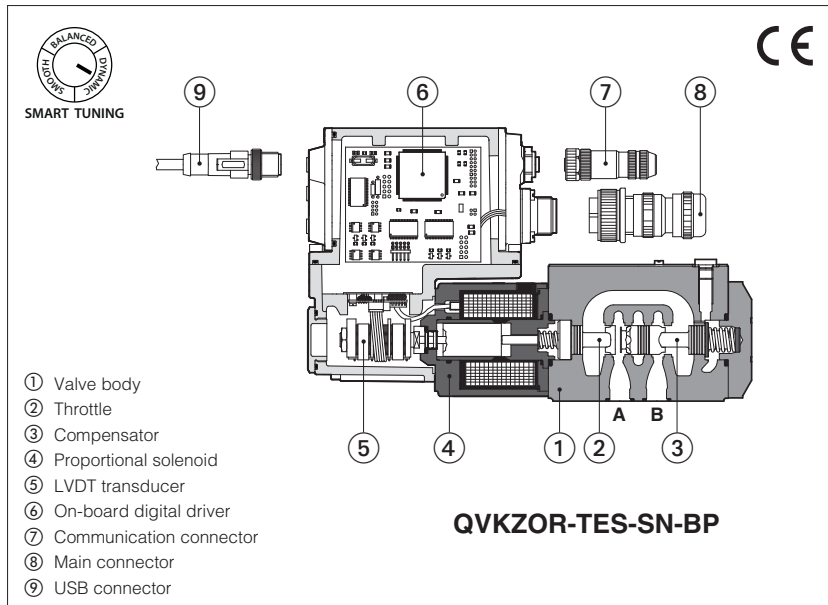


Digital proportional flow valves

direct, pressure compensated, with on-board driver and LVDT transducer



QVHZO-TEB, QVHZO-TES QVKZOR-TEB, QVKZOR-TES

Proportional flow control valves, direct, pressure compensated, equipped with LVDT position transducer for best accuracy in flow regulations.

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

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

For both **TEB** and **TES**, USB port is always present for valve settings via Atos PC software.

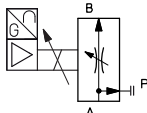
| | |
|------------------------------|------------------------------|
| QVHZO: | QVKZOR: |
| Size: 06 - ISO 4401 | Size: 10 - ISO 4401 |
| Max flow: 45 l/min | Max flow: 90 l/min |
| Max pressure: 210 bar | Max pressure: 210 bar |

1 MODEL CODE

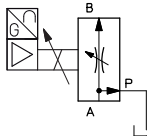
| | | | | | | | | | | | | | | |
|---|---|------------|---|-----------|---|-----------|---|-----------|---|-----------|---|----------|---|----------|
| QVKZOR | - | TES | - | SN | - | NP | - | 10 | / | 65 | / | * | / | * |
| Proportional flow control valves, direct, pressure compensated QVHZO = size 06 QVKZOR = size 10 TEB = basic on-board digital driver TES = full on-board digital driver Alternated P/Q controls: SN = none IO-Link interface , only for TEB, see section 6: NP = Not present IL = IO-Link Fieldbus interfaces , only for TES, see section 7: NP = Not present EW = POWERLINK BC = CANopen EI = EtherNet/IP BP = PROFIBUS DP EP = PROFINET RT/IRT EH = EtherCAT Valve size ISO 4401: 06 = size 06 10 = size 06 | | | | | | | | | | | | | | |
| Seals material , see section 11: - = NBR PE = FKM BT = NBR low temperature Series number | | | | | | | | | | | | | | |
| Electronics options (1) , not available for TEB-SN-IL: I = current reference input and monitor 4÷20 mA F = fault signal Q = enable signal Z = double power supply (only for TES), enable, fault and monitor signals -12 pin connector | | | | | | | | | | | | | | |
| Max regulated flow: QVHZO: 3 = 3,5 l/min 36 = 35 l/min 65 = 65 l/min 12 = 12 l/min 45 = 45 l/min 90 = 90 l/min 18 = 18 l/min | | | | | | | | | | | | | | |

(1) Possible combined options: /FI, /IQ, /IZ

2 HYDRAULIC SYMBOLS



2 way connection



3 way connection

The valves can be used in 2 or 3 way connection, depending to the application requirements.

In **2 way** the P port must not be connected (blocked)
 In **3 way** the P port has to be connected to tank or to other user lines
 The port T must be always not connected (blocked)

For application examples of 2 and 3 way connections, see section 13

3 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.

