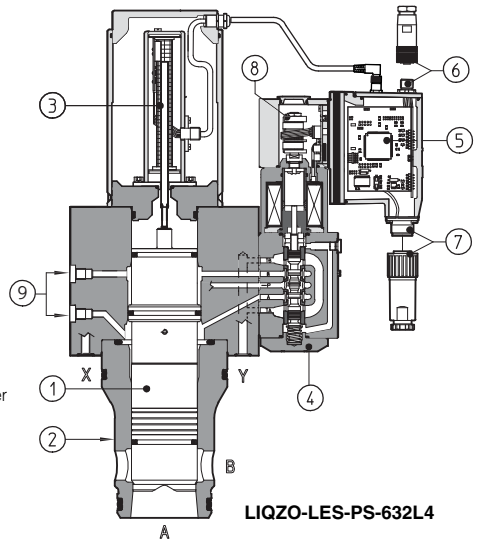
Proportional throttle cartridges type LIQZO-L*, 2-way

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



LIQZO-LES-PS-632L4

① Poppet
② Sleeve
③ Main stage position transducer
④ Pilot valve
⑤ Integral electronics
⑥ Communication connector
⑦ Main connector
⑧ Pilot valve position transducer
⑨ Air bleeding

LIQZO-L* are 2-way proportional cartridge valves, with double position transducer designed for mounting in mainfold blocks which provide proportional non compensated flow control according to electronic reference signal.

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

They are available in different executions:
- -L, with two integral position transducers ③, ⑧;
- -LE, -LES as -L plus analogue (LE) or digital (LES) integral electronics ⑤.

The regulation is operated by means of a poppet ① with double piloting area sliding into a sleeve ② and provided of integral LVDT position transducer ③.

The spool is operated by means of a high performances proportional directional valve in "rugged" executions to withstand high vibrations and mechanical stresses (type DLHZO for cartridge dimensions up to size 50 and type DLKZOR for cartridge dimensions up to size 100) - see tab. F180, provided of high precision sleeve and LVDT position transducer ③ for maximum regulating accuracy and dynamic response. It is controlled in double closed loop position by means of the LVDT position transducers ③ and ⑧.

The integral electronics ⑤ ensures factory presetting, fine functionality plus valve-to-valve interchangeability and simplified wiring and installation.
Standard 7 pin main connector is used for power supply, analog input reference and monitor signals.
12 pin connector is used for options /Z.

Following communication interfaces ⑥ are available for the digital -LES execution:
- -PS, Serial communication interface. The valve reference signal is provided with analogue commands
- -BC, CANopen interface
- -BP, PROFIBUS DP interface

The valves with -BC and -BP interfaces can be integrated into a fieldbus communication network and thus digitally operated by the machine control unit.

Typical applications: plastic injection and blow moulding, ceramics, punching & nibbling machines, die-casting, foundry and sheet machinery;

Mounting surface: ISO 7368

Sizes from 16 to 100;

Max flow up to 7200 l/min with differential pressure Δp = 5 bar, see section 2;

Max pressure = 350 bar.

1 MODEL CODE

LIQZO - LES - PS - 25 2 L4 / * ** /*

Flow control valve

L = with two integral position transducers
LE = as L plus integral electronics
LES = as L plus integral digital electronics

Communication interfaces (only for LES)
PS = Serial
BC = CANopen
BP = PROFIBUS DP

Valve size , see section 3
16 **25** **32** **40**
50 **63** **80** **100**

Valve configuration, see section 3
2 = 2 way

Spool type (regulating characteristics):
L4 = linear

Electronic options for -LE execution see section 6:
F = fault signal
I = current reference input and monitor (4÷20 mA)
Q = enable signal
Z = enable, fault and monitor signal (12 pin connector)

Electronic options for -LES execution see section 8:
I = current reference input and monitor (4÷20 mA)
Z = double power supply, enable, fault and monitor signals (12 pin connector)

