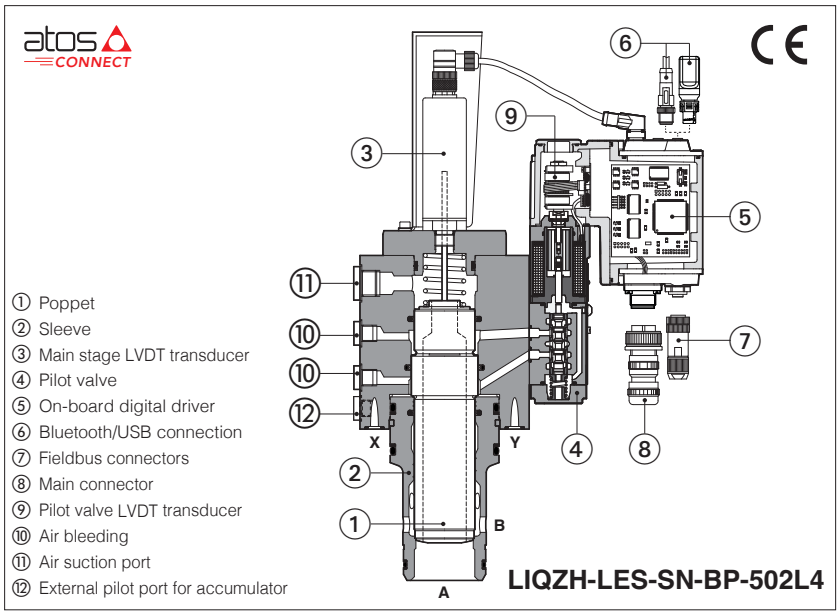
# Digital servoproportional 2-way cartridges high response

piloted, with on-board driver and two LVDT transducers




### LIQZH-LEB, LIQZH-LES

High response 2-way servoproportional cartridge valves specifically designed for high flow applications requiring maximum dynamics and accurate control. Typical applications are die casting and fast forging presses. They are equipped with two LVDT position transducers for best dynamics in not compensated flow regulations.

The cartridge execution for blocks installation grants high flow capabilities and minimized pressure drops.

**LEB** basic execution with analog reference signal or IO-Link interface for digital reference signals, valve settings, and real-time diagnostics.

**LES** full execution which includes also optional fieldbus interfaces for digital reference signals, valve settings, and real-time diagnostics.

Bluetooth/USB connection is always present for valve settings via mobile App and Atos PC software.

Size: **32** ÷ **100** - ISO 7368
Max flow: **1800** ÷ **16000 l/min**
Max pressure: **420 bar**

## 1 MODEL CODE

| LIQZH | - | LES | - | SN | - | NP | - | 40 | 2 | L4 | / | * | / | * | * | / | * |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

**LIQZH**: Servoproportional 2-way cartridge, piloted, high response

**LES**: **LEB** = basic on-board digital driver; **LES** = full on-board digital driver

**SN**: **Alternated p/Q controls**: **SN** = none

**NP**: **IO-Link interface**, only for LEB, see section 5: **NP** = Not present; **IL** = IO-Link

**Fieldbus interfaces**, only for LES, see section 6:
**NP** = Not present
**BC** = CANopen; **EW** = POWERLINK
**BP** = PROFIBUS DP; **EI** = EtherNet/IP
**EH** = EtherCAT; **EP** = PROFINET RT/IRT

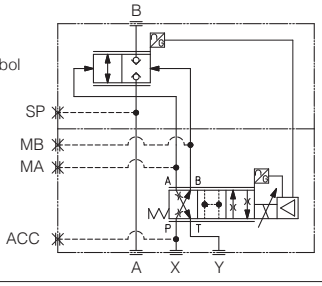
**40**: **Valve size** ISO 7368, see section 7:

| size | 32 | 40 | 50 |
|---|---|---|---|
| l/min | 800 | 1200 | 2000 |
| size | 63 | 80 | 100 |
| l/min | 3000 | 4500 | 7200 |

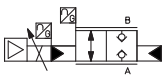
Nominal flow (l/min) at Δp 5 bar

**2**: **Configuration**:
**2** = 2 way

functional symbol




simplified symbol




**L4**: **Poppet type,** regulating characteristics, see section 11:
**L4** = linear

*****: **Electronic options (1)**, not available for LEB-SN-IL:
**F** = fault signal
**I** = current reference input and monitor 4 ÷ 20 mA
**Q** = enable signal
**Z** = double power supply (only for LES), enable, fault and monitor signals - 12 pin connector

*****: **Bluetooth option (1)**, see section 4:
**T** = Bluetooth adapter supplied with the valve

*****: Series number: **2***

*****: **Seals material**, see section 10:
**-** = NBR
**PE** = FKM
**BT** = NBR low temperature

**(1)** Possible combined options: /FI, /IQ, /IZ (/T Bluetooth adapter option can be combined with all other options)

## 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-SETUP 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 poppet.
The sudden interruption of the power supply during the valve operation causes the immediate shut-off of the main poppet.
This could cause pressure surges in the hydraulic system or high decelerations which may lead to machine damages.

## 3 VALVE SETTINGS AND PROGRAMMING TOOLS - see tech. table **GS500**

### 3.1 Atos CONNECT mobile App

Free downloadable App for smartphones and tablets which allows quick access to valve main functional parameters and basic diagnostic information via Bluetooth, thus avoiding physical cable connection and significantly reducing commissioning time.
Atos CONNECT supports Atos digital valve drivers equipped with E-A-BTH adapter or with built-in Bluetooth. It does not support valves with p/Q control or axis controls.

Download on the App Store

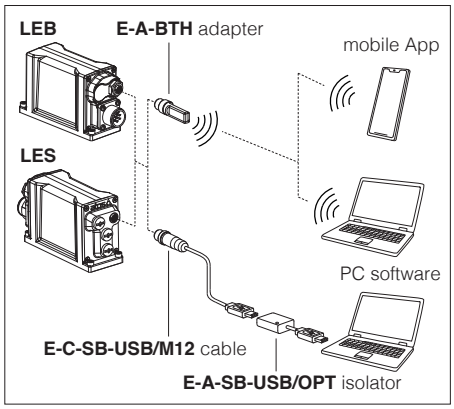
GET IT ON Google Play

### 3.2 E-SW-SETUP PC software

Free downloadable software for PC allows to set all valve functional parameters and to access complete diagnostic information of digital valve drivers via Bluetooth/USB service port.
Atos E-SW-SETUP PC software supports all Atos digital valve drivers and it is available at www.atos.com in MyAtos area.

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

**Bluetooth or USB connection**




## 4 BLUETOOTH OPTION - see tech. table **GS500**

**T** option adds Bluetooth® connectivity to Atos valve drivers thanks to E-A-BTH adapter, which can be left permanently installed on-board, to allow the Bluetooth connection with the valve drivers at any time. E-A-BTH adapter can also be purchased separately and used to connect with any supported Atos digital product.
Bluetooth connection to the valve can be protected against unauthorised access by setting a personal password. The adapter leds visually indicates the status of valve driver and Bluetooth connection.

**WARNING:** for the list of countries where the Bluetooth adapter has been approved, see tech. table **GS500**
T option is not available for the Indian market, so the Bluetooth adapter must be ordered separately.

## 5 IO-LINK - only for **LEB**, see tech. table **GS520**

IO-Link allows low cost digital communication between the valve and machine central unit. The valve is directly connected to a port of an IO-Link master (point-to-point connection) via low-cost unshielded cables for digital reference, diagnostic and settings. The IO-Link master works as a hub exchanging this information with the machine central unit via fieldbus.