4 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/Bluetooth to the digital driver. For fieldbus/IO-Link versions, the software permits valve's parameterization through USB/Bluetooth also if the driver is connected to the central machine unit via fieldbus/IO-Link.

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

E-SW-BASIC support: NP (USB) IL (IO-Link) 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)

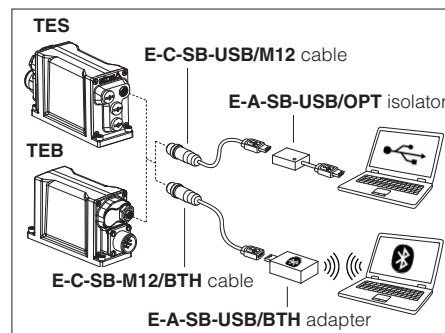


WARNING: drivers USB port is not isolated! For E-C-SB-USB/M12 cable, the use of isolator adapter is highly recommended for PC protection



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

USB or Bluetooth connection



5 SMART TUNING

Smart tuning allows to adjust the valve dynamic response in order to match different performance requirements.

The valve is provided with 3 factory settings for the spool control:

- **dynamic** fast response time and high sensitivity for best dynamic performances. Default factory setting for directional valves
- **balanced** average response time and sensitivity suitable for major applications
- **smooth** attenuated response time and sensitivity to improve control stability in critical applications or in environments with electrical disturbances

Smart tuning setting can be switched from Dynamic (default) to Balanced or Smooth via software or fieldbus; if requested, performances can be further customized directly tuning each single control parameter. For details consult related manuals E-MAN-RI-* and Quickstart, see section **23**.

6 IO-LINK - only for TEB, 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.

7 FIELDBUS - only for TES, 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.

8 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 | 150 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) RoHS Directive 2011/65/EU as last update by 2015/863/EU REACH Regulation (EC) n°1907/2006 |

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

| Valve model | QVHZO | | | | | QVKZOR | | |
|---|---|-----|---------|----|----|--------|---------|----|
| | Max regulated flow [l/min] | 3,5 | 12 | 18 | 35 | 45 | 65 | 90 |
| Min regulated flow [cm ³ /min] | 15 | 20 | 30 | 50 | 60 | 85 | 100 | |
| Regulating Δp [bar] | 4 - 6 | | 10 - 12 | | 15 | 6 - 8 | 10 - 12 | |
| Max flow on port A [l/min] | 50 | | | | 60 | 70 | 100 | |
| Max pressure [bar] | 210 | | | | | 210 | | |
| Response time 0÷100% step signal [ms] | 25 | | | | | 35 | | |
| Hysteresis [% of the regulated max flow] | 0,5 | | | | | 0,5 | | |
| Linearity [% of the regulated max flow] | 0,5 | | | | | 0,5 | | |
| Repeatability [% of the regulated max flow] | 0,1 | | | | | 0,1 | | |
| Thermal drift | zero point displacement < 1% at ΔT = 40°C | | | | | | | |

10 ELECTRICAL CHARACTERISTICS

| | | | | | |
|--|--|--|--|-----------------------------------|---|
| Power supplies | Nominal : +24 VDC Rectified and filtered : VRMS = 20 ÷ 32 VMAX (ripple max 10 % VPP) | | | | |
| Max power consumption | 50 W | | | | |
| Max. solenoid current | QVHZO = 2,6 A | | QVKZOR = 3 A | | |
| Coil resistance R at 20°C | QVHZO = 3 ÷ 3,3 W | | QVKZOR = 3,8 ÷ 4,1 W | | |
| Analog input signals | Voltage: range ±10 Vdc (24 VMAX tolerant) Current: range ±20 mA | | Input impedance: Ri > 50 kΩ Input impedance: Ri = 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: Ri > 10 kΩ | | | | |
| 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, SF, 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 (only for TES); spool position control by P.I.D. with rapid solenoid switching; protection against reverse polarity of power supply | | | | |
| Communication interface | USB Atos ASCII coding | IO-Link Interface and System Specification 1.1.3 | CANopen EN50325-4 + DS408 | PROFIBUS DP EN50170-2/IEC61158 | EtherCAT POWERLINK EtherNet/IP PROFINET IO RT/IRT IEC 61158 |
| Communication physical layer | not insulated USB 2.0+USB OTG | SDCI class port B | optical insulated CAN ISO11898 | optical insulated RS485 | Fast Ethernet, insulated 100 Base TX |
| Recommended wiring cable | LiYCY shielded cables, see section 20 | | | | |

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.

