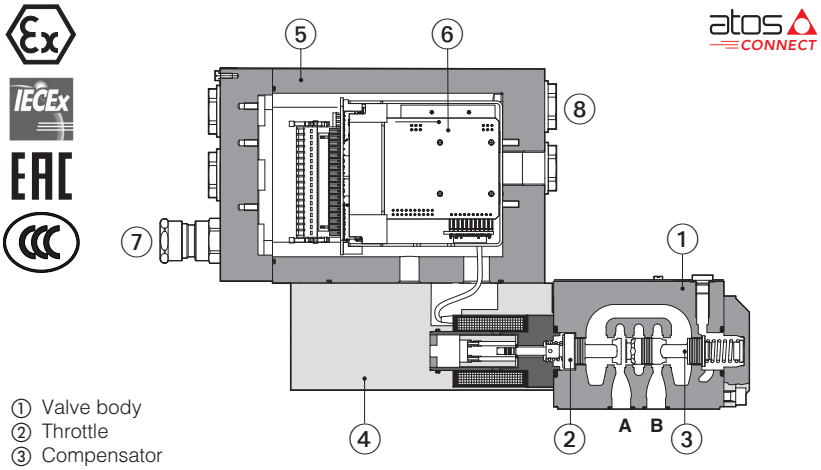
Ex-proof digital proportional flow valves

pressure compensated with on-board driver and without transducer - **ATEX, IECEx, EAC, CCC**



① Valve body
② Throttle
③ Compensator
④ Ex-proof solenoid
⑤ Ex-proof electronics housing
⑥ Ex-proof digital driver
⑦ Ex-proof cable glands
⑧ Bluetooth/USB connection

QVKZA-AES-NP-10

QVHZA-AES, QVKZA-AES

Ex-proof digital proportional flow valves, without position transducer for pressure compensated flow regulations.

They are equipped with ex-proof on-board digital driver and solenoid certified for safe operations in hazardous environments with potentially explosive atmosphere.

- Multicertification **ATEX**, **IECEx**, **EAC**, **CCC** for gas group **II 2G** and dust category **II 2D**

The flameproof enclosure of on-board digital driver and solenoid prevents the propagation of accidental internal sparks or fire to the external environment.

The driver and solenoid are also designed to limit the surface temperature within the classified limits.

QVHZA:
Size: **06** - ISO4401
Max flow: **45 l/min**
Max pressure: **210 bar**

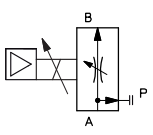
QVKZA:
Size: **10** - ISO4401
Max flow: **90 l/min**
Max pressure: **210 bar**

1 MODEL CODE

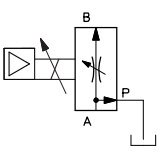
QVKZA	- AES - NP - 10 / 65 / M / *	* / *
Ex-proof pressure compensate proportional flow valve, direct **QVHZA** = size 06 **QVKZA** = size 10	**AES** = on-board driver, without transducer **Fieldbus interface,** see section 5 : **NP** = Not Present **BC** = CANopen **BP** = PROFIBUS DP **EH** = EtherCAT **Valve size** ISO 4401: **06** = size 06 **10** = size 10 **Max regulated flow**: QVHZA: **3** = 3,5 l/min **36** = 35 l/min **12** = 12 l/min **45** = 45 l/min **18** = 18 l/min QVKZA: **65** = 65 l/min **90** = 90 l/min **Cable entrance threaded connection**: **M** = M20x1,5 **Hydraulic options (1)**: **D** = quick venting of port B **Electronic options (1)**: **I** = current reference input 4 ÷ 20 mA	Series number **Seals material,** see section 9 : **-** = NBR **PE** = FKM **BT** = NBR low temp.

(1) For possible combined options, see section 15

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)

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 **FX900** and in the user manuals included in the E-SW-SETUP programming software.

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

WARNING: the below operation must be performed in a safety area!

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.

