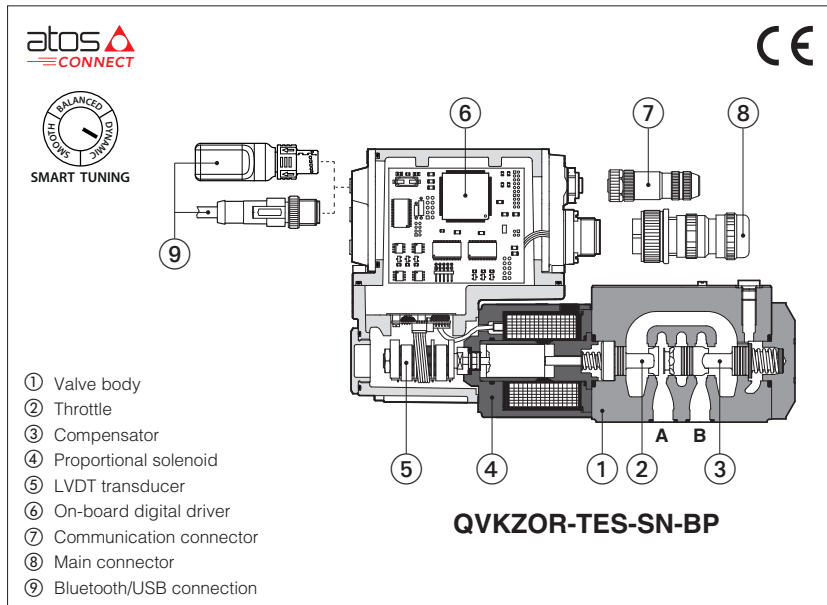


# Digital proportional flow valves

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.

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

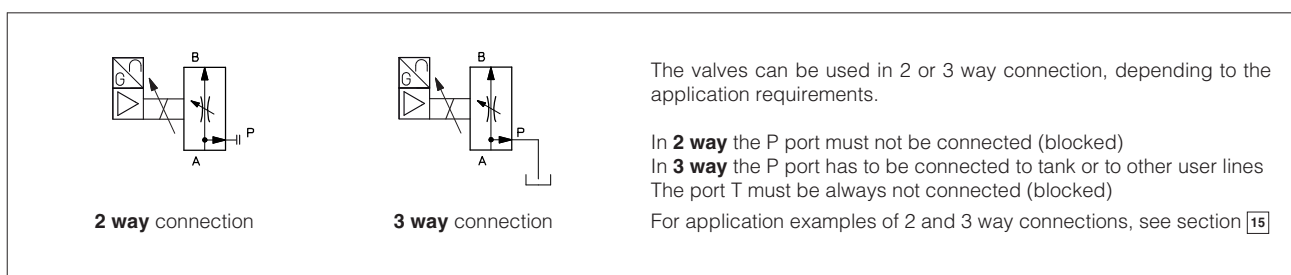
<b>QVHZO:</b>	<b>QVKZOR:</b>
Size: <b>06</b> - ISO 4401	Size: <b>10</b> - ISO 4401
Max flow: <b>45 l/min</b>	Max flow: <b>90 l/min</b>
Max pressure: <b>210 bar</b>	Max pressure: <b>210 bar</b>

