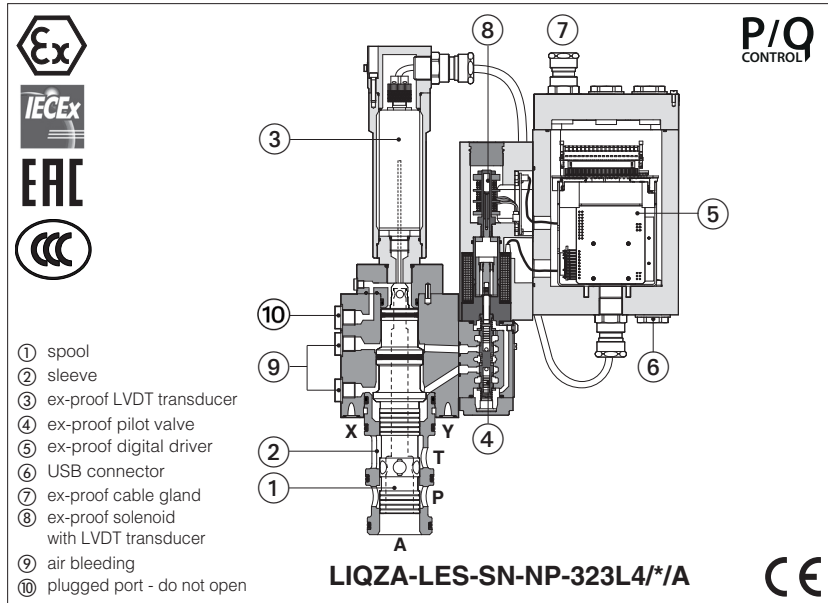


# Ex-proof digital servoproportional 3-way cartridges

piloted, with on-board driver and two LVDT transducers - **ATEX, IECEx, EAC, CCC**



- ① spool
- ② sleeve
- ③ ex-proof LVDT transducer
- ④ ex-proof pilot valve
- ⑤ ex-proof digital driver
- ⑥ USB connector
- ⑦ ex-proof cable gland
- ⑧ ex-proof solenoid with LVDT transducer
- ⑨ air bleeding
- ⑩ plugged port - do not open

## LIQZA-LES

Ex-proof digital servoproportional 3-way cartridges, with two LVDT position transducers (pilot valve and main stage) for best accuracy in directional controls and in not compensated flow regulations.

They are equipped with ex-proof on-board digital driver, LVDT transducers and proportional solenoid certified for safe operations in hazardous environments with potentially explosive atmosphere.

- Multicertification **ATEX, IECEx, EAC and CCC** for gas group **II 2G** and dust category **II 2D**

The flameproof enclosure of on-board digital driver, solenoid and transducer, prevents the propagation of accidental internal sparks or fire to the external environment.


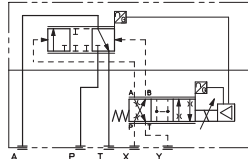
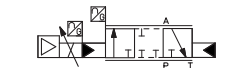
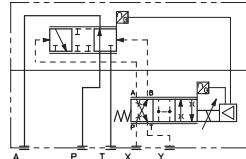
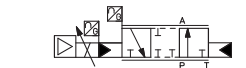
The driver and solenoid are also designed to limit the surface temperature within the classified limits.

Size: **25 ÷ 80** - not ISO cavity

Max flow: **500 ÷ 5000 l/min**

Max pressure: **420 bar**

## 1 MODEL CODE

|  |   |  |   |           |   |           |   |           |   |          |   |  |   |                           |   |  |   |   |   |   |  |   |  |   |  |  |  |   |
|--|---|--|---|-----------|---|-----------|---|-----------|---|----------|---|--|---|---------------------------|---|--|---|---|---|---|--|---|--|---|--|--|--|---|
| <b>LIQZA</b>                           | - | <b>LES</b>   | - | <b>SN</b> | - | <b>NP</b> | - | <b>32</b> | - | <b>3</b> | / | <b>L4</b>  | / | <b>M</b>                  | / | <b>*</b>   | / | <b>*</b>  | / | <b>*</b>  |  |   |  |   |  |  |  |   |
| <p>Ex-proof proportional cartridge</p> |   | <p><b>LES</b> = on-board driver and two LVDT transducers</p> |   |           |   |           |   |           |   |          |   | <p><b>L4</b> = linear</p>  |   | <p><b>M</b> = M20X1,5</p> |   | <p><b>Hydraulic options (1):</b><br/> <b>A</b> = reversal hydraulic configuration of main spool: P-A in rest position</p> <p><b>Electronic options (1):</b><br/> <b>C</b> = current feedback for pressure transducer 4÷20mA (omit for std voltage ±10Vdc) only for <b>SP, SL</b><br/> <b>I</b> = current reference input and monitor 4÷20 mA</p> |   | <p><b>Seals material, see section 9:</b><br/>         - = NBR<br/> <b>PE</b> = FKM<br/> <b>BT</b> = NBR low temp.</p> |   | <p><b>Alternated P/Q controls:</b><br/> <b>SN</b> = none<br/> <b>SP</b> = pressure control (1 pressure transducer)<br/> <b>SL</b> = force control (1 load cell)</p> |  | <p><b>Cable entrance threaded connection:</b><br/> <b>M</b> = M20X1,5</p> |  | <p><b>Spool type, regulating characteristics:</b></p> |  | <p><b>Configuration: 3 = 3 way</b><br/>         functional symbol: <b>Standard</b></p>  <p>simplified symbol: <b>Standard</b></p>  |  | <p>option <b>/A</b></p>  <p>option <b>/A</b></p>  |

Valve size and nominal flow (l/min) at Δp 5 bar:

- 25** = 185
- 32** = 330
- 40** = 420
- 50** = 780
- 63** = 1250
- 80** = 2100

(1) For possible combined options, see section 15

## 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 **FX900** and in the user manuals included in the E-SW-\* programming software.

## 3 VALVE SETTINGS AND PROGRAMMING TOOLS

**WARNING:** the below operation must be performed in a safety area

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.

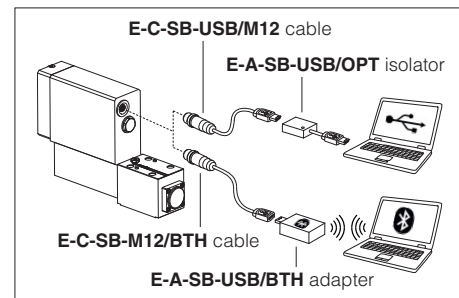
The software is available in different versions according to the driver's options (see table **GS500**):

|                      |   |                  |               |
|----------------------|---|------------------|---------------|
| <b>E-SW-BASIC</b>    | support: NP (USB)   | PS (Serial)      | IR (Infrared) |
| <b>E-SW-FIELDBUS</b> | support: BC (CANopen)   | BP (PROFIBUS DP) | EH (EtherCAT) |
|                      | EW (POWERLINK)  | EI (EtherNet/IP) | EP (PROFINET) |
| <b>E-SW-* /PQ</b>    | 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:** Bluetooth adapter is available only for European, USA and Canadian markets! Bluetooth adapter is certified according RED (Europe), FCC (USA) and ISED (Canada) directives

### USB or Bluetooth connection



## 4 FIELDBUS - see tech. table **GS510**

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

## 5 ALTERNATED P/Q CONTROLS - see tech. table **FX500**

**S\*** options add the closed loop control of pressure (**SP**) or force (**SL**) to the basic functions of proportional directional valves flow regulation. A dedicated algorithm alternates pressure (force) depending on the actual hydraulic system conditions.