## 6 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.

## 7 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 | **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 |
| Vibration resistance | See technical table G004 |
| Compliance | CE according to EMC directive 2014/30/EU (Immunity: EN 61000-6-2; Emission: EN 61000-6-3)<br>RoHS Directive 2011/65/EU as last update by 2015/863/EU<br>REACH Regulation (EC) n°1907/2006 |

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

| Size | | **32** | **40** | **50** | **63** | **80** | **100** |
|---|---|---|---|---|---|---|---|
| Max regulated flow | [l/min] | | | | | | |
| Δp A-B at Δp = 5 bar | | 800 | 1200 | 2000 | 3000 | 4500 | 7200 |
| at Δp = 10 bar | | 1100 | 1700 | 2800 | 4250 | 6350 | 10200 |
| Max permissible flow | | 1800 | 2500 | 4000 | 6000 | 10000 | 16000 |
| Max pressure | [bar] | Ports A, B = 420 X = 350 Y ≤ 10 | | | | | |
| Nominal flow of pilot valve at Δp = 70 bar | [l/min] | 20 | 40 | 40 | 100 | 100 | 100 |
| Leakage of pilot valve at P = 100 bar | [l/min] | 0,3 | 0,7 | 0,7 | 1 | 1 | 1 |
| Piloting pressure | [bar] | min: 40% of system pressure max 350 recommended 140 ÷ 160 | | | | | |
| Piloting volume | [cm³] | 3,31 | 5,34 | 7,42 | 10,28 | 19,55 | 22,53 |
| Piloting flow **(1)** | [l/min] | 13,2 | 17,8 | 22,3 | 31 | 39 | 45 |
| Response time 0 ÷ 100% step signal **(2)** | [ms] | 15 | 18 | 20 | 24 | 30 | 37 |
| 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)** With step reference input 0÷100% **(2)** With pilot pressure = 140 bar, see datailed diagrams in section 11.2

## 9 ELECTRICAL CHARACTERISTICS

| | | | | | |
|---|---|---|---|---|---|
| Power supplies | Nominal : +24 VDC<br>Rectified and filtered : VRMS = 20 ÷ 32 VMAX (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 tolerant) Input impedance: Ri > 50 kΩ<br>Current: range ±20 mA Input impedance: Ri = 500 Ω | | | | |
| Monitor outputs | Output range: voltage ±10 VDC @ max 5 mA<br>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: Ri > 10 kΩ | | | | |
| Fault output | Output range: 0 ÷ 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) | | | | |
| 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,<br>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 (only for LES); poppet position control by P.I.D. with rapid solenoid switching; protection against reverse polarity of power supply | | | | |
| Communication interface | USB<br>Atos ASCII coding | IO-Link<br>Interface and System Specification 1.1.3 | CANopen<br>EN50325-4 + DS408 | PROFIBUS DP<br>EN50170-2/IEC61158 | EtherCAT<br>POWERLINK<br>EtherNet/IP<br>PROFINET IO RT/IRT<br>IEC 61158 |
| Communication physical layer | not insulated<br>USB 2.0+USB OTG | SDCI<br>class port B | optical insulated<br>CAN ISO11898 | optical insulated<br>RS485 | Fast Ethernet, insulated<br>100 Base TX |
| Recommended wiring cable | LiYCY shielded cables, see section 19 | | | | |

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

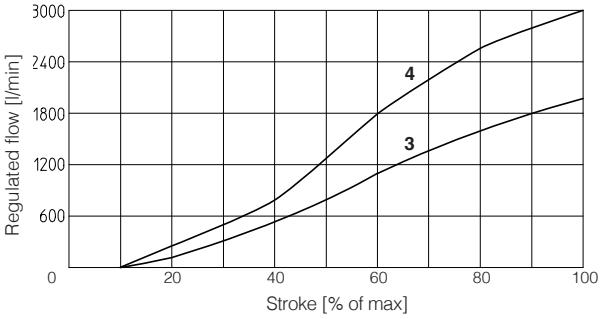
## 10 SEALS AND HYDRAULIC FLUIDS - for other fluids not included in below table, consult our technical office

| | | | | |
|---|---|---|---|---|
| Seals, recommended fluid temperature | | NBR seals (standard) = -20°C ÷ +60°C, with HFC hydraulic fluids = -20°C ÷ +50°C<br>FKM seals (/PE option) = -20°C ÷ +80°C<br>NBR low temp. seals (/BT option) = -40°C ÷ +60°C, with HFC hydraulic fluids = -20°C ÷ +50°C | | |
| Recommended viscosity | | 20÷100 mm²/s - max allowed range 15 ÷ 380 mm²/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, NBR low temp. | HL, HLP, HLPD, HVLP, HVLPD | DIN 51524 |
| Flame resistant without water | | FKM | HFDU, HFDR | ISO 12922 |
| Flame resistant with water | | NBR, NBR low temp. | HFC | |

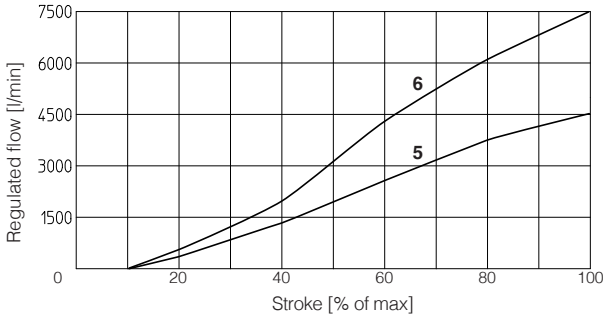
## 11 DIAGRAMS (based on mineral oil ISO VG 46 at 50 °C)

