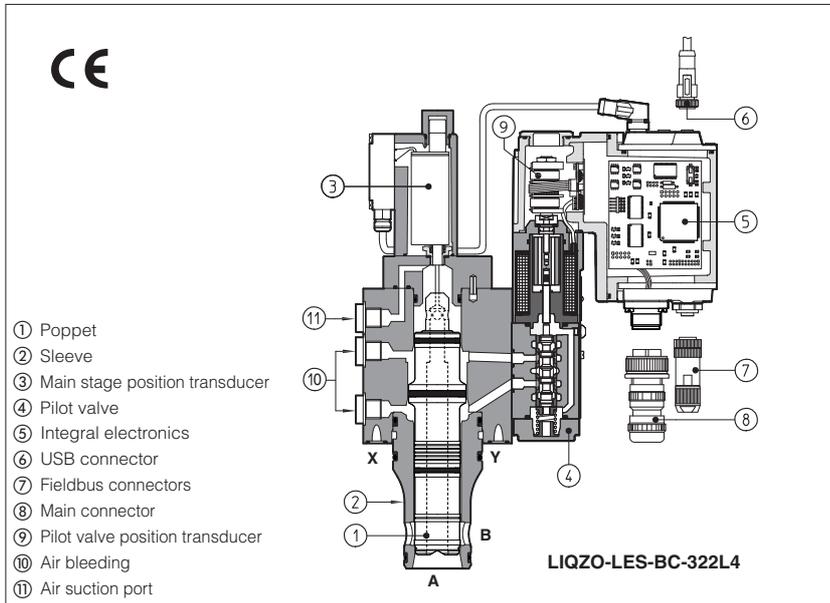


High Performance proportional 2-way cartridges

with two position transducers, ISO 7368 sizes from 16 to 100



- ① Poppet
- ② Sleeve
- ③ Main stage position transducer
- ④ Pilot valve
- ⑤ Integral electronics
- ⑥ USB connector
- ⑦ Fieldbus connectors
- ⑧ Main connector
- ⑨ Pilot valve position transducer
- ⑩ Air bleeding
- ⑪ Air suction port

LIQZO-LES-BC-322L4

LIQZO-L*; LIQZP-L*

High Performance, 2-way poppet type proportional cartridge valves with two position transducers for best accuracy and dynamics in not compensated flow regulations.

They are specifically designed to achieve high speed closed loop controls; the cartridge execution for blocks installation grants high flow capabilities and minimized pressure drops.

The main poppet ① is controlled in double closed loop position by the DLHZO (DLKZOR for size 63 to 100) servoproportional valve ④ (see table F180) and LVDT position transducers ③ and ⑨.

The electronic driver supplies the servoproportional valve with proper current to align valve regulation to the reference signal, the integral execution ⑤ has rugged construction and grants factory presetting for valve-to-valve interchangeability

Mounting surface: ISO 7368

LIQZO: sizes from **16 to 40**,
Max pressure **350 bar**
Max flow: **600 to 2500 l/min**

LIQZP: sizes from **50 to 100**,
Max pressure = **420 bar**
Max flow: **4000 to 16.000 l/min**

1 MODEL CODE

LIQZO	-	LES	-	NP	-	25	2	L4	/	*	**	/	*																				
<p>Flow control valve LIQZO = size 16 to 40, Pmax 350 bar LIQZP = size 50 to 100, Pmax 420 bar</p> <p>L = without integral electronics LE = with integral analog electronics LES = with integral digital electronics</p> <p>Fieldbus interfaces for LES: USB port always present NP = Not present BP = PROFIBUS DP BC = CANopen EH = EtherCAT</p> <p>Valve size, see section ③</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: left;">LIQZO =</td> <td style="text-align: center;">16</td> <td style="text-align: center;">25</td> <td style="text-align: center;">32</td> <td style="text-align: center;">40</td> </tr> <tr> <td style="text-align: left;">l/min</td> <td style="text-align: center;">250</td> <td style="text-align: center;">500</td> <td style="text-align: center;">800</td> <td style="text-align: center;">1200</td> </tr> <tr> <td style="text-align: left;">LIQZP =</td> <td style="text-align: center;">50</td> <td style="text-align: center;">63</td> <td style="text-align: center;">80</td> <td style="text-align: center;">100</td> </tr> <tr> <td style="text-align: left;">l/min</td> <td style="text-align: center;">2000</td> <td style="text-align: center;">3000</td> <td style="text-align: center;">4500</td> <td style="text-align: center;">7200</td> </tr> </table> <p>Nominal flow (l/min) at Δp 5 bar</p>														LIQZO =	16	25	32	40	l/min	250	500	800	1200	LIQZP =	50	63	80	100	l/min	2000	3000	4500	7200
LIQZO =	16	25	32	40																													
l/min	250	500	800	1200																													
LIQZP =	50	63	80	100																													
l/min	2000	3000	4500	7200																													

Seals materials
see section ③, ④

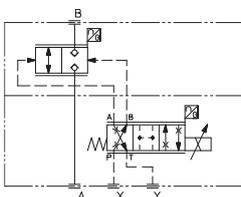
- = NBR
- PE** = FPM
- BT** = HNBR (only -LES)

Series number

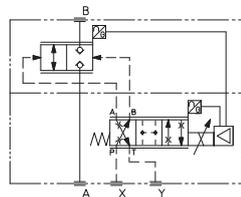
Electronic options, see section ⑧, ⑩ :

- F** = fault signal
- I** = current reference input and monitor (4±20 mA)
- Q** = enable signal
- Z** = **for LE execution**
enable, fault and monitor signal
(12 pin connector)
- for LES execution**
double power supply, enable, fault and monitor
signal (12 pin connector)

Configuration: 2 = 2 way



LIQZO-L



LIQZO-LE
LIQZO-LES

Spool type - regulating characteristics:

L4 = linear



2 GENERAL NOTES

LIQZO-L* proportional cartridges are CE marked according to the applicable Directives (e.g. Immunity/Emission EMC Directive and Low Voltage Directive). Installation, wirings and start-up procedures must be performed according to the general prescriptions shown in table F003 and in the installation notes supplied with relevant components.

The electrical signals of the valve (e.g. 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, EN-982).



