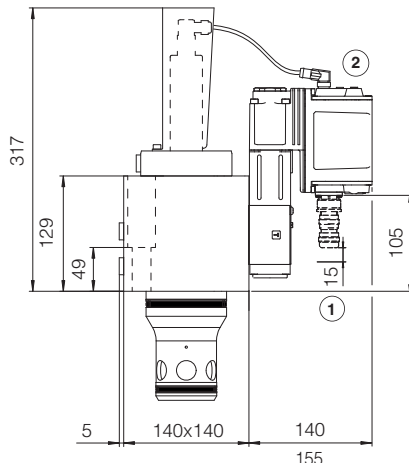
for **EW** - POWERLINK,
EI - EtherNet/IP,
EP - PROFINET IRT

① = Space to remove the connectors

② = The dimensions of all connectors must be considered, see section 15.4 and 15.5
For main connectors installation, see also section 19.

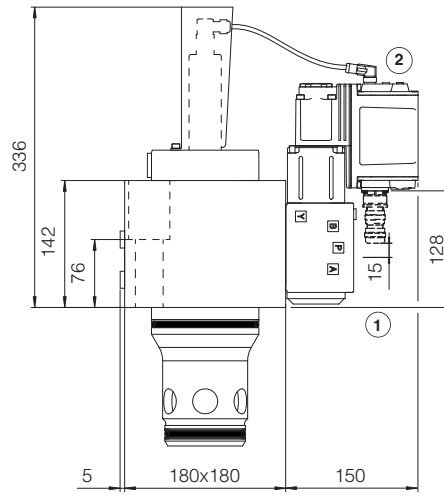
Note: for mounting surface and cavity dimensions, see table P006

LIQZP-LEB-502
LIQZP-LES-502



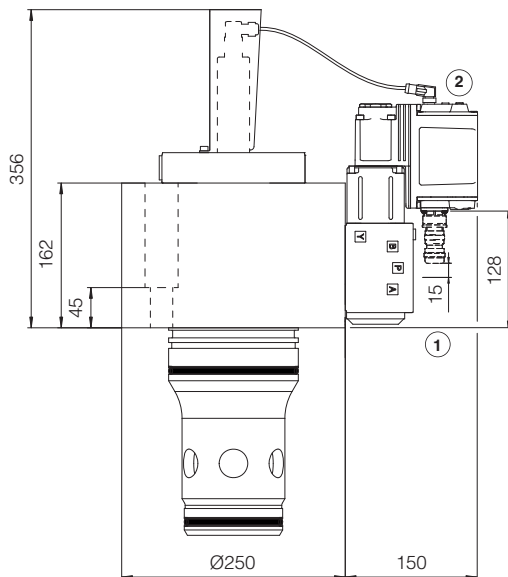
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EI - EtherNet/IP,
EP - PROFINET IRT

LIQZP-LEB-632
LIQZP-LES-632



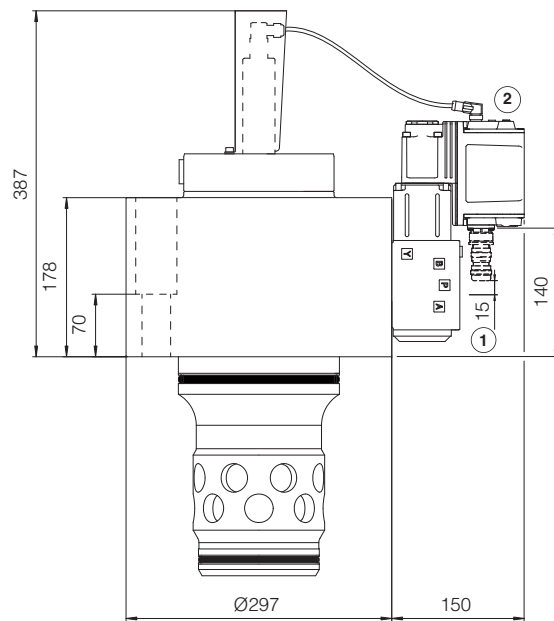
for **EW** - POWERLINK,
EI - EtherNet/IP,
EP - PROFINET IRT

LIQZP-LEB-802
LIQZP-LES-802



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

LIQZP-LEB-1002
LIQZP-LES-1002



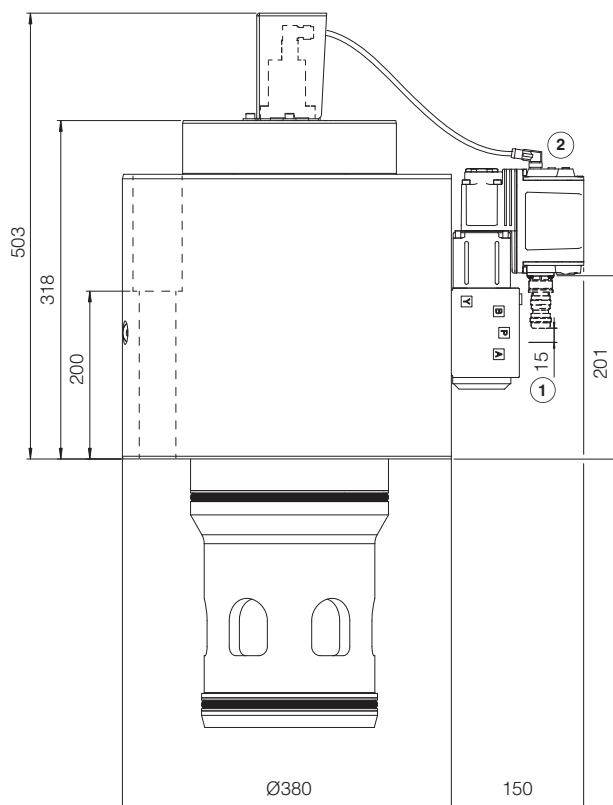
for **EW** - POWERLINK,
EI - EtherNet/IP,
EP - PROFINET IRT

① = Space to remove the connectors

② = The dimensions of all connectors must be considered, see section 15.4 and 15.5
For main connectors installation, see also section 19.

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

LIQZP-LEB-1252
LIQZP-LES-1252



165
 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 15.4 and 15.5
 For main connectors installation, see also section 19.

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

21 RELATED DOCUMENTATION

FS001	Basics for digital electrohydraulics	QB340	Quickstart for LEB valves commissioning
FS900	Operating and maintenance information for proportional valves	QF340	Quickstart for LES valves commissioning
GS500	Programming tools	E-MAN-RI-LEB	TEB/LEB user manual
GS510	Fieldbus	E-MAN-RI-LES	TES/LES user manual
K800	Electric and electronic connectors		
P006	Mounting surfaces and cavities for cartridge valves		