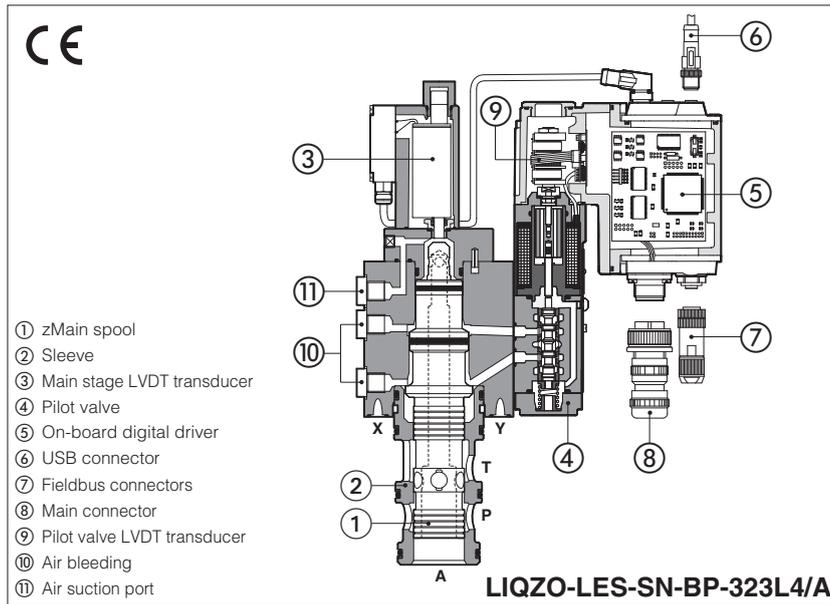




Table FS340-4/E

Digital servoproportional 3-way cartridges

piloted, with on-board driver and two LVDT transducers



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

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

Digital servoproportional 3-way cartridges specifically designed for high speed closed loop controls. They are equipped with two LVDT position transducers for best dynamics in directional controls and not compensated flow regulations. The cartridge execution for blocks installation grants high flow capabilities and minimized pressure drops.

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

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

LIQZO: Size: **25 ÷ 40**
Max flow: **500 ÷ 1050 l/min**
Max pressure: **350 bar**

LIQZP: Size: **50 ÷ 80**
Max flow: **2000 ÷ 5000 l/min**
Max pressure: **420 bar**

1 MODEL CODE

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|-----------|------------|-----------|-----------|---|-----------|---|-----------|--|----------|--|-----------|---|----------|--|----------|---|----------|----------------|-----------|-----------|-----------|-------|-----|-----|-----|----------------|-----------|-----------|-----------|-------|-----|------|------|
| LIQZO | - | LES | - | SN | - | NP | - | 25 | | 3 | | L4 | / | * | | * | / | * | | | | | | | | | | | | | | | | |
| <p>Servoproportional 3-way cartridge, piloted</p> <p>LIQZO = size 25 to 40, Pmax 350 bar LIQZP = size 50 to 80, Pmax 420 bar</p> <p>LEB = basic on-board digital driver (1) LES = full on-board digital driver</p> <p>Alternated P/Q controls: SN = none SP = pressure control (1 pressure transducer) SL = force control (1 load cell)</p> <p>Fieldbus interfaces, USB port always present: NP = Not present BC = CANopen BP = PROFIBUS DP EH = EtherCAT EW = POWERLINK EI = EtherNet/IP EP = PROFINET RT/IRT</p> <p>Valve size, see section 7:</p> <table border="1"> <tr> <td>LIQZO =</td> <td>25</td> <td>32</td> <td>40</td> </tr> <tr> <td>l/min</td> <td>185</td> <td>330</td> <td>420</td> </tr> <tr> <td>LIQZP =</td> <td>50</td> <td>63</td> <td>80</td> </tr> <tr> <td>l/min</td> <td>780</td> <td>1250</td> <td>2100</td> </tr> </table> <p>Nominal flow (l/min) at Δp 5 bar</p> | | | | | | | | | | | | | | | | | | | LIQZO = | 25 | 32 | 40 | l/min | 185 | 330 | 420 | LIQZP = | 50 | 63 | 80 | l/min | 780 | 1250 | 2100 |
| LIQZO = | 25 | 32 | 40 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| l/min | 185 | 330 | 420 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LIQZP = | 50 | 63 | 80 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| l/min | 780 | 1250 | 2100 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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

Hydraulic options (2):

A = reversal hydraulic configuration of main spool:
P-A in rest position

Electronic options (2):

C = current feedback for pressure transducer 4÷20mA (omit for std voltage ±10VDC) - only **LES-SP, SL**

F = fault signal

I = current reference input and monitor 4÷20mA (omit for std voltage ±10VDC)

Q = enable signal

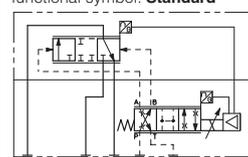
Z = double power supply, enable, fault and monitor signals - 12 pin connector (3)

Spool type
regulating characteristics:

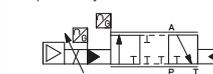
L4 = linear



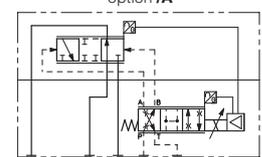
Configuration: 3 = 3 way
functional symbol: **Standard**



simplified symbol: **Standard**



option **/A**



option **/A**



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

(2) For possible combined options, see section 13

(3) Double power supply only for **LES**

2 GENERAL NOTES

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

! WARNING

To avoid overheating and possible damage of the electronic driver, the valves must be never energized without hydraulic supply to the pilot stage. In case of prolonged pauses of the valve operation during the machine cycle, it is always advisable to disable the driver (option /Q or /Z). A safety fuse 2,5 A installed on 24VDC power supply of each valve is always recommended, see also power supply note at sections **15**.

! 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.

3 VALVE SETTINGS AND PROGRAMMING TOOLS

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

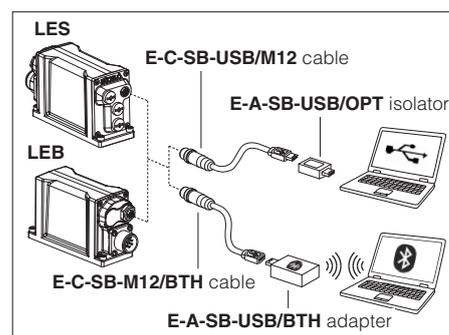
The software is available in different versions according to the driver's options (see table **GS500**):

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

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

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

USB or Bluetooth connection



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

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

5 ALTERNATED P/Q CONTROLS - only for LES, see tech. table FS500

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. Main 12 pin connector is the same as /Z option plus two analog signals specific for the pressure (force) control.