### 1 MODEL CODE

<b>QVKZOR</b>	-	<b>TES</b>	-	<b>SN</b>	-	<b>NP</b>	-	<b>10</b>	/	<b>65</b>	/	<b>*</b>	/	<b>*</b>	/	<b>*</b>	/	<b>*</b>	/	<b>*</b>	
Proportional flow control valves, direct, pressure compensated <b>QVHZO</b> = size 06 <b>QVKZOR</b> = size 10																		Series number *		Seals material, see section 13: - = NBR PE = FKM BT = NBR low temp.	
<b>TEB</b> = basic on-board digital driver <b>TES</b> = full on-board digital driver																		Damping plate option, see section 9: <b>V</b> = plate under the digital driver			
<b>Alternated P/Q controls:</b> <b>SN</b> = none																		Bluetooth option, see section 5: <b>T</b> = Bluetooth adapter supplied with the valve			
<b>IO-Link interface</b> , only for TEB, see section 7: <b>NP</b> = Not present <b>IL</b> = IO-Link																		<b>Electronic options (1)</b> , not available for TEB-SN-IL: <b>I</b> = current reference input and monitor 4÷20 mA <b>F</b> = fault signal <b>Q</b> = enable signal <b>Z</b> = double power supply (only for TES), enable, fault and monitor signals - 12 pin connector			
<b>Fieldbus interfaces</b> , only for TES, see section 8: <b>NP</b> = Not present <b>BC</b> = CANopen <b>EW</b> = POWERLINK <b>BP</b> = PROFIBUS DP <b>EI</b> = EtherNet/IP <b>EH</b> = EtherCAT <b>EP</b> = PROFINET RT/IRT																					
<b>Valve size ISO 4401:</b> <b>06</b> = size 06 <b>10</b> = size 10																				<b>Max regulated flow:</b> <b>QVHZO:</b> <b>3</b> = 3,5 l/min <b>36</b> = 35 l/min <b>12</b> = 12 l/min <b>45</b> = 45 l/min <b>18</b> = 18 l/min	<b>QVKZOR:</b> <b>65</b> = 65 l/min <b>90</b> = 90 l/min

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

### 2 HYDRAULIC SYMBOLS



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 15

### 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-SETUP programming software.

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

#### 4.1 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.

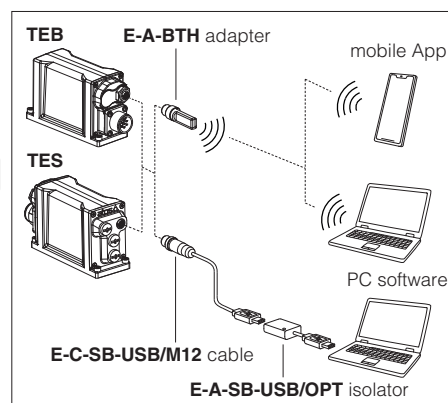


#### 4.2 E-SW-SETUP PC software

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](http://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



### 5 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.

### 6 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 **25**.

### 7 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.

### 8 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.

### 9 DAMPING PLATE OPTION

**V** option adds a rubber damping plate between the valve and the on-board digital driver to reduce acceleration mechanical stress on electronic components, consequently increasing valve life in applications with high vibrations and shocks. For more information see technical table **G004**.

### 10 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 values according to EN ISO 13849	150 years, for further details see technical table P007
Ambient temperature range	<b>Standard</b> = -20°C ÷ +60°C <b>/PE</b> option = -20°C ÷ +60°C <b>/BT</b> option = -40°C ÷ +60°C
Storage temperature range	<b>Standard</b> = -20°C ÷ +70°C <b>/PE</b> option = -20°C ÷ +70°C <b>/BT</b> 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

**11 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 <sup>3</sup> /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							

**12 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 Ω		QVKZOR = 3,8 ÷ 4,1 Ω		
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 <b>GS465</b> )				
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 <b>22</b>				

**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.

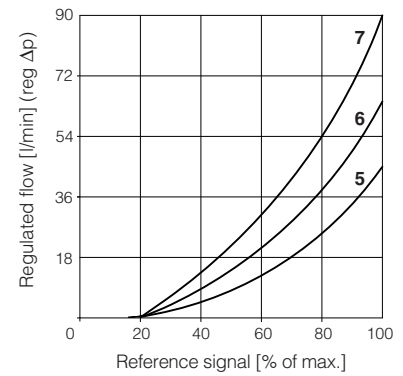
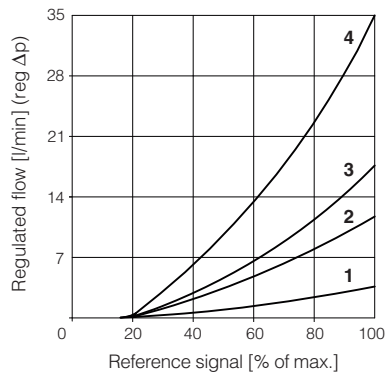
**13 SEALS AND HYDRAULIC FLUIDS** - for other fluids not included in below table, consult our technical office