Series number

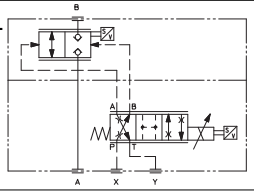
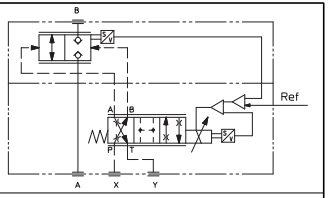
Synthetic fluids:
WG = water-glycol
PE = phosphate ester

2 ELECTRONIC DRIVERS

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

Note: For power supply and communication connector see section 15

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

Hydraulic symbols	LIQZO-L 				LIQZO-LE* 			
Model	LIQZO-L*							
Size	16	25	32	40	50	63	80	100
Max regulated flow [l/min] at Δp = 5 bar at Δp =10 bar Max permissible flow	 250 350 600	 500 700 1200	 800 1100 1800	 1200 1700 2500	 2000 2800 4000	 3000 4250 6000	 4500 6350 10000	 7200 10200 16000
Max pressure [bar]	350							
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
Response time 0 ÷ 100% step signal [ms]	13	14	15	18	20	24	30	50
Pilot volume [cm³]	1,6	2.2	7,0	9,4	17.7	32,5	39,5	59,4
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.
- Recommended piloting pressure is 140 ÷ 160 bar.
- In case of long time shutdown of the hydraulic supply to the pilot valve, the driver has to be switched off to avoid its overheating.

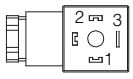
4 GENERAL NOTES

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).

5 CONNECTIONS FOR -L EXECUTION

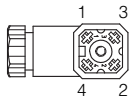
SOLENOID POWER SUPPLY CONNECTOR

PIN	Signal description
1	SUPPLY
2	SUPPLY
3	GND



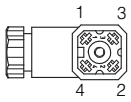
POSITION TRANSDUCER CONNECTOR (pilot and main stage)

PIN	Signal description
1	OUTPUT SIGNAL
2	SUPPLY -15 VDC
3	SUPPLY +15 VDC
4	GND



MAIN STAGE POSITION TRANSDUCER CONNECTOR

SIZES 16 ÷ 40		SIZE 50 ÷ 100	
PIN	Signal description	PIN	Signal description
1	OUTPUT SIGNAL	**1**	OUTPUT SIGNAL
2	SUPPLY -15 VDC	**2**	NOT CONNECTED
3	SUPPLY +15 VDC	**3**	SUPPLY +24 VDC
4	GND	**4**	GND



6 ANALOG INTEGRAL DRIVERS -LE - OPTIONS

Standard driver execution provides on the 7 pin main connector:

Power supply - 24VDC 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 µF/40 V capacitance to single phase rectifiers or a 4700 µF/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:

6.1 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.