6 GENERAL CHARACTERISTICS

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

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

| Size | 25 | 32 | 40 | 50 | 63 | 80 |
|--|---|-----|----------------------------|------|---------|-------------|
| Nominal flow Δp P-A or A-T [l/min] | | | | | | |
| $\Delta p = 5$ bar | 185 | 330 | 420 | 780 | 1250 | 2100 |
| $\Delta p = 10$ bar | 260 | 470 | 590 | 1100 | 1750 | 3000 |
| Max permissible flow | 500 | 850 | 1050 | 2000 | 3100 | 5000 |
| Max pressure [bar] | LIQZO | | Ports P, A, T = 350 | | X = 350 | Y \leq 10 |
| | LIQZP | | Ports P, A, T = 420 | | X = 350 | Y \leq 10 |
| Nominal flow of pilot valve at $\Delta p = 70$ 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 [cm ³] | 2,16 | 7,2 | 8,9 | 17,7 | 33,8 | 42,7 |
| Piloting flow (1) [l/min] | 6,5 | 20 | 25 | 43 | 68 | 76 |
| Response time 0 ÷ 100% step signal (2) [ms] | 21 | 22 | 22 | 25 | 30 | 34 |
| Hysteresis [% of the max regulation] | $\leq 0,1$ | | | | | |
| Repeatability [% of the max regulation] | $\pm 0,1$ | | | | | |
| Thermal drift | zero point displacement < 1% at $\Delta T = 40^\circ C$ | | | | | |

(1) With step reference input 0 ÷ 100%**(2)** With pilot pressure = 140 bar, see detailed diagrams in section 10.2**8 ELECTRICAL CHARACTERISTICS**

| | | | | |
|--|---|-----------------------------------|---|---|
| Power supplies | Nominal : +24 VDC Rectified and filtered : $V_{RMS} = 20 \div 32 V_{MAX}$ (ripple max 10 % VPP) | | | |
| Max power consumption | 50 W | | | |
| Max. solenoid current | 2,6 A | | | |
| Coil resistance R at 20°C | 3 ÷ 3,3 Ω | | | |
| Analog input signals | Voltage: range ± 10 VDC (24 VMAX tollerant) Current: range ± 20 mA | | Input impedance: $R_i > 50$ k Ω Input impedance: $R_i = 500$ Ω | |
| Monitor outputs | Output range: voltage ± 10 VDC @ max 5 mA current ± 20 mA @ max 500 Ω load resistance | | | |
| Enable input | Range: 0 ÷ 5 Vdc (OFF state), 9 ÷ 24 Vdc (ON state), 5 ÷ 9 Vdc (not accepted); Input impedance: $R_i > 10$ k Ω | | | |
| Fault output | Output range: 0 ÷ 24 Vdc (ON state > [power supply - 2 V] ; OFF state < 1 V) @ max 50 mA; external negative voltage not allowed (e.g. due to inductive loads) | | | |
| Pressure/Force transducer power supply (only for SP, SL) | +24VDC @ max 100 mA (E-ATR-8 see tech table GS465) | | | |
| Alarms | Solenoid not connected/short circuit, cable break with current reference signal, over/under temperature, valve spool transducer malfunctions, alarms history storage function | | | |
| Insulation class | H (180°) Due to the occurring surface temperatures of the solenoid coils, the European standards ISO 13732-1 and EN982 must be taken into account | | | |
| Protection degree to DIN EN60529 | IP66 / IP67 with mating connectors | | | |
| Duty factor | Continuous rating (ED=100%) | | | |
| Tropicalization | Tropical coating on electronics PCB | | | |
| Additional characteristics | Short circuit protection of solenoid's current supply; 3 leds for diagnostic; 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 | | | |
| Communication interface | USB | CANopen | PROFIBUS DP | EtherCAT, POWERLINK, EtherNet/IP, PROFINET IO RT / IRT EC 61158 |
| | Atos ASCII coding | EN50325-4 + DS408 | EN50170-2/IEC61158 | |
| Communication physical layer | not insulated USB 2.0 + USB OTG | optical insulated CAN ISO11898 | optical insulated RS485 | Fast Ethernet, insulated 100 Base TX |
| Recommended wiring cable | LiYCY shielded cables, see section 18 | | | |

Note: a maximum time of 800 ms (depending on communication type) have be considered between the driver energizing with the 24 Vdc power supply and when the valve is ready to operate. During this time the current to the valve coils is switched to zero.**9 SEALS AND HYDRAULIC FLUIDS** - for other fluids not included in below table, consult our technical office

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

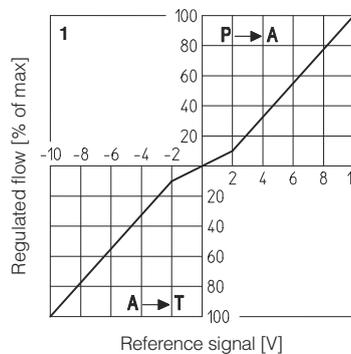
10 DIAGRAMS (based on mineral oil ISO VG 46 at 50 °C)

10.1 Regulation diagrams, see note

1 = LIQZO, LIQZP (all sizes)

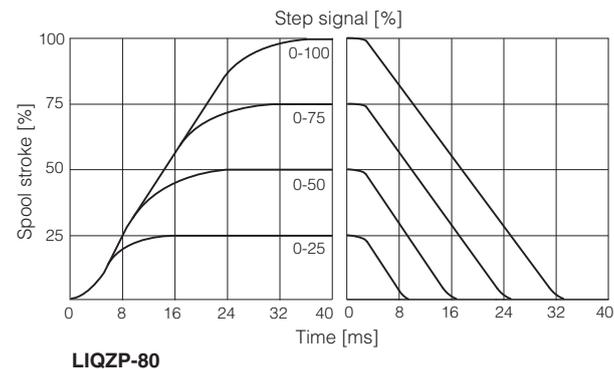
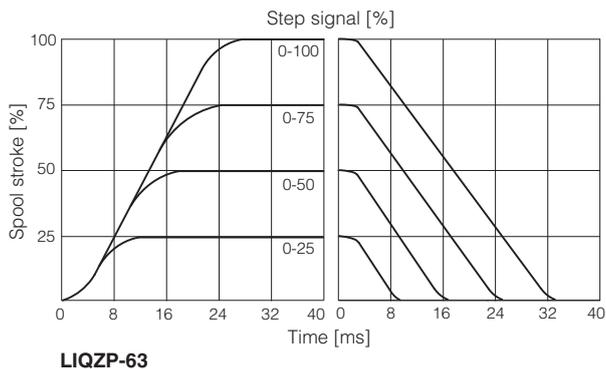
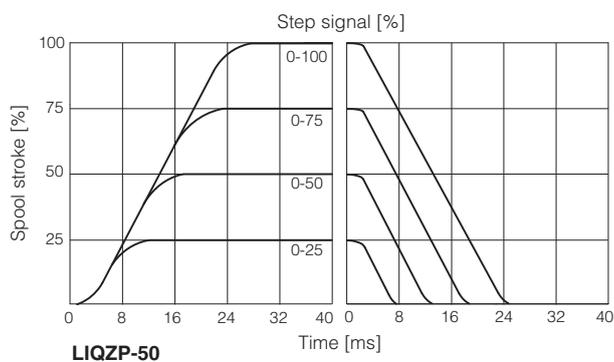
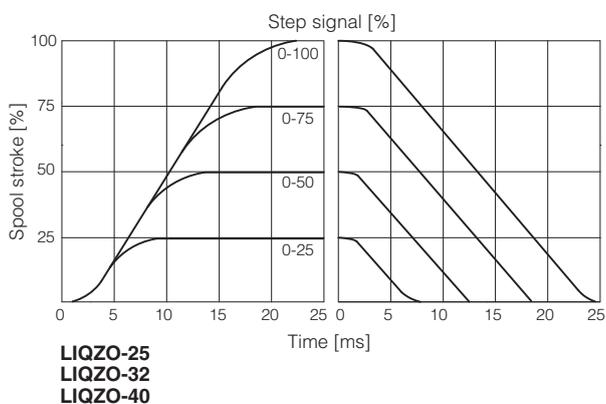
Hydraulic configuration vs. reference signal:

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

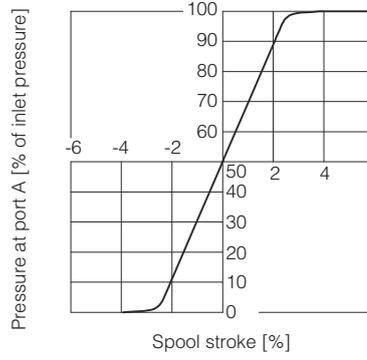
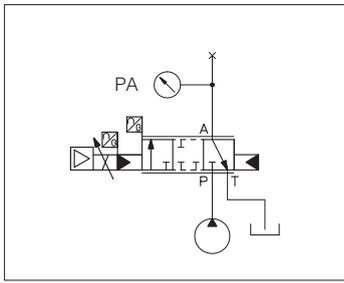


10.2 Response time

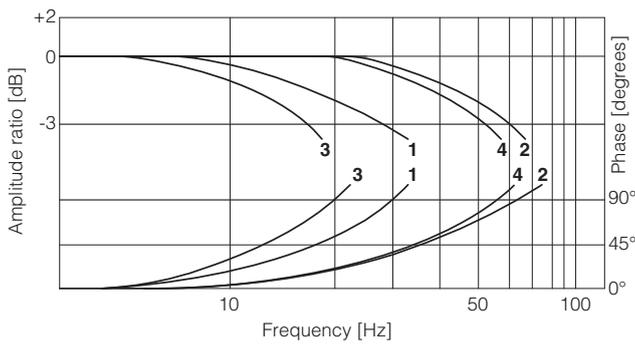
The response times in below diagrams are measured at different steps of the reference input signal. They have to be considered as average values. For the valves with digital electronics the dynamics performances can be optimized by setting the internal software parameters.



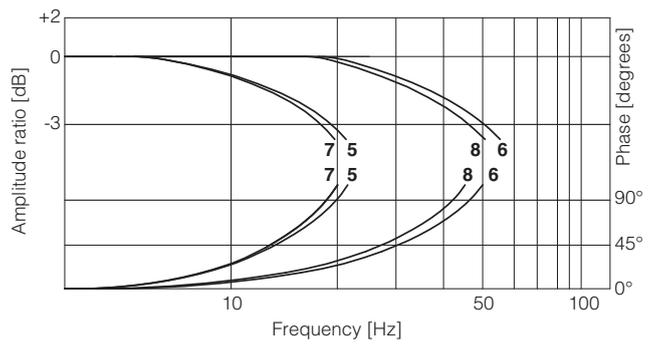
10.3 Pressure gain diagram



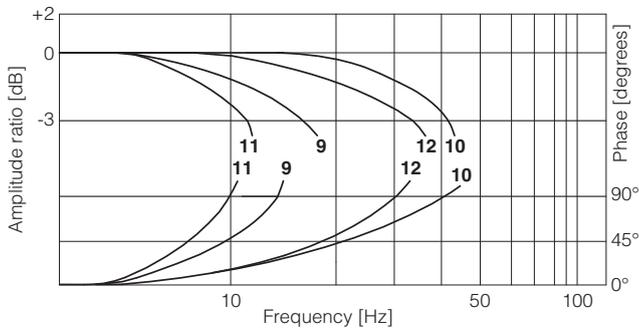
10.4 Bode diagrams



- 1 = LIQZO-L*-253L4: ± 90%
- 2 = LIQZO-L*-253L4: ± 5%
- 3 = LIQZO-L*-323L4: ± 90%
- 4 = LIQZO-L*-323L4: ± 5%



- 5 = LIQZO-L*-403L4: ± 90%
- 6 = LIQZO-L*-403L4: ± 5%
- 7 = LIQZP-L*-503L4: ± 90%
- 8 = LIQZP-L*-503L4: ± 5%



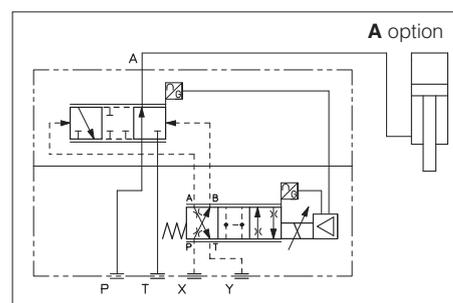
- 9 = LIQZP-L*-633L4: ± 90%
- 10 = LIQZP-L*-633L4: ± 5%
- 11 = LIQZP-L*-803L4: ± 90%
- 12 = LIQZP-L*-803L4: ± 5%

11 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.

**12 ELECTRONICS OPTIONS**

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

I = This option provides 4 ÷ 20 mA current reference and monitor signals, instead of the standard 0 ÷ 10 VDC.

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

It is normally used in case of long distance between the machine control unit and the valve or where the reference signal can be affected by electrical noise; the valve functioning is disabled in case of reference signal cable breakage.

Q = This option permits to inhibit the valve function without removing the power supply to the driver. Upon disable command the current to the solenoid is zeroed and the valve's spool moves to rest position.

The option /Q is suggested for all cases where the valve has to be frequently inhibited during the machine cycle - see 13.5 for signal specifications.