Download on the App Store — GET IT ON Google Play — EXPLORE IT ON AppGallery

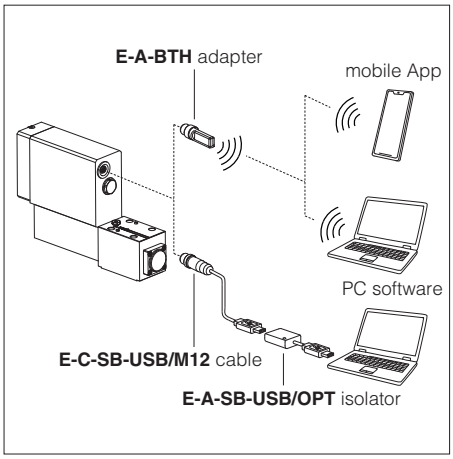
4.2 E-SW-SETUP PC software

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 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

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

Bluetooth or USB connection



5 FIELDBUS - see tech. table **GS510**

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

6 GENERAL CHARACTERISTICS

Assembly position	Any position
Subplate surface finishing to ISO 4401	Acceptable roughness index, Ra ≤0,8 recommended Ra 0,4 - flatness ratio 0,01/100
MTTFd values 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
Corrosion resistance	Salt spray test (ISO 9227) > 200 h
Vibration resistance	See technical table GX004
Compliance	Explosion proof protection, see section 10 -Flame proof enclosure “Ex d” -Dust ignition protection by enclosure “Ex t” RoHs Directive 2011/65/EU as last update by 2015/863/EU REACH Regulation (EC) n°1907/2006

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

Valve model		QVHZA					QVKZA	
Max regulated flow	[l/min]	3,5	12	18	35	45	65	90
Min regulated flow	[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 **(1)**	[l/min]	40			50	55	70	100
Max pressure	[bar]	210						
Response time 0÷100% step signal	[ms]	≤ 35					≤ 50	
Hysteresis		≤ 5 [% of the regulated max flow]						
Linearity		≤ 3 [% of the regulated max flow]						
Repeatability		≤ 1 [% of the regulated max flow]						

(1) for different Δp, the max flow is in accordance to diagrams in section 16.3

8 ELECTRICAL CHARACTERISTICS

Power supplies	Nominal : +24 VDC Rectified and filtered : VRMS = 20 ÷ 32 VMAX (ripple max 10 % VPP)			
Max power consumption	35 W			
Analog input signals	Voltage: range ±10 VDC (24 VMAX tolerant) Input impedance: Ri > 50 kΩ Current: range ±20 mA Input impedance: Ri = 500 Ω			
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			
Monitor outputs	Voltage: maximum range ± 5 VDC @ max 5 mA			
Enable input	Range: 0 ÷ 9 VDC (OFF state), 15 ÷ 24 VDC (ON state), 9 ÷ 15 VDC (not accepted); Input impedance: Ri > 87kΩ			
Fault output	Output range : 0 ÷ 24 VDC (ON state ≅ VL+ [logic power supply] ; OFF state ≅ 0 V) @ max 50 mA; 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, current control monitoring, power supplies level			
Protection degree to DIN EN60529	IP66/67 with relevant cable gland			
Duty factor	Continuous rating (ED=100%)			
Tropicalization	Tropical coating on electronics PCB			
Additional characteristics	Short circuit protection of solenoid current supply; current control by P.I.D. with rapid solenoid switching; protection against reverse polarity of power supply			
Electromagnetic compatibility (EMC)	According to Directive 2014/30/UE (Immunity: EN 61000-6-2; Emission: EN 61000-6-3)			
Communication interface	USB Atos ASCII coding	CANopen EN50325-4 + DS408	PROFIBUS DP EN50170-2/IEC61158	EtherCAT EC 61158
Communication physical layer	not insulated USB 2.0 + USB OTG	optical insulated CAN ISO11898	optical insulated RS485	Fast Ethernet, insulated 100 Base TX