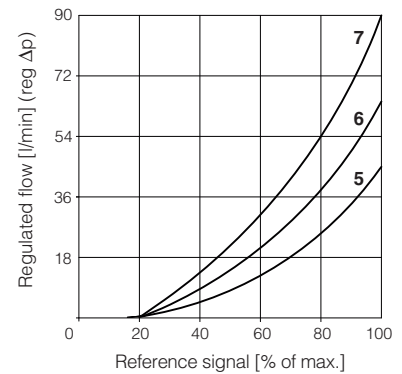
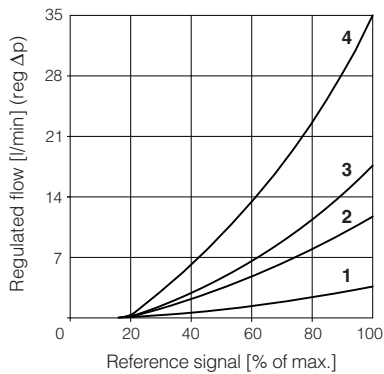
11 SEALS AND HYDRAULIC FLUIDS - for other fluids not included in below table, consult our technical office

| | | | | | |
|--------------------------------------|--|--|----------------------------|--|-----------------------------|
| 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 NBR low temp. seals (/BT option) = -40°C ÷ +60°C, with HFC hydraulic fluids = -20°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 |
| | longer life | ISO4406 class 16/14/11 NAS1638 class 5 | | | www.atos.com or KTF catalog |
| Hydraulic fluid | Suitable seals type | | Classification | | Ref. Standard |
| Mineral oils | NBR, FKM, NBR low temp. | | HL, HLP, HLPD, HVLP, HVLDP | | DIN 51524 |
| Flame resistant without water | FKM | | HFDU, HFDR | | ISO 12922 |
| Flame resistant with water | NBR, NBR low temp. | | HFC | | |

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

12.1 Regulation diagrams

- 1 = QVHZO-*-06/3
- 2 = QVHZO-*-06/12
- 3 = QVHZO-*-06/18
- 4 = QVHZO-*-06/36
- 5 = QVHZO-*-06/45
- 6 = QVKZOR-*-10/65
- 7 = QVKZOR-*-10/90

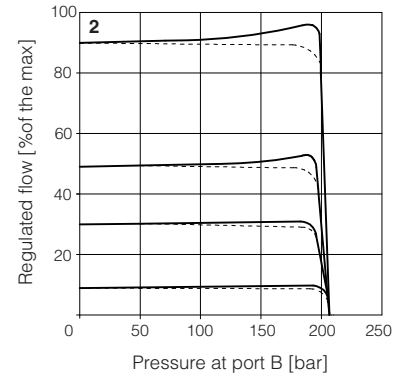
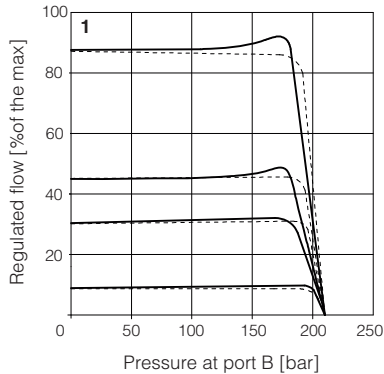


12.2 Regulated flow/outlet pressure diagrams

with inlet pressure = 210 bar

- 1 = QVHZO
- 2 = QVKZOR

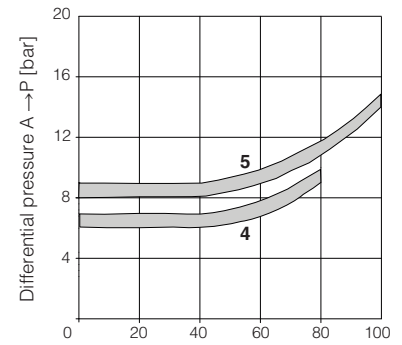
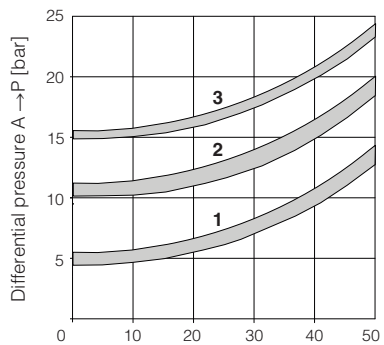
Dotted line for 3-way versions