Z = This option provides, on the 12 pin main connector, the following additional features:

Fault output signal - see above option /F

Enable input signal - see above option /Q

Repeat enable output signal - only for **LEB** (see 13.6)

Power supply for driver's logics and communication - only for **LES** (see 13.2)

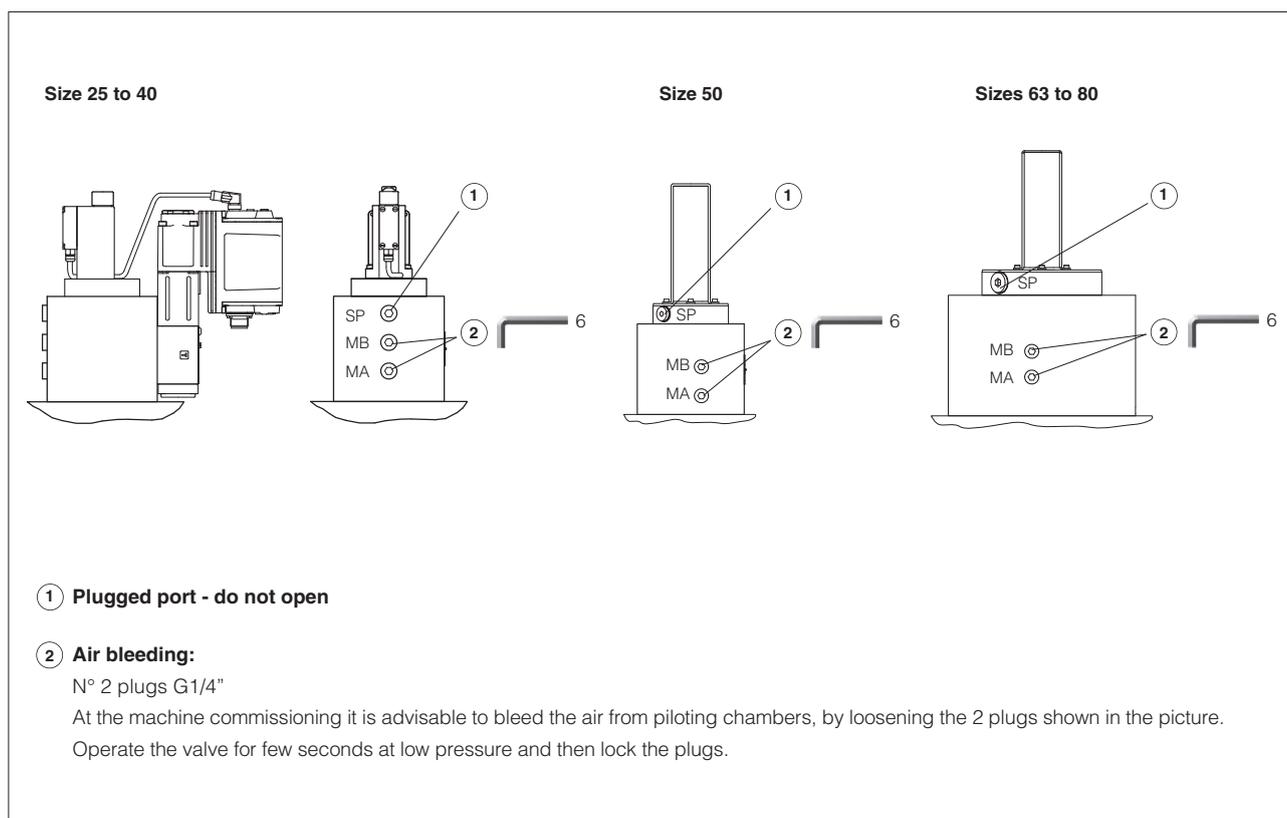
C = This option is available to connect pressure (force) transducers with 4 ÷ 20 mA current output signal, instead of the standard ±10 VDC. Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ±10 VDC or ±20 mA.

13 POSSIBLE COMBINED OPTIONS**LEB-SN, LES-SN**

/AF, /AI, /AQ, /AZ, /FI, /IQ, /IZ, /AFI, /AIQ, /AIZ

LES-SP, SL

/AC, /CI, /ACI

14 AIR BLEEDING

15 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).

15.1 Power supply (V+ and V0)

The power supply must be appropriately stabilized or rectified and filtered: 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. In case of separate power supply see 15.2.

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

15.2 Power supply for driver's logic and communication (VL+ and VL0) - only for /Z option and LES-SP, SL with fieldbus

The power supply for driver's logic and communication must be appropriately stabilized or rectified and filtered: 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.

The separate power supply for driver's logic on pin 9 and 10, allow to remove solenoid power supply from pin 1 and 2 maintaining active the diagnostics, USB and fieldbus communications.

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

15.3 Flow reference input signal (Q_INPUT+)

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

Reference input signal is factory preset according to selected valve code, defaults are 0 \div 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 24Vdc.

15.4 Pressure or force reference input signal (F_INPUT+) - only for LES-SP, SL

Functionality of F_INPUT+ signal (pin 7), is used as reference for the driver pressure/force closed loop (see tech. table **FS500**).

Reference input signal is factory preset according to selected valve code, defaults are 0 \div 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 24Vdc.

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

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

Monitor output signal is factory preset according to selected valve code, defaults are \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.

15.6 Pressure or force monitor output signal (F_MONITOR) - only for LES-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 0 \div 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.

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

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

Enable input signal can be used as generic digital input by software selection.

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

Repeat enable is used as output repeater signal of enable input signal (see 15.7).

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

Fault output signal indicates fault conditions of the driver (solenoid short circuits/not connected, reference signal cable broken for 4 \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.

15.10 Remote pressure/force transducer input signal - only for LES-SP, SL

Analog remote pressure transducers or load cell can be directly connected to the driver (see 16.4).

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 tech table **FS500**).

15.11 Multiple PID selection (D_IN0 and D_IN1) - only NP execution for LES-SP, SL

Two on-off input signals are available on the main connector to select one of the four pressure (force) PID parameters setting, stored into the driver.

Switching the active setting of pressure PID during the machine cycle allows to optimize the system dynamic response in different hydraulic working conditions (volume, flow, etc.).

Supply a 24 VDC or a 0 VDC on pin 9 and/or pin 10, to select one of the PID settings as indicated by binary code table at side. Gray code can be selected by software.

| PIN | PID SET SELECTION | | | |
|-----|-------------------|--------|--------|--------|
| | SET 1 | SET 2 | SET 3 | SET 4 |
| 9 | 0 | 24 Vdc | 0 | 24 Vdc |
| 10 | 0 | 0 | 24 Vdc | 24 Vdc |

16 ELECTRONIC CONNECTIONS AND LEDS**16.1 Main connector signals - 7 pin - standard, /F and /Q options (A1)**

| PIN | Standard | /Q | /F | TECHNICAL SPECIFICATIONS | NOTES |
|-----|-------------------------------|---------------|--------------|---|--|
| A | V+ | | | Power supply 24 Vdc Rectified and filtered: $V_{RMS} = 20 \div 32 V_{MAX}$ (ripple max 10 % VPP) | Input - power supply |
| B | V0 | | | Power supply 0 Vdc | Gnd - power supply |
| C | AGND | | AGND | Analog ground | Gnd - analog signal |
| | | ENABLE | | Enable (24 Vdc) or disable (0 Vdc) the valve, referred to V0 | Input - on/off signal |
| D | Q_INPUT+ | | | Flow reference input signal: $\pm 10 Vdc / \pm 20 mA$ maximum range Defaults are 0 \div 10 Vdc for standard and 4 \div 20 mA for /I option | Input - analog signal Software selectable |
| E | INPUT- | | | Negative reference input signal for Q_INPUT+ | Input - analog signal |
| F | Q_MONITOR referred to: | | | Flow monitor output signal: $\pm 10 Vdc / \pm 20 mA$ maximum range Defaults are 0 \div 10 Vdc for standard and 4 \div 20 mA for /I option | Output - analog signal Software selectable |
| | AGND | V0 | | | |
| G | | | FAULT | Fault (0 Vdc) or normal working (24 Vdc) | Output - on/off signal |
| | EARTH | | | Internally connected to the driver housing | |

