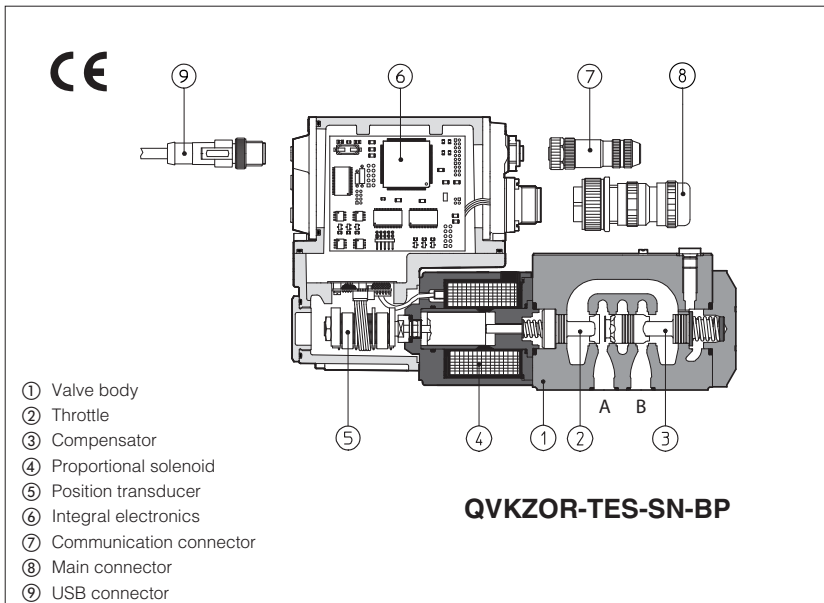


Proportional flow valves

digital, pressure compensated, direct operated, with position transducer



QVHZO-TEB, QVHZO-TES

QVKZOR-TEB, QVKZOR-TES

Pressure compensated proportional flow control valves, direct operated.

They are equipped with LVDT position transducer for best accuracy in flow regulations.

The integral digital electronic driver performs the valve's hydraulic regulation according to the reference signal and assures valve-to-valve interchangeability thanks to the factory presetting.

They are available in TEB basic execution with analog reference signals and USB port for software functional parameters setting or in TES full execution which includes also optional fieldbus interfaces for functional parameters setting, reference signals and real-time diagnostics.

Sizes: **06** and **10**

Max flow: up to **45** and **90 l/min**

Max pressure: **210 bar**

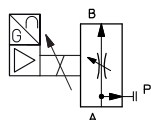
1 MODEL CODE

[illegible]

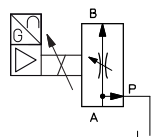
(1) TEB basic execution available only in version **SN-NP**

(2) double power supply only for **TES**

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 **2 way** the F 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 **9**

3 GENERAL NOTES

QVHZO-TEB, TES and QVKZOR-TEB, TES proportional valves are CE marked according to the applicable Directives (e.g. Immunity/Emission EMC Directive and Low Voltage Directive). Installation, wirings and start-up procedures must be performed according to the general prescriptions shown in table F003 and in the installation notes supplied with relevant components. The electrical signals of the valve (e.g. 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, EN-982).

4 FIELDBUS - only for TES

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. For detailed information about fieldbus features and specification see tech table **GS510**.

5 MAIN CHARACTERISTICS - based on mineral oil ISO VG 46 at 50 °C

Assembly position	Any position			
Subplate surface finishing	Roughness index, Ra 0,4 flatness ratio 0,01/100 (ISO 1101)			
MTTFd valves according to EN ISO 13849	150 years, see technical table P007			
Ambient temperature range	standard execution = -20°C ÷ +60°C /BT option = -40°C ÷ +60°C			
Storage temperature range	Standard execution = -20°C ÷ +70°C /BT option = -40°C ÷ +60°C			
Coil resistance R at 20°C	QVHZO = 3 ÷ 3,3 Ω QVKZOR = 3,8 ÷ 4,1 Ω			
Max. solenoid current	QVHZO = 2,6 A QVKZOR = 3 A			
Max. power	50 Watt			
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	IP66/67			
Tropicalization	Tropical coating on electronics PCB			
Duty factor	Continuous rating (ED=100%)			
EMC, climate and mechanical load	See technical table G004			
Communication interface	USB Atos ASCII coding	CANopen EN50325-4 + DS408	PROFIBUS DP EN50170-2/IEC61158	EtherCAT IEC 61158
Communication physical layer	not insulated USB 2.0 + USB OTG	optical insulated CAN ISO11898	optical insulated RS485	Fast Ethernet, insulated 100 Base TX

Valve model	QVHZO					QVKZOR	
Max regulated flow [l/min]	3,5	12	18	35	45	65	90
Min regulated flow (1) [cm³/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 (2) [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						

Notes: Above performance data refer to valves coupled with Atos electronic drivers, see sections.