### 11.1 Regulation diagrams (values measured at Δp 5 bar)


**1** = LIQZH-L*-32*
**2** = LIQZH-L*-40*



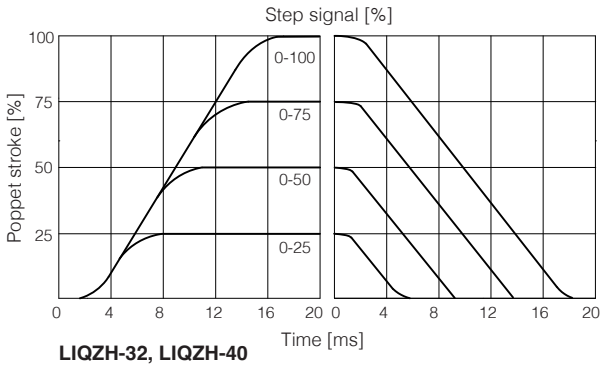

**3** = LIQZH-L*-50*
**4** = LIQZH-L*-63*



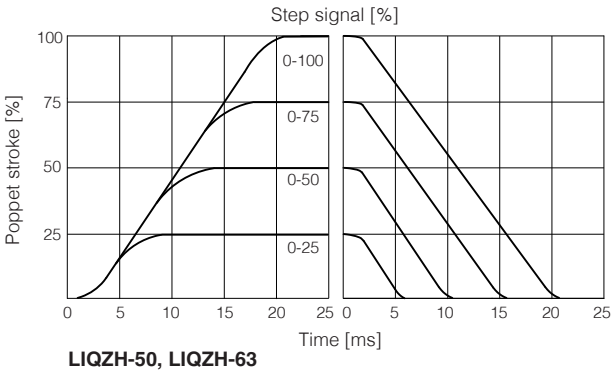

**5** = LIQZH-L*-80*
**6** = LIQZH-L*-100*

### 11.2 Response time

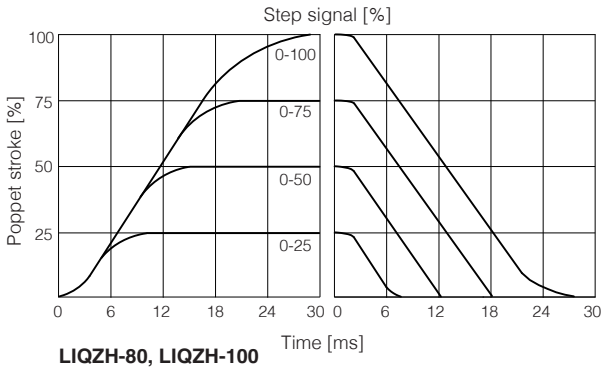
The response times in below diagrams are measured at different steps of the reference input signal. They have to be considered as average values. For the valves with digital electronics the dynamics performances can be optimized by setting the internal software parameters.




**LIQZH-32, LIQZH-40**

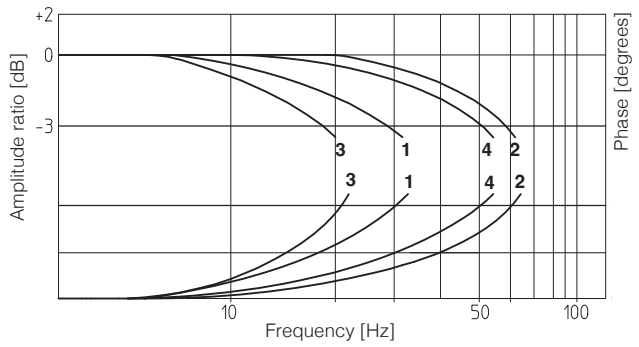



**LIQZH-50, LIQZH-63**

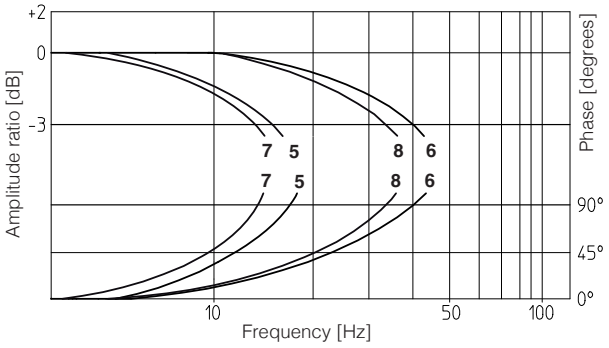



**LIQZH-80, LIQZH-100**

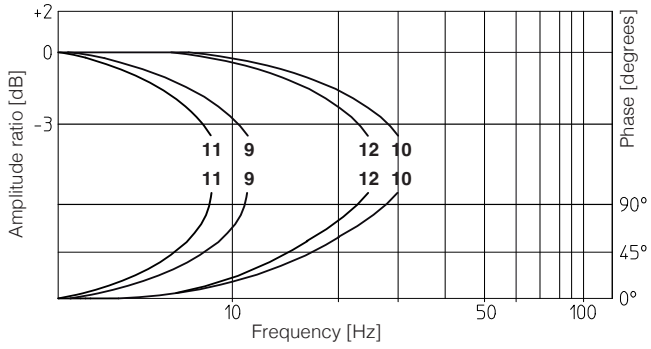
### 11.3 Bode diagrams - stated at nominal hydraulic conditions




**1** = LIQZH-L*-32*: 10% ↔ 90% **3** = LIQZH-L*-40*: 10% ↔ 90%
**2** = LIQZH-L*-32*: 50% ± 5% **4** = LIQZH-L*-40*: 50% ± 5%




**5** = LIQZH-L*-50*: 10% ↔ 90% **7** = LIQZH-L*-63*: 10% ↔ 90%
**6** = LIQZH-L*-50*: 50% ± 5% **8** = LIQZH-L*-63*: 50% ± 5%




**9** = LIQZH-L*-80*: 10% ↔ 90% **11** = LIQZH-L*-100*: 10% ↔ 90%
**10** = LIQZH-L*-80*: 50% ± 5% **12** = LIQZH-L*-100*: 50% ± 5%

## 12 ELECTRONIC OPTIONS - not available for **LEB-SN-IL**

**F** = This option permits to monitor the eventual fault condition of the driver, as for example the solenoid short circuit/not connected, reference signal cable broken for option /I, poppet position transducer broken, etc. - see 15.7 for signal specifications.

**I** = This option provides 4 ÷ 20 mA current reference and monitor signals, instead of the standard 0 ÷ 10 VDC.
Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ±10 VDC or ±20 mA.
It is normally used in case of long distance between the machine control unit and the valve or where the reference signal can be affected by electrical noise; the valve functioning is disabled in case of reference signal cable breakage.

**Q** = This option permits to inhibit the valve function without removing the power supply to the driver. Upon disable command the current to the solenoid is zeroed and the valve's poppet moves to rest position.
The option /Q is suggested for all cases where the valve has to be frequently inhibited during the machine cycle – see 15.5 for signal specifications.

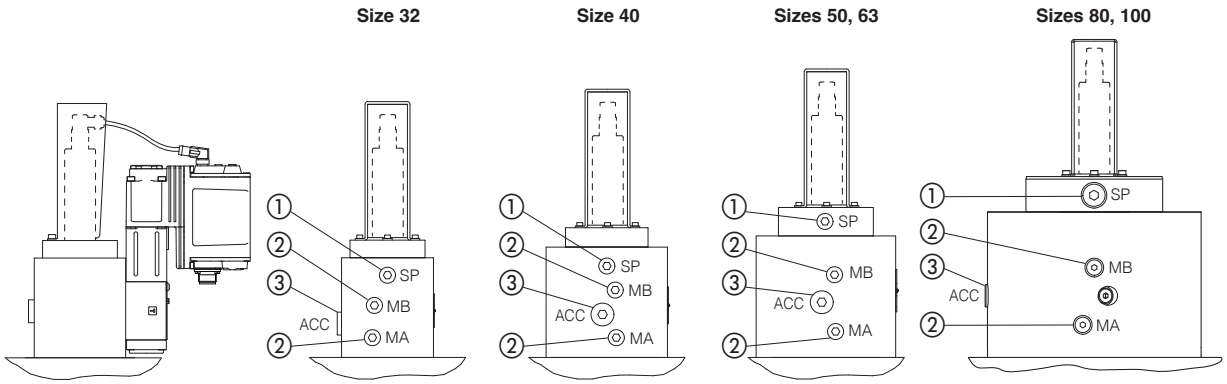
**Z** = This option provides, on the 12 pin main connector, the following additional features:
**Fault output signal** - see above option **/F**
**Enable input signal** - see above option **/Q**
**Repeat enable output signal** - only for **LEB-SN-NP** (see 15.6)
**Power supply for driver's logics and communication** - only for **LES** (see 15.2)

## 13 POSSIBLE COMBINED OPTIONS

/FI, /IQ, /IZ

**Note**: **/T** Bluetooth adapter option can be combined with all other options

## 14 AIR BLEEDING

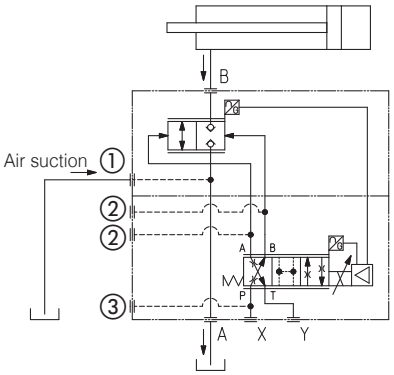



① To be used only in case port A is connected to tank and subjected to negative pressure, consult our technical office.