16.2 Main connector signals - 12 pin - /Z option and SP, SL (A2)

| PIN | LEB-SN /Z | LES-SN /Z | LES-SP, SL | | TECHNICAL SPECIFICATIONS | NOTES |
|-----|-------------------------------|------------|-------------------------------|-----------|--|--|
| | | | Fieldbus | NP | | |
| 1 | V+ | | | | Power supply 24 Vdc | Input - power supply |
| 2 | V0 | | | | Power supply 0 Vdc | Gnd - power supply |
| 3 | ENABLE referred to: | | | | Enable (24 Vdc) or disable (0 Vdc) the valve | Input - on/off signal |
| | V0 | VLO | VLO | V0 | | |
| 4 | Q_INPUT+ | | | | Flow reference input signal: $\pm 10 Vdc / \pm 20 mA$ maximum range Defaults are 0 \div 10 Vdc for standard and 4 \div 20 mA for /I option | Input - analog signal Software selectable |
| 5 | INPUT- | | | | Negative reference input signal for Q_INPUT+ and F_INPUT+ | Input - analog signal |
| 6 | Q_MONITOR referred to: | | | | Flow monitor output signal: $\pm 10 Vdc / \pm 20 mA$ maximum range Defaults are 0 \div 10 Vdc for standard and 4 \div 20 mA for /I option | Output - analog signal Software selectable |
| | AGND | VLO | VLO | V0 | | |
| 7 | AGND | | | | Analog ground | Gnd - analog signal |
| | | NC | | | Do not connect | |
| 8 | | | F_INPUT+ | | Pressure/Force reference input signal: $\pm 10 Vdc / \pm 20 mA$ maximum range Defaults are $\pm 10 Vdc$ for standard and 4 \div 20 mA for /I option | Input - analog signal Software selectable |
| | R_ENABLE | NC | | | Repeat enable, output repeter signal of enable input, referred to V0 Do not connect | Output - on/off signal |
| 9 | | | F_MONITOR referred to: | | Pressure/Force monitor output signal: $\pm 10 Vdc / \pm 20 mA$ maximum range Defaults are $\pm 10 Vdc$ for standard and 4 \div 20 mA for /I option | Output - analog signal Software selectable |
| | NC | | VLO | V0 | | |
| 10 | | | | | Do not connect | |
| | NC | VL+ | | | Power supply 24 Vdc for driver's logic and communication | Input - power supply |
| 11 | | | D_IN0 | | Multiple pressure/force PID selection, referred to V0 | Input - on/off signal |
| | NC | VLO | | | Do not connect | |
| 12 | | | D_IN1 | | Multiple pressure/force PID selection, referred to V0 | Input - on/off signal |
| | NC | | | | Do not connect | |
| PE | EARTH | | | | Internally connected to the driver housing | |

16.3 Communications connectors (B) - (C)

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

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

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

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

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

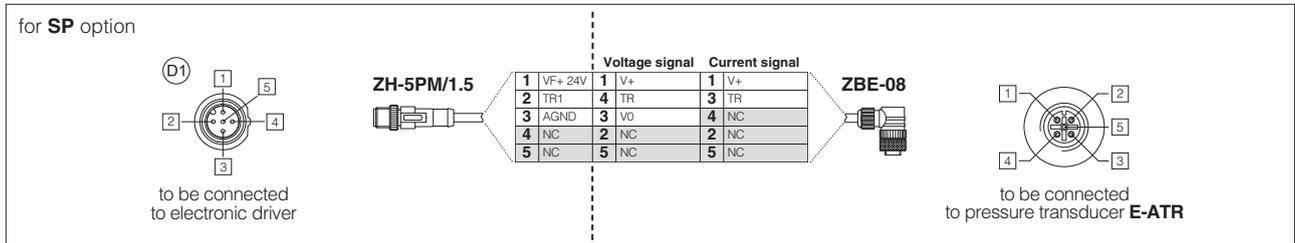
(2) Pin 2 can be fed with external +5V supply of CAN interface

16.4 Remote pressure transducer connector - M12 - 5 pin - only for SP, SL (D)

| PIN | SIGNAL | TECHNICAL SPECIFICATION | Voltage | Current |
|-----|---------|--|---------|---------|
| 1 | VF +24V | Power supply +24Vdc | Connect | Connect |
| 2 | TR | Signal transducer ± 10 Vdc / ± 20 mA maximum range, software selectable Defaults are ± 10 Vdc for standard and $4 \div 20$ mA for /C option | Connect | Connect |
| 3 | AGND | Common GND for transducer power and signals | Connect | / |
| 4 | NC | Not Connect | / | / |
| 5 | NC | Not Connect | / | / |