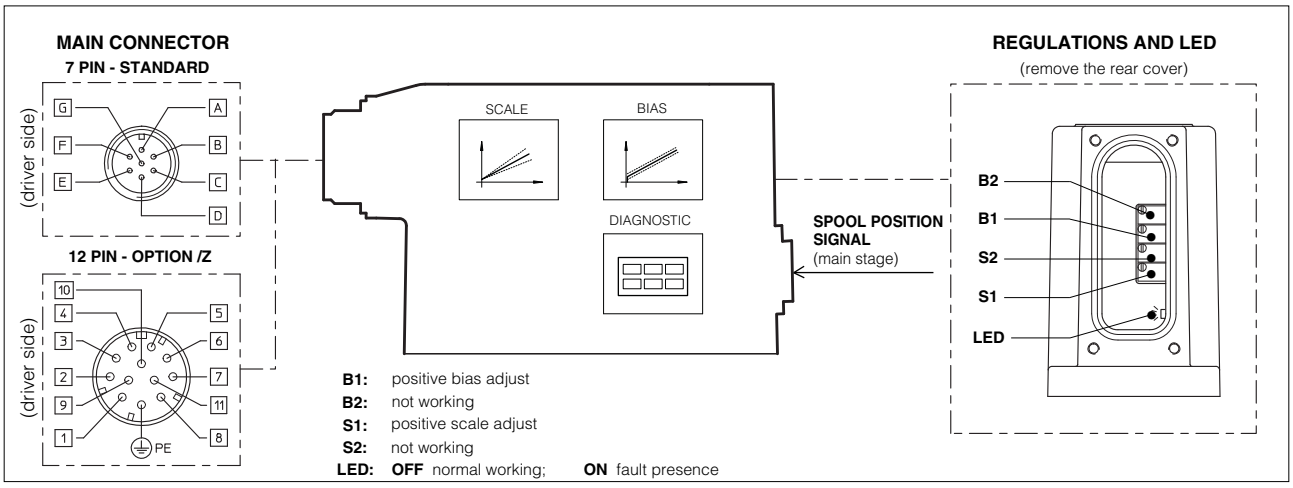
6.2 Option /I
It provides the 4÷20 mA current reference and monitor signals instead of the standard ±10 VDC
It is normally used in case of long distance between the machine control unit and the valve or where the reference signal can be affected by electrical noise; the valve functioning is disabled in case of reference signal cable breakage.

6.3 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 24VDC on the enable input signal.

6.4 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.

6.5 Possible combined options: /FI and /IZ

7 ANALOG INTEGRAL DRIVERS -LE - MAIN FUNCTIONS AND ELECTRONIC CONNECTIONS



7.1 ELECTRONIC CONNECTIONS - 7 & 12 PIN MAIN CONNECTORS

Standard 7pin	/Z option 12pin	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES
A	1	V+	Power supply 24 VDC for solenoid power stage and driver logic	Input - power supply
B	2	V0	Power supply 0 VDC for solenoid power stage and driver logic	Gnd - power supply
C (1)	7	AGND	Ground - signal zero for MONITOR signal (for standard, /Z option)	Gnd - analog signal
	3	ENABLE	Enable (24 VDC) or disable (0 VDC) the driver (for /Q and /Z options)	Input - on/off signal
D	4	INPUT+	Reference analog differential input: 0 ÷ +10 VDC maximum range (4 ÷ 20 mA for /I option)	Input - analog signal
E	5	INPUT -		
F (2)	6	MONITOR	Monitor analog output: ±10 VDC maximum range (4 ÷ 20 mA for /I option)	Output - analog signal
	11	FAULT	Fault (0V) or normal working (24V) (for /F and /Z options)	Output - on/off 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
G	PE	EARTH	Internally connected to the driver housing	

Notes:

(1) with /Q option ENABLE signal replaces AGND on pin C; MONITOR signal is reffered to pin B

(2) with /F option FAULT signal replaces MONITOR on pin F.

- A minimum time of 50ms to 100ms 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 DIGITAL INTEGRAL DRIVERS -LES - OPTIONS

Standard driver execution provides on the 7 pin main connector:

Power supply - 24VDC 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 µF/40 V capacitance to single phase rectifiers or a 4700 µF/40 V capacitance to three phase rectifiers

Reference input signal - analog differential input with ±10VDC 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 ±10VDC nominal range

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

8.1 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.

8.2 Option /Z

It provides on a 12 pin main connector the above standard features plus:

Logic power supply

Option /Z provides separate 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