② 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.

③ Additional external pilot port for accumulator connection.

| Port | LIQZH Size | | | | | |
|---|---|---|---|---|---|---|
| | 32 | 40 | 50 | 63 | 80 | 100 |
| ① Air suction | G1/4" CH 6 | | G1/2" CH 10 | | | |
| ② Air bleeding | G1/4" CH 6 | | | | | |
| ③ External pilot | G3/8" CH 8 | | G1/2" CH 10 | | | |



## 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).

For **LEB-SN-IL** signals see section 16

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

The power supply must be appropriately stabilized or rectified and filtered: apply at least a 10000 μF/40 V capacitance to single phase rectifiers or a 4700 μF/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

The power supply for driver's logic and communication must be appropriately stabilized or rectified and filtered: apply at least a 10000 μF/40 V capacitance to single phase rectifiers or a 4700 μF/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 ÷ 10 VDC for standard and 4 ÷ 20 mA for /I option.
Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ±10 VDC or ± 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 ÷ 24VDC.

### 15.4 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 0 ÷ 10 VDC for standard and 4 ÷ 20 mA for /I option.
Output signal can be reconfigured via software selecting between voltage and current, within a maximum range of ±10 VDC or ± 20 mA.

### 15.5 Enable input signal (ENABLE) - not for standard and **/F**

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

### 15.6 Repeat enable output signal (R_ENABLE) - only for **LEB-SN-NP** with **/Z** option

Repeat enable is used as output repeater signal of enable input signal (see 15.5).

### 15.7 Fault output signal (FAULT) - not for standard and **/Q**

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

## 16 IO-LINK SIGNALS SPECIFICATIONS - only for **LEB-SN-IL**

### 16.1 Power supply for IO-Link communication (L+ and L-)

The IO-Link master provides dedicated 24 VDC power supply for IO-Link communication.
Maximum power consumption: 2 W
Internal electrical isolation of power L+, L- from P24, N24

### 16.2 Power supply for driver's logic and valve regulation (P24 and N24)

The IO-Link master provides dedicated 24 VDC power supply for valve regulation, logics and diagnostics.
Maximum power consumption: 50 W
Internal electrical isolation of power P24, N24 from L+, L-

### 16.3 IO-Link data line (C/Q)

C/Q signal is used to establish communication between IO-Link master and valve.

## 17 ELECTRONIC CONNECTIONS AND LEDS

### 17.1 Main connector signals - 7 pin - standard, **/F** and **/Q** options (A1)

| PIN | Standard | /Q | /F | TECHNICAL SPECIFICATIONS | NOTES |
|---|---|---|---|---|---|
| A | **V+** | | | Power supply 24 VDC | Input - power supply |
| B | **V0** | | | Power supply 0 VDC | Gnd - power supply |
| C | **AGND** | | **AGND** | Analog ground | Gnd - analog signal |
| | | **ENABLE** | | Enable (24 VDC) or disable (0 VDC) the valve, referred to V0 | Input - on/off signal |
| D | **Q_INPUT+** | | | Flow reference input signal: ±10 VDC / ±20 mA maximum range<br>Defaults are 0 ÷ 10 VDC for standard and 4 ÷ 20 mA for /I option | Input - analog signal<br>**Software selectable** |
| E | **INPUT-** | | | Negative reference input signal for Q_INPUT+ | Input - analog signal |
| F | **Q_MONITOR** referred to:<br>AGND / V0 | | | Flow monitor output signal: ±10 VDC / ±20 mA maximum range<br>Defaults are 0 ÷ 10 VDC for standard and 4 ÷ 20 mA for /I option | Output - analog signal<br>**Software selectable** |
| | | | **FAULT** | Fault (0 VDC) or normal working (24 VDC) | Output - on/off signal |
| G | **EARTH** | | | Internally connected to the driver housing | |

### 17.2 Main connector signal - 12 pin - **/Z** option (A2)

| PIN | LEB /Z | LES /Z | TECHNICAL SPECIFICATIONS | NOTES |
|---|---|---|---|---|
| | **V+** | | Power supply 24 VDC | Input - power supply |
| 1 | **V0** | | Power supply 0 VDC | Gnd - power supply |
| 2<br>3 | **ENABLE** referred to:<br>V0 / VL0 | | Enable (24 VDC) or disable (0 VDC) the valve | Input - on/off signal |
| 4 | **Q_INPUT+** | | Flow reference input signal: ±10 VDC / ±20 mA maximum range<br>Defaults are 0 ÷ 10 VDC for standard and 4 ÷ 20 mA for /I option | Input - analog signal<br>**Software selectable** |
| 5 | **INPUT-** | | Negative reference input signal for Q_INPUT+ | Input - analog signal |
| 6 | **Q_MONITOR** referred to:<br>AGND / VL0 | | Flow monitor output signal: ±10 VDC / ±20 mA maximum range<br>Defaults are 0 ÷ 10 VDC for standard and 4 ÷ 20 mA for /I option | Input - analog signal<br>**Software selectable** |
| 7 | **AGND** | | Analog ground | Output - analog signal |
| | | **NC** | Do not connect | Gnd - analog signal |
| 8 | **R_ENABLE** | | Repeat enable, output repeater signal of enable input, referred to V0 | Output - on/off signal |
| | | **NC** | Do not connect | |
| 9 | **NC** | | Do not connect | |
| | | **VL+** | Power supply 24 VDC for driver's logic and communication | Input - power supply |
| 10 | **NC** | | Do not connect | |
| | | **VL0** | Power supply 0 VDC for driver's logic and communication | Gnd - power supply |
| 11<br>PE | **FAULT** referred to:<br>V0 / VL0 | | Fault (0 VDC) or normal working (24 VDC) | Output - on/off signal |
| | **EARTH** | | Internally connected to the driver housing | |

**Note:** do not disconnect VL0 before VL+ when the driver is connected to PC USB port

### 17.3 IO-Link connector signals - M12 - 5 pin - Coding A, port class B (A) only for **LEB-SN-IL**

| PIN | SIGNAL | TECHNICAL SPECIFICATIONS | NOTES |
|---|---|---|---|
| 1 | **L+** | Power supply 24 VDC for IO-Link communication | Input - power supply |
| 2 | **P24** | Power supply 24 VDC for valve regulation, logics and diagnostics | Input - power supply |
| 3 | **L-** | Power supply 0 VDC for IO-Link communication | Gnd - power supply |
| 4 | **C/Q** | IO-Link data line | Input / Output - signal |
| 5 | **N24** | Power supply 0 VDC for valve regulation, logics and diagnostics | Gnd - power supply |