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 <sup>2</sup> /s - max allowed range 15 ÷ 380 mm <sup>2</sup> /s		
Max fluid contamination level	normal operation	ISO4406 class 18/16/13 NAS1638 class 7	see also filter section at
	longer life	ISO4406 class 16/14/11 NAS1638 class 5	www.atos.com or KTF catalog
<b>Hydraulic fluid</b>	<b>Suitable seals type</b>	<b>Classification</b>	<b>Ref. Standard</b>
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	

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

**14.1 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

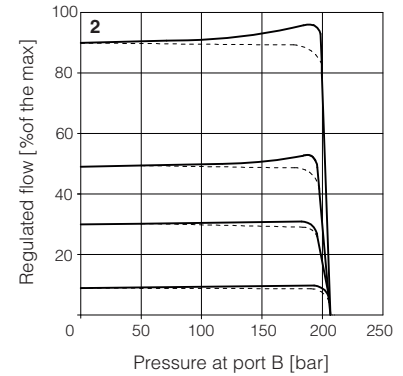
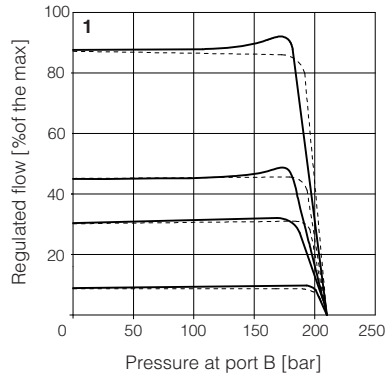


**14.2 Regulated flow/outlet pressure diagrams**

with inlet pressure = 210 bar

- 1 = QVHZO
- 2 = QVKZOR

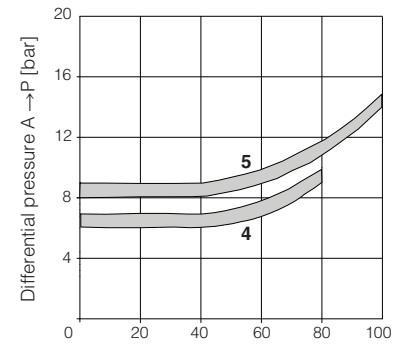
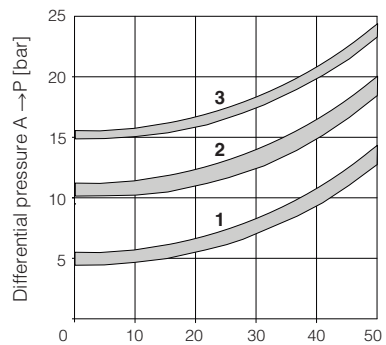
Dotted line for 3-way versions



**14.3 Flow A → P/Δp diagrams**

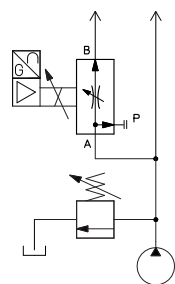
3-way configuration

- 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



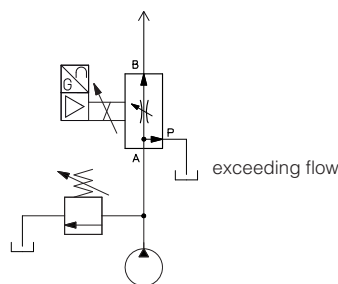
**15 APPLICATIONS AND CONNECTIONS**

compensated flow



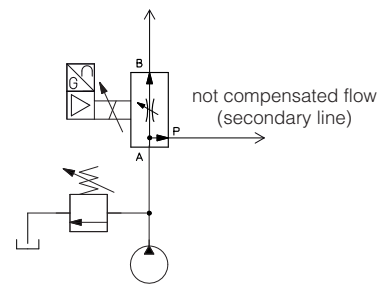
**2 way connection**

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.