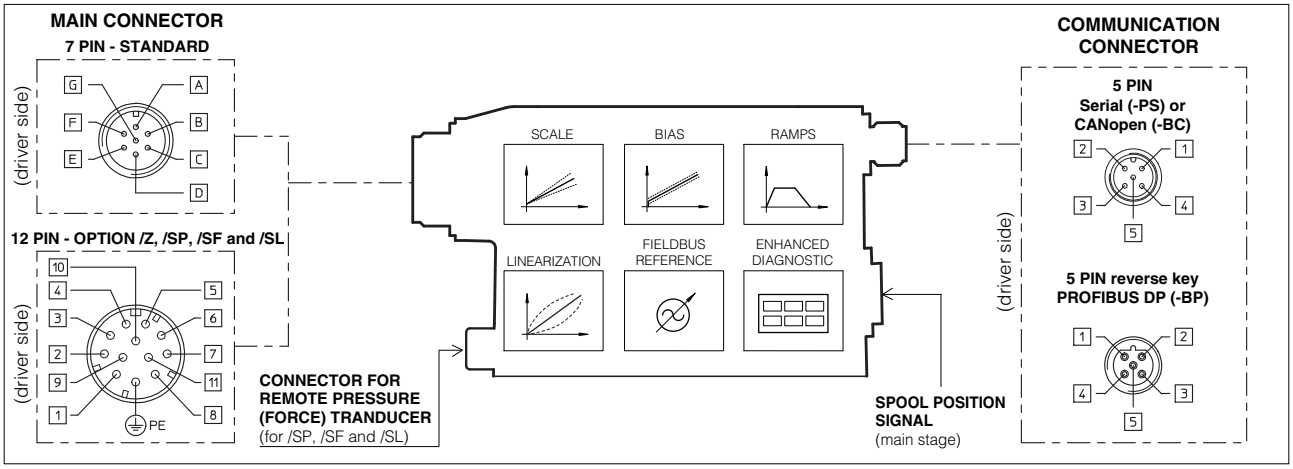
To enable the driver supply a 24VDC on pin 3 referred to pin 2: when the Enable signal is set to zero the valve functioning is disabled (zero current to the solenoid) but the driver current output stage is still active. This condition does not comply with European Norms EN13849-1 (ex EN954-1).

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 24VDC (pin 11 referred to pin 2): Fault status is not affected by the Enable input signal

8.3 Possible combined options: /IZ

9 DIGITAL INTEGRAL DRIVERS -LES - MAIN FUNCTIONS AND ELECTRONIC CONNECTIONS



9.1 ELECTRONIC CONNECTIONS - 7 & 12 PIN MAIN CONNECTORS

Standard 7pin	/Z option 12pin	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES
A	1	V+	Power supply 24 VDC for solenoid power stage (and for driver logic on 7 pin connection)	Input - power supply
B	2	V0	Power supply 0 VDC for solenoid power stage (and for driver logic on 7 pin connection)	Gnd - power supply
-	3	ENABLE	Enable (24 VDC) or disable (0 VDC) the driver	Input - on/off signal
D	4	INPUT+	Reference analog input: 0 ÷ +10 VDC maximum range (4 ÷ 20 mA for /I option) standard: differential input; /Z option: common mode INPUT+ referred to AGND	Input - analog signal
E	-	INPUT -		
C	5	AGND	Ground - signal zero for MONITOR signal signal zero for INPUT+ signal (only for /Z option)	Gnd - analog signal
F	6	MONITOR	Monitor analog output: ±10 VDC maximum range (4 ÷ 20 mA for /I option)	Output - analog signal
-	7	NC	do not connect	
-	8	NC	do not connect	
-	9	VL+	Power supply 24 VDC for driver logic	Input - power supply
-	10	VL0	Power supply 0 VDC for driver logic	Gnd - power supply
-	11	FAULT	Fault (0V) or normal working (24V)	Output - on/off signal
G	PE	EARTH	Internally connected to the driver housing	

Note: A minimum time of 300 to 500 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.