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 (for -LE and -LES valves with option /Q or /Z). A safety fuse 2,5 A installed on 24VDC power supply of each valve is always recommended for valves -LE and -LES, see also Power supply note at sections 8 and 10

3 MAIN CHARACTERISTICS

Assembly position	Any position
Subplate surface finishing	Roughness index, Ra 0,4 flatness ratio 0,01/100 (ISO 1101)
MTTFd valves according to EN ISO 13849	150 years, see technical table P007
Ambient temperature range	-L execution = -20°C ÷ +70°C -LE and -LES executions = -20°C ÷ +60°C /BT option only for -LES executions = -40°C ÷ +60°C
Storage temperature range	Standard execution = -20°C ÷ +70°C /BT option only for -LES execution = -40°C ÷ +70°C
Coil resistance R at 20°C	3 ÷ 3,3 Ω
Max. solenoid current	2,6 A
Max. power	L execution = 35 Watt -LE and -LES executions = 50 Watt
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	-L execution = IP65 -LE execution = IP67 -LES execution = IP66/67
Duty factor	Continuous rating (ED=100%)
EMC, climate and mechanical load	See technical table G004

Size	16	25	32	40	50	63	80	100
Max regulated flow [l/min]								
at Δp = 5 bar	250	500	800	1200	2000	3000	4500	7200
at 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	7	14	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	59,4
Piloting flow (1)	7,5	9,5	28	32	54	82	80	72
Response time 0 ÷ 100% step signal (2) [ms]	13	14	15	18	20	24	30	50
Hysteresis [% of the max flow]	≤ 0,1%							
Repeatability [% of the max flow]	± 0,1%							
Thermal drift	zero point displacement < 1% at ΔT = 40°C							

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

- (1) with step reference input 0÷100%
(2) see detailed diagrams in section 4

4 SEALS AND HYDRAULIC FLUID

Seals, recommended temperature fluid	NBR seals = -20°C ÷ +60°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals = -20°C ÷ +80°C HNBR seals = -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		
Fluid contamination class	ISO 4406 class 20/18/15 NAS 1638 class 9, in line filters of 10 μm (β ₁₀ ≥ 75 recommended)		
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	

Note: For other fluids not included in above table, consult our technical office

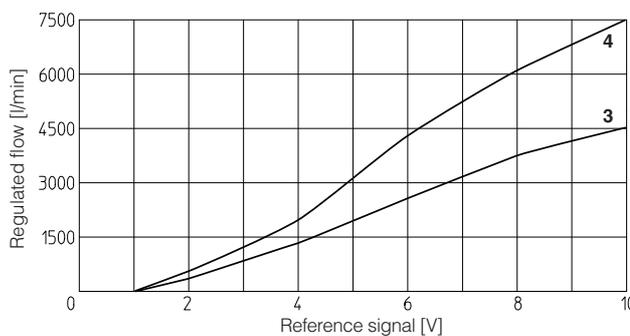
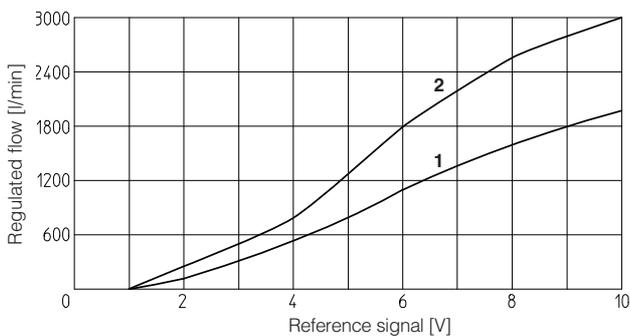
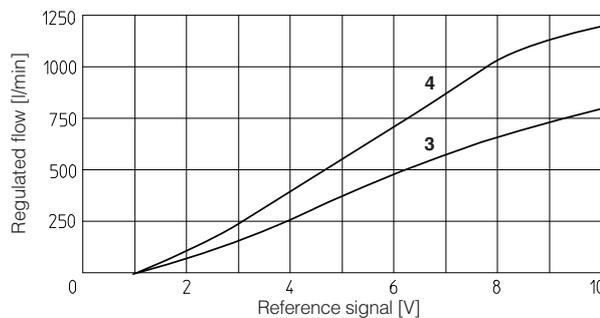
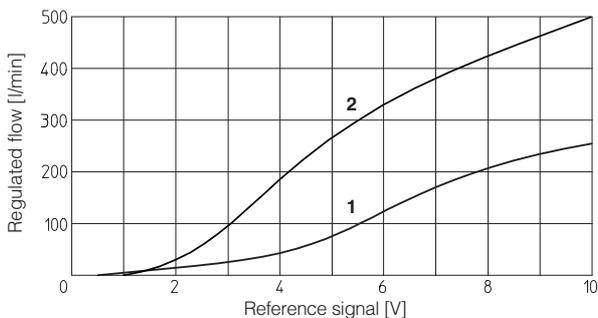
5 ELECTRONIC DRIVERS

Valve model	-L	-LE	-LES
Drivers model	E-ME-L	E-RI-LE	E-RI-LES
Type	Analog		Digital
Format	Eurocard	Integral to valve	
Data sheet	G150	G200	G210

Note: For main and communication connectors see section [14](#), [15](#)

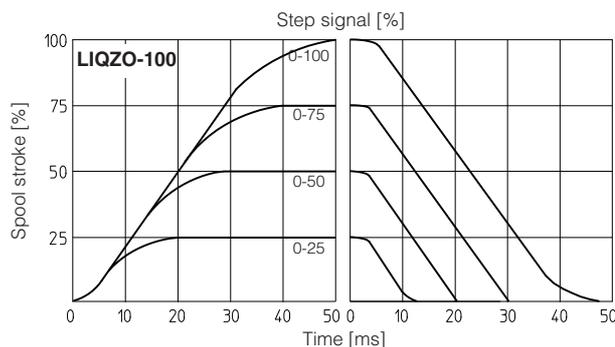
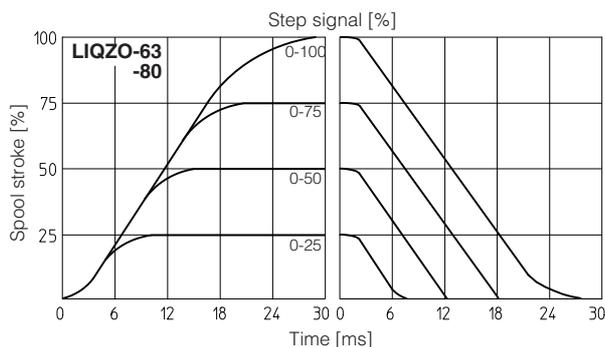
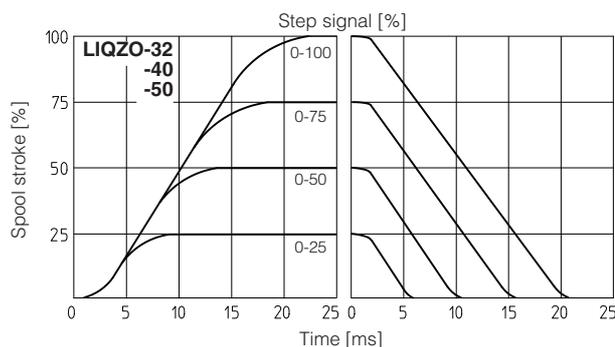
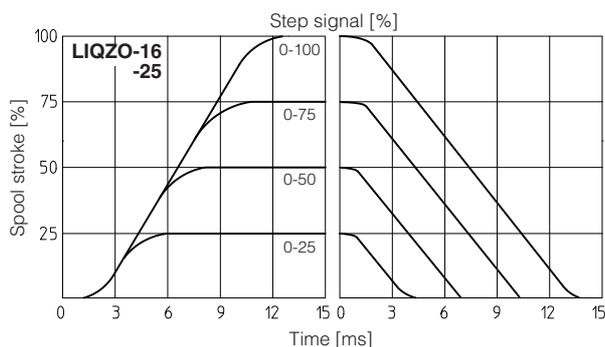
6 DIAGRAMS (based on mineral oil ISO VG 46 at 50 °C)