Note: a maximum time of 500 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

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

Seals, recommended fluid temperature		NBR seals (standard) = -20°C ÷ +60°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option) = -20°C ÷ +80°C 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 **(1)**		NBR, NBR low temp.	HFC	

⚠ The ignition temperature of the hydraulic fluid must be 50°C higher than the max solenoid surface temperature

(1) Performance limitations in case of flame resistant fluids with water:
-max operating pressure = 210 bar
-max fluid temperature = 50°C

10 CERTIFICATION DATA

Valve type	QVHZA, QVKZA		
Certifications	Multicertification Group II **ATEX IECEx EAC CCC**		
Solenoid certified code	**OZA-AES**		
Type examination certificate **(1)**	• ATEX: TUV IT 18 ATEX 068 X • IECEx: IECEx TPS 19.0004X • EAC: RU C - IT.AЖ38.B.00425/21 • CCC: 2024322307006321		
Method of protection	• ATEX Ex II 2G Ex db IIC T6/T5/T4 Gb; Ex II 2D Ex tb IIIC T85°C/T100°C/T135°C Db • EAC 1Ex d IIC T6/T5/T4 Gb X; Ex tb IIIC T85°C/T100°C/T135°C Db X • IECEx, CCC Ex db IIC T6/T5/T4 Gb Ex tb IIIC T85°C/T100°C/T135°C Db		
Temperature class	**T6**	**T5**	**T4**
Surface temperature	≤ 85 °C	≤ 100 °C	≤ 135 °C
Ambient temperature **(2)**	-40 ÷ +40 °C	-40 ÷ +55 °C	-40 ÷ +70 °C
Applicable Standards	EN 60079-0 EN 60079-31 IEC 60079-0 IEC 60079-31:2013 EN 60079-1 IEC 60079-1		
Cable entrance: threaded connection	**M** = M20x1,5		

(1) The type examination certificates can be downloaded from www.atos.com
(2) The driver and solenoids are certified for minimum ambient temperature -40°C.
In case the complete valve must withstand with minimum ambient temperature -40°C, select **/BT** in the model code.

⚠ **WARNING: service work performed on the valve by the end users or not qualified personnel invalidates the certification**

11 CABLE SPECIFICATION AND TEMPERATURE - Power supply and grounding cables have to comply with following characteristics:

Power supply and signals: section of wire = 1,0 mm²	**Grounding:** section of external ground wire = 4 mm²

11.1 Cable temperature

The cable must be suitable for the working temperature as specified in the "safety instructions" delivered with the first supply of the products.

Max ambient temperature [°C]	Temperature class	Max surface temperature [°C]	Min. cable temperature [°C]
40 °C	T6	85 °C	80 °C
55 °C	T5	100 °C	90 °C
70 °C	T4	135 °C	110 °C

12 CABLE GLANDS

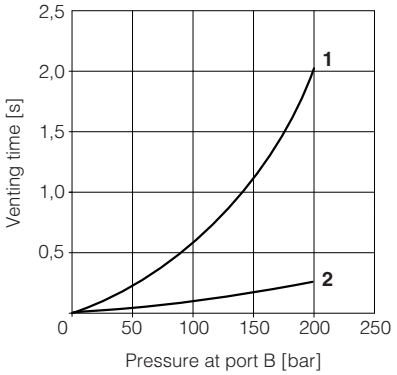
Cable glands with threaded connections M20x1,5 for standard or armoured cables have to be ordered separately, see tech table **KX800**

Note: a Loctite sealant type 545, should be used on the cable gland entry threads

13 HYDRAULIC OPTIONS

D = This option provides a quick venting of the use port B when the valve is closed or de-energized. The valve must be connected in 3 way, with P port connected to tank. When the proportional throttle is fully closed, the valve's port B is internally connected to port P (tank), permitting a quickly decompression of the pressure in the use line.
In the diagram aside are represented the venting times of **QVHZA** and **QVKZA** option **/D** respect to standard versions:

1 = standard versions
2 = option /D



14 ELECTRONIC OPTIONS

I = It provides 4 ÷ 20 mA current reference signal, 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.