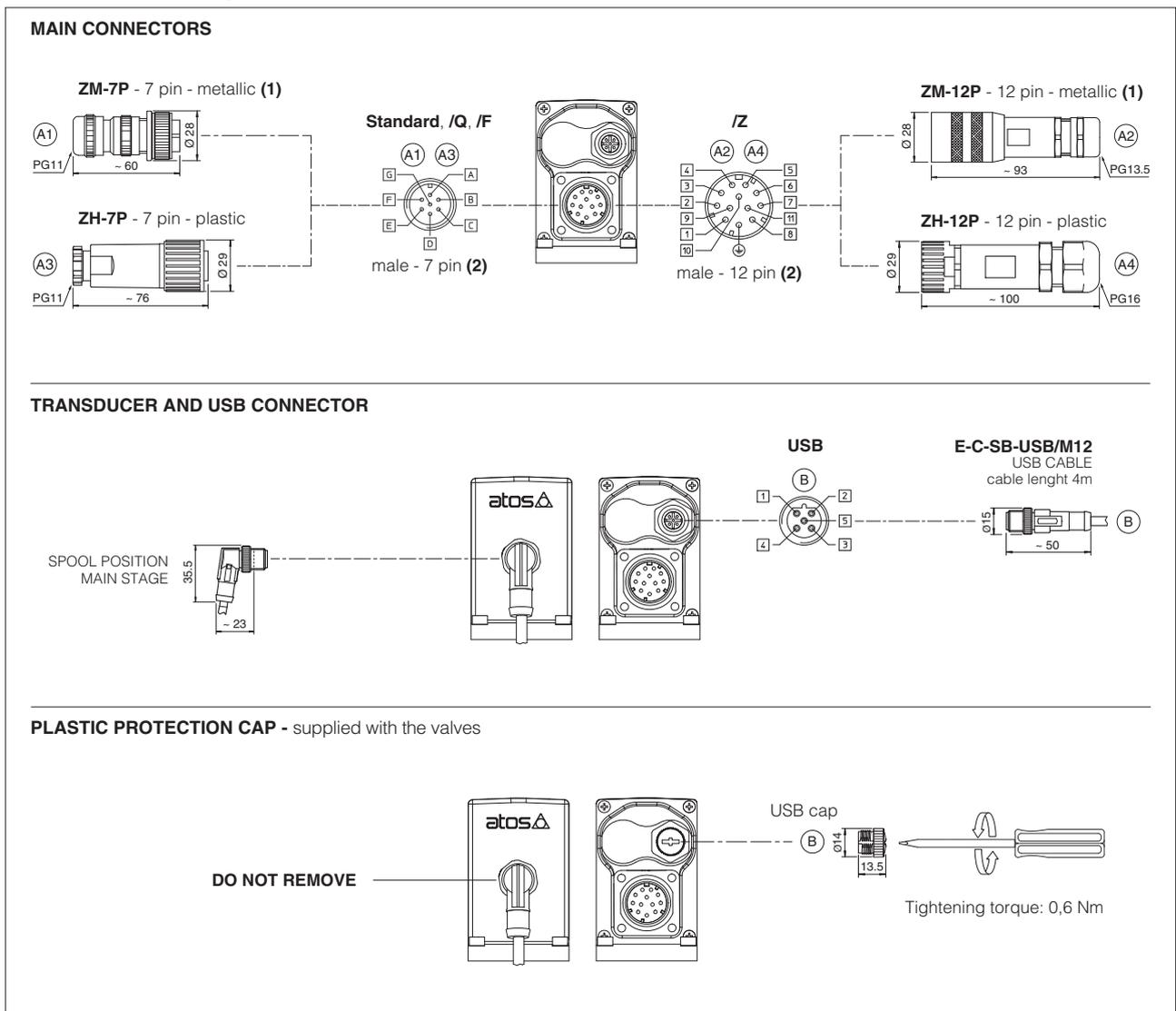
(1) Single/double transducer configuration is software selectable

Remote pressure transducers connection - example



Note: pin layout always referred to driver's view

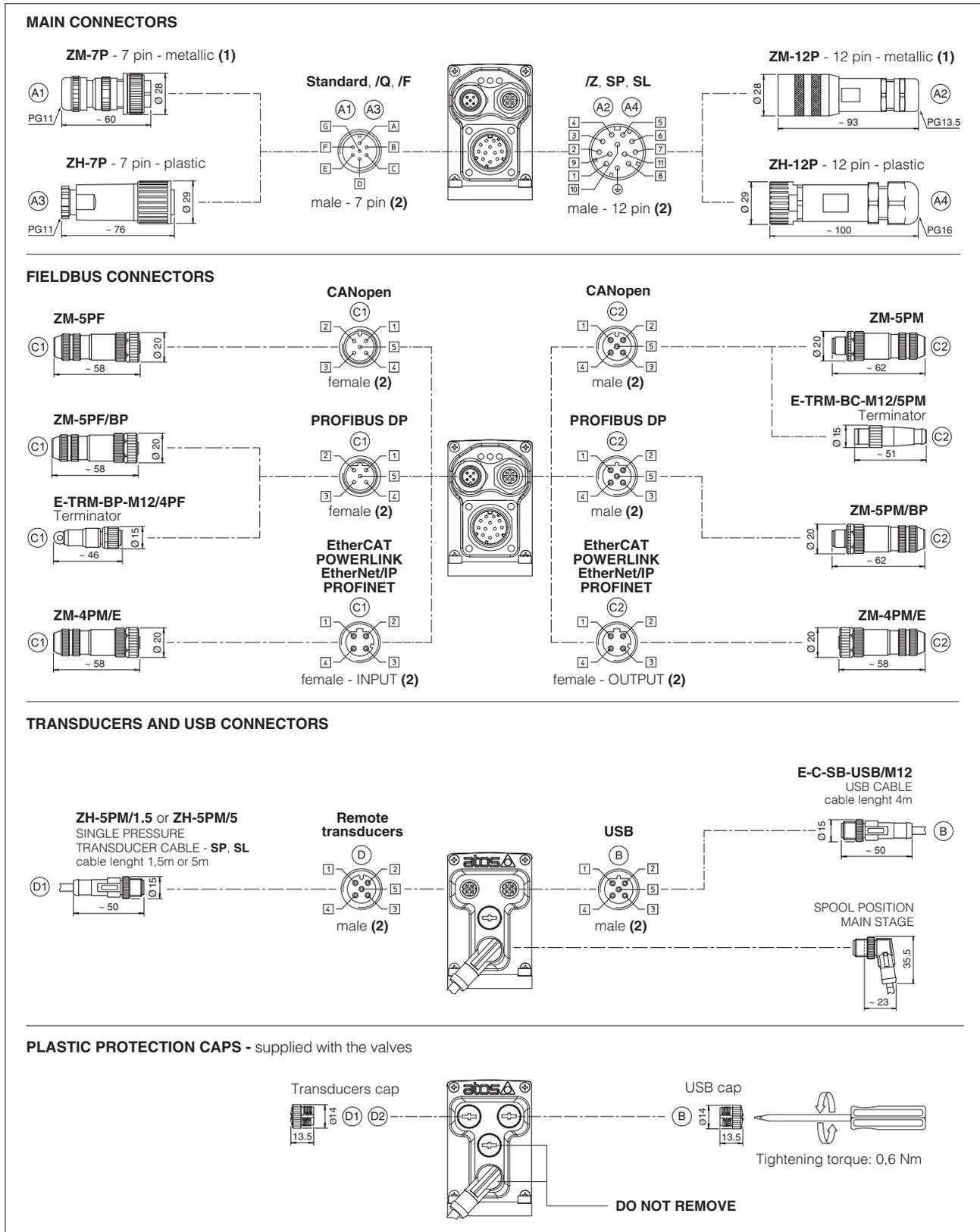
16.5 LEB connections layout



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

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

16.6 LES connections layout



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

16.7 Diagnostic LEDs - only for LES

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

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

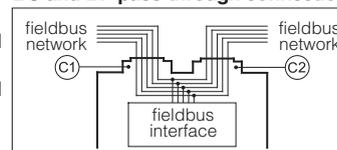
17 IN / OUT FIELDBUS COMMUNICATION CONNECTORS

Two fieldbus communication connectors are always available for digital drivers executions BC, BP, EH, EW, EI, EP. This features allows considerable technical advantages in terms of installation simplicity, wirings reduction and also avoid the usage expensive T-connectors.