6.1 Regulation diagrams (values measured at Δp 5 bar)

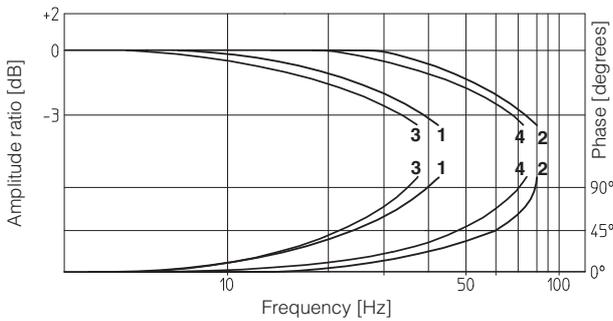


6.2 Response time

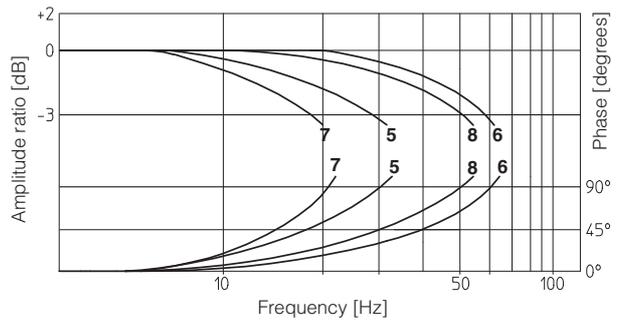
The response times in below diagrams are measured at different steps of the reference input signal. They have to be considered as average values. For the valves with digital electronics the dynamics performances can be optimized by setting the internal software parameters.



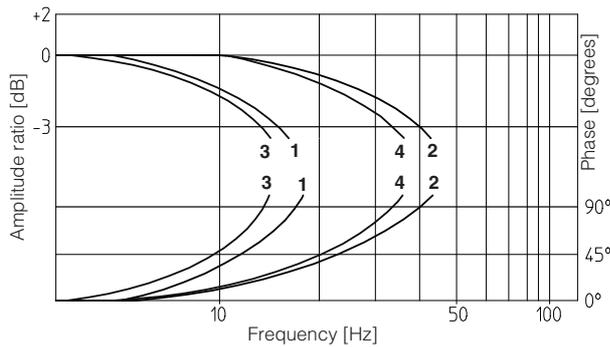
6.3 Bode diagrams - stated at nominal hydraulic conditions



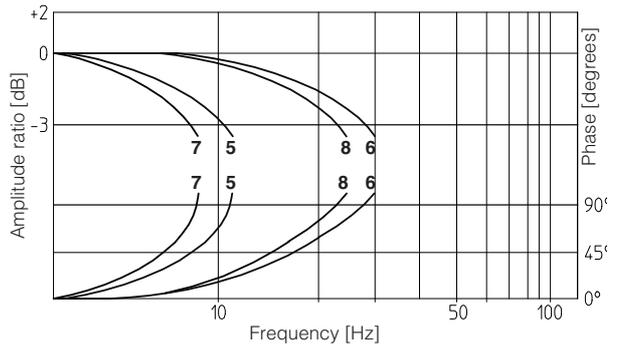
- 1 = LIQZO-L*-16*: 10% ↔ 90%
- 2 = LIQZO-L*-16*: 50% ± 5%
- 3 = LIQZO-L*-25*: 10% ↔ 90%
- 4 = LIQZO-L*-25*: 50% ± 5%



- 5 = LIQZO-L*-32*: 10% ↔ 90%
- 6 = LIQZO-L*-32*: 50% ± 5%
- 7 = LIQZO-L*-40*: 10% ↔ 90%
- 8 = LIQZO-L*-40*: 50% ± 5%

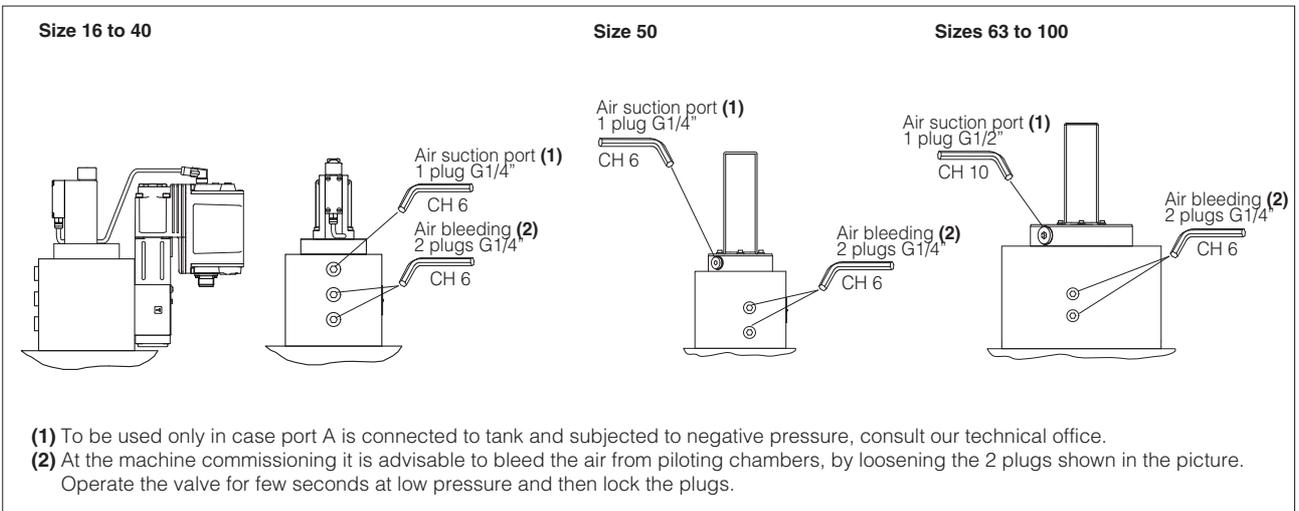


- 1 = LIQZP-L*-50*: 10% ↔ 90%
- 2 = LIQZP-L*-50*: 50% ± 5%
- 3 = LIQZP-L*-63*: 10% ↔ 90%
- 4 = LIQZP-L*-63*: 50% ± 5%



- 5 = LIQZP-L*-80*: 10% ↔ 90%
- 6 = LIQZP-L*-80*: 50% ± 5%
- 7 = LIQZP-L*-100*: 10% ↔ 90%
- 8 = LIQZP-L*-100*: 50% ± 5%

7 AIR BLEEDING



8 CONNECTIONS FOR -L EXECUTION

SOLENOID POWER SUPPLY CONNECTOR		666
PIN	Signal description	
1	SUPPLY	
2	SUPPLY	
3	GND	