**Note:** L+, L- and P24, N24 are electrically isolated

### 17.4 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** | |

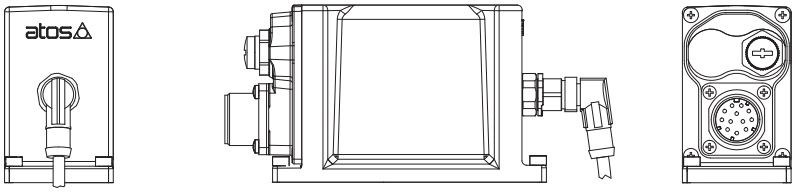
| (C1) (C2) **EH, EW, EI, EP fieldbus execution, connector - M12 - 4 pin** | | |
|---|---|---|
| **PIN** | **SIGNAL** | **TECHNICAL SPECIFICATION** (1) |
| 1 | **TX+** | Transmitter |
| 2 | **RX+** | Receiver |
| 3 | **TX-** | Transmitter |
| 4 | **RX-** | Receiver |
| | **SHIELD** | |

**(1)** shield connection on connector's housing is recommended

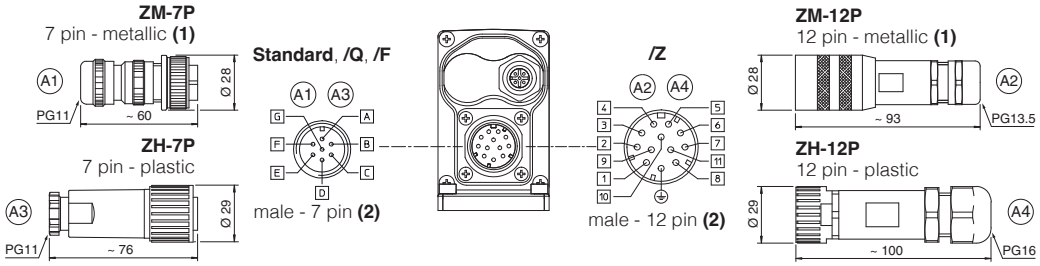
**(2)** Pin 2 can be fed with external +5V supply of CAN interface

### 17.5 LEB-SN-NP connections layout

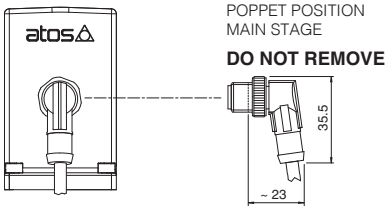
**DRIVER OVERVIEW**



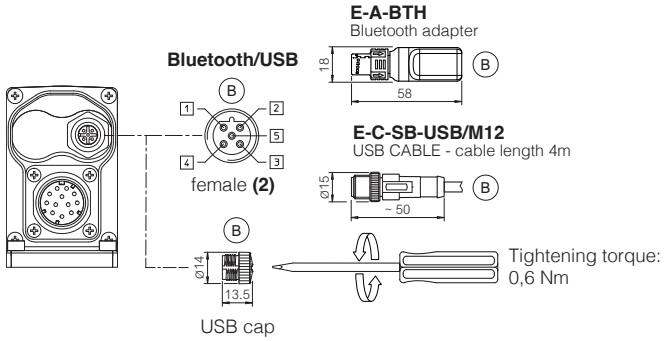
**MAIN CONNECTORS**




**TRANSDUCER CONNECTOR**



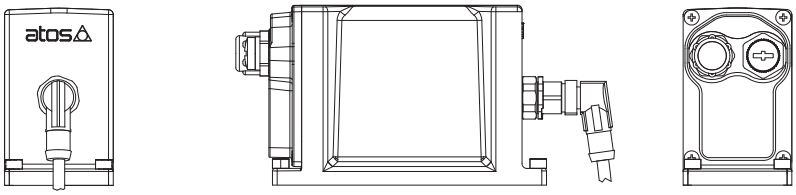

**BLUETOOTH ADAPTER AND USB CONNECTOR**



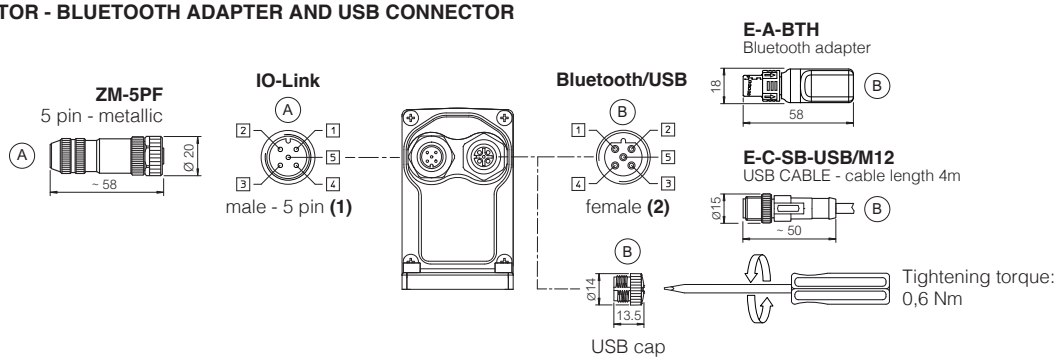

**(1)** Use of metallic connectors is strongly recommended in order to fulfill EMC requirements **(2)** Pin layout always referred to driver's view