## 16 ELECTRONIC 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 18.9 for signal specifications.
- I** = This option provides  $4 \div 20$  mA current reference and monitor signals, instead of the standard  $0 \div 10$  VDC.  
Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of  $\pm 10$  VDC or  $\pm 20$  mA.  
It is normally used in case of long distance between the machine control unit and the valve or where the reference signal can be affected by electrical noise; the valve functioning is disabled in case of reference signal cable breakage.
- 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 18.7 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 18.6)  
**Power supply for driver's logics and communication** - only for **TES** (see 18.2)

## 17 POSSIBLE COMBINED OPTIONS - not available for **TEB-SN-IL**

/F1, /IQ, /IZ

**Note:** /T Bluetooth adapter option and /V damping plate option can be combined with all other options

## 18 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 19

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

The power supply must be appropriately stabilized or rectified and filtered: apply at least a  $10000 \mu\text{F}/40$  V capacitance to single phase rectifiers or a  $4700 \mu\text{F}/40$  V capacitance to three phase rectifiers. In case of separate power supply see 18.2.



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

### 18.2 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  $10000 \mu\text{F}/40$  V capacitance to single phase rectifiers or a  $4700 \mu\text{F}/40$  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.

### 18.3 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  $0 \div 24$ VDC.

### 18.4 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  $0 \div 10$  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.

### 18.5 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.

### 18.6 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 18.5).

### 18.7 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  $4 \div 20$  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.

## 19 IO-LINK SIGNALS SPECIFICATIONS - only for **TEB-SN-IL**

### 19.1 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

### 19.2 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-

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

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

## 20 ELECTRONIC CONNECTIONS AND LEDS

### 20.1 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: $\pm 10$ Vdc / $\pm 20$ mA maximum range Defaults are 0 ÷ 10 Vdc for standard and 4 ÷ 20 mA for /I option	Input - analog signal <b>Software selectable</b>
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 ÷ 10 Vdc for standard and 4 ÷ 20 mA for /I option	Output - analog signal <b>Software selectable</b>
	AGND	V0	FAULT	Fault (0 Vdc) or normal working (24 Vdc)	Output - on/off signal
G	EARTH			Internally connected to the driver housing	

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

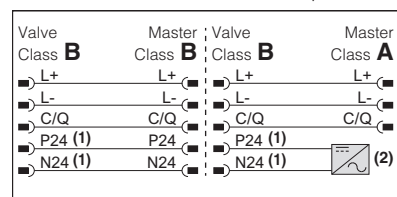
PIN	TEB-SN /Z	TES-SN /Z	TECHNICAL SPECIFICATIONS	NOTES
	V+		Power supply 24 Vdc	Input - power supply
1	V0		Power supply 0 Vdc	Gnd - power supply
2	ENABLE referred to:		Enable (24 Vdc) or disable (0 Vdc) the valve	Input - on/off signal
3		V0		
4	Q_INPUT+		Flow reference input signal: $\pm 10$ Vdc / $\pm 20$ mA maximum range Defaults are 0 ÷ 10 Vdc for standard and 4 ÷ 20 mA for /I option	Input - analog signal <b>Software selectable</b>
5	INPUT-		Negative reference input signal for Q_INPUT+	Input - analog signal
6	Q_MONITOR referred to:		Flow monitor output signal: $\pm 10$ Vdc / $\pm 20$ mA maximum range Defaults are 0 ÷ 10 Vdc for standard and 4 ÷ 20 mA for /I option	Input - analog signal <b>Software selectable</b>
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	
		VLO	Power supply 0 Vdc for driver's logic and communication	Gnd - power supply
11	FAULT referred to:		Fault (0 Vdc) or normal working (24 Vdc)	Output - on/off signal
PE	V0	VLO		
	EARTH		Internally connected to the driver housing	