(1) For different Δp, the max flow is in accordance to the diagrams in section 8.2

(2) Referred to spool in neutral position and 50°C oil temperature.

(3) 0-100% step signal

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

Seals, recommended fluid temperature	NBR seals (standard) = -20°C ÷ +60°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option) = -20°C ÷ +80°C HNBR seals (/BT option) = -40°C ÷ +60°C, with HFC hydraulic fluids = -40°C ÷ +50°C		
Recommended viscosity	20÷100 mm²/s - max allowed range 15 ÷ 380 mm²/s		
Fluid contamination class	ISO 4406 class 20/18/15 NAS 1638 class 9, in line filters of 10 μm (β10 ≥75 recommended)		
Hydraulic fluid	Suitable seals type	Classification	Ref. Standard
Mineral oils	NBR, FKM, HNBR	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water	FKM	HFDU, HFDR	ISO 12922
Flame resistant with water	NBR, HNBR	HFC	

7 ELECTRONIC DRIVERS

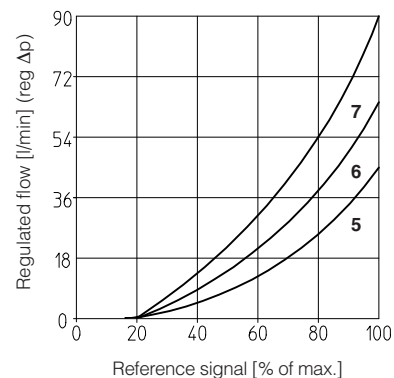
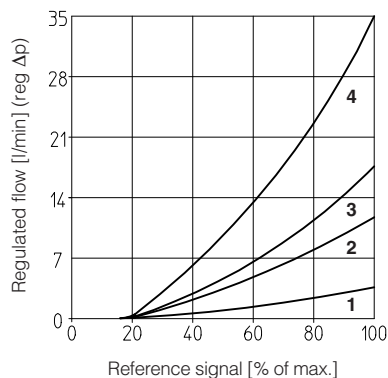
Valve model	TEB	TES
Drivers model	E-RI-TEB-N	E-RI-TES-N
Type	Digital	
Format	Integral to valve	
Data sheet	GS208	GS210

Note: for main and communication connector see sections 12, 13

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

8.1 Regulation diagrams

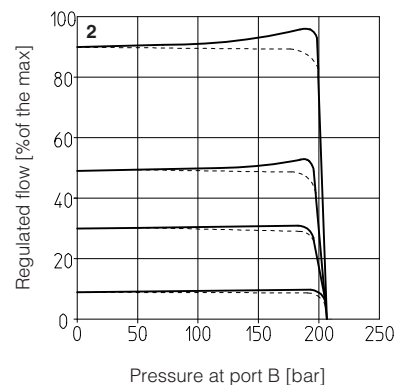
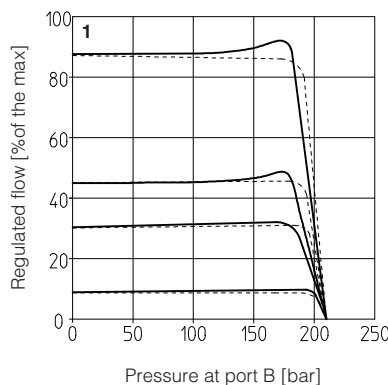
- 1 = QVHZO-*-06/3
- 2 = QVHZO-*-06/12
- 3 = QVHZO-*-06/18
- 4 = QVHZO-*-06/36
- 5 = QVHZO-*-06/45
- 6 = QVKZOR-*-10/65
- 7 = QVKZOR-*-10/90