### 17.6 LEB-SN-IL connections layout

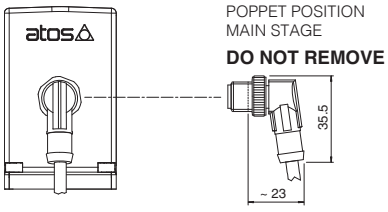
**DRIVER OVERVIEW**



**IO-Link CONNECTOR - BLUETOOTH ADAPTER AND USB CONNECTOR**



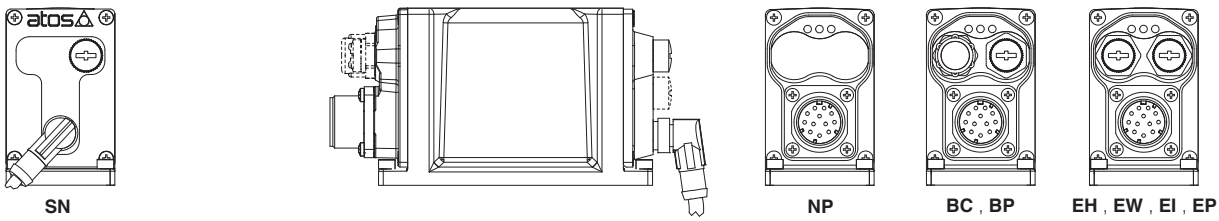

**TRANSDUCER CONNECTOR**



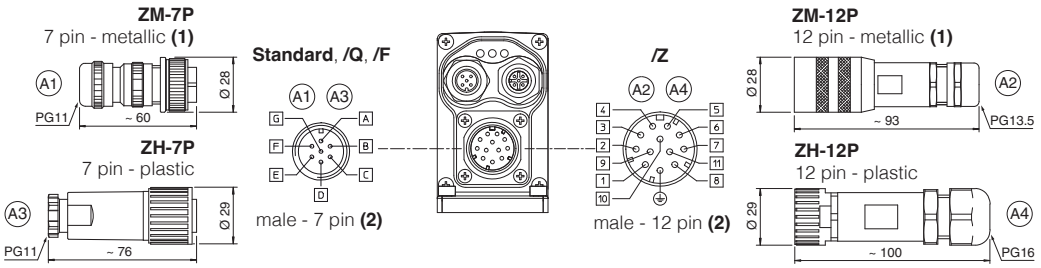

**(1)** Pin layout always referred to driver's view

### 17.7 LES connections layout

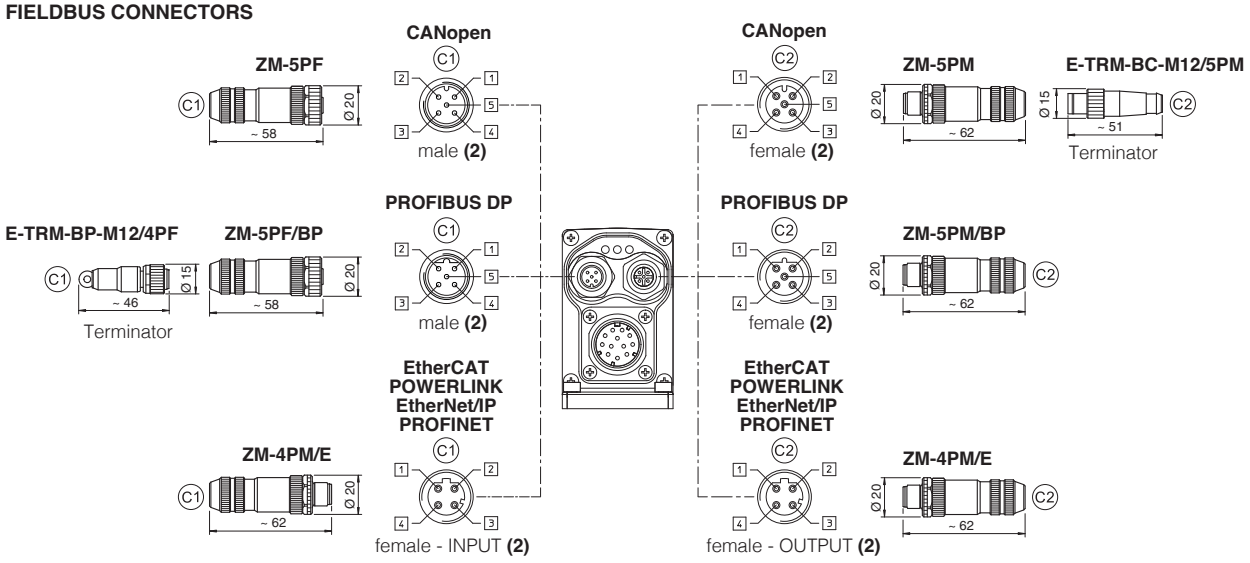
**DRIVER OVERVIEW**



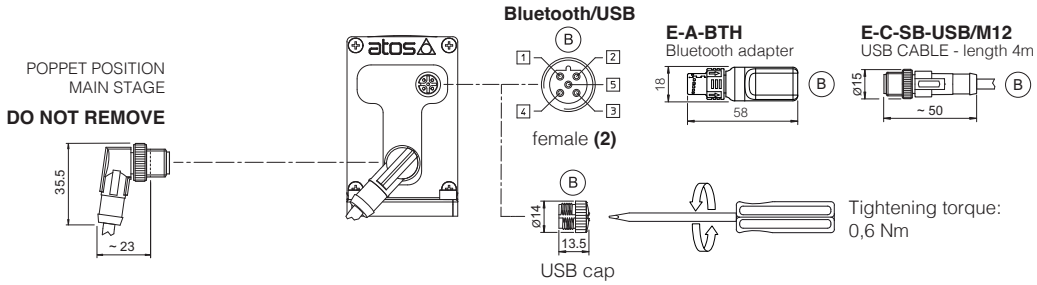

**MAIN CONNECTORS**




**FIELDBUS CONNECTORS**



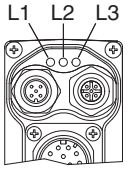

**TRANSDUCERS CONNECTORS - BLUETOOTH ADAPTER AND USB CONNECTOR**




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

### 17.8 Diagnostic LEDs - only for **LES**

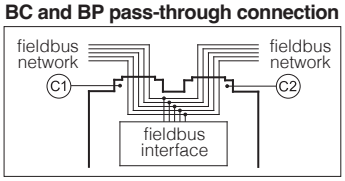
Three leds show driver operative conditions for immediate basic diagnostics. Please refer to the driver user manual for detailed information.

| LEDS \ FIELDBUS | 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 | | | | |

## 18 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**




## 19 CONNECTORS CHARACTERISTICS - to be ordered separately

### 19.1 Main connectors - 7 pin

| CONNECTOR TYPE | POWER SUPPLY AND SIGNALS | POWER SUPPLY AND SIGNALS |
|---|---|---|
| **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 mm² max 20 m (logic and power supply) or LiYCY 7 x 1 mm² max 40 m (logic and power supply) | LiYCY 7 x 0,75 mm² max 20 m (logic and power supply) or LiYCY 7 x 1 mm² max 40 m (logic and power supply) |
| Conductor size | up to 1 mm² - available for 7 wires | up to 1 mm² - available for 7 wires |
| Connection type | to solder | to solder |
| Protection (EN 60529) | IP 67 | IP 67 |

### 19.2 Main connectors - 12 pin

| CONNECTOR TYPE | POWER SUPPLY AND SIGNALS | POWER SUPPLY AND SIGNALS |
|---|---|---|
| **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 mm² max 20 m (logic and power supply) | LiYCY 10 x 0,14mm² max 40 m (logic)<br>LiYY 3 x 1mm² max 40 m (power supply) |
| Conductor size | 0,5 mm² to 1,5 mm² - available for 12 wires | 0,14 mm² to 0,5 mm² - available for 9 wires<br>0,5 mm² to 1,5 mm² - available for 3 wires |
| Connection type | to crimp | to crimp |
| Protection (EN 60529) | IP 67 | IP 67 |

### 19.3 IO-Link connector - only for **LEB-SN-IL**

| CONNECTOR TYPE | IL IO-Link |
|---|---|
| **CODE** | (A) **ZM-5PF** |
| Type | 5pin female straight circular |
| Standard | M12 coding A – IEC 61076-2-101 |
| Material | Metallic |
| Cable gland | Pressure nut - cable diameter 6÷8 mm |
| Recommended cable | 5 x 0,75 mm² max 20 m |
| Connection type | screw terminal |
| Protection (EN 60529) | IP 67 |

### 19.4 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

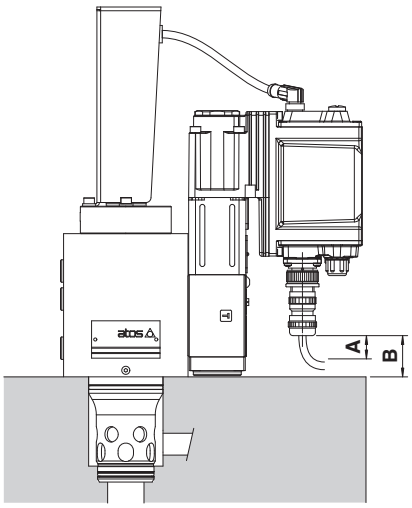
## 20 FASTENING BOLTS AND VALVE MASS

| Type | Size | Fastening bolts (1) | Mass [kg] |
|---|---|---|---|
| LIQZH | **32** | 4 socket head screws M16x60 class 12.9<br>Tightening torque = 300 Nm | 12,4 |
| | **40** | 4 socket head screws M20x70 class 12.9<br>Tightening torque = 600 Nm | 18,0 |
| | **50** | 4 socket head screws M20x80 class 12.9<br>Tightening torque = 600 Nm | 26,0 |
| | **63** | 4 socket head screws M30x120 class 12.9<br>Tightening torque = 2100 Nm | 46,9 |
| | **80** | 8 socket head screws M24x80 class 12.9<br>Tightening torque = 1000 Nm | 75,0 |
| | **100** | 8 socket head screws M30x120 class 12.9<br>Tightening torque = 2100 Nm | 128,4 |