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

### 20.3 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

Valve to Master connection examples



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

(1) Maximum power consumption: 50 W

(2) External power supply

### 20.4 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

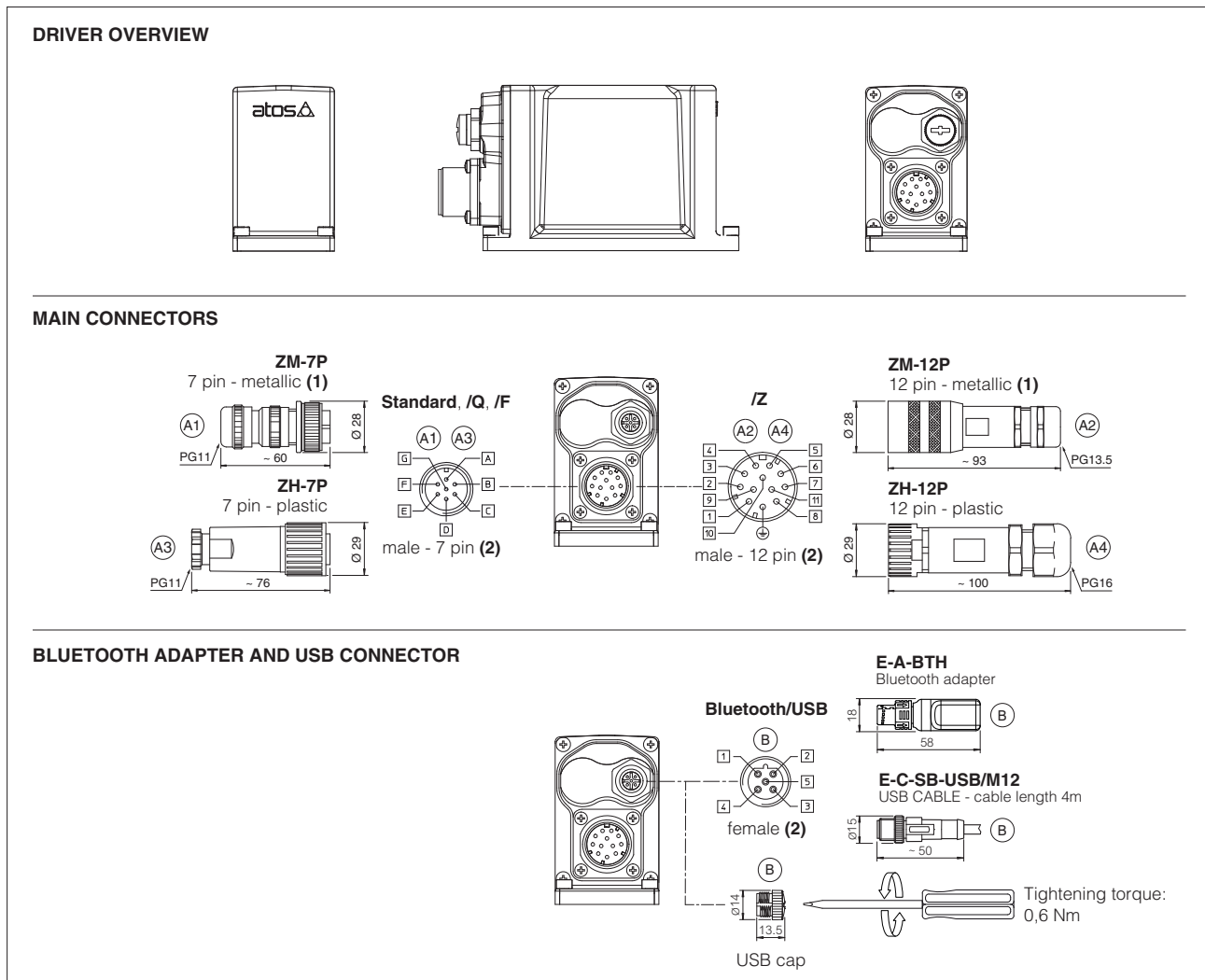
PIN	SIGNAL	TECHNICAL SPECIFICATION (1)
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
	SHIELD	