12.3 Flow A → P/Δp diagrams

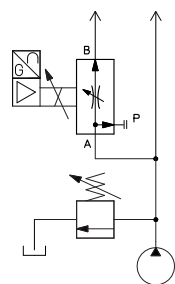
3-way configuration

- 1 = QVHZO-*-06/3
- 2 = QVHZO-*-06/12
- 3 = QVHZO-*-06/18
- 4 = QVHZO-*-06/36
- 5 = QVHZO-*-06/45
- 6 = QVKZOR-*-10/65
- 7 = QVKZOR-*-10/90



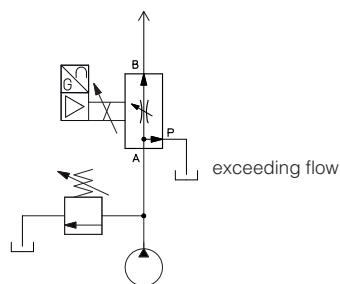
13 APPLICATIONS AND CONNECTIONS

compensated flow



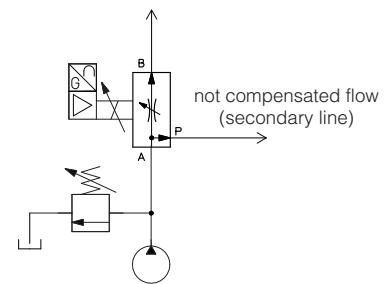
2 way connection

compensated flow



3 way connection

compensated flow
primary circuit (priority)



priority connection

2 way connection

The 2 way connection is normally used to control the flow in one part of the hydraulic circuit or to regulate the speed of a specific actuator. The metered flow in the controlled line is kept constant, independently to the load variations. If the valve is directly installed on the pump main line, the exceeding flow is returned to tank through the pressure relief valve.

3 way connection

The 3 way connection is normally used when the valve directly controls the pump flow (main line). The metered flow in the controlled line is kept constant, independently to the load variations. The exceeding flow (not metered by the valve) it is returned to tank through the valve P port = T line (3rd way).

Priority connection

The priority connection guarantees the pressure compensated flow supply to the primary circuit. The exceeding flow (not required by the primary circuit) is bypassed through the valve P port, to secondary circuit operating at lower pressure and not requiring compensated flow regulations.

14 ELECTRONICS OPTIONS - not available for **TEB-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, spool position transducer broken, etc. - see 16.9 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 16.7 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 **TEB-SN-NP** (see 16.6)
Power supply for driver's logics and communication - only for **TES** (see 16.2)

15 POSSIBLE COMBINED OPTIONS - not available for **TEB-SN-IL**

/FI, /IQ, /IZ

16 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 **TEB-SN-IL** signals see section 17

16.1 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 16.2.



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

16.2 Power supply for driver's logic and communication (VL+ and VL0) - only for **TES** with /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.

16.3 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.

16.4 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 ±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.

16.5 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.

16.6 Repeat enable output signal (R_ENABLE) - only for **TEB-SN-NP** with /Z option

Repeat enable is used as output repeater signal of enable input signal (see 16.5).

16.7 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.

17 IO-LINK SIGNALS SPECIFICATIONS - only for **TEB-SN-IL**

17.1 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

17.2 Power supply for drive 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-

17.3 IO-Link data line (C/Q)

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

18 ELECTRONIC CONNECTIONS AND LEDS

18.1 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 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: ± 10 Vdc / ± 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 | FAULT | Fault (0 Vdc) or normal working (24 Vdc) | Output - on/off signal |
| G | EARTH | | | Internally connected to the driver housing | |

18.2 Main connector signal - 12 pin - /Z option (A2)

| PIN | TEB-SN /Z | TES-SN /Z | TECHNICAL SPECIFICATIONS | NOTES |
|----------|------------------------|-----------|---|---|
| | V+ | | Power supply 24 Vdc | Input - power supply |
| 1 | V0 | | Power supply 0 Vdc | Gnd - power supply |
| 2 | ENABLE referred to: | | Enable (24 Vdc) or disable (0 Vdc) the valve | Input - on/off signal |
| 3 | | V0 | | |
| 4 | Q_INPUT+ | | Flow reference input signal: ± 10 Vdc / ± 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+ | Input - analog signal |
| 6 | Q_MONITOR referred to: | | Flow monitor output signal: ± 10 Vdc / ± 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 |
| | AGND | VL0 | | |
| 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 PE | FAULT referred to: | | Fault (0 Vdc) or normal working (24 Vdc) | Output - on/off signal |
| | V0 | VL0 | | |
| | EARTH | | Internally connected to the driver housing | |