PILOT VALVE POSITION TRANSDUCER CONNECTOR		345
PIN	Signal description	
1	OUTPUT SIGNAL	
2	SUPPLY -15 Vdc	
3	SUPPLY +15 Vdc	
4	GND	

LIQZO MAIN STAGE POSITION TRANSDUCER CONNECTOR		345
PIN	Signal description	
1	OUTPUT SIGNAL	
2	SUPPLY -15 Vdc	
3	SUPPLY +15 Vdc	
4	GND	

LIQZP MAIN STAGE POSITION TRANSDUCER CONNECTOR		ZBE-08
PIN	Signal description	
1	-	
2	SUPPLY +15 Vdc	
3	GND	
4	OUTPUT SIGNAL	
5	SUPPLY -15 Vdc	

9 ANALOG INTEGRAL DRIVERS -LE - OPTIONS

Standard driver execution provides on the 7 pin main connector:

Power supply - 24 Vdc must be appropriately stabilized or rectified and filtered; a 2,5 A safety fuse is required in series to the driver power supply. Apply at least a 10000 μ F/40 V capacitance to single phase rectifiers or a 4700 μ F/40 V capacitance to three phase rectifiers

Reference input signal - analog differential input with ± 10 Vdc nominal range (pin D, E), proportional to desired valve spool position

Monitor output signal - analog output signal proportional to the actual valve's spool position with ± 10 Vdc nominal range

Following options are available to adapt standard execution to special application requirements:

9.1 Option /F

It provides a Fault output signal in place of the Monitor output signal, to indicate fault conditions of the driver (cable interruption of spool transducers or reference signal - for /I option): Fault presence corresponds to 0 Vdc, normal working corresponds to 24 Vdc.

9.2 Option /I

It provides the 4÷20 mA current reference and monitor signals instead of the standard ± 10 Vdc

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.

9.3 Option /Q

It provides the possibility to enable or disable the valve functioning without cutting the power supply (the valve functioning is disabled but the driver current output stage is still active). To enable the driver supply a 24 Vdc on the enable input signal.

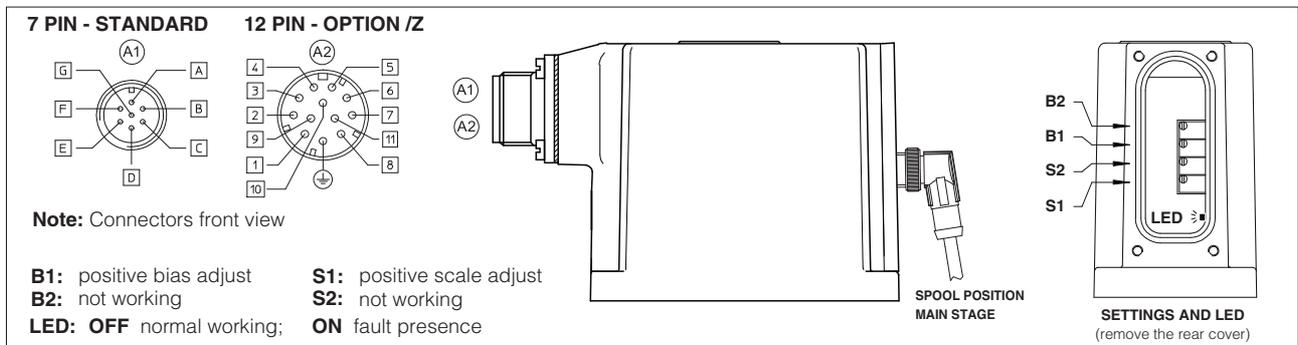
9.4 Option /Z

This option includes /F and /Q features, plus the Monitor output signal.

When the driver is disabled (0 Vdc on Enable signal) Fault output is forced to 0 Vdc.

9.5 Possible combined options: /FI and /IZ

10 ANALOG INTEGRAL DRIVERS -LE - ELECTRONIC CONNECTIONS



10.1 MAIN CONNECTOR - 7 pin (A1)

PIN	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES
A	V+	Power supply 24 Vdc for solenoid power stage and driver logic	Input - power supply
B	V0	Power supply 0 Vdc for solenoid power stage and driver logic	Gnd - power supply
C	AGND	Ground - signal zero for MONITOR signal	Gnd - analog signal
	ENABLE	Enable (24 Vdc) or disable (0 Vdc) the driver (for /Q option) with /Q option ENABLE signal replaces AGND on pin C; MONITOR signal is referred to pin B	Input - on/off signal
D	INPUT+	Reference analog differential input: ± 10 Vdc maximum range (4 ÷ 20 mA for /I option) For single solenoid valves the reference input is 0 ÷ +10 Vdc (4 ÷ 20 mA for /I option)	Input - analog signal
E	INPUT -	For double solenoid valves the reference input is ± 10 Vdc (4 ÷ 20 mA for /I option)	
F	MONITOR	Monitor analog output: ± 10 Vdc maximum range (4 ÷ 20 mA for /I option)	Output - analog signal
	FAULT	Fault (0 Vdc) or normal working (for /F option) with /F option FAULT signal replaces MONITOR on pin F	Output - on/off signal
G	EARTH	Internally connected to the driver housing	

10.2 MAIN CONNECTOR - 12 pin (/Z option) (A2)

PIN	SIGNAL option /Z	TECHNICAL SPECIFICATIONS	NOTES
1	V+	Power supply 24 Vdc for solenoid power stage and driver logic	Input - power supply
2	V0	Power supply 0 Vdc for solenoid power stage and driver logic	Gnd - power supply
3	ENABLE	Enable (24 Vdc) or disable (0 Vdc) the driver	Input - on/off signal
4	INPUT+	Reference analog differential input: ± 10 Vdc maximum range (4 ÷ 20 mA for /I option) For single solenoid valves the reference input is 0 ÷ +10 Vdc (4 ÷ 20 mA for /I option)	Input - analog signal
5	INPUT -	For double solenoid valves the reference input is ± 10 Vdc (4 ÷ 20 mA for /I option)	
6	MONITOR	Monitor analog output: ± 10 Vdc maximum range (4 ÷ 20 mA for /I option)	Output - analog signal
7	AGND	Ground - signal zero for MONITOR signal	Gnd - analog signal
8	R_ENABLE	Repeat Enable - output repetition of Enable input	Output - on/off signal
9	NC	do not connect	Output - on/off signal
10	NC	do not connect	Output - on/off signal
11	FAULT	Fault (0 Vdc) or normal working (24 Vdc)	Output - on/off signal
PE	EARTH	Internally connected to the driver housing	

- A minimum time of 26 ms to 120 ms 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.