An additional connector is available for transducers to be interfaced to the valve's driver (1 pressure transducer for SP or 1 load cell for SL). The alternated pressure control (SP) is possible only for specific installation conditions.

## 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, for further details see technical table P007  |
| Ambient temperature range              | <b>Standard</b> = -20°C ÷ +60°C <b>/PE option</b> = -20°C ÷ +60°C <b>/BT option</b> = -40°C ÷ +60°C   |
| Storage temperature range              | <b>Standard</b> = -20°C ÷ +70°C <b>/PE option</b> = -20°C ÷ +70°C <b>/BT option</b> = -40°C ÷ +70°C   |
| Surface protection                     | Zinc coating with black passivation   |
| Corrosion resistance                   | Salt spray test (EN ISO 9227) > 200 h   |
| Compliance                             | Explosion proof protection, see section <b>13</b><br>-Flame proof enclosure "Ex d"<br>-Dust ignition protection by enclosure "Ex t"<br>RoHs Directive 2011/65/EU as last update by 2015/863/EU<br>REACH Regulation (EC) n°1907/2006 |

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

|  | 25  | 32   | 40   | 50   | 63   | 80   |
|--|---|------|------|------|------|------|
| Max regulated flow [l/min]                         |   |      |      |      |      |      |
| Δp P-A or A-T at Δp = 5 bar                        | 185   | 330  | 420  | 780  | 1250 | 2100 |
| at Δp = 10 bar                                     | 260   | 470  | 590  | 1100 | 1750 | 3000 |
| Max permissible flow                               | 500   | 850  | 1050 | 2000 | 3100 | 5000 |
| Max pressure [bar]                                 | Ports P, A, T = <b>420</b> X = 350    Y ≤ 10                    |      |      |      |      |      |
| Nominal flow of pilot valve at Δp = 70 bar [l/min] | 4   | 8    | 28   | 40   | 100  | 100  |
| Leakage of pilot valve at P = 100 bar [l/min]      | 0,2   | 0,2  | 0,5  | 0,7  | 0,7  | 0,7  |
| Piloting pressure [bar]                            | min: 40% of system pressure    max 350    recommended 140 ÷ 160 |      |      |      |      |      |
| Piloting volume [cm³]                              | 2,16  | 7,2  | 8,9  | 17,7 | 33,8 | 42,7 |
| Piloting flow <b>(1)</b> [l/min]                   | 6,5   | 20   | 25   | 43   | 68   | 76   |
| Response time <b>(2)</b> [ms]                      | ≤ 25  | ≤ 27 | ≤ 27 | ≤ 30 | ≤ 35 | ≤ 40 |
| Hysteresis [% of the max regulation]               | ≤ 0,1   |      |      |      |      |      |
| Repeatability [% of the max regulation]            | ± 0,1   |      |      |      |      |      |
| Thermal drift                                      | zero point displacement < 1% at ΔT = 40°C                       |      |      |      |      |      |

**(1)** 0 ÷ 100% step signal

**(2)** With pilot pressure = 140 bar

**WARNING**

The loss of the pilot pressure causes the undefined position of the main spool.

The sudden interruption of the power supply during the valve operation causes the immediate main spool opening A → T or P → A (for option /A). This could cause pressure surges in the hydraulic system or high decelerations which may lead to machine damages.

## 8 ELECTRICAL CHARACTERISTICS

|  |  |                   |   |   |
|--|--|-------------------|---|---|
| Power supplies   | Nominal : +24 VDC<br>Rectified and filtered : $V_{RMS} = 20 \div 32 V_{MAX}$ (ripple max 10 % $V_{PP}$ )   |                   |   |   |
| Max power consumption                                    | 35 W   |                   |   |   |
| Analog input signals                                     | Voltage: range $\pm 10$ VDC (24 $V_{MAX}$ tolerant)<br>Current: range $\pm 20$ mA  |                   | Input impedance: $R_i > 50$ k $\Omega$<br>Input impedance: $R_i = 500 \Omega$ |   |
| 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  |                   |   |   |
| Monitor outputs  | Output range: voltage $\pm 10$ VDC @ max 5 mA<br>current $\pm 20$ mA @ max 500 $\Omega$ load resistance  |                   |   |   |
| Enable input   | Range: 0 $\div$ 5 Vdc (OFF state), 9 $\div$ 24 VDC (ON state), 5 $\div$ 9 VDC (not accepted); Input impedance: $R_i > 10$ k $\Omega$   |                   |   |   |
| Fault output   | Output range: 0 $\div$ 24 Vdc (ON state > [power supply - 2 V] ; OFF state < 1 V ) @ max 50 mA;<br>external negative voltage not allowed (e.g. due to inductive loads)   |                   |   |   |
| Pressure/force transducer power supply (only for SP, SL) | +24VDC @ max 100 mA (E-ATRA-7 see tech table <b>GX800</b> )  |                   |   |   |
| Alarms   | Solenoid not connected/short circuit, cable break with current reference signal, over/under temperature, valve spool transducer malfunctions   |                   |   |   |
| Protection degree to DIN EN60529                         | IP66/67 with relevant cable gland  |                   |   |   |
| Duty factor  | Continuous rating (ED=100%)  |                   |   |   |
| Tropicalization  | Tropical coating on electronics PCB  |                   |   |   |
| Additional characteristics                               | Short circuit protection of solenoid current supply; spool position control (SN) or pressure/force control (SP, SL) by P.I.D. with rapid solenoid switching; protection against reverse polarity of power supply |                   |   |   |
| Electromagnetic compatibility (EMC)                      | According to Directive 2014/30/UE (Immunity: EN 61000-6-2; Emission: EN 61000-6-3)   |                   |   |   |
| 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  | optical insulated | optical insulated   | Fast Ethernet, insulated 100 Base TX                            |
|  | USB 2.0 + USB OTG  | CAN ISO11898      | RS485   |   |

**Note:** a maximum time of 800 ms (depending on communication type) 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

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

|                                       |   |  |  |
|---------------------------------------|---|--|--|
| Seals, recommended fluid temperature  | NBR seals (standard) = $-20^{\circ}\text{C} \div +60^{\circ}\text{C}$ , with HFC hydraulic fluids = $-20^{\circ}\text{C} \div +50^{\circ}\text{C}$<br>FKM seals (/PE option) = $-20^{\circ}\text{C} \div +80^{\circ}\text{C}$<br>NBR low temperature (/BT option) = $-40^{\circ}\text{C} \div +60^{\circ}\text{C}$ , with HFC hydraulic fluids = $-20^{\circ}\text{C} \div +50^{\circ}\text{C}$ |  |  |
| Recommended viscosity                 | 20 $\div$ 100 mm <sup>2</sup> /s - max allowed range 15 $\div$ 380 mm <sup>2</sup> /s   |  |  |
| Max fluid contamination level         | normal operation  | ISO4406 class 18/16/13 NAS1638 class 7 | see also filter section at <a href="http://www.atos.com">www.atos.com</a> or KTF catalog |
|                                       | longer life   | ISO4406 class 16/14/11 NAS1638 class 5 |  |
| <b>Hydraulic fluid</b>                | <b>Suitable seals type</b>  | <b>Classification</b>                  | <b>Ref. Standard</b>   |
| Mineral oils                          | NBR, FKM, HNBR  | HL, HLP, HLPD, HVLP, HVLPD             | DIN 51524  |
| Flame resistant without water         | FKM   | HFDD, HFDR                             | ISO 12922  |
| Flame resistant with water <b>(1)</b> | NBR, NBR low temp.  | HFC                                    |  |