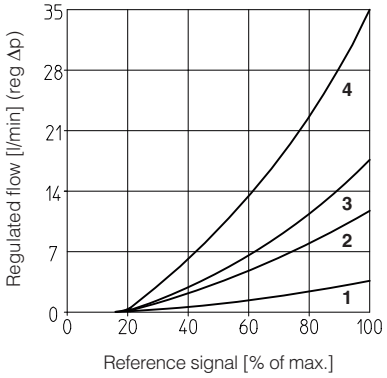
15 POSSIBLE COMBINED OPTIONS

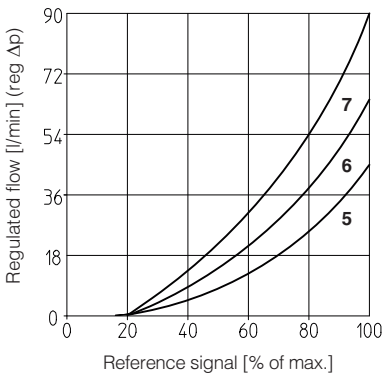
/DI

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

16.1 Regulation diagrams

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

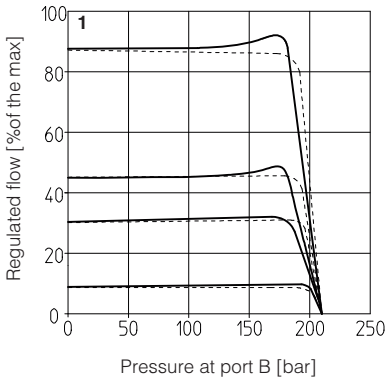


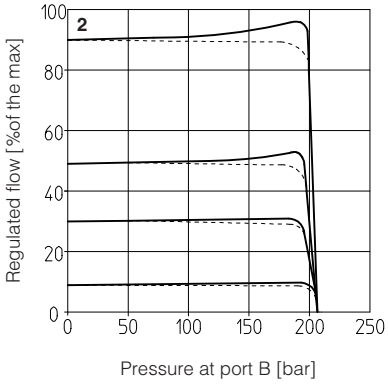


16.2 Regulated flow/outlet pressure diagrams
with inlet pressure = 210 bar

1 = QVHZA
2 = QVKZA

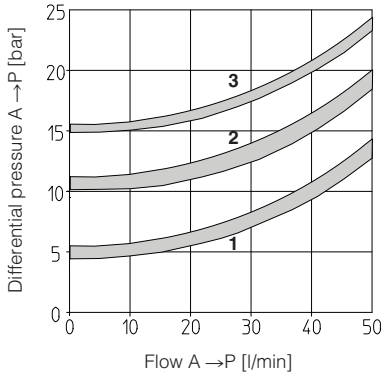
Dotted line for 3-way versions

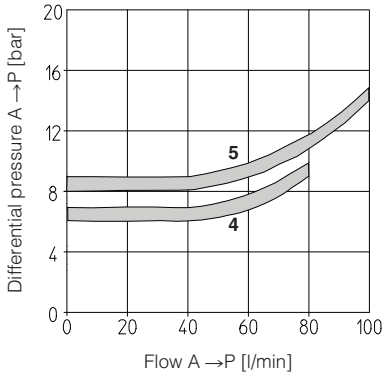




16.3 Flow A → P/Δp diagrams
3-way configuration

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





17 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).

17.1 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.

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

17.2 Power supply for driver's logic and communication (VL+ and VL0)

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 3 and 4, 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.

17.3 Flow reference input signal (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.

17.4 Monitor output signals (MONITOR)

The driver generates an analog output signal (MONITOR) proportional to the actual coil current 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).
Monitor output signal is factory preset according to selected valve code, default settings is 0 ÷ 5 VDC (1V = 1A).
Output signal can be reconfigured via software, within a maximum range of ±5 VDC.