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

18.3 IO-Link connector signals - M12 - 5 pin - Coding A, port class B (A) only for TEB-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

18.4 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) |

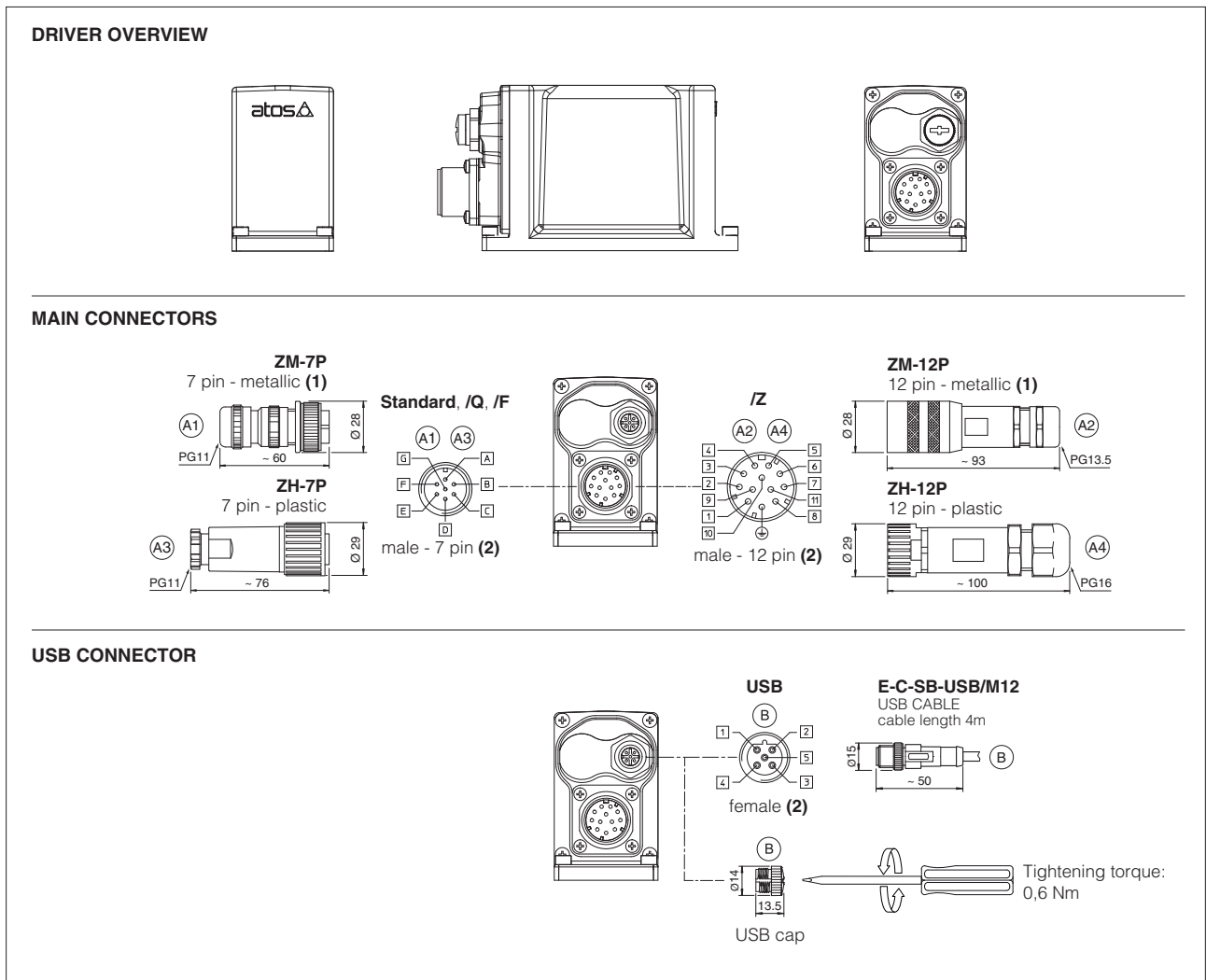
| (C1) (C2) BP fieldbus execution, connector - M12 - 5 pin | | |
|--|--------|---------------------------------------|
| PIN | SIGNAL | TECHNICAL SPECIFICATION (1) |
| 1 | +5V | Termination supply signal |
| 2 | LINE-A | Bus line (high) |
| 3 | DGND | Data line and termination signal zero |
| 4 | LINE-B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