**(1)** Fastening bolts supplied with the valve

## 21 MAIN CONNECTORS INSTALLATION DIMENSIONS

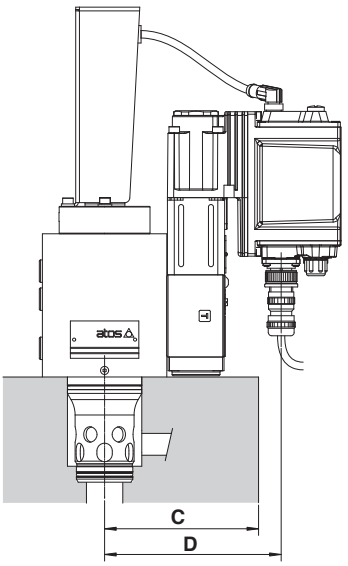
**Installation 1** - possible interference between manifold and main connector




**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 | | | | | |
|---|---|---|---|---|---|---|---|
| | | **32** | **40** | **50** | **63** | **80** | **100** |
| **B** | ZM-7P | 35 | 35 | 45 | 65 | 65 | 80 |
| | ZH-7P | **(1)** | **(1)** | 29 | 52 | 52 | 67 |
| | ZM-12P | **(1)** | **(1)** | **(1)** | 32 | 32 | 47 |
| | ZH-12P | **(1)** | **(1)** | **(1)** | **(1)** | **(2)** | 40 |
| **C** (max) | - | 121 | 134 | 141 | 172 | 202 | 229 |
| **D** | - | 141 | 154 | 161 | 192 | 222 | 249 |

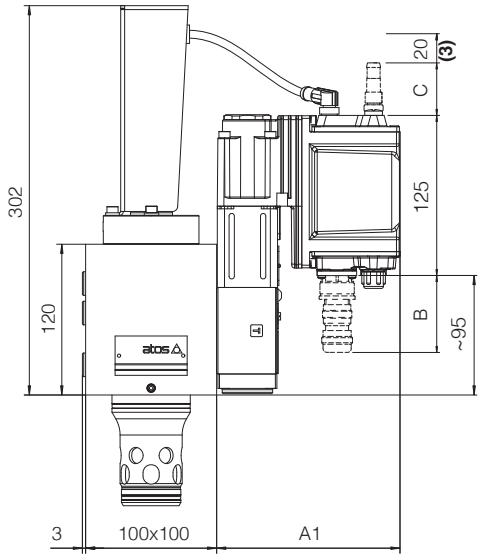
Above dimenions refer to the main connector fully screwed to driver's connector. The space **A** = 15 mm to remove the connector must be considered

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

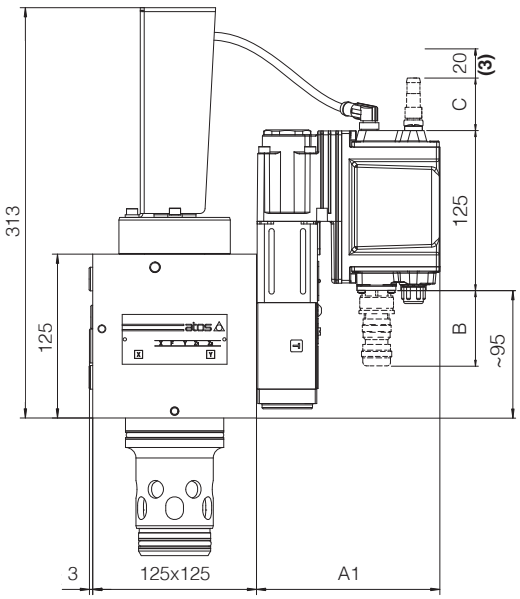
**(2)** The connector installation may be critic, depending to the cable size and bending radius