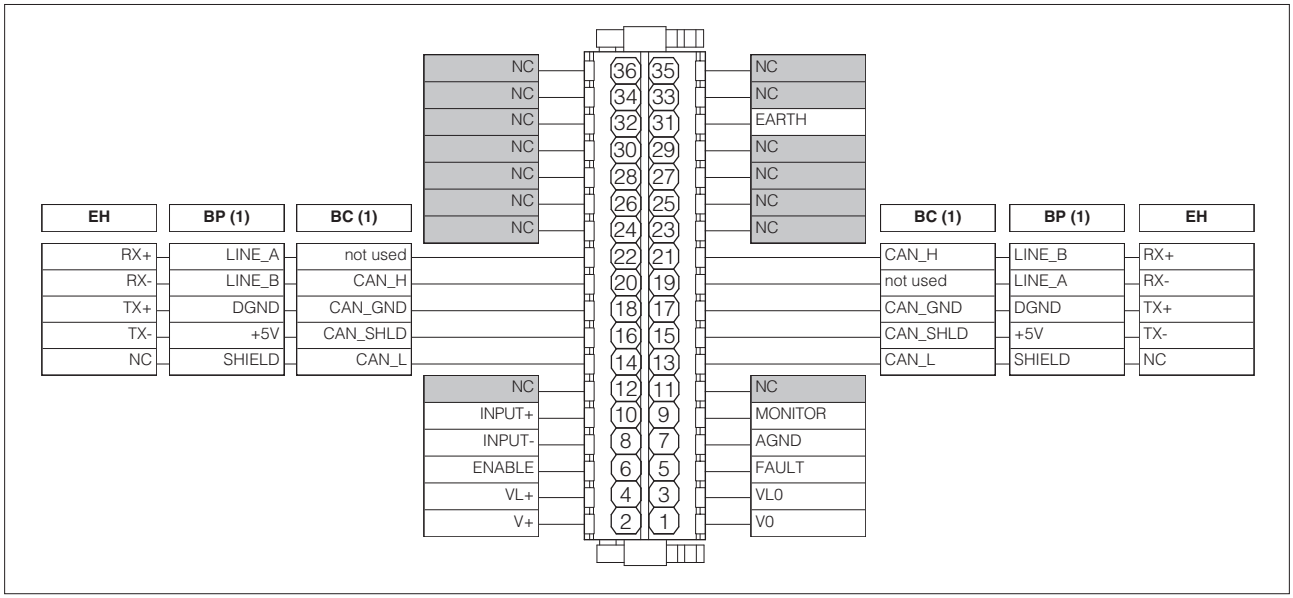
17.5 Enable input signal (ENABLE)

To enable the driver, supply a 24 VDC on pin 6: 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.

17.6 Fault output signal (FAULT)

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.

18 TERMINAL BOARD OVERVIEW



(1) For BC and BP executions the fieldbus connections have an internal pass-through connection