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

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

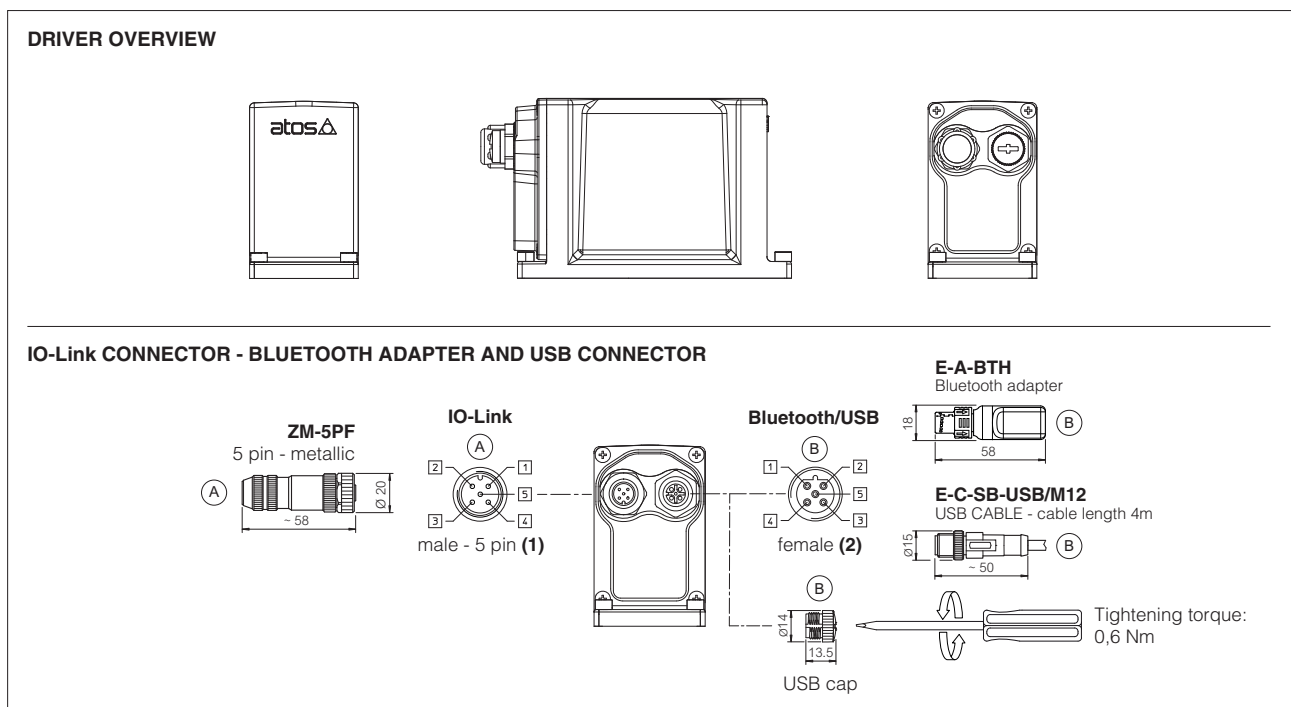


## 20.5 TEB-SN-NP connections layout



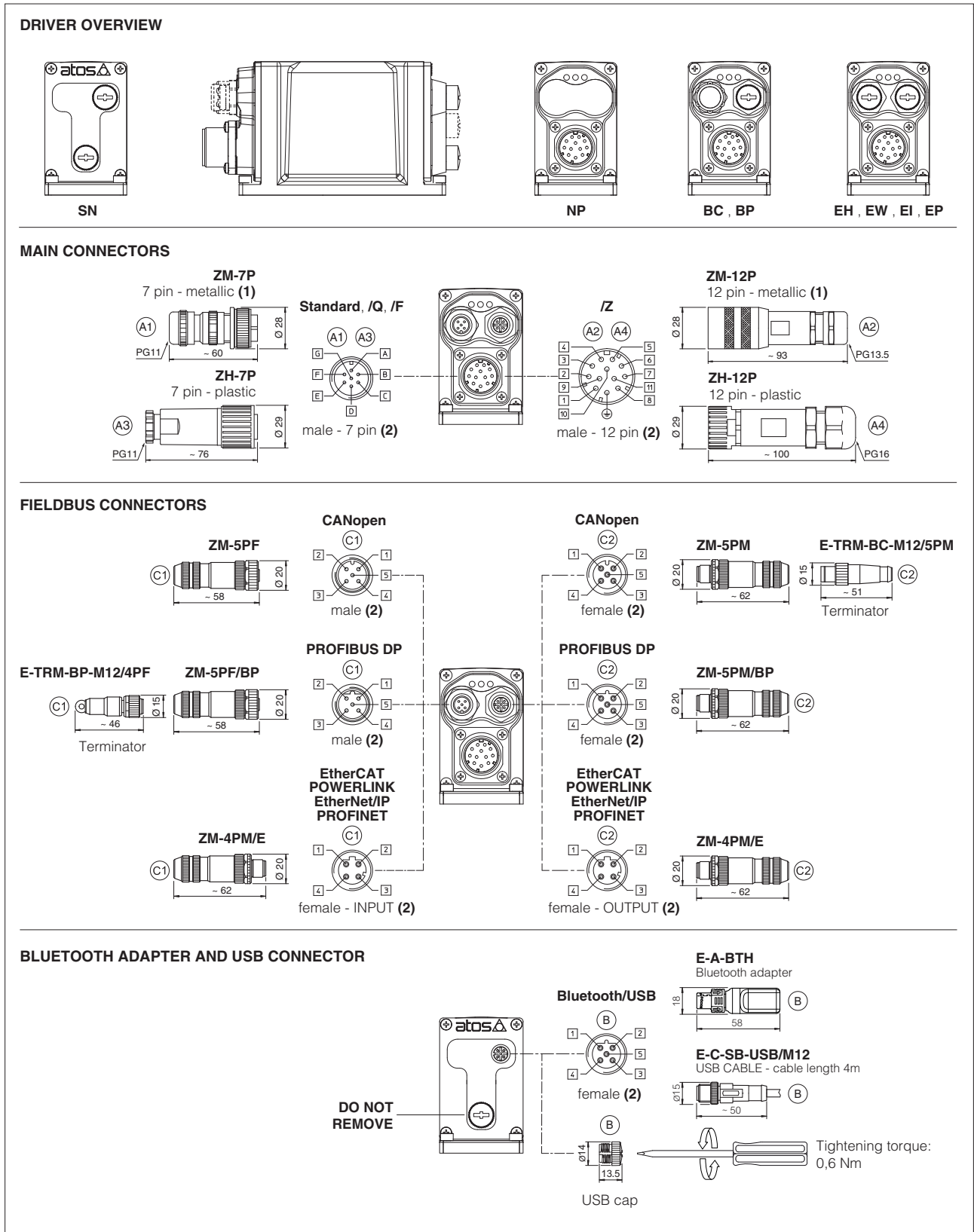
(1) Use of metallic connectors is strongly recommended in order to fulfill EMC requirements (2) Pin layout always referred to driver's view