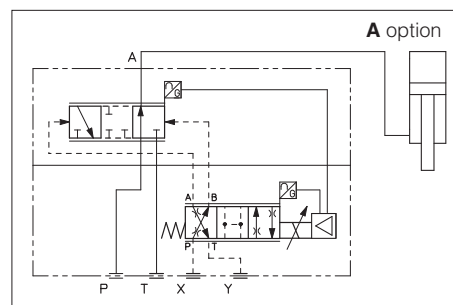
**⚠** The ignition temperature of the hydraulic fluid must be 50°C higher than the max solenoid surface temperature

### (1) Performance limitations in case of flame resistant fluids with water:

- max operating pressure = 210 bar
- max fluid temperature = 50°C

## 10 HYDRAULIC OPTIONS

**A** = The standard valve version provides the hydraulic configuration A-T of main spool in absence of electric power supply to the valve.  
The option /A provides the reverse configuration P-A of main spool in absence of electric power supply to the valve.  
This execution is particularly requested in vertical presses for safety reasons, because in case of electric power breakdown the P-A configuration of the main spool prevents the uncontrolled and dangerous downstroke of the press ram.



## 11 ELECTRONICS OPTIONS

- I** = This option provides 4  $\div$  20 mA current reference and monitor signals, instead of the standard 0  $\div$  10 VDC.  
Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of  $\pm 10$  VDC or  $\pm 20$  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.
- C** = Only for **SP, SL**  
This option is available to connect pressure (force) transducers with 4  $\div$  20 mA current output signal, instead of the standard  $\pm 10$  VDC.  
Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of  $\pm 10$  VDC or  $\pm 20$  mA.

## 12 POSSIBLE COMBINED OPTIONS

- For **SN**: /AI  
For **SP, SL**: /AC, AI, /CI, /ACI

**13 CERTIFICATION DATA**

|                                     |   |              |                            |   |
|-------------------------------------|---|--------------|----------------------------|---|
| Components type                     | Pilot valve solenoid and LVDT transducer  |              |                            | LVDT main stage transducer  |
| Certifications                      | Multicertification Group II <b>ATEX</b> <b>IECEX</b> <b>EAC</b> <b>CCC</b>  |              |                            |   |
| Components Certified code           | <b>OZA-LES</b>  |              |                            | <b>ETHA-15</b>  |
| Type examination certificate (1)    | ATEX: TUV IT 18 ATEX 068 X<br>IECEX: IECEX TPS 19.0004X<br>EAC: RU C-IT. AX38.B.00425/21<br>CCC: 2021322307004057   |              |                            | ATEX: TUV IT 16 ATEX 053 X<br>IECEX: IECEX TPS 16.0003X<br>EAC: RU C-IT. AX38.B.00425/21<br>CCC: 2021322315004329   |
| Method of protection                | <ul style="list-style-type: none"> <li>• ATEX<br/>Ex II 2G Ex db IIC T6/T5/T4 Gb<br/>Ex II 2D Ex tb IIIC T85°C/T100°C/T135°C Db</li> <li>• IECEx<br/>Ex db IIC T6/T5/T4 Gb<br/>Ex tb IIIC T85°C/T100°C/T135°C Db</li> <li>• CCC<br/>Ex d IIC T6/T5/T4 Gb<br/>Ex tD A21 IP66/IP67 T85°C/T100°C/T135°C</li> </ul> |              |                            | <ul style="list-style-type: none"> <li>• ATEX<br/>Ex II 2G Ex db IIC T6 Gb<br/>Ex II 2D Ex tb IIIC T85°C Db<br/>Ex I M2 Ex db IMb</li> <li>• IECEx<br/>Ex db IIC T6 Gb<br/>Ex tb IIIC T85°C Db<br/>Ex db IMb</li> <li>• CCC<br/>Ex d IIC T6 Gb<br/>Ex tD A21 IP66/IP67 T85°C</li> </ul> |
| Temperature class                   | <b>T6</b>   | <b>T5</b>    | <b>T4</b>                  | <b>T6</b>   |
| Surface temperature                 | ≤ 85 °C   | ≤ 100 °C     | ≤ 135 °C                   | ≤ 85 °C   |
| Ambient temperature (2)             | -40 ÷ +40 °C  | -40 ÷ +55 °C | -40 ÷ +70 °C               | -40 ÷ +70 °C  |
| Applicable Standards                | EN 60079-0<br>EN 60079-1  | EN 60079-31  | IEC 60079-0<br>IEC 60079-1 | IEC 60079-31  |
| Cable entrance: threaded connection | <b>M = M20x1,5</b>  |              |                            | factory wired   |

(1) The type examiner certificates can be downloaded from [www.atos.com](http://www.atos.com)

(2) The driver solenoid and LVDT transducers are certified for minimum ambient temperature -40°C.

In case the complete valve must withstand with minimum ambient temperature -40°C, select **/BT** in the model code.

**⚠ WARNING: service work performed on the valve by the end users or not qualified personnel invalidates the certification**

**14 CABLE SPECIFICATION AND TEMPERATURE** - Power supply and grounding cables have to comply with following characteristics:

|  |   |
|--|---|
| <b>Power supply and signals:</b> section of wire = 1,0 mm <sup>2</sup> | <b>Grounding:</b> section of external ground wire = 4 mm <sup>2</sup> |
|--|---|

**14.1 Cable temperature**

The cable must be suitable for the working temperature as specified in the "safety instructions" delivered with the first supply of the products.

| Max ambient temperature [°C] | Temperature class | Max surface temperature [°C] | Min. cable temperature [°C] |
|------------------------------|-------------------|------------------------------|-----------------------------|
| 40 °C                        | T6                | 85 °C                        | 80 °C                       |
| 55 °C                        | T5                | 100 °C                       | 90 °C                       |
| 70 °C                        | T4                | 135 °C                       | 110 °C                      |

**15 CABLE GLANDS**

Cable glands with threaded connections M20x1,5 for standard or armoured cables have to be ordered separately, see tech table **KX800**

**Note:** a Loctite sealant type 545, should be used on the cable gland entry threads

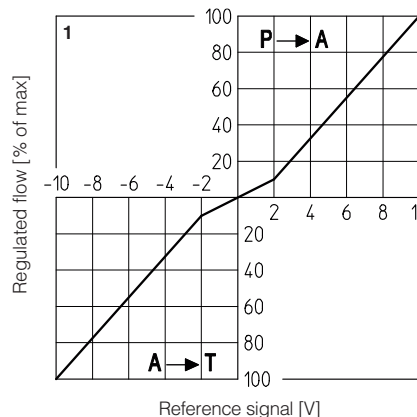
**16 DIAGRAMS** (based on mineral oil ISO VG 46 at 50 °C)

**16.1 Regulation diagrams, see note**

**1** = LIQZA (all sizes)

Hydraulic configuration vs. reference signal:

|  |          |           |
|--|----------|-----------|
|  | standard | option /A |
| Reference signal 0 ÷ +10 V<br>12 ÷ 20 mA | P → A    | A → T     |
| Reference signal 0 ÷ -10 V<br>4 ÷ 12 mA  | A → T    | P → A     |




## 17 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).

### 17.1 Power supply (V+ and V0)

The power supply must be appropriately stabilized or rectified and filtered: apply at least a 10000  $\mu$ F/40 V capacitance to single phase rectifiers or a 4700  $\mu$ F/40 V capacitance to three phase rectifiers.