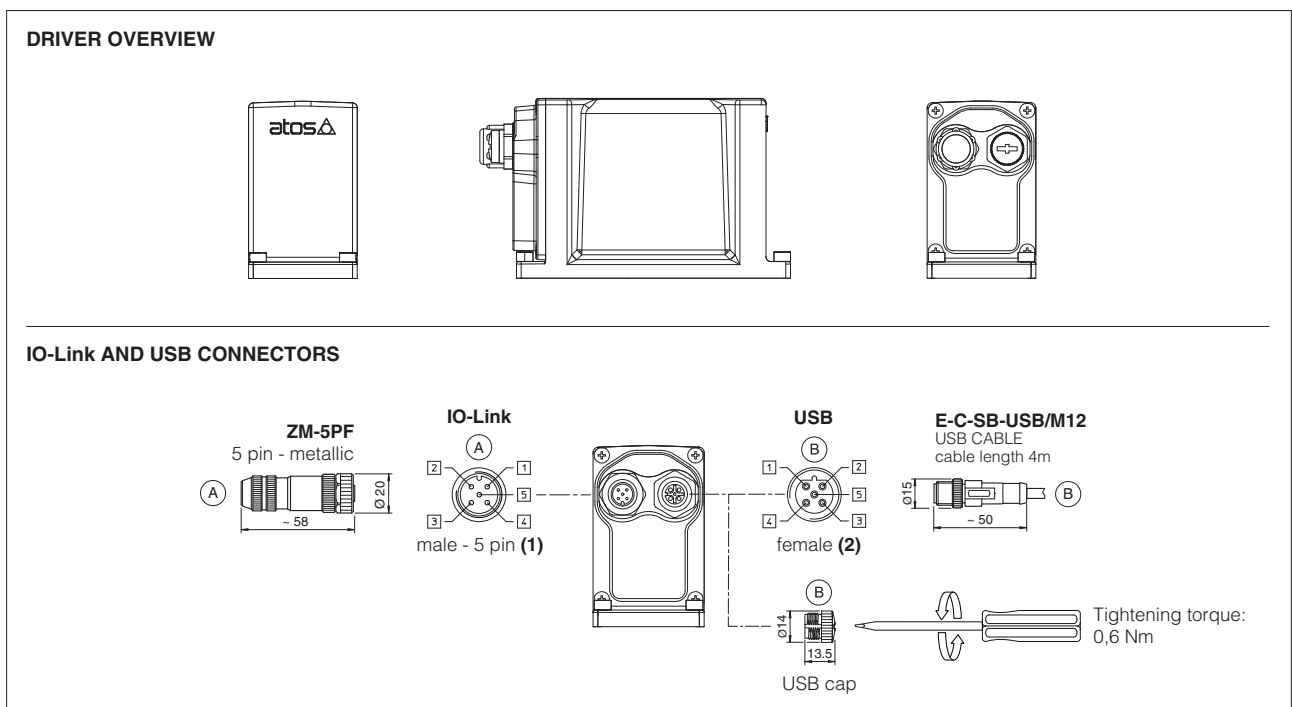
(2) Pin 2 can be fed with external +5V supply of CAN interface