11 DIGITAL INTEGRAL DRIVERS -LES - OPTIONS

Standard driver execution provides on the 7 pin main connector:

Power supply - 24 VDC must be appropriately stabilized or rectified and filtered; a 2,5 A safety fuse is required in series to each driver power supply. Apply at least a 10000 μ F/40 V capacitance to single phase rectifiers or a 4700 μ F/40 V capacitance to three phase rectifiers

Reference input signal - analog differential input with ± 10 VDC nominal range (pin D, E), proportional to desired valve spool position

Monitor output signal - analog output signal proportional to the actual valve's spool position with ± 10 VDC nominal range

Following options are available to adapt standard execution special to application requirements:

11.1 Option /F

It provides a Fault output signal in place of the Monitor output signal, to indicate fault conditions of the driver (cable interruption of spool transducers or reference signal - for /I option): Fault presence corresponds to 0 VDC, normal working corresponds to 24 VDC.

11.2 Option /I

It provides 4÷20 mA current reference and monitor signals, instead of the standard ± 10 V.

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.

11.3 Option /Q

It provides the possibility to enable or disable the valve functioning without cutting the power supply (the valve functioning is disabled but the driver current output stage is still active). To enable the driver supply a 24 VDC on the enable input signal.

11.4 Option /Z

It provides, on the 12 pin main connector, the following additional features:

Logic power supply

Separated power supply for the solenoid (pin 1, 2) and for the digital electronic circuits (pin 9, 10).

Cutting solenoid power supply allows to interrupt the valve functioning but keeping energized the digital electronics thus avoiding fault conditions of the machine fieldbus controller. This condition allows to realize safety systems in compliance with European Norms EN13849-1 (ex EN954-1).

Enable Input Signal

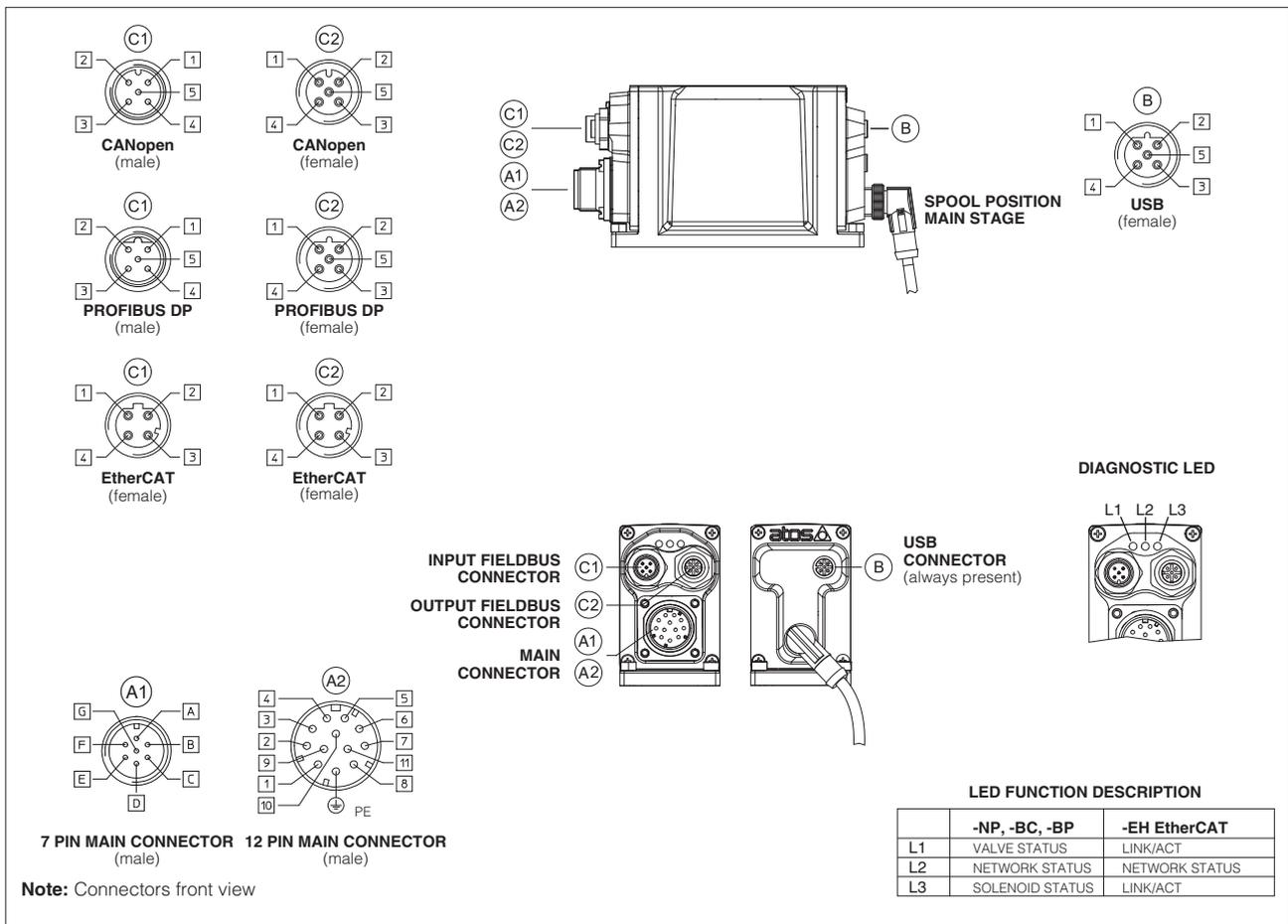
To enable the driver, supply 24 VDC on pin 3 referred to pin 2: when the Enable signal is set to zero the valve functioning is disabled (zero current to the solenoid) but the driver current output stage is still active.

Fault Output Signal

Fault output signal indicates fault conditions of the driver (solenoid short circuits/not connected, reference signal cable broken for 4÷20mA input, etc.). Fault presence corresponds to 0 VDC, normal working corresponds to 24 VDC (pin 11 referred to pin 2): Fault status is not affected by the Enable input signal

11.5 Possible combined options: /FI, /IQ and /IZ.

12 DIGITAL INTEGRAL DRIVERS -LES - ELECTRONIC CONNECTIONS AND LEDS



12.1 Main connector - 7 pin (standard, /F and /Q options) (A1)

PIN	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES
A	V+	Power supply 24 Vdc for solenoid, driver's logic and communication	Input - power supply
B	V0	Power supply 0 Vdc for solenoid, driver's logic and communication	Gnd - power supply
C	AGND	Ground - signal zero for MONITOR signal (applying 24 Vdc to AGND electronics will be damaged)	Gnd - analog signal
	ENABLE	Enable (24 Vdc) or disable (0 Vdc) the driver (for /Q option)	Input - on/off signal
D	INPUT+	Reference analog input, differential: ± 10 Vdc / ± 20 mA, maximum range software selectable	Input - analog signal
E	INPUT-		
F	MONITOR	Monitor analog output: ± 10 Vdc / ± 20 mA, maximum range software selectable, referred to AGND for Standard and /F option or to V0 for /Q option	Output - analog signal
	FAULT	Driver status: Fault (0 Vdc) or normal working (24 Vdc) (for /F option)	Output - on/off signal
G	EARTH	Internally connected to driver housing	