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

### 17.2 Power supply for driver's logic and communication (VL+ and VL0)

The power supply for driver's logic and communication must be appropriately stabilized or rectified and filtered: apply at least a 10000  $\mu$ F/40 V capacitance to single phase rectifiers or a 4700  $\mu$ F/40 V capacitance to three phase rectifiers.

The separate power supply for driver's logic on pin 3 and 4, 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.

### 17.3 Flow reference input signal (Q\_INPUT+)

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

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

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

Drivers with fieldbus interface can be software set to receive reference signal directly from the machine control unit (fieldbus reference).

Analog reference input signal can be used as on-off commands with input range  $0 \div 24$ VDC.

### 17.4 Pressure or force reference input signal (F\_INPUT+) - only SP, SL

Functionality of F\_INPUT+ signal (pin 12), is used as reference for the driver pressure/force closed loop (see tech. table FX500).

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

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

Drivers with fieldbus interface can be software set to receive reference signal directly by the machine control unit (fieldbus reference).

Analog reference input signal can be used as on-off commands with input range  $0 \div 24$ VDC.

### 17.5 Flow monitor output signal (Q\_MONITOR)

The driver generates an analog output signal proportional to the actual spool position of the valve; the monitor output signal can be software set to show other signals available in the driver (e.g. analog reference, fieldbus reference, pilot spool position).

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

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

### 17.6 Pressure or force monitor output signal (F\_MONITOR) - only for SP, SL

The driver generates an analog output signal proportional to alternated pressure/force control; the monitor output signal can be software set to show other signals available in the driver (e.g. analog reference, force reference).

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

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

### 17.7 Enable input signal (ENABLE)

To enable the driver, supply a 24 VDC on pin 6: 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.

### 17.8 Fault output signal (FAULT)

Fault output signal indicates fault conditions of the driver (solenoid short circuits/not connected, reference signal cable broken for  $4 \div 20$  mA input, spool position transducer cable broken, etc.). Fault presence corresponds to 0 VDC, normal working corresponds to 24 Vdc.

Fault status is not affected by the Enable input signal. Fault output signal can be used as digital output by software selection.

### 17.9 Remote pressure/force transducer input signal - only for SP, SL

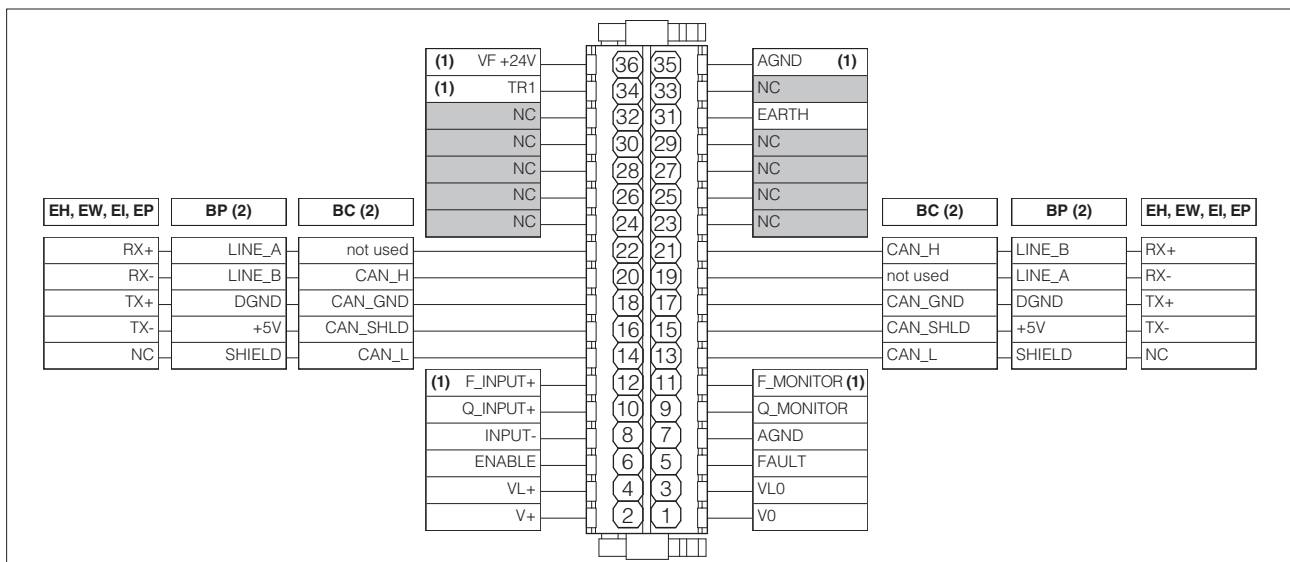
Analog remote pressure transducers or load cell can be directly connected to the driver.

Analog input signal is factory preset according to selected valve code, defaults are  $\pm 10$  VDC for standard and  $4 \div 20$  mA for /C option.

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

Refer to pressure/force transducer characteristics to select the transducer type according to specific application requirements (see table FX500).

## 18 TERMINAL BOARD OVERVIEW



(1) Connections available only SP, SL

(2) For BC and BP executions the fieldbus connections have an internal pass-through connection