18.5 TEB-SN-NP connections layout



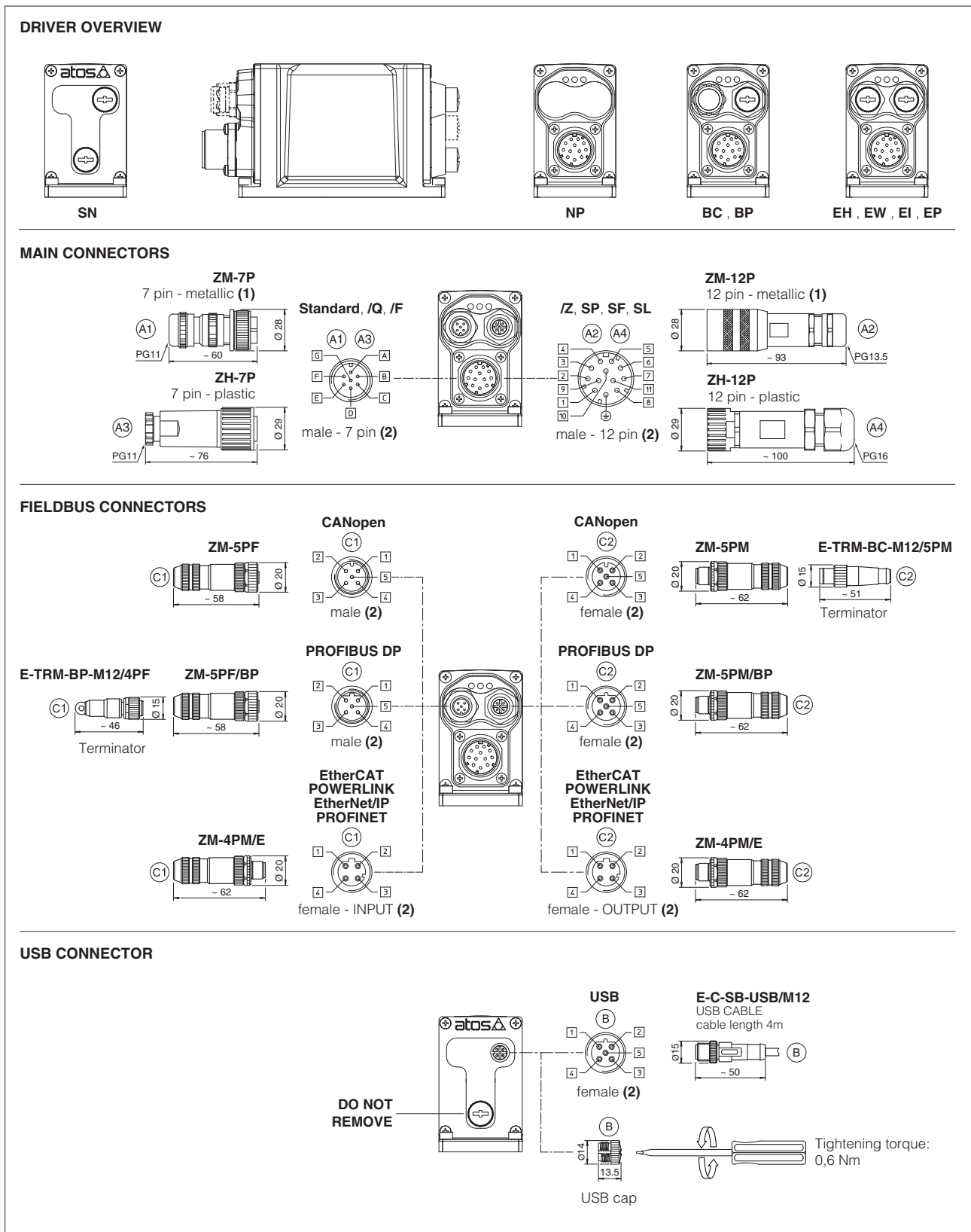
(1) Use of metallic connectors is strongly recommended in order to fulfill EMC requirements (2) Pin layout always referred to driver's view

18.6 TEB-SN-IL connections layout



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

18.7 TES 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

18.8 Diagnostic LEDs - only for TES

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 | | | |

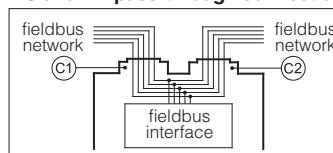
19 IN / OUT FIELDBUS COMMUNICATION CONNECTORS

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



20 CONNECTORS CHARACTERISTICS - to be ordered separately

20.1 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 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 |

20.2 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 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 |

20.3 IO-Link connector - only for TEB-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 mm ² max 20 m |
| Connection type | screw terminal |
| Protection (EN 60529) | IP 67 |