## 20.6 TEB-SN-IL connections layout



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

## 20.7 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

## 20.8 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			



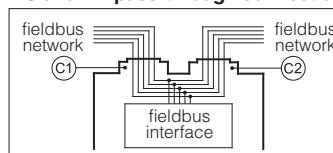
## 21 IN / OUT FIELDBUS COMMUNICATION CONNECTORS

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



## 22 CONNECTORS CHARACTERISTICS - to be ordered separately

### 22.1 Main connectors - 7 pin

CONNECTOR TYPE	POWER SUPPLY AND SIGNALS	POWER SUPPLY AND SIGNALS
<b>CODE</b>	<b>(A1) ZM-7P</b>	<b>(A3) ZH-7P</b>
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 <sup>2</sup> max 20 m (logic and power supply) or LiYCY 7 x 1 mm <sup>2</sup> max 40 m (logic and power supply)	LiYCY 7 x 0,75 mm <sup>2</sup> max 20 m (logic and power supply) or LiYCY 7 x 1 mm <sup>2</sup> max 40 m (logic and power supply)
Conductor size	up to 1 mm <sup>2</sup> - available for 7 wires	up to 1 mm <sup>2</sup> - available for 7 wires
Connection type	to solder	to solder
Protection (EN 60529)	IP 67	IP 67

### 22.2 Main connectors - 12 pin

CONNECTOR TYPE	POWER SUPPLY AND SIGNALS	POWER SUPPLY AND SIGNALS
<b>CODE</b>	<b>(A2) ZM-12P</b>	<b>(A4) ZH-12P</b>
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 <sup>2</sup> max 20 m (logic and power supply)	LiYCY 10 x 0,14mm <sup>2</sup> max 40 m (logic) LiYY 3 x 1mm <sup>2</sup> max 40 m (power supply)
Conductor size	0,5 mm <sup>2</sup> to 1,5 mm <sup>2</sup> - available for 12 wires	0,14 mm <sup>2</sup> to 0,5 mm <sup>2</sup> - available for 9 wires 0,5 mm <sup>2</sup> to 1,5 mm <sup>2</sup> - available for 3 wires
Connection type	to crimp	to crimp
Protection (EN 60529)	IP 67	IP 67