**19 ELECTRONIC CONNECTIONS**

**19.1 Main connections signals**

| CABLE ENTRANCE | PIN          | SIGNAL                                 | TECHNICAL SPECIFICATIONS  | NOTES  |
|----------------|--------------|--|---|--|
| <b>A</b>       | 1            | <b>V0</b>                              | Power supply 0 Vdc  | Gnd - power supply                                   |
|                | 2            | <b>V+</b>                              | Power supply 24 Vdc   | Input - power supply                                 |
|                | 3            | <b>VL0</b>                             | Power supply 0 Vdc for driver's logic and communication   | Gnd - power supply                                   |
|                | 4            | <b>VL+</b>                             | Power supply 24 Vdc for driver's logic and communication  | Input - power supply                                 |
|                | 5            | <b>FAULT</b>                           | Fault (0 Vdc) or normal working (24 Vdc), referred to VL0   | Output - on/off signal                               |
|                | 6            | <b>ENABLE</b>                          | Enable (24 Vdc) or disable (0 Vdc) the driver, referred to VL0  | Input - on/off signal                                |
|                | 7            | <b>AGND</b>                            | Analog ground   | Gnd - analog signal                                  |
|                | 8            | <b>INPUT-</b>                          | Negative reference input signal for Q_INPUT+ and F_INPUT+   | Input - analog signal                                |
|                | 9            | <b>Q_MONITOR</b>                       | Flow monitor output signal: $\pm 10$ Vdc / $\pm 20$ mA maximum range, referred to AGND<br>Defaults are: $\pm 10$ Vdc for standard and $4 \div 20$ mA for /I option                      | Output - analog signal<br><b>Software selectable</b> |
|                | 10           | <b>Q_INPUT+</b>                        | Flow reference input signal: $\pm 10$ Vdc / $\pm 20$ mA maximum range<br>Defaults are: $\pm 10$ Vdc for standard and $4 \div 20$ mA for /I option                                       | Input - analog signal<br><b>Software selectable</b>  |
|                | 11           | <b>F_MONITOR</b>                       | Pressure/Force monitor output signal: $\pm 10$ Vdc / $\pm 20$ mA maximum range, referred to AGND <b>(1)</b><br>Defaults are: $\pm 10$ Vdc for standard and $4 \div 20$ mA for /I option | Output - analog signal<br><b>Software selectable</b> |
|                | 12           | <b>F_INPUT+</b>                        | Pressure/Force reference input signal: $\pm 10$ Vdc / $\pm 20$ mA maximum range <b>(1)</b><br>Defaults are: $\pm 10$ Vdc for standard and $4 \div 20$ mA for /I option                  | Input - analog signal<br><b>Software selectable</b>  |
| 31             | <b>EARTH</b> | Internally connected to driver housing |   |  |

**(1)** Available only for **SP, SL**

**19.2 USB connector - M12 - 5 pin** always present

| CABLE ENTRANCE | PIN | SIGNAL         | TECHNICAL SPECIFICATIONS | Driver view     |  |
|----------------|-----|----------------|--------------------------|-----------------|--|
| <b>B</b>       | 1   | <b>+5V_USB</b> | Power supply             | <p>(female)</p> |  |
|                | 2   | <b>ID</b>      | Identification           |                 |  |
|                | 3   | <b>GND_USB</b> | Signal zero data line    |                 |  |
|                | 4   | <b>D-</b>      | Data line -              |                 |  |
|                | 5   | <b>D+</b>      | Data line +              |                 |  |

**19.3 BC fieldbus execution connections**

| CABLE ENTRANCE | PIN | SIGNAL          | TECHNICAL SPECIFICATIONS           |
|----------------|-----|-----------------|------------------------------------|
| <b>C1</b>      | 14  | <b>CAN_L</b>    | Bus line (low)                     |
|                | 16  | <b>CAN_SHLD</b> | Shield                             |
|                | 18  | <b>CAN_GND</b>  | Signal zero data line              |
|                | 20  | <b>CAN_H</b>    | Bus line (high)                    |
|                | 22  | <b>not used</b> | Pass-through connection <b>(1)</b> |

| CABLE ENTRANCE | PIN | SIGNAL          | TECHNICAL SPECIFICATIONS           |
|----------------|-----|-----------------|------------------------------------|
| <b>C2</b>      | 13  | <b>CAN_L</b>    | Bus line (low)                     |
|                | 15  | <b>CAN_SHLD</b> | Shield                             |
|                | 17  | <b>CAN_GND</b>  | Signal zero data line              |
|                | 19  | <b>not used</b> | Pass-through connection <b>(1)</b> |
|                | 21  | <b>CAN_H</b>    | Bus line (high)                    |

**(1)** Pin 19 and 22 can be fed with external +5V supply of CAN interface

**19.4 BP fieldbus execution connections**

| CABLE ENTRANCE | PIN | SIGNAL        | TECHNICAL SPECIFICATIONS              |
|----------------|-----|---------------|---------------------------------------|
| <b>C1</b>      | 14  | <b>SHIELD</b> |                                       |
|                | 16  | <b>+5V</b>    | Power supply                          |
|                | 18  | <b>DGND</b>   | Data line and termination signal zero |
|                | 20  | <b>LINE_B</b> | Bus line (low)                        |
|                | 22  | <b>LINE_A</b> | Bus line (high)                       |

| CABLE ENTRANCE | PIN | SIGNAL        | TECHNICAL SPECIFICATIONS              |
|----------------|-----|---------------|---------------------------------------|
| <b>C2</b>      | 13  | <b>SHIELD</b> |                                       |
|                | 15  | <b>+5V</b>    | Power supply                          |
|                | 17  | <b>DGND</b>   | Data line and termination signal zero |
|                | 19  | <b>LINE_A</b> | Bus line (high)                       |
|                | 21  | <b>LINE_B</b> | Bus line (low)                        |

**19.5 EH, EW, EI, EP fieldbus execution connections**

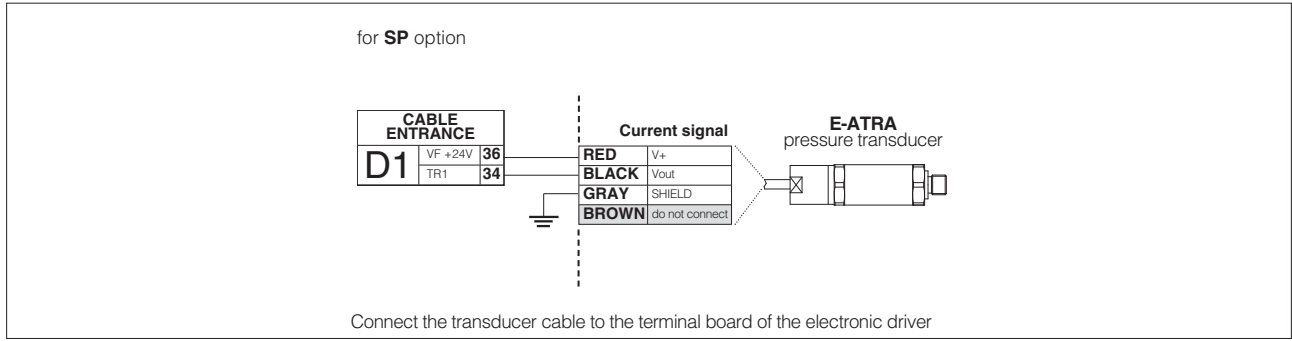
| CABLE ENTRANCE       | PIN | SIGNAL     | TECHNICAL SPECIFICATIONS |
|----------------------|-----|------------|--------------------------|
| <b>C1</b><br>(input) | 14  | <b>NC</b>  | do not connect           |
|                      | 16  | <b>TX-</b> | Transmitter              |
|                      | 18  | <b>TX+</b> | Transmitter              |
|                      | 20  | <b>RX-</b> | Receiver                 |
|                      | 22  | <b>RX+</b> | Receiver                 |

| CABLE ENTRANCE        | PIN | SIGNAL     | TECHNICAL SPECIFICATIONS |
|-----------------------|-----|------------|--------------------------|
| <b>C2</b><br>(output) | 13  | <b>NC</b>  | do not connect           |
|                       | 15  | <b>TX-</b> | Transmitter              |
|                       | 17  | <b>TX+</b> | Transmitter              |
|                       | 19  | <b>RX-</b> | Receiver                 |
|                       | 21  | <b>RX+</b> | Receiver                 |