20.4 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

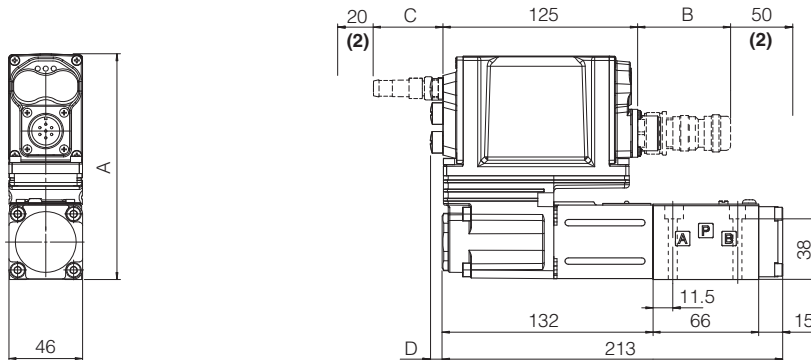
21 FASTENING BOLTS AND SEALS

| | | |
|--|---|---|
| | <p>QVHZO</p> <p>Fastening bolts: 4 socket head screws M5x50 class 12.9 Tightening torque = 8 Nm</p> | <p>QVKZOR</p> <p>Fastening bolts: 4 socket head screws M6x40 class 12.9 Tightening torque = 15 Nm</p> |
| | <p>Seals: 4 OR 108 Diameter of ports A, B, P, T: Ø 7,5 mm (max)</p> | <p>Seals: 5 OR 2050 Diameter of ports A, B, P, T: Ø 11,2 mm (max)</p> |

QVHZO-TEB, QVHZO-TES

ISO 4401: 2005

Mounting surface: 4401-03-02-0-05 (see tab. P005)



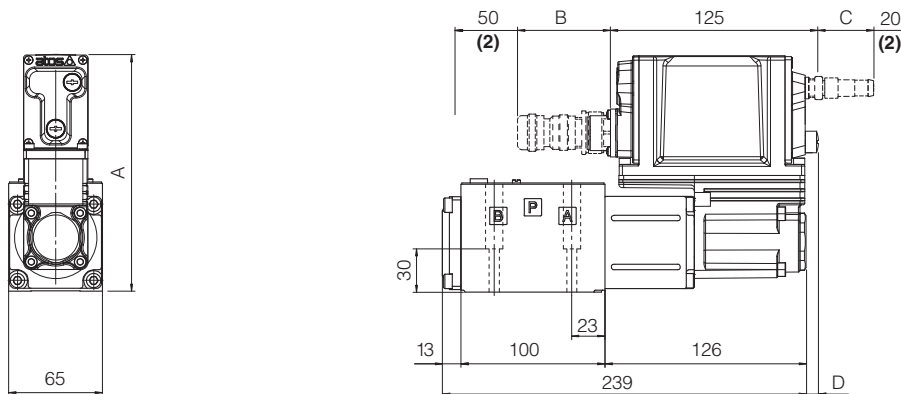
| QVHZO | A | B (1) | C (1) | D | Mass [kg] |
|---------------------------|-----|-------|-------|---|-----------|
| TEB - SN - IL | 140 | 60 | - | - | 2,7 |
| TEB - SN - NP | 140 | 100 | - | - | |
| TES - SN - NP, BC, BP, EH | 140 | 100 | 50 | 8 | |
| TES - SN - EW, EI, EP | 155 | 100 | 50 | 8 | |

- (1) The indicated dimension refers to the longer connectors. For dimensions of all connectors, see sections 18.5, 18.6 and 18.7
 (2) Space required for connection cable and for connector removal

QVKZOR-TEB, QVKZOR-TES

ISO 4401: 2005

Mounting surface: 4401-05-04-0-05 (see tab. P005)



| QVKZOR | A | B (1) | C (1) | D | Mass [kg] |
|---------------------------|-----|-------|-------|---|-----------|
| TEB - SN - IL | 150 | 60 | - | - | 4,7 |
| TEB - SN - NP | 150 | 100 | - | - | |
| TES - SN - NP, BC, BP, EH | 150 | 100 | 50 | 8 | |
| TES - SN - EW, EI, EP | 165 | 100 | 50 | 8 | |

- (1) The indicated dimension refers to the longer connectors. For dimensions of all connectors, see sections 18.5, 18.6 and 18.7
 (2) Space required for connection cable and for connector removal

23 RELATED DOCUMENTATION

| | | | |
|--------------|---|---------------------|---|
| FS001 | Basics for digital electrohydraulics | P005 | Mounting surfaces for electrohydraulic valves |
| FS900 | Operating and maintenance information for proportional valves | QB300 | Quickstart for TEB valves commissioning |
| GS500 | Programming tools | QF300 | Quickstart for TES valves commissioning |
| GS510 | Fieldbus | E-MAN-RI-LEB | TEB/LEB user manual |
| GS520 | IO-Link interface | E-MAN-RI-LES | TES/LES user manual |
| K800 | Electric and electronic connectors | | |