12.2 MAIN CONNECTOR - 12 pin (/Z option) (A2)

PIN	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES
1	V+	Power supply 24 Vdc for solenoid	Input - power supply
2	V0	Power supply 0 Vdc for solenoid	Gnd - power supply
3	ENABLE	Enable (24 Vdc) or disable (0 Vdc) the controller	Input - on/off signal
4	INPUT+	Reference analog input, differential: ± 10 Vdc / ± 20 mA, maximum range software selectable	Input - analog signal
5	INPUT-		
6	MONITOR	Monitor analog output: ± 10 Vdc / ± 20 mA, maximum range software selectable, referred to VL0	Output - analog signal
7	NC	do not connect	
8	NC	do not connect	
9	VL+	Power supply 24 Vdc for driver's logic and communication	Input - power supply
10	VL0	Power supply 0 Vdc for driver's logic and communication	Gnd - power supply
11	FAULT	Driver status: Fault (0 Vdc) or normal working (24 Vdc)	Output - on/off signal
PE	EARTH	Internally connected to driver housing	

Note: A minimum time of 300 to 500 ms have 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.

12.3 COMMUNICATION CONNECTOR (B) - (C)

(B) USB connector - M12 - 5 pin always present		
PIN	SIGNAL	TECHNICAL SPECIFICATION (*)
1	+5V_USB	Supply for external USB Flash Drive
2	ID	USB Flash Drive identification
3	GND_USB	Signal zero data line
4	D-	Data line -
5	D+	Data line +

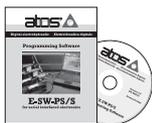
(C1) (C2) -BC fieldbus execution, connector - M12 - 5 pin		
PIN	SIGNAL	TECHNICAL SPECIFICATION (*)
1	CAN_SHLD	Shield
2	NC	do not connect
3	CAN_GND	Signal zero data line
4	CAN_H	Bus line (high)
5	CAN_L	Bus line (low)

(C1) (C2) -BP fieldbus execution, connector - M12 - 5 pin		
PIN	SIGNAL	TECHNICAL SPECIFICATION (*)
1	+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 fieldbus execution, connector - M12 - 4 pin		
PIN	SIGNAL	TECHNICAL SPECIFICATION (*)
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
Housing	SHIELD	

(*) **Note:** Shield connection on connector's housing is recommended

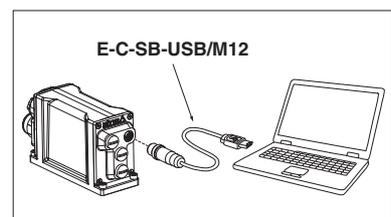
13 PROGRAMMING TOOLS (see table G500)



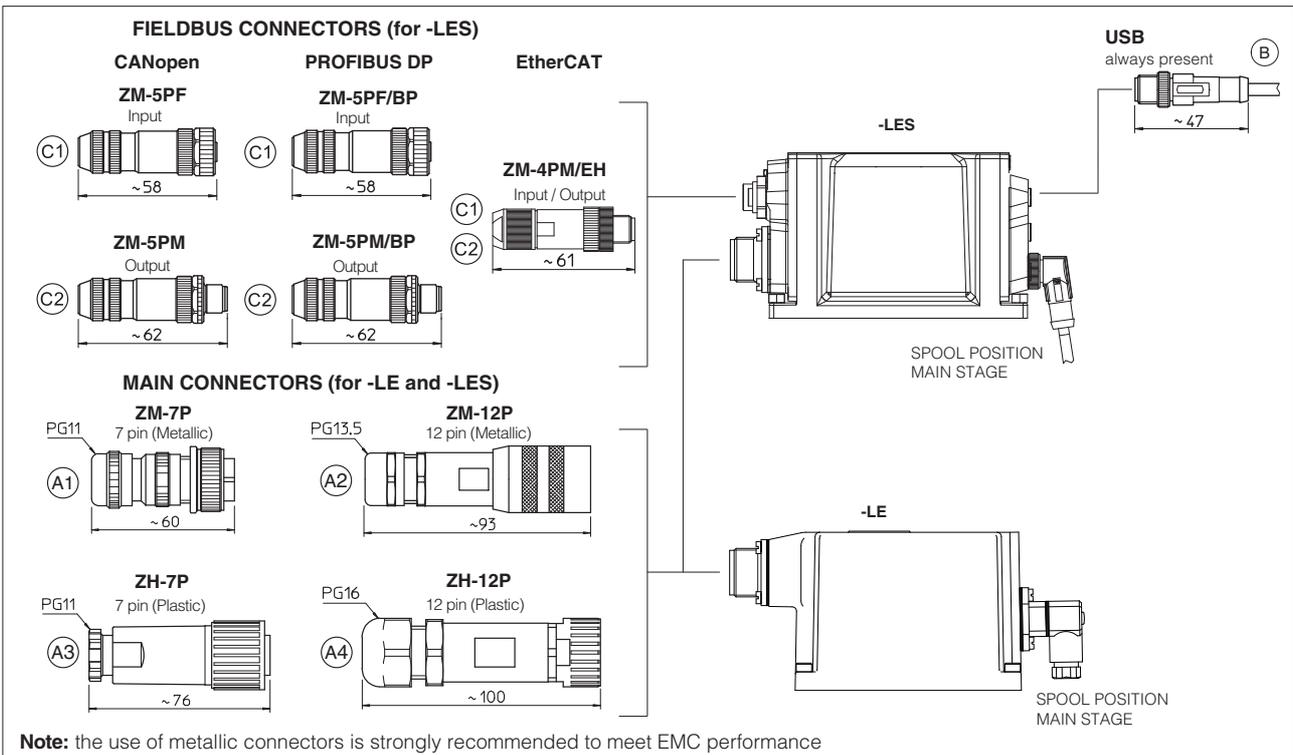
Valve's functional parameters and configurations, can be easily set and optimized using Atos E-SW programming software connected via USB communication port to the digital driver. E-SW software is available in different versions according to the driver's fieldbus interface: -NP (not present) E-SW-PS, -BC (CANopen) E-SW-BC, -BP (PROFIBUS DP) E-SW-BP and -EH (EtherCAT) E-SW-EH.

For fieldbus versions, E-SW software permits valve's parameterization through USB communication port also if the driver is connected to the central machine unit via fieldbus.