## 22 INSTALLATION DIMENSIONS [mm]

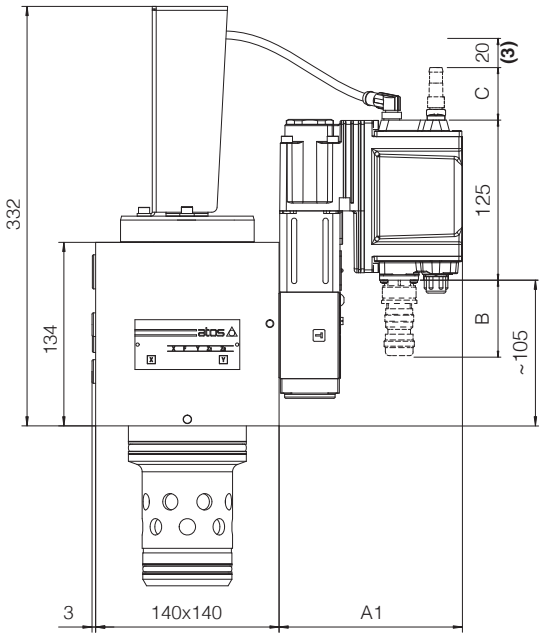
**LIQZH-LEB-322**
**LIQZH-LES-322**



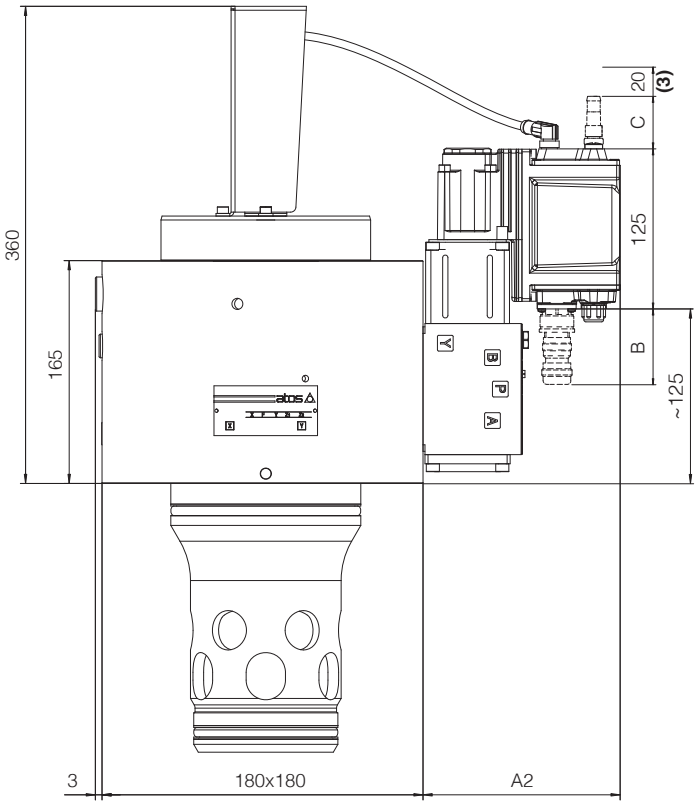

**LIQZH-LEB-402**
**LIQZH-LES-402**




**LIQZH-LEB-502**
**LIQZH-LES-502**




**LIQZH-LEB-632**
**LIQZH-LES-632**

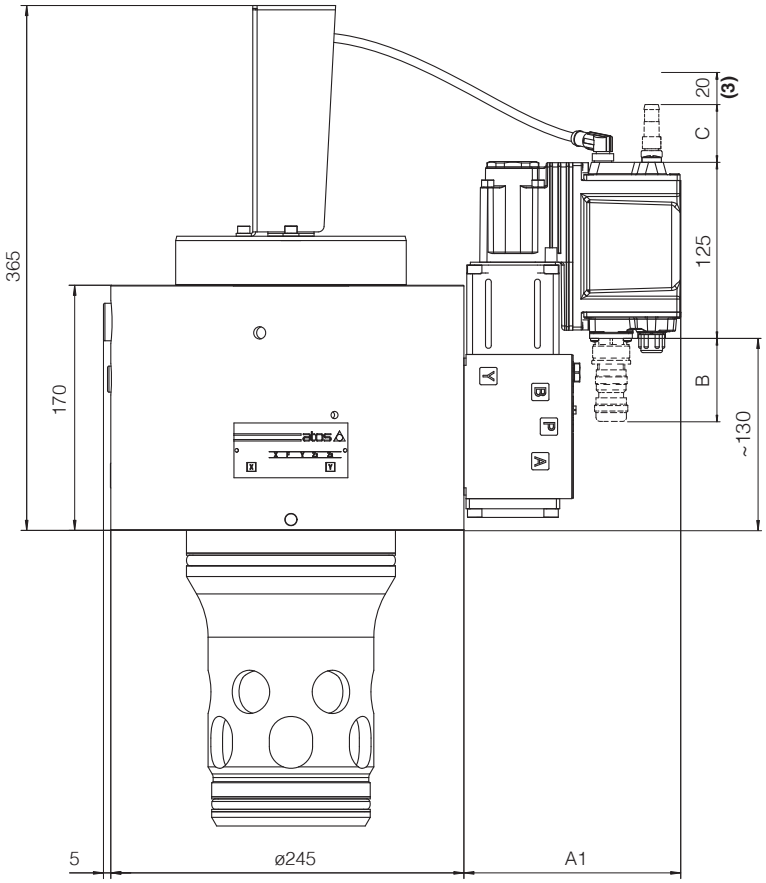



| LIQZH | A1 | A2 | B (1) | C (2) |
|---|---|---|---|---|
| LEB - SN - IL | 140 | 150 | 60 | - |
| LEB - SN - NP | 140 | 150 | 60 | - |
| LES - SN - NP, BC, BP, EH | 140 | 150 | 60 | 58 |
| LES - SN - EW, EI, EP | 155 | 165 | 60 | 58 |

**(1)** The indicated dimension refers to the main connector ZM-7P. See section 21 for main connectors installation dimensions
**(2)** The indicated dimension refers to the longer connectors or Bluetooth adapter
For dimensions of connectors and Bluetooth adapter, see sections 17.5, 17.6 and 17.7
**(3)** Space required for connection cable and for connector removal

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

**LIQZH-LEB-802**
**LIQZH-LES-802**

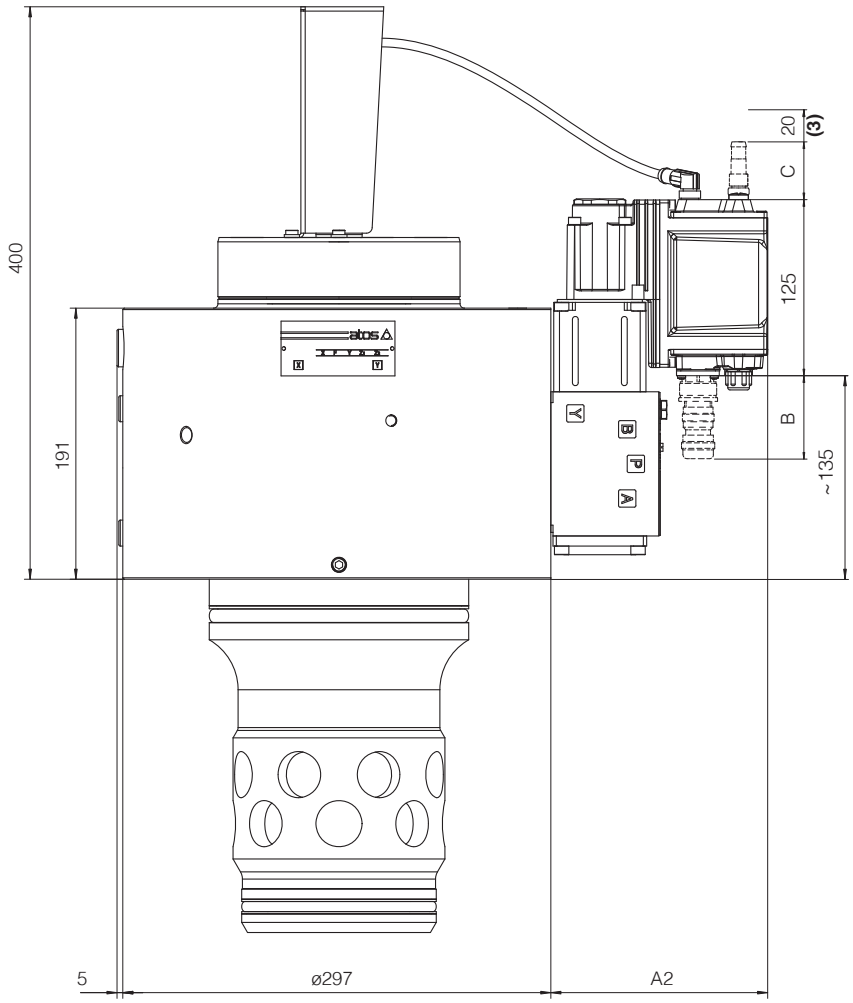



| LIQZH | A2 | B (1) | C (2) |
|---|---|---|---|
| LEB - SN - IL | 150 | 60 | - |
| LEB - SN - NP | 150 | 60 | - |
| LES - SN - NP, BC, BP, EH | 150 | 60 | 58 |
| LES - SN - EW, EI, EP | 165 | 60 | 58 |

**(1)** The indicated dimension refers to the main connector ZM-7P. See section 21 for main connectors installation dimensions
**(2)** The indicated dimension refers to the longer connectors or Bluetooth adapter
For dimensions of connectors and Bluetooth adapter, see sections 17.5, 17.6 and 17.7
**(3)** Space required for connection cable and for connector removal

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

**LIQZH-LEB-1002**
**LIQZH-LES-1002**




| LIQZH | A2 | B (1) | C (2) |
|---|---|---|---|
| LEB - SN - IL | 150 | 60 | - |
| LEB - SN - NP | 150 | 60 | - |
| LES - SN - NP, BC, BP, EH | 150 | 60 | 58 |
| LES - SN - EW, EI, EP | 165 | 60 | 58 |

**(1)** The indicated dimension refers to the main connector ZM-7P. See section 21 for main connectors installation dimensions
**(2)** The indicated dimension refers to the longer connectors or Bluetooth adapter
For dimensions of connectors and Bluetooth adapter, see sections 17.5, 17.6 and 17.7
**(3)** Space required for connection cable and for connector removal

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

## 23 RELATED DOCUMENTATION

| | |
|---|---|
| **FS001** | Basics for digital electrohydraulics |
| **FS900** | Operating and maintenance information for proportional valves |
| **GS500** | Programming tools |
| **GS510** | Fieldbus |
| **GS520** | IO-Link interface |
| **K800** | Electric and electronic connectors |
| **P006** | Mounting surfaces and cavities for cartridge valves |
| **E-MAN-RI-LEB** | TEB/LEB user manual |
| **E-MAN-RI-LES** | TES/LES user manual |