9.2 ELECTRONIC CONNECTIONS - 5 PIN COMMUNICATION CONNECTORS

	-PS Serial		-BC CANopen		-BP PROFIBUS DP	
PIN	SIGNAL	TECHNICAL SPECIFICATION	SIGNAL	TECHNICAL SPECIFICATION	SIGNAL	TECHNICAL SPECIFICATION
1	NC	do not connect	CAN_SHLD	Shield	+5V	for termination
2	NC	do not connect	NC	do not connect	LINE-A	Bus line (high)
3	RS_GND	Signal zero data line	CAN_GND	Signal zero data line	DGND	data line and termination Signal zero
4	RS_RX	Valves receiving data line	CAN_H	Bus line (high)	LINE-B	Bus line (low)
5	RS_TX	Valves transmitting data line	CAN_L	Bus line (low)	SHIELD	

10 SOFTWARE TOOLS

The functional parameters of digital valves, as the bias, scale ramp and linearization of the regulation characteristic, can be easily set and optimized with the Atos E-SW programming software, available in three different versions according to the driver's communication interfacing: E-SW-PS (Serial), E-SW-BC (CANopen) and E-SW-BP (PROFIBUS DP).
A proper connection is required between the PC and the electronic driver communication port: for a more detailed description of software interface, PC requirements, adapters, cables and terminators, please **see table G500.**
Proportional valves with fieldbus communication interface (-BC and -BP) can be directly managed by the machine control unit; it is required to implement in the machine control the standard communication as described in the user manuals supplied with the relevant programming software. For detailed description of available fieldbus feature, **see table G510.**
On first supply of the E-SW software, it is required to apply for the registration in the Atos download area: www.download.atos.com
Once the registration is completed, the password will be sent by email.
The software remains active for 10 days from the installation date and then it stops until the user inputs his password.
With the password you can also download, in your personal area, the latest releases of the Atos software, manuals, drivers and configuration files.

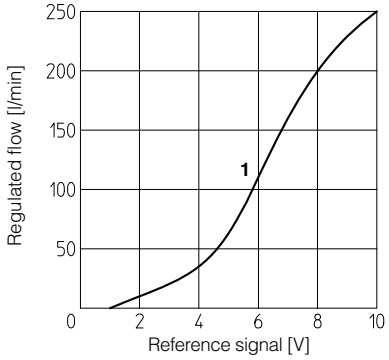
11 MAIN CHARACTERISTICS OF PROPORTIONAL DIRECTIONAL VALVES

Assembly position	Any position
Subplate surface finishing	Roughness index, $\sqrt{}^{0.4}$ flatness ratio 0,01/100 (ISO 1101)
Ambient temperature	-20°C ÷ +70°C for -L execution; -20°C ÷ +60°C for -LE and LES executions
Fluid	Hydraulic oil as per DIN 51524 ... 535 for other fluids see section 1
Recommended viscosity	15 ÷100 mm²/s at 40°C (ISO VG 15÷100)
Fluid contamination class	ISO 18/15 achieved with in line filters of 10 μm and $\beta_{10} \geq 75$ (recommended)
Fluid temperature	-20°C +60°C (standard and /WG seals) -20°C +80°C (/PE seals)
Coil resistance R at 20°C	3 ÷ 3,3 Ω
Max. solenoid current	2,6 A
Max. power	35 Watt
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 (CEI EN-60529)	IP65 for -L execution; IP65÷67 for -LE and -LES executions, depending to the connector type (see sect. 15)
Duty factor	Continuous rating (ED=100%)

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

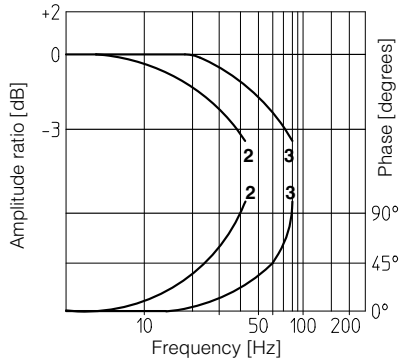
12.1 Regulation diagrams

1 = LIQZO-L*-16*



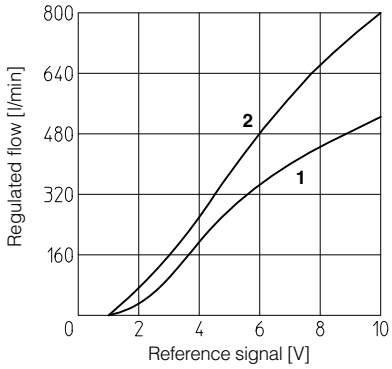
12.2 Bode diagrams
stated at nominal hydraulic conditions