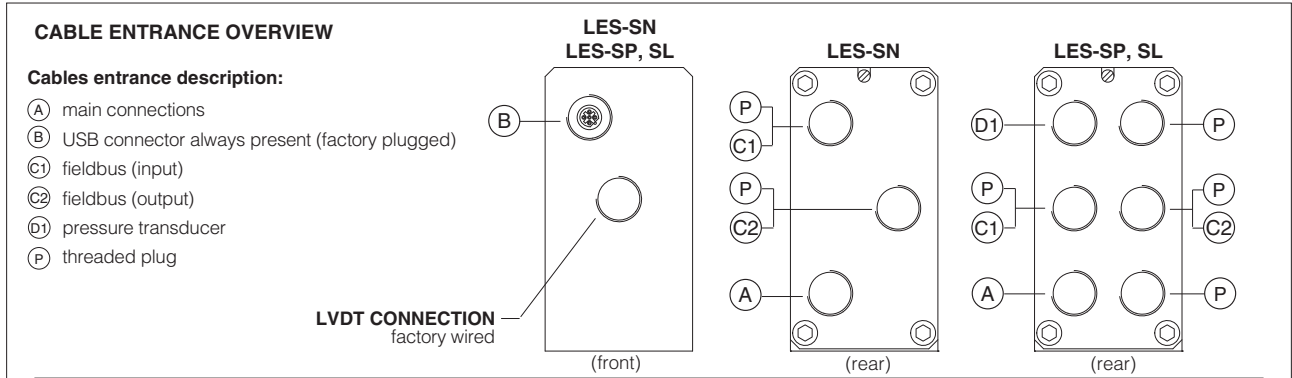
**19.6 Remote pressure transducer connector - only for SP, SL**

| CABLE ENTRANCES | PIN | SIGNAL         | TECHNICAL SPECIFICATIONS  | NOTES   | SP, SL - Single transducer (1) |         | SF - Double transducers (1) |         |
|-----------------|-----|----------------|---|---|--------------------------------|---------|-----------------------------|---------|
|                 |     |                |   |   | Voltage                        | Current | Voltage                     | Current |
| <b>D1</b>       | 34  | <b>TR1</b>     | 1st signal transducer<br>$\pm 10$ Vdc / $\pm 20$ mA maximum range | Input - analog signal<br><b>Software selectable</b> | Connect                        | Connect | Connect                     | Connect |
|                 | 35  | <b>AGND</b>    | Common gnd for transducer power and signals                       | Common gnd  | Connect                        | /       | Connect                     | /       |
|                 | 36  | <b>VF +24V</b> | Power supply +24Vdc   | Output - power supply                               | Connect                        | Connect | Connect                     | Connect |



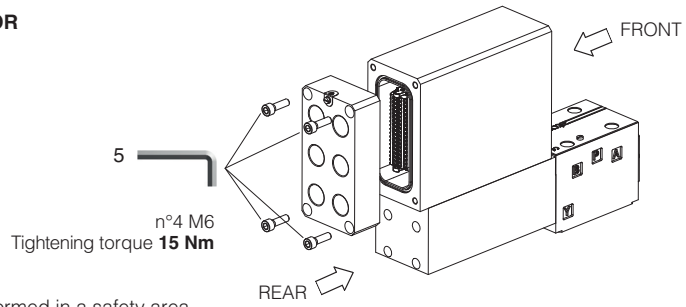


20 CONNECTIONS LAYOUT



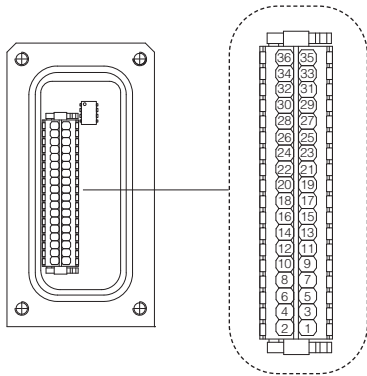
**TERMINAL BOARD AND FIELDBUS TERMINATOR**

Remove the 4 screws of driver's rear cover to access terminal board and fieldbus terminator

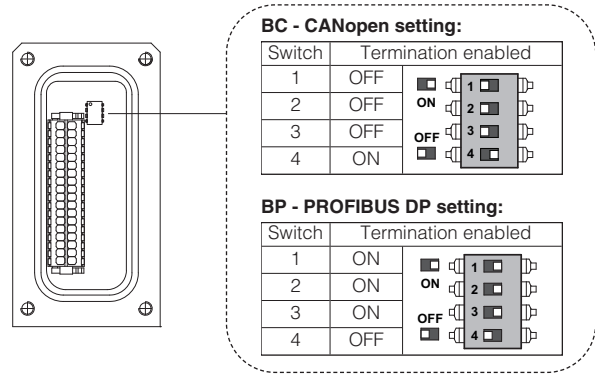


**WARNING:** the above operation must be performed in a safety area

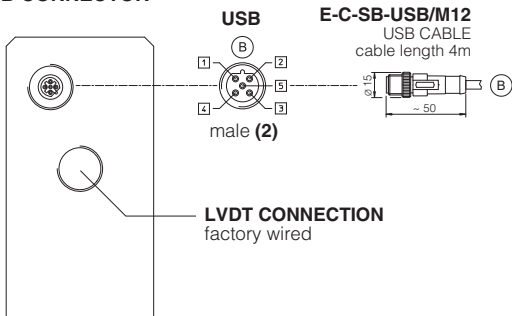
Terminal board - see section 18



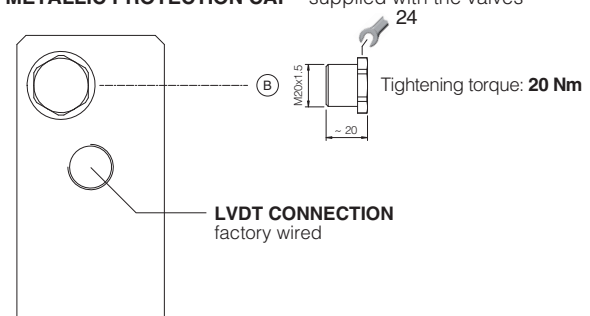
Fieldbus terminator only for BC and BP executions (1)



**USB CONNECTOR**

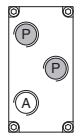
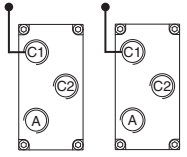
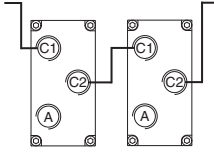


**METALLIC PROTECTION CAP** - supplied with the valves

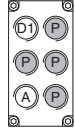
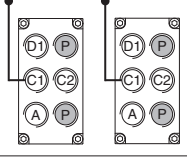
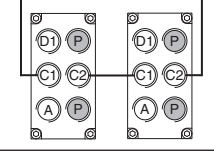


(1) Drivers with BC and BP fieldbus interface are delivered by default 'Not Terminated'. All switches are set OFF  
(2) Pin layout always referred to driver's view