### 22.3 IO-Link connector - only for TEB-SN-IL

CONNECTOR TYPE	IL IO-Link
<b>CODE</b>	<b>(A) ZM-5PF</b>
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 <sup>2</sup> max 20 m
Connection type	screw terminal
Protection (EN 60529)	IP 67

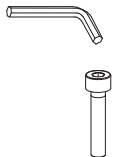

### 22.4 Fieldbus communication connectors

CONNECTOR TYPE	BC CANopen (1)		BP PROFIBUS DP (1)		EH EtherCAT, EW POWERLINK, EI EtherNet/IP, EP PROFINET (2)
<b>CODE</b>	<b>(C1) ZM-5PF</b>	<b>(C2) ZM-5PM</b>	<b>(C1) ZM-5PF/BP</b>	<b>(C2) ZM-5PM/BP</b>	<b>(C1) (C2) ZM-4PM/E</b>
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

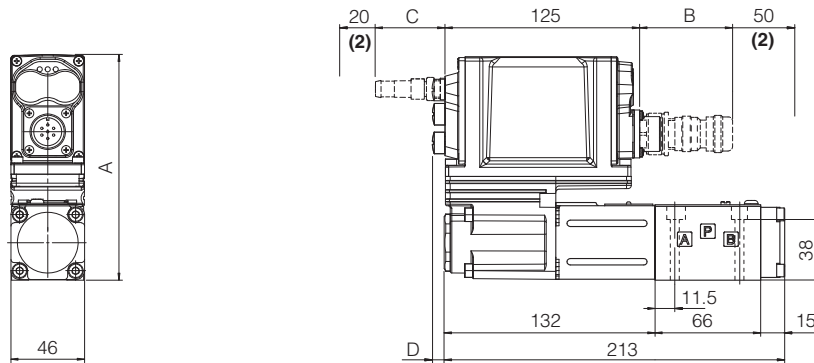
## 23 FASTENING BOLTS AND SEALS

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

## QVHZO-TEB, QVHZO-TES

ISO 4401: 2005

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



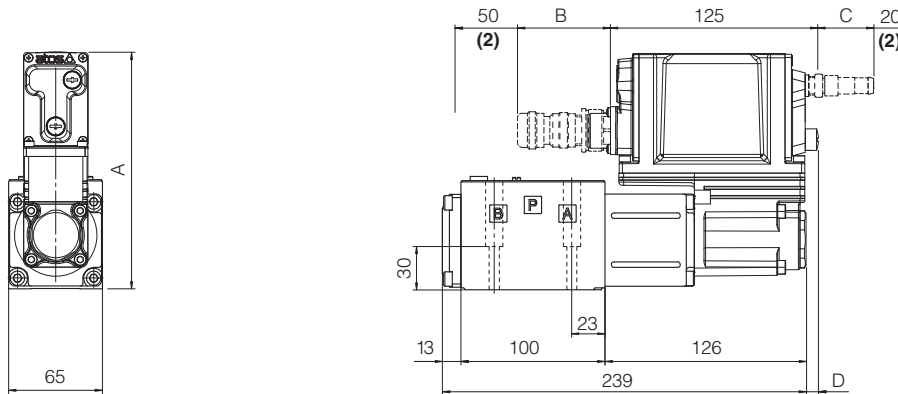
QVHZO	A	B (1)	C (1)	D	Mass [kg]
TEB - SN - IL	140	60	-	-	2,7
TEB - SN - NP	140	100	-	-	
TES - SN - NP, BC, BP, EH	140	100	58	8	
TES - SN - EW, EI, EP	155	100	58	8	
Option /V	+15		-		

- (1) The indicated dimension refers to the longer connectors or Bluetooth adapter  
For dimensions of connectors and Bluetooth adapter, see sections 20.5, 20.6 and 20.7  
(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	58	8	
TES - SN - EW, EI, EP	165	100	58	8	
Option /V	+15		-		

- (1) The indicated dimension refers to the longer connectors or Bluetooth adapter  
For dimensions of connectors and Bluetooth adapter, see sections 20.5, 20.6 and 20.7  
(2) Space required for connection cable and for connector removal

## 25 RELATED DOCUMENTATION

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