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



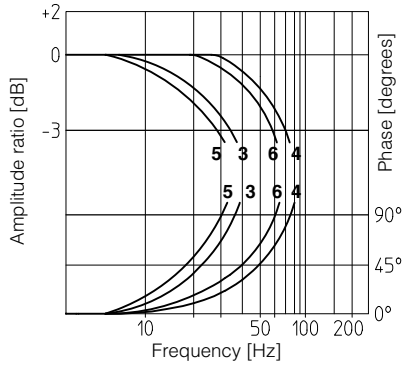
12.3 Regulation diagrams

1 = LIQZO-L*-25*
2 = LIQZO-L*-32*



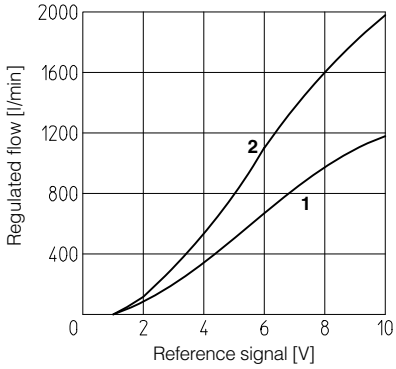
12.4 Bode diagrams
stated at nominal hydraulic conditions

3 = LIQZO-L*-25*: 10% ↔ 90%
4 = LIQZO-L*-25*: 50% ± 5%
5 = LIQZO-L*-32*: 10% ↔ 90%
6 = LIQZO-L*-32*: 50% ± 5%



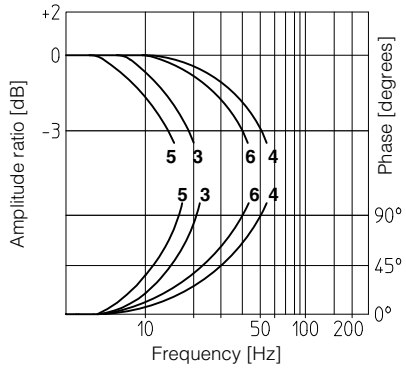
12.5 Regulation diagrams

1 = LIQZO-L*-40*
2 = LIQZO-L*-50*



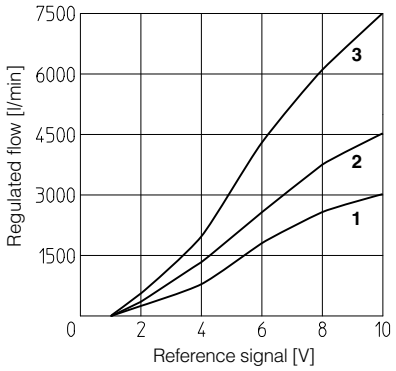
12.6 Bode diagrams
stated at nominal hydraulic conditions

3 = LIQZO-L*-40*: 10% ↔ 90%
4 = LIQZO-L*-40*: 50% ± 5%
5 = LIQZO-L*-50*: 10% ↔ 90%
6 = LIQZO-L*-50*: 50% ± 5%



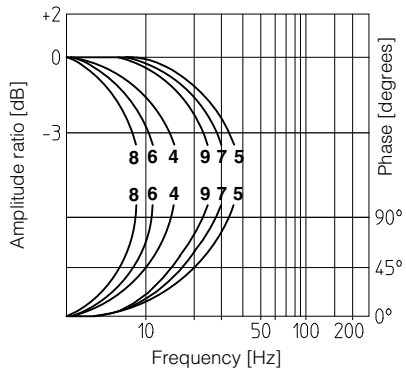
12.7 Regulation diagrams

1 = LIQZO-L*-63*
2 = LIQZO-L*-80*
3 = LIQZO-L*-100*



12.8 Bode diagrams
stated at nominal hydraulic conditions

4 = LIQZO-L*-63*: 10% ↔ 90%
5 = LIQZO-L*-63*: 50% ± 5%
6 = LIQZO-L*-80*: 10% ↔ 90%
7 = LIQZO-L*-80*: 50% ± 5%
8 = LIQZO-L*-100*: 10% ↔ 90%
9 = LIQZO-L*-100*: 50% ± 5%