USB connection



14 CONNECTORS



15 MODEL CODES OF MAIN CONNECTORS AND COMMUNICATION CONNECTORS (to be ordered separately)

VALVE VERSION	-L		-LE, -LES	-LE /Z -LES /Z	CANopen (-BC)	PROFIBUS DP (-BP)	EtherCat (-EH)
	Power supply	Transducer					
CONNECTOR CODE	666	345 (1) ZBE-08 (2)	ZM-7P (A1) ZH-7P (A3)	ZM-12P (A2) ZH-12P (A4)	ZM-5PF (C1) ZM-5PM (C2)	ZM-5PF/BP (C1) ZM-5PM/BP (C2)	ZM-4PM/EH (C1) ZM-4PM/EH (C2)
PROTECTION DEGREE	IP65	IP67	IP67				
DATA SHEET	K500		G200, G210, G212, K500				

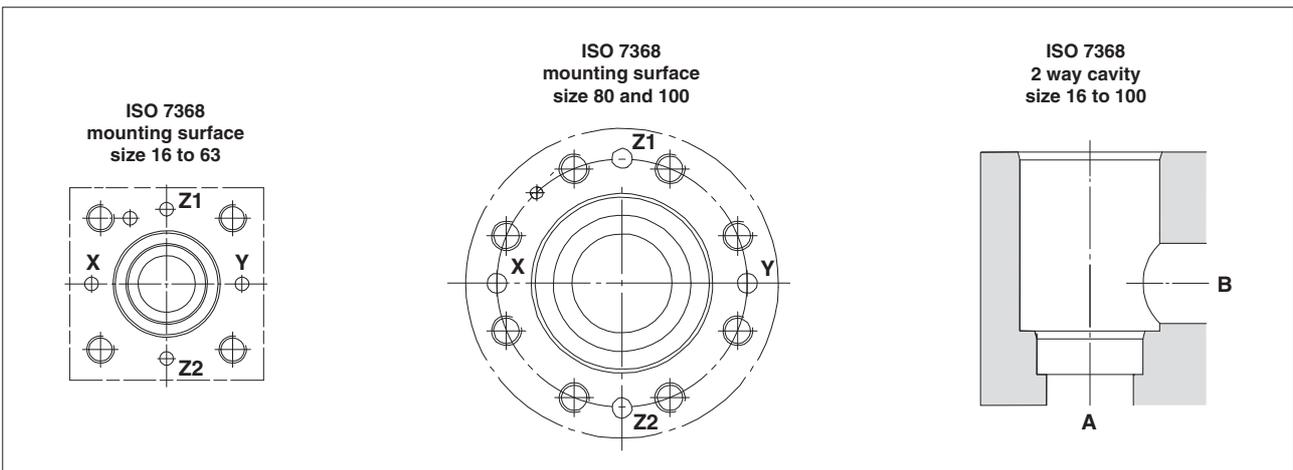
connectors supplied with the valve (1) for LIQZO (2) for LIQZP

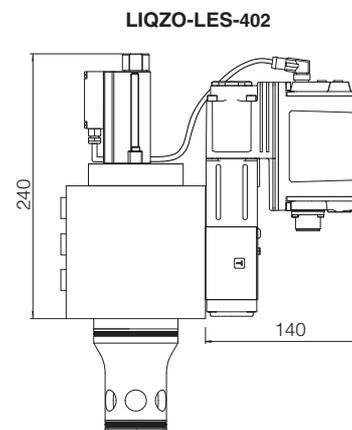
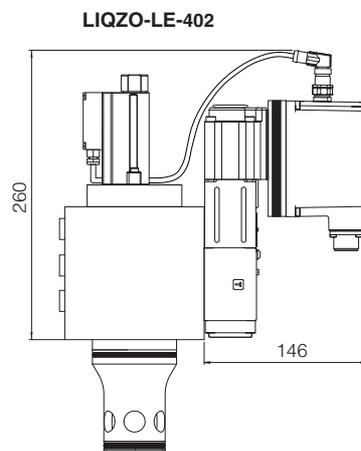
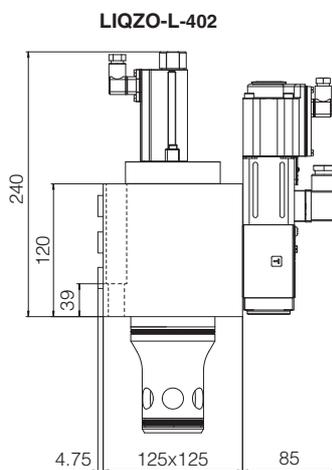
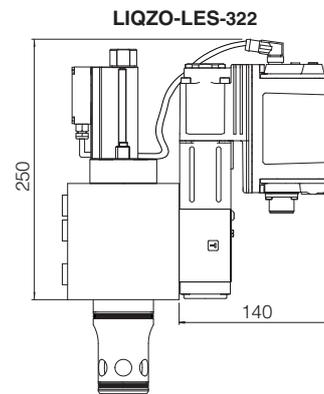
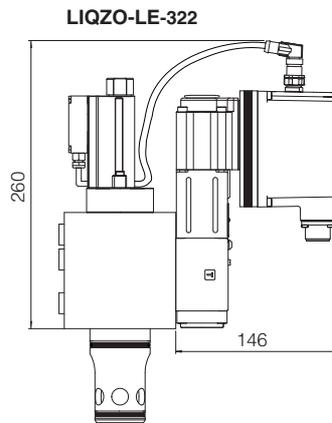
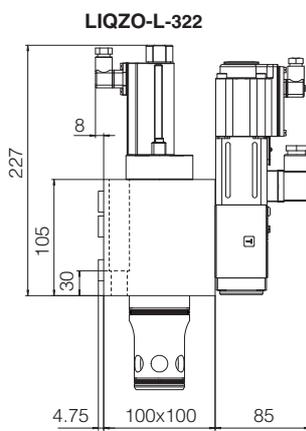
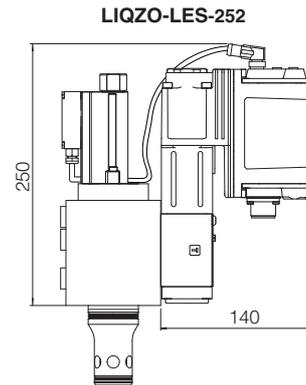
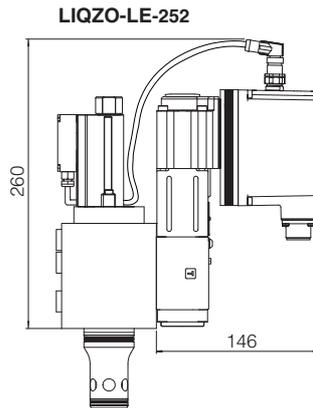
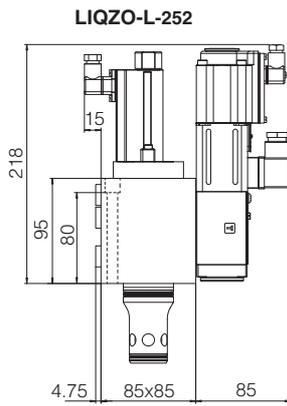
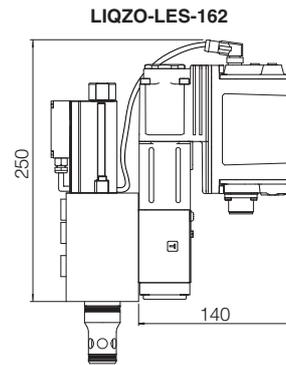
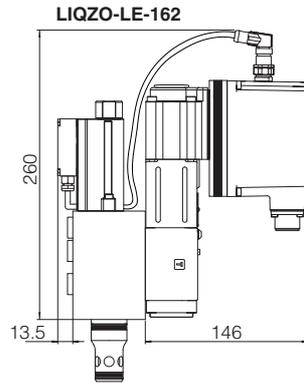
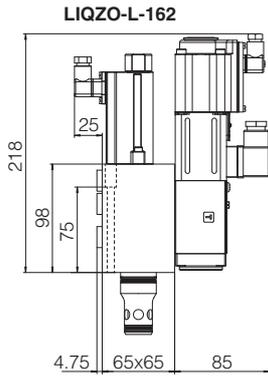
16 FASTENING BOLTS and VALVE MASS