For BC and BP executions the fieldbus connectors have an internal pass-through connection and can be used like end point of the fieldbus network, using an external terminator (see tech table **GS500**).

For EH, EW, EI and EP executions the external terminators are not required: each connector is internally terminated.

BC and BP pass-through connection



18 CONNECTORS CHARACTERISTICS - to be ordered separately

18.1 Main connectors - 7 pin

| CONNECTOR TYPE | POWER SUPPLY | POWER SUPPLY |
|-----------------------|---|---|
| CODE | (A1) ZM-7P | (A3) ZH-7P |
| Type | 7pin female straight circular | 7pin female straight circular |
| Standard | According to MIL-C-5015 | According to MIL-C-5015 |
| Material | Metallic | Plastic reinforced with fiber glass |
| Cable gland | PG11 | PG11 |
| Recommended cable | LiYCY 7 x 0,75 mm ² max 20 m (logic and power supply) or LiYCY 7 x 1 mm ² max 40 m (logic and power supply) | LiYCY 7 x 0,75 mm ² max 20 m (logic and power supply) or LiYCY 7 x 1 mm ² max 40 m (logic and power supply) |
| Conductor size | up to 1 mm ² - available for 7 wires | up to 1 mm ² - available for 7 wires |
| Connection type | to solder | to solder |
| Protection (EN 60529) | IP 67 | IP 67 |

18.2 Main connectors - 12 pin

| CONNECTOR TYPE | POWER SUPPLY | POWER SUPPLY |
|-----------------------|---|---|
| CODE | (A2) ZM-12P | (A4) ZH-12P |
| Type | 12pin female straight circular | 12pin female straight circular |
| Standard | DIN 43651 | DIN 43651 |
| Material | Metallic | Plastic reinforced with fiber glass |
| Cable gland | PG13,5 | PG16 |
| Recommended cable | LiYCY 12 x 0,75 mm ² max 20 m (logic and power supply) | LiYCY 10 x 0,14mm ² max 40 m (logic) LiYY 3 x 1mm ² max 40 m (power supply) |
| Conductor size | 0,5 mm ² to 1,5 mm ² - available for 12 wires | 0,14 mm ² to 0,5 mm ² - available for 9 wires 0,5 mm ² to 1,5 mm ² - available for 3 wires |
| Connection type | to crimp | to crimp |
| Protection (EN 60529) | IP 67 | IP 67 |

18.3 Fieldbus communication connectors

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

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

(2) Internally terminated

18.4 Pressure/Force transducer connectors - only for **SP, SL**

| CONNECTOR TYPE | SP, SL - Single transducer | |
|-----------------------|--------------------------------|---------------------|
| CODE | (D) ZH-5PM/1.5 | (D) ZH-5PM/5 |
| Type | 5 pin male straight circular | |
| Standard | M12 coding A – IEC 61076-2-101 | |
| Material | Plastic | |
| Cable gland | Connector moulded on cables | |
| | 1,5 m lenght | 5 m lenght |
| Cable | 5 x 0,25 mm ² | |
| Connection type | molded cable | |
| Protection (EN 60529) | IP 67 | |

19 FASTENING BOLTS AND VALVE MASS

| Type | Size | Fastening bolts (1) | Mass [kg] |
|-------|------|--|-----------|
| LIQZO | 25 | 4 socket head screws M12x100 class 12.9 Tightening torque = 125 Nm | 8,8 |
| | 32 | 4 socket head screws M16x60 class 12.9 Tightening torque = 300 Nm | 11,2 |
| | 40 | 4 socket head screws M20x70 class 12.9 Tightening torque = 600 Nm | 17,3 |
| LIQZP | 50 | 4 socket head screws M20x80 class 12.9 Tightening torque = 600 Nm | 24,6 |
| | 63 | 4 socket head screws M30x120 class 12.9 Tightening torque = 2100 Nm | 44,6 |
| | 80 | 8 socket head screws M24x80 class 12.9 Tightening torque = 1000 Nm | 72,2 |

(1) Fastening bolts supplied with the valve

20 MAIN CONNECTORS INSTALLATION DIMENSIONS

Installation 1 - possible interference between manifold and main connector

A = 15 mm space to remove the 7 or 12 pin main connectors
B = Clearance between main connector to valve's mounting surface.
 See the below table to verify eventual interferences, depending to the valve size and connector type

Installation 2 - no interference

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

| Reference dimension | Main connector code | Valve size | | | | | |
|-----------------------------------|---------------------|------------|-----|-----|-----|-----|-----|
| | | 25 | 32 | 40 | 50 | 63 | 80 |
| B | ZM-7P | 32 | 32 | 32 | 45 | 68 | 68 |
| | ZH-7P | (1) | (1) | (1) | 29 | 52 | 52 |
| | ZM-12P | (1) | (1) | (1) | (1) | 35 | 35 |
| | ZH-12P | (1) | (1) | (1) | (1) | (1) | (2) |
| C (max) for standard valve | - | 134 | 141 | 154 | 161 | 192 | 222 |
| C (max) for /A option | - | 114 | 121 | 134 | 141 | 172 | 202 |
| D for standard valve | - | 154 | 161 | 174 | 181 | 212 | 242 |
| D for /A option | - | 134 | 141 | 154 | 161 | 192 | 222 |

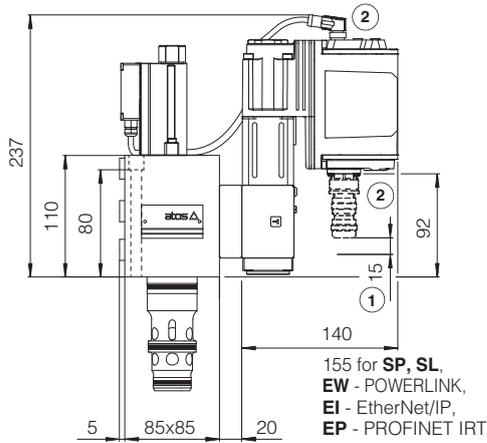
Above dimensions refer to the main connector fully screwed to driver's connector. The space **A** = 15 mm to remove the connector must be considered

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

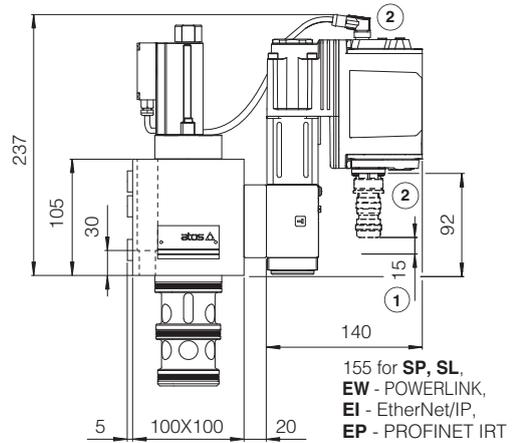
(2) The connector installation may be critical, depending to the cable size and bending radius