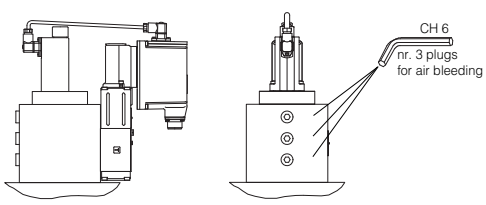
Note:
For the valves with digital electronics, the regulation characteristic can be modified by setting the internal software parameters, see tab. G500.

12.9 Dynamic response

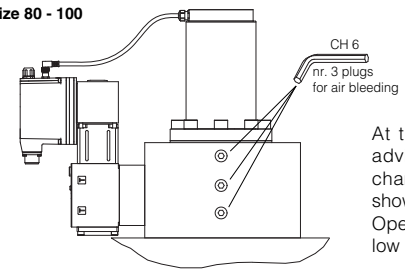
The response times in section 2 and the frequency responses of the bode diagrams in section 12.2, 12.4, 12.6, 12.8, have to be considered as average values. For the valves with digital electronics the dynamics performances can be optimized by setting the internal software parameters.

13 AIR BLEEDING

Sizes 16 - 50



Size 80 - 100

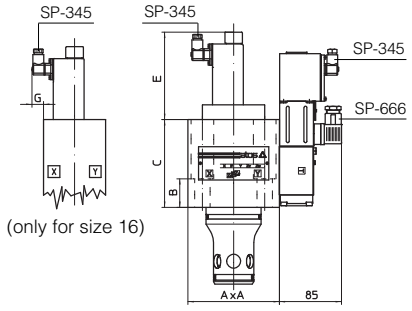


At the machine commissioning it is advisable to bleed the air from pilot chambers, by loosening the 3 plugs shown in the picture.
Operate the valve for few seconds at low pressure and then lock the plugs.

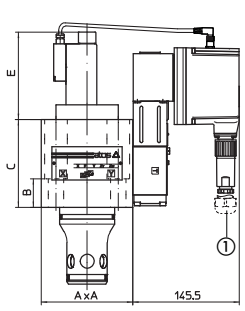
14 INSTALLATION DIMENSIONS [mm]