8.2 Regulated flow/outlet pressure diagrams with inlet pressure = 210 bar

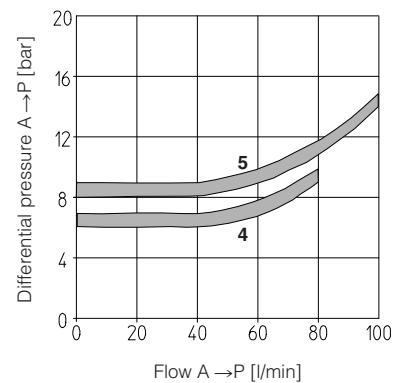
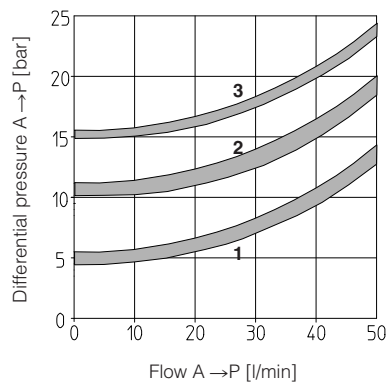
- 1 = QVHZO
- 2 = QVKZOR

Dotted line for 3-way versions

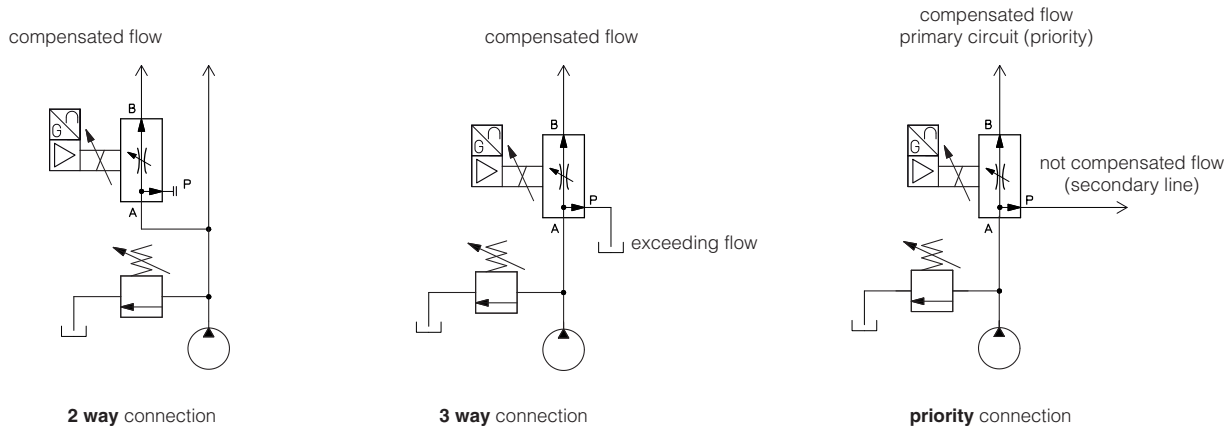


8.3 Flow A → P/Δp diagrams 3-way configuration

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



9 APPLICATIONS AND CONNECTIONS



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.

10 ELECTRONIC OPTIONS

Standard driver execution provides on the 7 pin main connector:

Power supply - 24 VDC must be appropriately stabilized or rectified and filtered; a 2,5 A safety fuse is required in series to each driver power supply. Apply at least a 10000 μ F/40 V capacitance to single phase rectifiers or a 4700 μ F/40 V capacitance to three phase rectifiers.

Reference input signal - analog differential input with ± 10 VDC nominal range (pin D, E), proportional to desired valve spool position.

Monitor output signal - analog output signal proportional to the actual valve's spool position with ± 10 VDC nominal range.

A minimum time of 300 to 500 ms have to be considered between the driver energizing with the 24 Vdc power supply and when the valve is ready to operate. During this time the current to the valve coils is switched to zero.

10.1 Option /F

It provides a Fault output signal in place of the Monitor output signal, to indicate fault conditions of the driver (cable interruption of spool transducers or reference signal - for /I option): Fault presence corresponds to 0 VDC, normal working corresponds to 24 VDC.

10.2 Option /I

It provides 4 \div 20 mA current reference and monitor signals, instead of the standard ± 10 V.

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

10.3 Option /Q

It provides the possibility to enable or disable the valve functioning without cutting the power supply (the valve functioning is disabled but the driver current output stage is still active). To enable the driver supply a 24 VDC on the enable input signal.

10.4 Option /Z

It provides, on the 12 pin main connector, the following additional features:

Enable Input Signal

To enable the driver, supply 24 VDC on pin 3 referred to pin 2: when the Enable signal is set to zero the valve functioning is disabled (zero current to the solenoid) but the driver current output stage is still active.