21 INSTALLATION DIMENSIONS [mm]

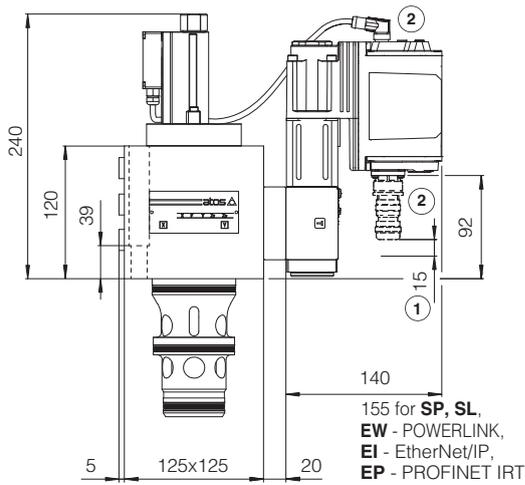
LIQZO-LEB-253
LIQZO-LES-253



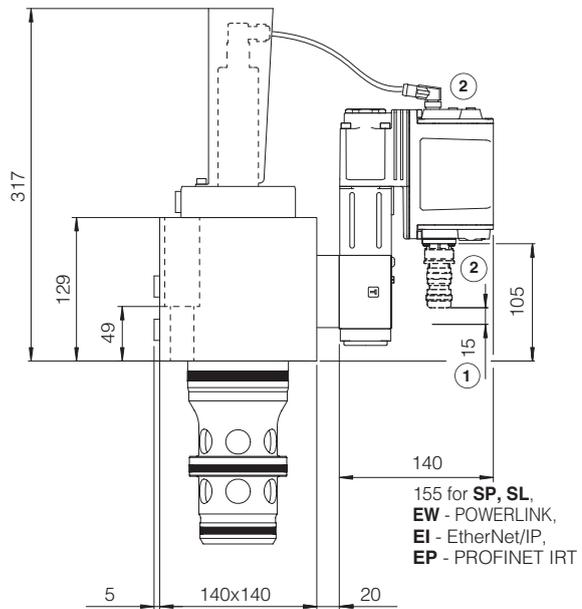
LIQZO-LEB-323
LIQZO-LES-323



LIQZO-LEB-**-403
LIQZO-LES-**-403



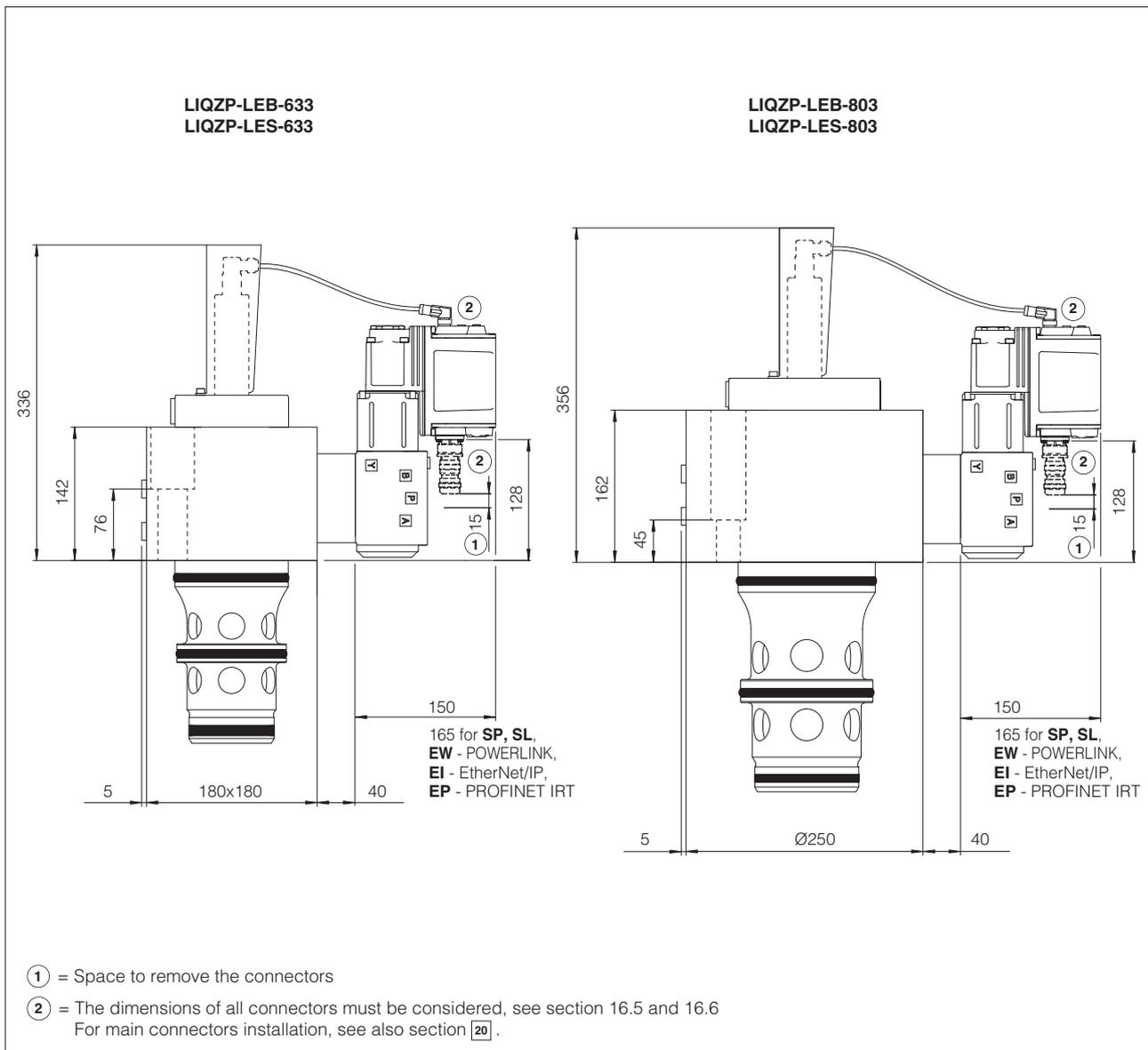
LIQZP-LEB-503
LIQZP-LES-503



① = Space to remove the connectors

② = The dimensions of all connectors must be considered, see section 16.5 and 16.6
For main connectors installation, see also section 20.

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



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

22 RELATED DOCUMENTATION

| | | | |
|--------------|---|--------------|---|
| FS001 | Basics for digital electrohydraulics | K800 | Electric and electronic connectors |
| FS500 | Digital proportional valves with P/Q control | P006 | Mounting surfaces and cavities for cartridge valves |
| FS900 | Operating and maintenance information for proportional valves | QB340 | Quickstart for LEB valves commissioning |
| GS500 | Programming tools | QF340 | Quickstart for LES valves commissioning |
| GS510 | Fieldbus | | |