Size 16, 25, 32 and 40

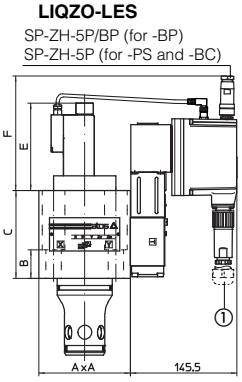
LIQZO-L



LIQZO-LE

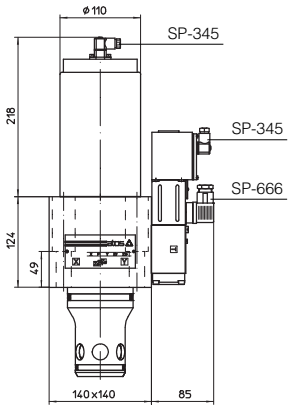


LIQZO-LES

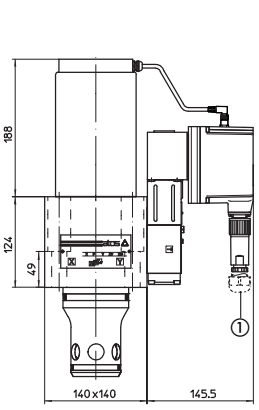


Size 50

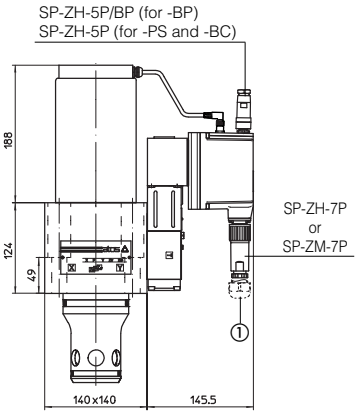
LIQZO-L



LIQZO-LE

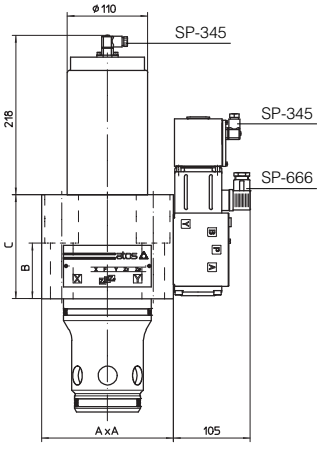


LIQZO-LES

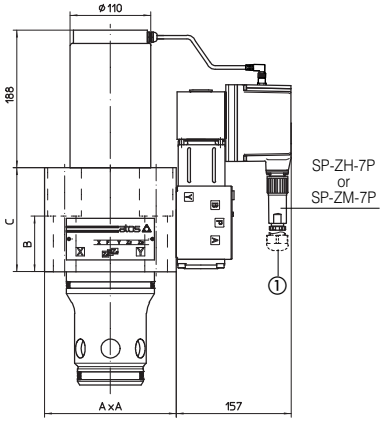


Size 63, 80 and 100

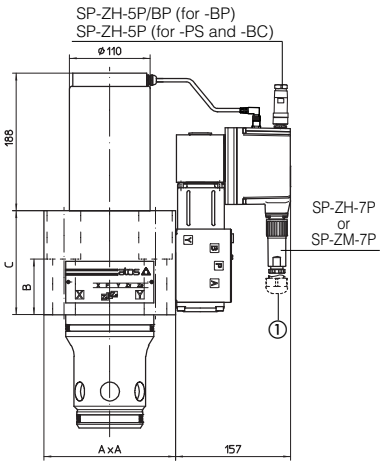
LIQZO-L



LIQZO-LE



LIQZO-LES



Size	A	B	C	D	E	F	G	Fastening bolts class 12.9	Tightening torque	Weight (Kg) L	Weight (Kg) LE-LES
16	65	75	98	-	99,5	147	26	N°4 M8x90	35 Nm	5,6	6,2
25	85	80	95	241	127,5	153,5	-	N°4 M12x100	25 Nm	8,2	8,8
32	100	30	105	226	135	161	-	N°4 M16x60	300 Nm	10,9	11,2
40	125	39	120	241	147,5	173,5	-	N°4 M20x70	600 Nm	16,7	17,3
50	see drawing						-	N°4 M20x80	600 Nm	23,9	24,6
63	180	76	142	-	-	-	-	N°4 M30x120	2100 Nm	44	44,6
80	Ø 250	55	165	-	-	-	-	N°8 M24x80	1000 Nm	71,6	72,2
100	Ø 300	70	195	-	-	-	-	N°8 M30x120	2100 Nm	122,5	123,1

-LE* EXECUTION

① Dotted line = 12 pin connector SP-ZH-12P for option /Z

Mounting surface and cavity: ISO 7368
(see table P006)

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

VALVE VERSION	-L		-LE, -LES		-LE/Z -LES /Z	LES -PS, -BC	LES -BP
	Power supply	Transducer					
CONNECTOR CODE	SP-666	SP-345	SP-ZH-7P	SP-ZM-7P	SP-ZH-12P	SP-ZH-5P	SP-ZH-5P/BP
PROTECTION DEGREE	IP65	IP65	IP67	IP67	IP65	IP67	IP67
DATA SHEET	K500		G200, G210, K500			G210, K500	

connectors supplied with the valve