Fault Output Signal

Fault output signal indicates fault conditions of the driver (solenoid short circuits/not connected, reference signal cable broken for 4-20mA input, etc.). Fault presence corresponds to 0 VDC, normal working corresponds to 24VDC (pin 11 referred to pin 2): Fault status is not affected by the Enable input signal.

Power supply for driver's logics and communication - only for TES

Separated power supply for the solenoid (pin 1, 2) and for the digital electronic circuits (pin 9, 10).

Cutting solenoid power supply allows to interrupt the valve functioning but keeping energized the digital electronics thus avoiding fault conditions of the machine fieldbus controller. This condition aids to realize safety systems in compliance with European Norms EN13849-1 (ex EN954-1).

10.5 Possible combined options

/FI, /IQ and /IZ

11 ELECTRONIC CONNECTIONS AND LEDS

11.1 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 ± 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: AGND V0			Flow monitor output signal: ± 10 Vdc / ± 20 mA maximum range Defaults are ± 10 Vdc for standard and $4 \div 20$ mA for /I option	Output - analog signal Software selectable
			FAULT	Fault (0 Vdc) or normal working (24 Vdc)	Output - on/off signal
G	EARTH			Internally connected to the driver housing	

11.2 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: 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 Defaults are ± 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: AGND VL0		Flow monitor output signal: ± 10 Vdc / ± 20 mA maximum range Defaults are ± 10 Vdc for standard and $4 \div 20$ mA for /I option	Input - analog signal Software selectable
7	AGND		Analog ground	Output - analog signal
8		NC	Do not connect	Gnd - analog signal
	R_ENABLE		Repeat enable, output repeter signal of enable input, referred to V0	
9		NC	Do not connect	Output - on/off signal
	NC		Do not connect	
10		VL+	Power supply 24 Vdc for driver's logic and communication	Input - power supply
11 PE		NC	Do not connect	
	FAULT referred to: 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

11.3 Communications connectors (B) - (C)

(B) USB connector - M12 - 5 pin always present		
PIN	SIGNAL	TECHNICAL SPECIFICATION (1)
1	+5V_USB	Supply for external USB Flash Drive
2	ID	USB Flash Drive identification
3	GND_USB	Signal zero data line
4	D-	Data line -
5	D+	Data line +

(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	

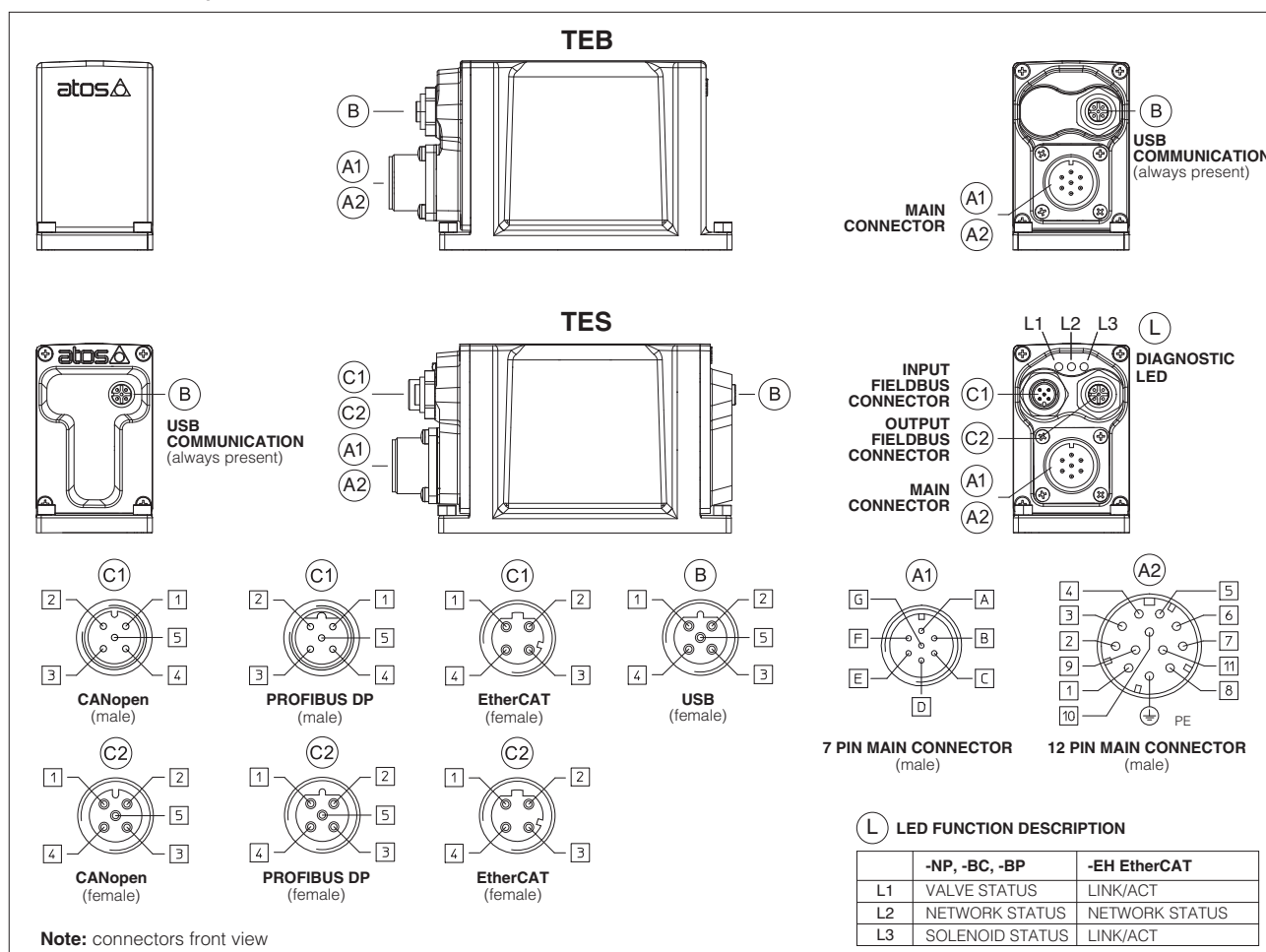
Notes: (1) shield connection on connector's housing is recommended