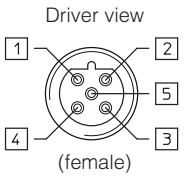
19 ELECTRONIC CONNECTIONS

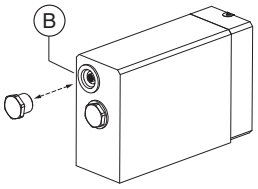
19.1 Main connections signals

CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES
A	1	**V0**	Power supply 0 VDC	Gnd - power supply
	2	**V+**	Power supply 24 VDC	Input - power supply
	3	**VL0**	Power supply 0 VDC for driver's logic and communication	Gnd - power supply
	4	**VL+**	Power supply 24 VDC for driver's logic and communication	Input - power supply
	5	**FAULT**	Fault (0 VDC) or normal working (24 VDC), referred to VL0	Output - on/off signal
	6	**ENABLE**	Enable (24 VDC) or disable (0 VDC) the driver, referred to VL0	Input - on/off signal
	7	**AGND**	Analog ground	Gnd - analog signal
	8	**INPUT-**	Negative reference input signal for INPUT+	Input - analog signal
	9	**MONITOR**	Monitor output signal: ±5 VDC maximum range, referred to AGND Default is: 0 ÷ 5 VDC	Output - analog signal **Software selectable**
	10	**INPUT+**	Reference input signal: ±10 VDC / ±20 mA maximum range Defaults are: 0 ÷ 10 VDC for standard and 4 ÷ 20 mA for /I option	Input - analog signal **Software selectable**
	31	**EARTH**	Internally connected to driver housing	

19.2 USB connector - M12 - 5 pin always present

CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS
B	1	**+5V_USB**	Power supply
	2	**ID**	Identification
	3	**GND_USB**	Signal zero data line
	4	**D-**	Data line -
	5	**D+**	Data line +





19.3 BC fieldbus execution connections

CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS
C1	14	**CAN_L**	Bus line (low)
	16	**CAN_SHLD**	Shield
	18	**CAN_GND**	Signal zero data line
	20	**CAN_H**	Bus line (high)
	22	**not used**	Pass-through connection **(1)**

CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS
C2	13	**CAN_L**	Bus line (low)
	15	**CAN_SHLD**	Shield
	17	**CAN_GND**	Signal zero data line
	19	**not used**	Pass-through connection **(1)**
	21	**CAN_H**	Bus line (high)

(1) pin 19 and 22 can be fed with external +5V supply of CAN interface

19.4 BP fieldbus execution connections

CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS
C1	14	**SHIELD**	
	16	**+5V**	Power supply
	18	**DGND**	Data line and termination signal zero
	20	**LINE_B**	Bus line (low)
	22	**LINE_A**	Bus line (high)

CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS
C2	13	**SHIELD**	
	15	**+5V**	Power supply
	17	**DGND**	Data line and termination signal zero
	19	**LINE_A**	Bus line (high)
	21	**LINE_B**	Bus line (low)

19.5 EH fieldbus execution connections

CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS
C1 (input)	14	**NC**	do not connect
	16	**TX-**	Transmitter
	18	**TX+**	Transmitter
	20	**RX-**	Receiver
	22	**RX+**	Receiver

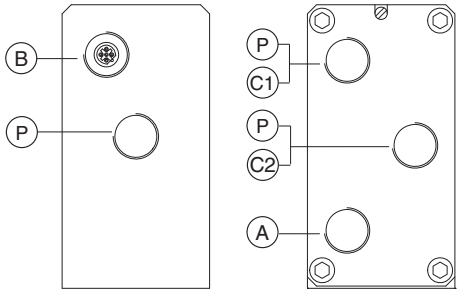
CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS
C2 (output)	13	**NC**	do not connect
	15	**TX-**	Transmitter
	17	**TX+**	Transmitter
	19	**RX-**	Receiver
	21	**RX+**	Receiver

20 CONNECTIONS LAYOUT

CABLE ENTRANCE OVERVIEW

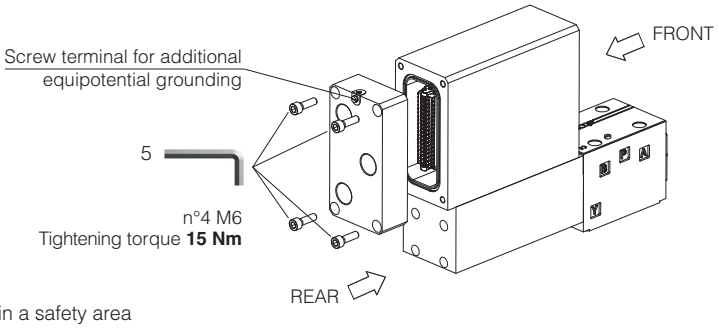
Cables entrance description:

- (A) main connections
- (B) USB connector always present (factory plugged)
- (C1) fieldbus interface (input)
- (C2) fieldbus interface (output)
- (P) threaded plug



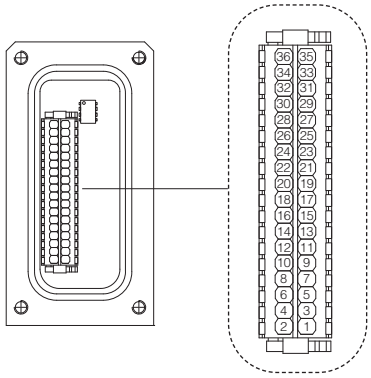
TERMINAL BOARD AND FIELDBUS TERMINATOR

Remove the 4 screws of driver's rear cover to access terminal board and fieldbus terminator

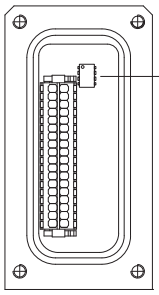


⚠ **WARNING:** the above operation must be performed in a safety area

Terminal board - see section 18

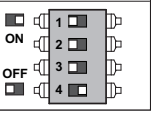


Fieldbus terminator only for BC and BP executions **(1)**



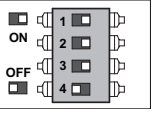
BC - CANopen setting:

Switch	Termination enabled
1	OFF
2	OFF
3	OFF
4	ON

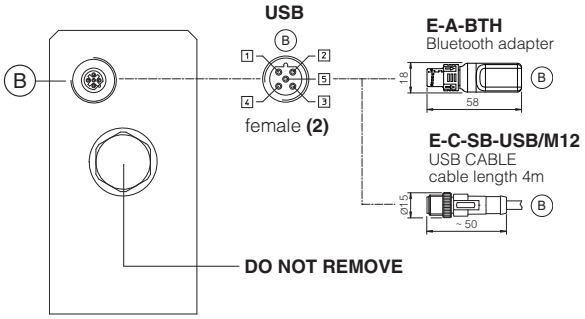


BP - PROFIBUS DP setting:

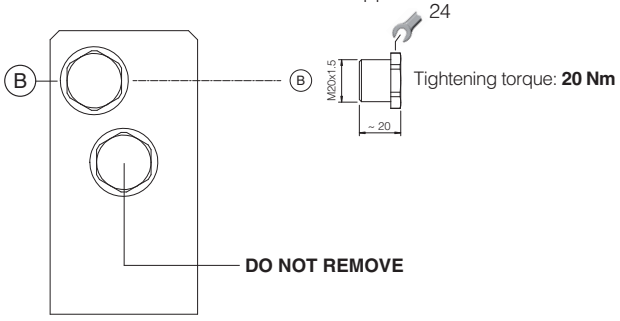
Switch	Termination enabled
1	ON
2	ON
3	ON
4	OFF



BLUETOOTH ADAPTER AND USB CONNECTOR

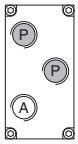
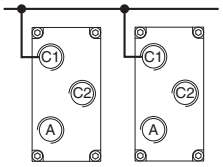
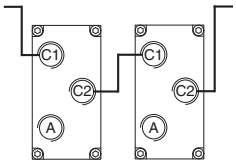


METALLIC PROTECTION CAP - supplied with the valves

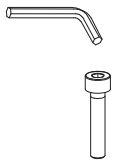


(1) Drivers with BC and BP fieldbus interface are delivered by default 'Not Terminated'. All switches are set OFF
(2) Pin layout always referred to driver's view