**20.1 Cable glands and threaded plug for LES-SN - see tech table KX800**

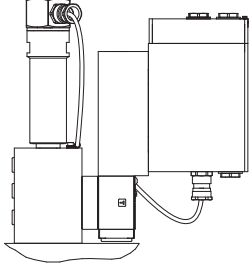
| Communication interfaces                           | To be ordered separately |               |                        |          | Cable entrance overview   | Notes  |
|--|--------------------------|---------------|------------------------|----------|---|--|
|  | Cable gland quantity     | entrance      | Threaded plug quantity | entrance |   |  |
| NP   | 1                        | A             | none                   | none     |  | Cable entrance A is open for costumers<br>Cable entrance P are factory plugged |
| BC, BP, EH, EW, EI, EP<br>"via stub" connection    | 2                        | C1<br>A       | 1                      | C2       |  | Cable entrance A, C1, C2 are open for costumers                                |
| BC, BP, EH, EW, EI, EP<br>"daisy chain" connection | 3                        | C1<br>C2<br>A | none                   | none     |  | Cable entrance A, C1, C2 are open for costumers                                |

**20.2 Cable glands and threaded plug for LES-SP, SL - see tech table KX800**

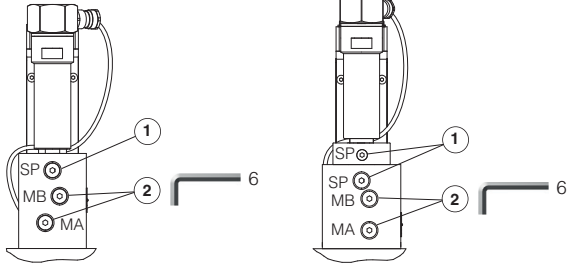
| Communication interfaces                           | To be ordered separately |                    |                        |          | Cable entrance overview   | Notes   |
|--|--------------------------|--------------------|------------------------|----------|---|---|
|  | Cable gland quantity     | entrance           | Threaded plug quantity | entrance |   |   |
| NP   | 2                        | D1<br>A            | none                   | none     |   | Cable entrance A, D1 are open for costumers<br>Cable entrance P are factory plugged         |
| BC, BP, EH, EW, EI, EP<br>"via stub" connection    | 3                        | D1<br>C1<br>A      | 1                      | C2       |  | Cable entrance A, C1, C2, D1 are open for costumers<br>Cable entrance P are factory plugged |
| BC, BP, EH, EW, EI, EP<br>"daisy chain" connection | 4                        | D1<br>C1 - C2<br>A | none                   | none     |  | Cable entrance A, C1, C2, D1 are open for costumers<br>Cable entrance P are factory plugged |

**21 AIR BLEEDING**

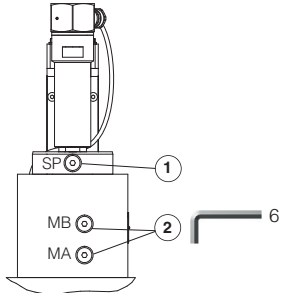
**Size 25**



**Sizes 32, 40**



**Sizes 50 to 80**



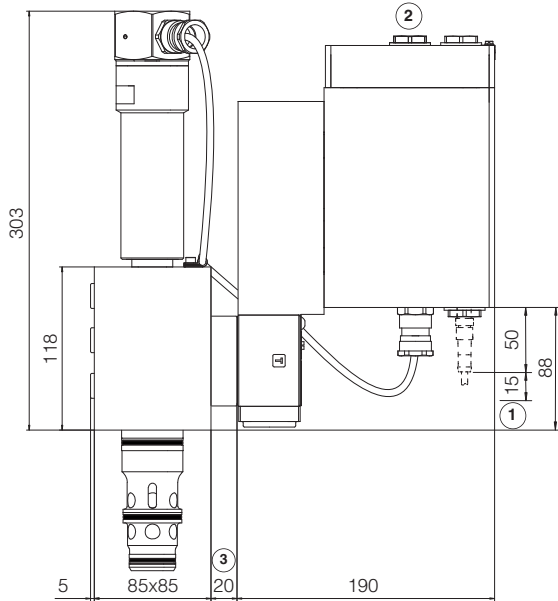
**1 Plugged port - do not open**

**2 Air bleeding (MA, MB):**  
N° 2 plugs G1/4"  
At the machine commissioning it is advisable to bleed the air from piloting chambers, by loosening the 2 plugs shown in the picture.  
Operate the valve for few seconds at low pressure and then lock the plugs.