Size	Fastening bolts class 12.9	Tightening torque	LIQZO	
			Mass (Kg) L	Mass (Kg) LE-LES
16	N°4 M8x90	35 Nm	5,6	6,2
25	N°4 M12x100	125 Nm	8,2	8,8
32	N°4 M16x60	300 Nm	10,9	11,2
40	N°4 M20x70	600 Nm	16,7	17,3

Size	Fastening bolts class 12.9	Tightening torque	LIQZP	
			Mass (Kg) L	Mass (Kg) LE-LES
50	N°4 M20x80	600 Nm	23,9	24,6
63	N°4 M30x120	2100 Nm	44	44,6
80	N°8 M24x80	1000 Nm	71,6	72,2
100	N°8 M30x120	2100 Nm	122,5	123,1

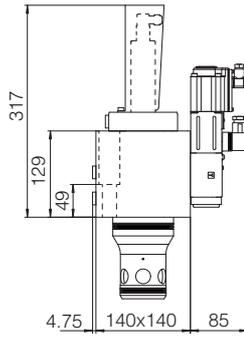
17 MOUNTING SURFACE AND CAVITY - see table P006 for dimensions



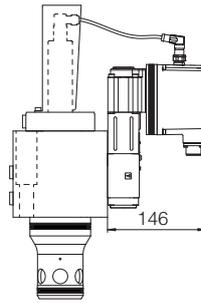


Note: for main and communication connectors see section 14, 15
for mounting surface and cavity see section 17 and table P006

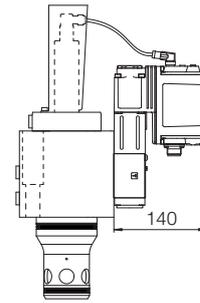
LIQZP-L-502



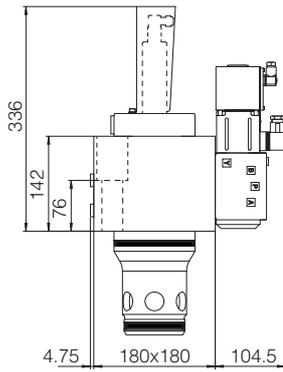
LIQZP-LE-502



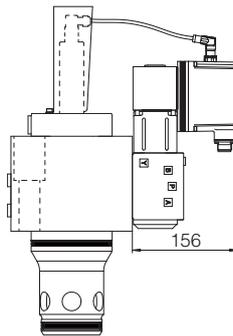
LIQZP-LES-502



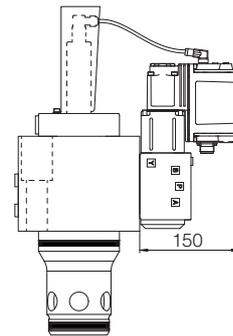
LIQZP-L-632



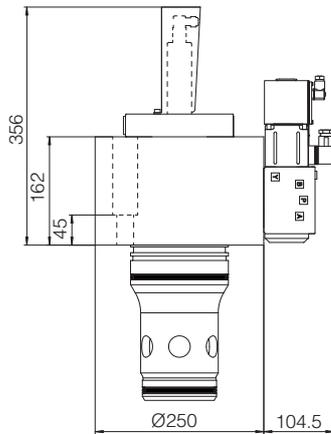
LIQZP-LE-632



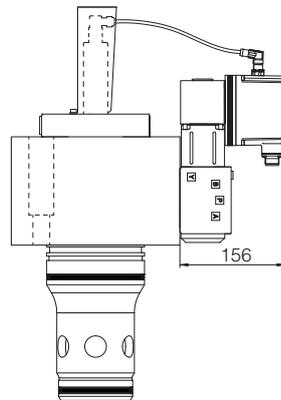
LIQZP-LES-632



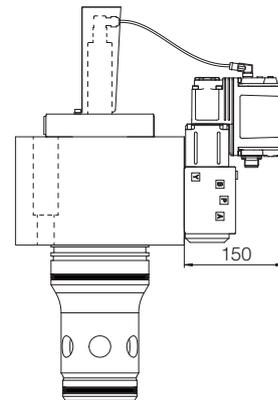
LIQZP-L-802



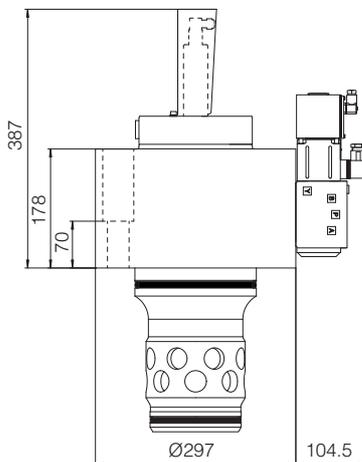
LIQZP-LE-802



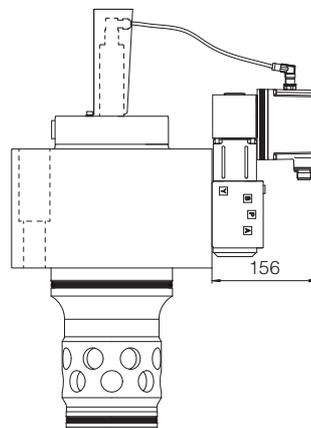
LIQZP-LES-802



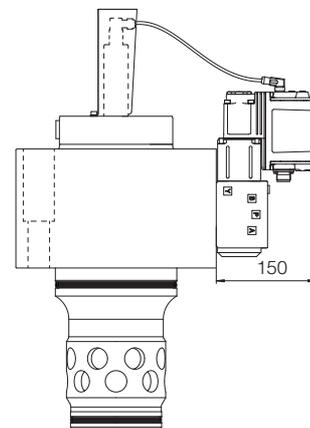
LIQZP-L-1002



LIQZP-LE-1002



LIQZP-LES-1002



Note: for main and communication connectors see section [14](#), [15](#)
for mounting surface and cavity see section [17](#) and table P006