20.1 Cable glands and threaded plug for AES - see tech table **KX800**

Communication interfaces	To be ordered separately				Cable entrance overview	Notes
	Cable gland		Threaded plug			
	quantity	entrance	quantity	entrance		
NP	1	A	none	none		Cable entrance P are factory plugged Cable entrance A is open for costumers
BC, BP, EH "via stub" connection	2	C1 A	1	C2		Cable entrance A, C1, C2 are open for costumers
BC, BP, EH "daisy chain" connection	3	C1 C2 A	none	none		Cable entrance A, C1, C2 are open for costumers

21 FASTENING BOLTS AND SEALS

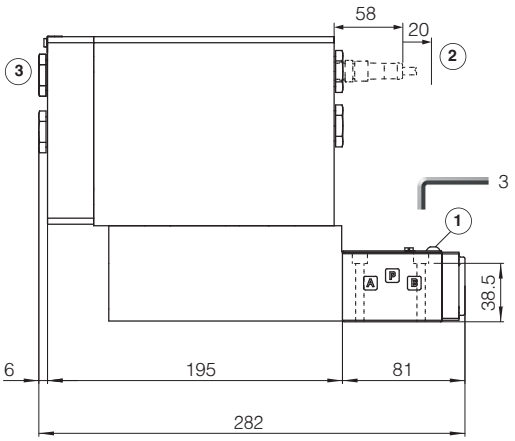
	QVHZA	QVKZA
	**Fastening bolts:** 4 socket head screws M5x50 class 12.9 Tightening torque = 8 Nm	**Fastening bolts:** 4 socket head screws M6x40 class 12.9 Tightening torque = 15 Nm
	**Seals:** 4 OR 108; Diameter of ports A, B, P, T: Ø 7,5 mm (max)	**Seals:** 5 OR 2050; Diameter of ports A, B, P, T: Ø 11,2 mm (max)

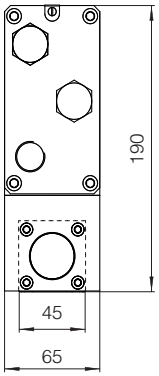
22 INSTALLATION DIMENSIONS [mm]

QVHZA-AES

ISO 4401: 2005
Mounting surface: 4401-03-02-0-05 (see tab. P005)

Mass [kg]	
QVHZA-AES	8,2

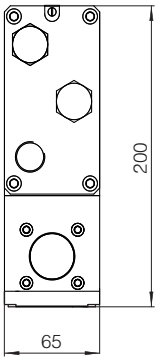


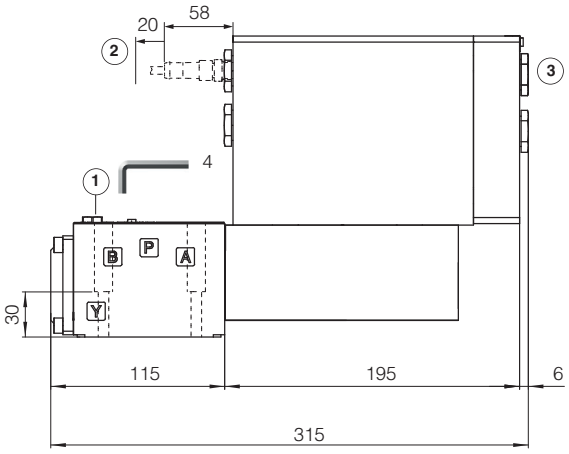


QVKZA-AES

ISO 4401: 2005
Mounting surface: 4401-05-04-0-05 (see tab. P005)

Mass [kg]	
QVKZA-AES	10





(1) = Air bleed off
(2) = Space required for connection cable and for Bluetooth adapter or USB connector removal
(3) = The dimensions of cable glands must be considered (see tech table **KX800**)

23 RELATED DOCUMENTATION

X010 Basics for electrohydraulics in hazardous environments
X020 Summary of Atos ex-proof components certified to ATEX, IECEx, EAC, PESO, CCC
FX900 Operating and manintenance information for ex-proof proportional valves
GS500 Programming tools
GS510 Fieldbus
P005 Mounting surfaces for electrohydraulic valves
E-MAN-RA-AES AES user manual