(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)

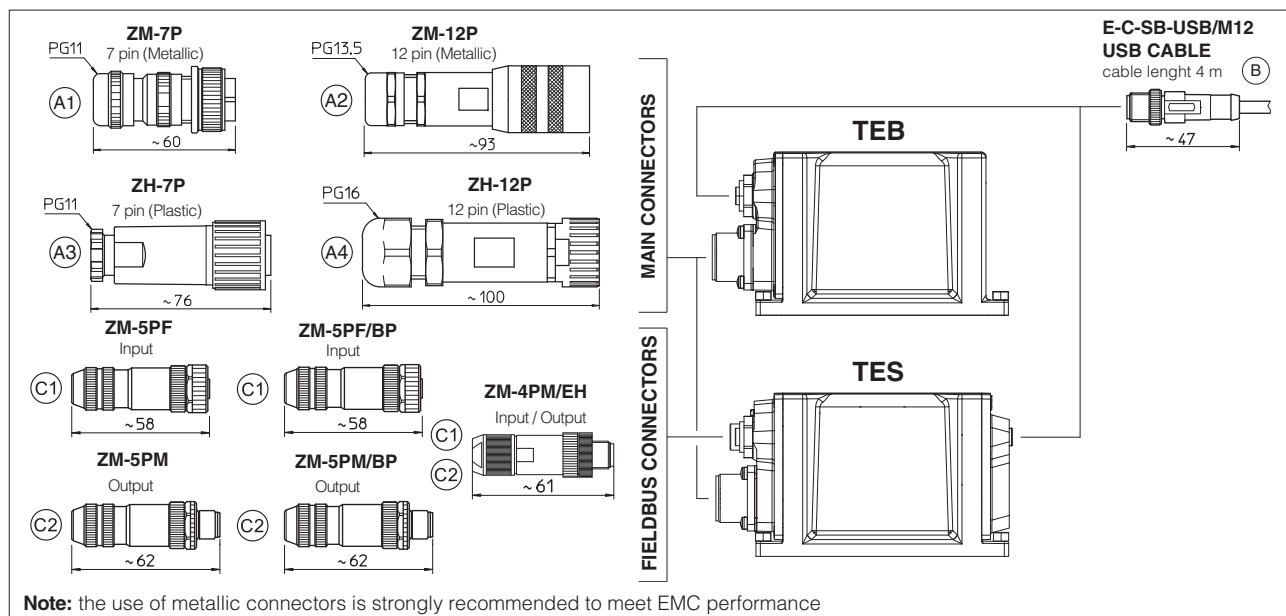
(C1) (C2) EH fieldbus execution, connector - M12 - 4 pin		
PIN	SIGNAL	TECHNICAL SPECIFICATION (1)
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
	SHIELD	