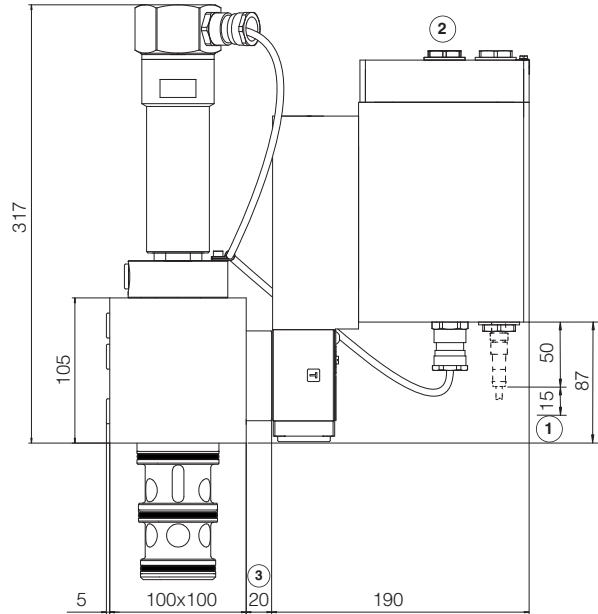


22 INSTALLATION DIMENSIONS [mm]

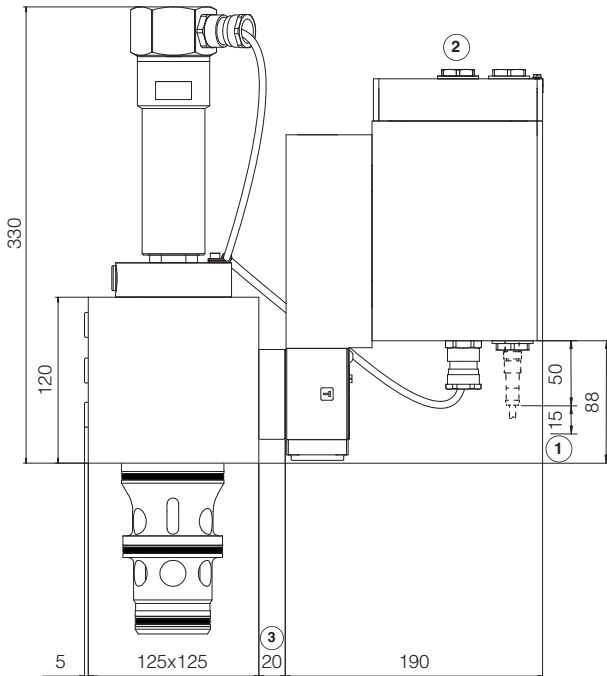
LIQZA-LES-253



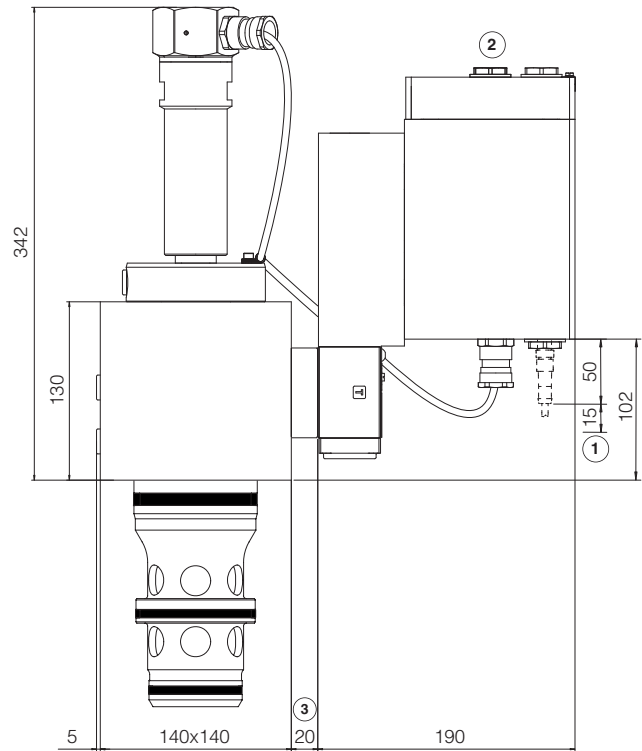
LIQZA-LES-323



LIQZA-LES-403



LIQZA-LES-503

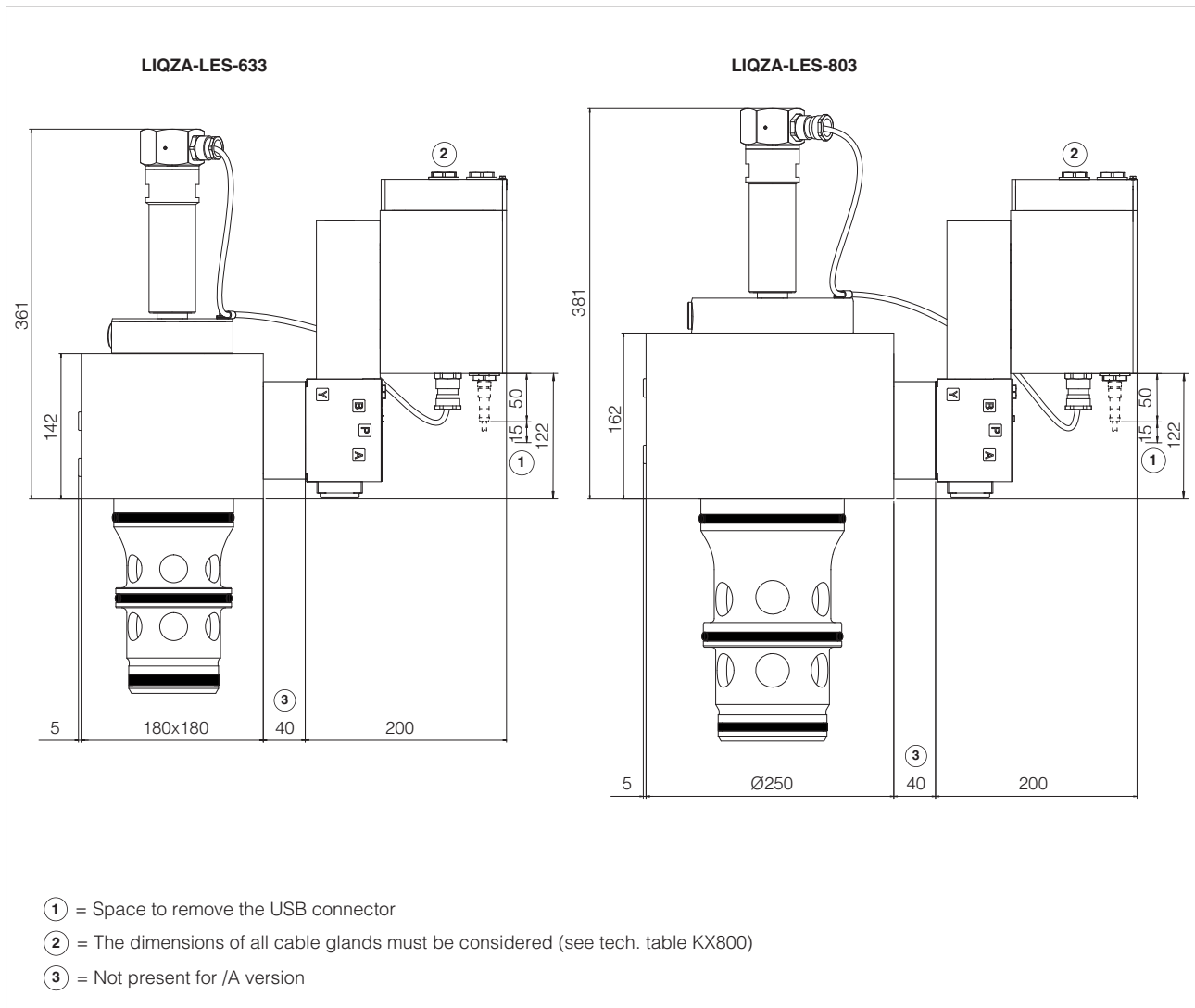


① = Space to remove the USB connector

② = The dimensions of all cable glands must be considered (see tech. table KX800)

③ = Not present for /A version

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



**23 FASTENING BOLTS AND VALVE MASS**

| Type  | Size | Fastening bolts (1) supplied with the valve                            | Mass [kg] |
|-------|------|--|-----------|
| LIQZA | 25   | 4 socket head screws M12x100 class 12.9<br>Tightening torque = 125 Nm  | 15,8      |
|       | 32   | 4 socket head screws M16x60 class 12.9<br>Tightening torque = 300 Nm   | 18,2      |
|       | 40   | 4 socket head screws M20x70 class 12.9<br>Tightening torque = 600 Nm   | 23,7      |
|       | 50   | 4 socket head screws M20x80 class 12.9<br>Tightening torque = 600 Nm   | 31,6      |
|       | 63   | 4 socket head screws M30x120 class 12.9<br>Tightening torque = 2100 Nm | 51,6      |
|       | 80   | 8 socket head screws M24x80 class 12.9<br>Tightening torque = 1000 Nm  | 79,2      |

**24 RELATED DOCUMENTATION**

|              |  |                       |   |
|--------------|--|-----------------------|---|
| <b>X010</b>  | Basics for electrohydraulics in hazardous environments                       | <b>GS510</b>          | Fieldbus  |
| <b>X020</b>  | Summary of Atos ex-proof components certified to ATEX, IECEx, EAC, PESO, CCC | <b>KX800</b>          | Cable glands for ex-proof valves                    |
| <b>FX500</b> | Ex-proof digital proportionals with P/Q control                              | <b>P006</b>           | Mounting surfaces and cavities for cartridge valves |
| <b>FX900</b> | Operating and maintenance information for ex-proof proportional valves       | <b>E-MAN-RA-LES</b>   | TES/LES user manual                                 |
| <b>GS500</b> | Programming tools  | <b>E-MAN-RA-LES-S</b> | TES/LES with P/Q control user manual                |