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

11.4 Connections layout



12 CONNECTORS



13 MODEL CODES OF MAIN CONNECTORS AND COMMUNICATION CONNECTORS - to be ordered separately

VALVE VERSION	TES	TEB /Z TES /Z	CANopen (BC)	PROFIBUS DP (BP)	EtherCat (EH)
CONNECTOR CODE	ZM-7P (A1)	ZM-12P (A2)	ZM-5PF (C1)	ZM-5PF/BP (C1)	ZM-4PM/EH (C1)
	ZH-7P (A3)	ZH-12P (A4)	ZM-5PM (C2)	ZM-5PM/BP (C2)	ZM-4PM/EH (C2)
PROTECTION DEGREE	IP67				
DATA SHEET	GS208, GS210, K500				

only for TES

14 PROGRAMMING TOOLS - see table GS500



Valve's functional parameters and configurations, can be easily set and optimized using Atos E-SW programming software connected via USB communication port to the digital driver. E-SW software is available in different versions according to the driver's fieldbus interface:

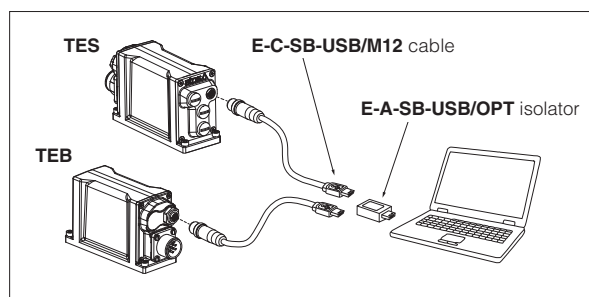
NP (not present) E-SW-PS, BC (CANopen) E-SW-BC, BP (PROFIBUS DP) E-SW-BP and EH (EtherCAT) E-SW-EH.

For fieldbus versions, E-SW software permits valve's parameterization through USB communication port also if the driver is connected to the central machine unit via fieldbus.

WARNING: drivers USB port is not isolated!

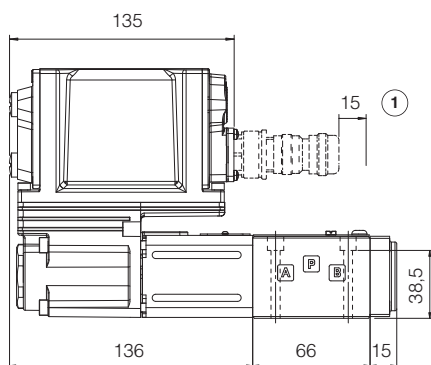
Use of E-A-SB-USB/OPT isolator adapter is highly recommended for PC protection.

USB connection

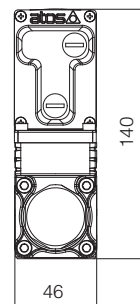


15 INSTALLATION DIMENSIONS [mm]

QVHZO-TEB QVHZO-TES



Mass: 2,3 kg



ISO 4401: 2005

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

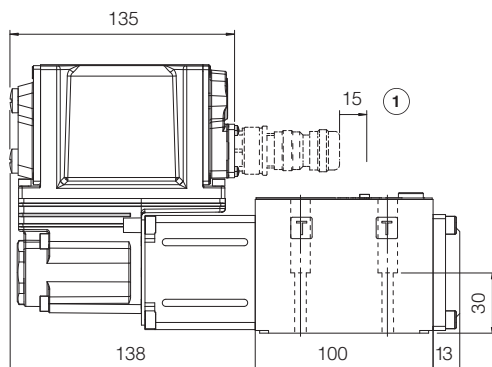
Fastening bolts: 4 socket head screws M5x50 class 12.9

Tightening torque = 8 Nm

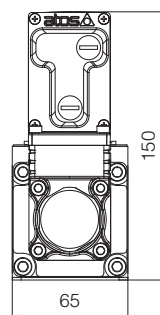
Seals: 4 OR 108;

Diameter of ports A, B, P, T: Ø 7,5 mm (max)

QVKZOR-TEB QVKZOR-TES



Mass: 4,3 kg



ISO 4401: 2005

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

Fastening bolts: 4 socket head screws M6x40 class 12.9

Tightening torque = 15 Nm

Seals: 5 OR 2050;

Diameter of ports A, B, P, T: Ø 11,2 mm (max)

① = Space to remove the 7 or 12 pin main connector

Note: for main and communication connectors see section 12, 13